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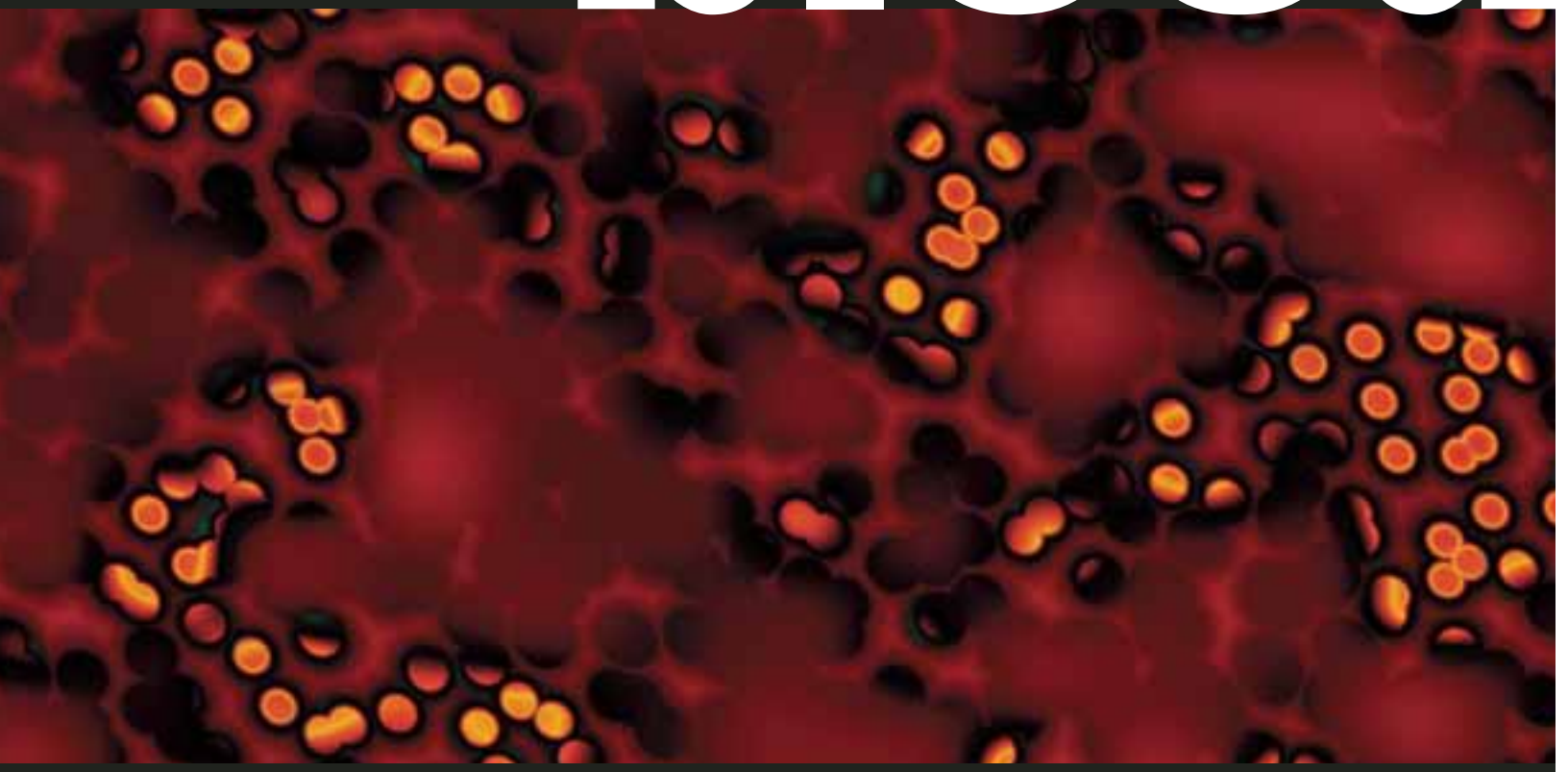
blood



TERI JUNGE, CST/CFA

components

Whole blood consists of two main elements: the formed elements and the liquid element. The formed elements are cell fragments and cells, known as corpuscles, which account for approximately 45% of the total volume of the blood. The liquid element is the intracellular matrix, known as plasma, which accounts for approximately 55% of the total volume of the blood. In the adult, hematopoiesis (blood cell production) occurs in the red bone marrow (myeloid tissue) and all types of blood cells are produced from a single type of pluripotent stem cell (hemocytoblast). Additionally, some leukocytes are produced by the lymphatic system.

Editor's Note: This is part of a review series of short articles about blood. An article on blood basics was published in the January 2003 issue. The attached CE covers the first two articles in this series.

Corpuscles

The formed elements of blood are the erythrocyte (red blood cell, RBC), leukocyte (white blood cell, WBC), and thrombocyte (platelet).

Erythrocytes

Normal mature erythrocytes are red nonnucleated biconcave disks that measure approximately 7.5 microns in diameter. The biconcave shape increases the surface area of the cell and allows flexibility of the cell during passage through the capillaries. Each red blood cell consists of a cell membrane, which encloses the hemoglobin and the cytoplasm. Hemoglobin is the red-pigmented portion of the erythrocyte. Each hemoglobin molecule consists of four polypeptide chains (known as globin) and four nonprotein pigments (known as heme) that contain one ferrous iron atom at the center. This configuration allows four binding sites per hemoglobin molecule. Hemoglobin synthesis depends on the presence of iron and vitamins C, B2, B3, B6, B12, E, and folate (a form of a water-soluble B vitamin). Hemoglobin is responsible for carrying oxygen to the cells (in the form of oxyhemoglobin) and waste products (such as CO_2 in the form of carbaminohemoglobin) away from the cells. Antigens (agglutinogens) contained within the membrane of the erythrocyte determine an individual's blood type (ABO and Rh, positive or negative).

Red blood cell production is triggered by an oxygen sensing (negative feedback) mechanism within the cells of the kidney. A reduced number of erythrocytes results in less oxygen being delivered to the kidney (hypoxia) which in turn causes the kidney cells to release an enzyme capable of converting one of the plasma proteins into a hormone called erythropoietin. Erythropoietin causes the red bone marrow to produce more red blood cells. In turn, the additional red blood cells deliver more oxygen to the kidney cells and the signal to release the enzyme is disrupted. The life span of a red blood cell is 120 days; approximately 2.5 million (1% of the total) red blood cells are replaced per second. Red blood cells are not capable of division.

The process of erythropoiesis (red blood cell production) is as follows:

- The pluripotent stem cell is stimulated by the hormone thrombopoietin (secreted by the liver) to become a blood cell (red blood cell, white blood cell—with the exception of the lymphocyte, or a platelet) in the myeloid tissue (myeloid progenitor).
- The myeloid progenitor is stimulated by erythropoietin to produce the megakaryocyte/erythroid progenitor (proerythroblast), which is the differentiated stem cell that will eventually become the erythrocyte (takes approximately 12 hours) or the thrombocyte.
- As the euchromatic nucleus of the proerythroblast begins to shrink and the cytoplasm darkens with ribosomes, the basophilic erythroblast is formed (takes approximately 19 hours).
- The basophilic erythroblast begins to produce hemoglobin and becomes a polychromatophilic erythroblast (takes approximately 32 hours).
- The polychromatophilic erythroblast becomes an orthochromatic erythroblast (takes approximately 48 hours).
- The reticulocyte forms as the orthochromatic erythroblast shed its nucleus.
- The reticulocyte (marrow reticulocyte) begins to mature in the bone marrow (takes approximately 41 hours).
- The marrow reticulocyte transitions (is extruded) into the blood (blood reticulocyte) where it continues to mature (takes approximately 32 hours).
- The circulating mature red blood cell is functional for approximately 120 days.

Normal destruction of aged, abnormal, or damaged red blood cells takes place primarily in the spleen and liver but can also occur in bone marrow and lymph nodes via phagocy-

tosis. Hemoglobin is divided into globin and heme. Globin is broken down into amino acids that are recycled. The heme is further divided into bilirubin and iron. Iron is recycled to the red bone marrow and bilirubin is sent to the liver and is secreted in bile. The bile is excreted into the intestine where the bilirubin is converted into pigment that is expelled with the feces.

Leukocytes

Leukocytes are round colorless nucleated cells that are part of the body's defense mechanism. White blood cell production is called leukopoiesis. Leukocytes are initially released from the bone marrow into the blood stream; however, they do not remain in the circulating blood. From the blood, the various cells escape through the capillary walls by a process called diapedesis. Leukocytes are mobile cells that migrate to the extravascular tissues using amoeboid motion. Each type of leukocyte performs a different function and has a different life span. Leukocytes are divided into two main categories: granulocytes and agranulocytes.

Granulocytes

The cytoplasm of the granulocyte contains granules. Formation of granulocytes is called granulopoiesis. There are three types of granular leukocytes: neutrophils, eosinophils, and basophils.

Neutrophils

Neutrophils are the most common type of leukocyte accounting for approximately 54%-62% of all leukocytes. Mature neutrophils are released from the bone marrow into the blood. The neutrophils migrate from the blood to the interstitial fluid where they await activation (due to an injury or infection). Neutrophils use phagocytosis to ingest other cells, bacteria, necrotic tissue, and foreign particles and then destroy them with the use of oxidants (expose the cell to destructive oxygen), lysozymes (enzymes destructive to certain bacterial cell membranes), or defensins (antibiotic polypeptides that are destructive to certain bacterial cell membranes).

Neutrophils develop as follows:

- The pluripotent stem cell is stimulated by the hormone thrombopoietin (secreted by the liver) to become a blood cell (red blood cell, white blood cell—with the exception of the lymphocyte, or a platelet) in the myeloid tissue (myeloid progenitor).
- The myeloid progenitor is stimulated by granulocyte monocyte colony stimulating factor to produce the granulocyte macrophage progenitor, which is the differentiated stem cell that will eventually become either a granulocyte or a monocyte.
- The granulocyte macrophage progenitor is stimulated by granulocyte colony stimulating factor to become a neutrophil.

Eosinophils

Eosinophils account for approximately 1%-3% of all leukocytes. Eosinophils use phagocytosis to ingest the undesirable material and destroy it by releasing its cytotoxic granules. Function of the eosinophil is not completely understood. Eosinophils are associated with allergic reactions, inflammation, and the destruction of parasites and certain types of cancer cells.

Eosinophils develop from the granulocyte macrophage progenitor (refer to neutrophil development for the initial developmental stages) when the granulocyte macrophage progenitor that has been stimulated by granulocyte colony stimulating factor to become a neutrophil is additionally

influenced by interleukin-5 to become an eosinophil.

Basophils

Basophils account for less than 1% of all leukocytes. Basophils accumulate at the site of an infection or inflammation, then release their granules that contain mediators (such as heparin, histamine, and serotonin), which increase blood flow to the area. Basophils contribute to (intensify) allergic responses such as hay fever or anaphylaxis related to an insect sting.

Basophils develop from the granulocyte macrophage progenitor (refer to neutrophil development for the initial developmental stages) when the granulocyte macrophage progenitor that has been stimulated by granulocyte colony stimulating factor to become a neutrophil is additionally influenced by interleukin-3 to become a basophil.

Agranulocytes

The cytoplasm of the agranulocyte is relatively clear. Formation of agranulocytes is called agranulopoiesis. There are two types of agranular leukocytes: monocytes and lymphocytes.

Monocytes

Monocytes account for approximately 3%-7% of all leukocytes and are the largest of all leukocytes. Monocytes mature as they enter the blood stream to become macrophages. Macrophages are large phagocytes that migrate to the tissues (especially the liver, lungs, and lymph nodes) and engulf particulate matter such as antigens (foreign material) and dying or dead body cells. Monocytes along with T and B-lymphocytes are important in the immune response system.

Monocytes develop from the granulocyte macrophage progenitor (refer to neutrophil development for the initial developmental stages) when the granulocyte macrophage progenitor is stimulated by macrophage colony stimulating factor to become a monocyte (which eventually matures to become a macrophage).

Lymphocytes

Lymphocytes account for approximately 25%-38% of all leukocytes. There are two main types of lymphocytes: B-lymphocytes (cells) and T-lymphocytes (cells). Lymphocytes mediate the immune response.

Lymphocytes develop as follows:

- The pluripotent stem cell in the bone marrow is stimulated by interleukin-7 to become a lymphoid progenitor.
- Some lymphoid progenitors are released (and transported through the blood) to the thymus where they mature to become T-lymphocytes (hence the name T-cell).
- Other lymphoid progenitors remain in the bone marrow where they are further stimulated by interleukin-6 to become B-lymphocytes (hence the name B-cell).

B-Lymphocytes

B-lymphocytes circulate through the body in the blood, but concentrate in certain tissues (eg, liver), or the lymphoid organs such as the lymph nodes, tonsils, and the spleen. B-cells are specific only to one type of antigen and produce only one type of antibody. B-cells divide mitotically in the bone marrow producing more lymphocytes (clones) containing the genetic material for the same antibody. There are two main types of B-cells: plasma cells and memory cells.

Plasma cells produce and release an antibody specific to a certain type of antigen. Memory cells contain antibody information specific to a certain type of antigen. If the same antigen is encountered again, the memory cells divide rapidly replicating the specific plasma cells and producing more memory cells. Because of the memory cells, the body's second response to the antigen is more rapid.

T-Lymphocytes

T-lymphocytes have specific cell receptors on their surface that are similar to antibodies and are specific to one antigen. T-cells are activated during contact with an antigen. The T-cell with the specific antibody responds by dividing mitotically. There are three main types of T-cells: helper T-cells, killer T-cells, and memory T-cells.

Helper T-cells release cytokines when the receptors on their surface are activated. The cytokines stimulate the related B-cells to divide into plasma cells that make the antibody. The cytokines also stimulate macrophagic phagocytosis.

Killer T-cells (sometimes called natural killer cells) search for and bind to body cells affected by an invader displaying a certain antigen. The killer T-cells kill both the invader and the affected cell by attaching to the cell and secreting a toxin such as hydrogen peroxide.

Memory T-cells are similar to memory B-cells because they initiate a more rapid response if the same antigen is reencountered.

Thrombocytes

Thrombocytes are small nonnucleated cell fragments. Thrombocytes are part of the blood clotting process (cascade). When a vascular injury occurs, thrombocytes are attracted by and adhere to exposed collagen on the blood vessel wall. The clumped (aggregated) thrombocytes swell and release ADP contained in their granules causing more thrombocytes to adhere to the site forming a plug and thereby reducing blood loss. They also release chemicals that cause vascular spasm at a site of injury. The lifespan of a thrombocyte is approximately four days.

The process of thrombopoiesis (platelet production) is as follows:

- The pluripotent stem cell is stimulated by the hormone thrombopoietin (secreted by the liver) to become a blood cell (red blood cell, white blood cell—with the exception of the lymphocyte, or a platelet) in the myeloid tissue (myeloid progenitor).
- The myeloid progenitor is stimulated by erythropoietin to produce the megakaryocyte/erythroid progenitor, which is the differentiated stem cell that will eventually become the erythrocyte or the thrombocyte.
- The megakaryocyte/erythroid progenitor is again stimulated by thrombopoietin as well as interleukin-11 to become the megakaryocyte.
- The megakaryocyte replicates its DNA repeatedly while still in the bone marrow, the cell enlarges but does not divide.
- The megakaryocyte ruptures and fragments of the cytoplasm (thrombocytes) enter the blood.
- Some thrombocytes remain in circulation while others are stored in the spleen and released as needed.

Plasma

Plasma, the straw-colored liquid element of blood, is made up of approximately 90% water. The remaining 10% consists of a variable number of substances such as proteins, nutrients, amino acids, lipids, electrolytes, vitamins, hor-

mones, drugs, and waste products that are either suspended or dissolved in the water. Variations occur as substances are added and removed from the plasma as the blood circulates through the tissues. Proteins account for the largest percentage of material in the plasma. Plasma is the transportation medium for the corpuscles.

> ***Serum***
> Serum is what remains of the plasma when the clotting factors are removed.

Note: Many factors influence hematopoiesis—not all are listed in this brief article.

About the author

Teri Junge, CST/CFA, is currently the surgical technology program director for the San Joaquin Valley College, Fresno, California. While on AST's staff as medical editor, she wrote numerous *Journal* articles and educational materials, including chapters for the future second edition of the textbook, *Surgical Technology for the Surgical Technologist: A Positive Care Approach.*

References

1. Blood (2002). Kimball, JW. *Kimball's Biology Pages.* ***users.rcn.com/jkimball.ma.ultranet/BiologyPages/B/Blood.html*** Accessed 1-2-03
2. Blood and Cardiovascular Physiology (2001). Fyffe, WE. Northwest Nazarene University. ***courses.nnu.edu/bi362bf/newpage4.htm*** Accessed 1-2-03
3. *Human Anatomy & Physiology, second edition (1990).* Solomon, EP, Schmidt, RR, Adragna, PJ. Saunders: Fort Worth, TX.
4. *Surgical Technology for the Surgical Technologist: A Positive Care Approach (2001).* Caruthers B, et al. Delmar Thompson Learning: Albany, New York.
5. *The Anatomy and Physiology Learning System (1995).* Applegate, E. W.B. Saunders Company: Philadelphia, PA.
6. *The Blood (1994).* Corrigan, D. Association of Surgical Technologists: Englewood, CO.
7. *The Human Body in Health & Disease, eighth edition (1996).* Memmler, RL, Cohen, BJ, Wood, DL. Lippincott: Philadelphia, PA.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The challenges of medical futility

REBECCA PIEKNIK, CST, BHS

The definition of medical futility continues to elude the medical profession. The tendency to aggressively treat gravely ill patients prompts physicians to consider the reliability of the treatment goals, not to mention how to justify those goals in light of their obligation to do good and avoid harm for their patients. This article examines the various concepts of medical futility and considers the feasibility of developing practice guidelines to help clarify treatment options and justify appropriate treatment goals.

Medical futility falls into the void of obscure conduits that often plague the medical community in the decision-making process. Medical futility can best be defined as an instance when a terminally ill patient and others for whom everything medically plausible, including heroic methods, has been tried; or a situation in which a patient has exhausted the course of innovative and tested therapeutic interventions, and nevertheless will die or live endlessly in a persistent vegetative state (PVS). An intervention is medically futile when there is no therapeutic benefit to the patient nor will the treatment return the patient back to an acceptable level of continued existence. When comparing the quality of the outcome to the intervention, the outcome falls below the minimally established guidelines determined by the social standards set in the community. In addition, the likelihood of medical treatment offering any positive physiological benefit to the patient would not be measurable.[5] This article seeks to clarify medical futility together with the rationale for creating a policy. It will also examine the importance of having guidelines in place and what guidelines should be embraced in order to avoid nonmaleficence and promote respect for persons and justice in the medical arena.

The concept of medical futility continues to elude the medical community. It is as individual in meaning to patients as their diagnoses. This challenges hospitals to establish medical futility guidelines and develop a policy that not only encompasses a patient's autonomy, but also supports the ethical principles of respect for persons, beneficence and justice. These principles are the basis of the physician-patient relationship. Autonomy gives the patient the right to determine what course of action is preferable, based on their own value system. The ethics of medicine refers not only to the rules, customs and beliefs of a society; it also attempts to enunciate and evaluate those rules, customs and beliefs.[9] Englehardt and Beauchamp elaborated on the ethical principles that have become the foundation of the physician-patient relationship.[9]

For more than a decade, bioethics and health care professionals have struggled to define the exact meaning of medical futility.[14] Often, by the time the physician is comfortable in labeling a patient's treatment medically futile, success of the treatment is nonexistent. The word "futile" is derived from the Latin word *"futilis,"* meaning that which easily melts. The common usage developed from the Greek legend in which the daughters of Danaus, King of Argos, murdered their husbands and as punishment, were condemned to collect water for eternity in leaking buckets. To arrive at a destination with an empty bucket, when the goal was to bring water, offers the definition of futile as something that is useless or ineffective.[1]

Two questions often arise. 1) Have we taken the respect for patient autonomy too far? 2) Does patient autonomy automatically require the physician to provide any treatment plan that the patient or surrogate desires? Treating the patient with interventions that will not improve physiologic functioning could be construed as unethical. Hippocrates advised us to refuse to treat those who are overmastered by their disease. According to the American Medical Association's Code of Ethics, physicians have no obligation to suggest futile intervention based upon the ethical principle of beneficence. We can also ascertain that nonmaleficence disallows physicians from harming patients with futile interventions that could infer injury to the patient.[3] Yet the challenge remains: define and incorporate medical futility guidelines into the continuum of care, while offering medical interventions that provide positive physiological benefit for the patient.

Four concepts of futility

In bioethical literature, four basic concepts of futility have been identified. As presented by Tomlinson and Brody from Michigan State University, the first concept is based on beneficence, and emphasizes physiological or strict futility.[10] The intervention is considered futile in the sense that it is unlikely to produce a physiological benefit. For example, a patient with a Glasgow

Coma Score of 3 after an intracerebral bleed is strictly futile as there is no expectation for spontaneous brain function to be re-established.[10] Therefore, the procedure is unlikely to be successful in achieving its objective.

The second concept introduced by Schneiderman identifies clinical or overall futility. The intervention is futile when it is unlikely to restore the patient's ability to interact with the environment and resume human development. An example is one where the patient is in a persistent vegetative state (PVS) who has irreversibly lost these capacities. Even though parenteral nutrition or the dispensing of fluids is physiologically effective, the patient will not benefit.[10] An example of this would be a patient in a PVS state who has received parenteral nutrition and remains in a PVS state indefinitely.

The case of Nancy Cruzan falls under this concept of medical futility. Nancy Cruzan, at the age of 24, lost control of her car, leaving her in a water-filled ditch. Paramedics arrived on the scene to find her heart had stopped. Although they were able to shock her heart into action, her brain had been deprived of oxygen too long, and Nancy was PVS. Nancy was kept alive with a respirator and feeding tube for seven years. Her care cost the state of Missouri $112,000 per year. In those seven years, Nancy never interacted with family or friends again. The feeding tube and respirator were merely apparatuses that connected Nancy to this world, keeping only her body, but not her mind, in the present time.

The third concept is imminent demise futility, which has been identified by Brody and Halevy.[10] An intervention is futile when the patient is unfailingly expected to die without recovering consciousness before being discharged from the clinical setting. Studies have shown that patients who have arrested outside the clinical setting and were not successfully resuscitated on arrival in the emergency department were dead at discharge, and few ever regained consciousness.[10]

Qualitative futility, the fourth element of the concepts of medical futility, was presented by Tomlinson and Brody. The intervention may be deemed futile if the quality of life after treatment is unacceptable to the patient.[10] Other guidelines extend the scope to include when the quality of life resulting from the treatment is exceedingly poor by the minimum standards, thereby substantiating medical futility. Clinical paradigms of futile care will often involve life-sustaining intervention for patients in a persistent vegetative state or resuscitation efforts.[11] This concept can also be illustrated by treatment that is so unlikely to succeed that many people would state that it is not worth the cost.

Qualitative versus quantitative futility

Further defined in the fourth element are the distinctive aspects that differ between qualitative and quantitative futility. Medical futility is associated with interventions that are unlikely to produce any significant benefit for the patient.[8] Qualitative futility is treatment that is considered futile: if "it offers no reasonable hope of recovery or physiological improvement or because the person is permanently unable to experience any benefit."[16]

One such example of qualitative futility is the case of a 65-year-old retired corporate vice president who became ill with pneumonia, needed mechanical ventilation and was admitted to the intensive care unit (ICU). His treatment in the ICU became complicated by adult respiratory distress syndrome, prolonged ventilation requiring tracheostomy and subsequent chronic pulmonary insufficiency. During his stay in the ICU, cardiopulmonary arrest occurred. Resuscitation efforts were successful, but the patient suffered severe anoxic encephalopathy secondary to the cardiac arrest and remained in a persistent vegetative state. Three months after the cardiac arrest, the neurologist concluded that the patient's chances for a meaningful recovery were slim.

The caregivers spoke to the Orthodox Jewish family about a do-not-resuscitate (DNR) order, but the family refused the order, stating religious obligations to preserve life. After lengthy discussions, the health care team called in a bioethicist. Ultimately, CPR was determined to be physiologically futile, the DNR was written

against the family's wishes, and the family sought a court injunction to remove the DNR. The decision was upheld based on the Joint Statement on Resuscitative Interventions, a position paper published by the Canadian Medical Association.

A second case of qualitative futility is that of Helga Wanglie (see sidebar). The physician felt that ventilation was futile since it could not heal her lungs, palliate her suffering, or enable the unconscious patient to reap the benefit of the life enhanced by respirator support.[3] The husband claimed the patient only wanted to extend her life and valued any life, therefore, she was entitled to ventilation even though she was in a vegetative state. This case is one of a value judgment as the physician and the patient differ in opinion. The treatment was not futile from the husband's point of view, since the physiological effect was the extension of her life. The patient's autonomy to choose continued treatment was respected, albeit the physician felt there was no benefit to the treatment and deemed it futile. Both views are value laden. Medical futility is rooted in the belief that medical treatment will offer no physiological benefit to the patient. When addressing medical futility, many have found there is no clear, concise answer.

To better understand qualitative futility, it is more explicable to assign it a value. When determining if a treatment is futile using documented futility guidelines, health care professionals can look at the percentage or value determined for the probability of the treatment. For example, a surgeon might deem a treatment futile, unless it has at least a 10% chance of success, while the dilemma arises when the patient's family or surrogate might be willing to accept a 0% or 1% chance of success.[14]

Baby K is a classic case of medical futility based on a value system. Baby K was born with the terminal condition of anencephaly. The family felt the continuation of artificial respiration was a benefit even though there was a 0% chance of Baby K becoming conscious or having any quality of life. The mother felt that the ongoing condition of life was benefit enough. According to Dr Shelton, "Our society allows people to make irrational decisions in many areas of their lives, even if the life plans they have chosen have no chance of being achieved."[14] Can medical futility be defined in a society with such a tolerance for individual choice? This raises the ethical issue of allocating scarce resources. If we allowed scarce resources to be used on Baby K, is treatment denied to others who would benefit?

Quantitative futility is when the likelihood or probability that an intervention will benefit the patient is unlikely.[8] This concept, more evident in everyday clinical settings, is more likely to be received as standard everyday practice. A physician who prescribes antibiotics for a viral infection is practicing quantitative futility. The treatment will not benefit the patient; therefore, what justification does the physician have for prescribing the drugs? Is it accurate to assume that quantitative futility is influenced by the economics of treating patients? The physician is likely to prescribe antibiotics, since not doing so might compel the patient to seek treatment from another physician. Would the physician be culpable of medical futility if the patient did receive benefit from the antibiotic although the outcome was not anticipated when the drug was prescribed?

Another illustration of quantitative medical futility can be recognized in brain death criteria. According to Dr Doty, "The diagnosis of death is uncontroversial when made at the bedside by establishing the irreversible cessation of heart, lung and brain functions. When CPR and life support systems are used, brain death often occurs despite the reversal of cardiac and respiratory arrest."[3] It is conceivable that each time CPR is administered on a patient showing signs of brain death, the functions of heart, lung and brain are still reversible.

The use of chemotherapy for incurable cancer is a clear case of quantitative futility. Despite the administration of chemotherapy treatment, the patient will die. The empirical evidence docu-

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Landmark cases: the case of Helga Wanglie

The case of Helga Wanglie is one of informed demand for nonbeneficial medical treatment. Helga was an 85-year-old woman who was taken from the nursing home where she resided to the Hennepin County Medical Center on January 1, 1990 for emergency treatment of dyspnea from chronic bronchiectasis. She was intubated and placed on a respirator. Occasionally she was in discomfit and, although she recognized her family, she could not communicate very well. In May, attempts were made to wean her from the respirator without success. She was transmitted to a chronic care hospital. One week later her heart stopped during another attempt to wean her from the respirator. She was resuscitated and taken to another hospital for intensive care.[2] She remained unconscious.

The physician at the facility suggested it might be time to consider withdrawing life support. The family opted to transfer her back to a medical center on May 31. Two weeks later, physicians concluded Helga was in a persistent vegetative state (PVS) from the result of severe anoxic encephalopathy. She was maintained on a respirator with treatments of antibiotics, recurrent airway suctioning, tube feedings, air flotation bed and biochemical monitoring. In June and July of 1990, physicians suggested to the family that life sustaining treatment be withdrawn as it was not beneficial. Helga's husband, son and daughter insisted on continued treatment. "They felt the physicians should not play God, that the patient would not be better off dead, that removing life support showed moral decay in our civilization and that a miracle could occur."[2]

Wanglie at age 86 died of sepsis on July 4, 1991, after being in a persistent vegetative state for over a year. Her case was part of the controversy over the "right to die." The court case was held just three days prior to her death. Her husband and children wanted her life maintained at all costs, while the medical institution and doctors who were caring for her felt treatment was inappropriate and futile.

This case is different from the classic cases of Karen Ann Quinlan* and Nancy Cruzan in the fact that the family here was insistent on continuing treatment; whereas in the cases of Quinlan and Cruzan, they wished to suspend treatment. Mr Wanglie believed life should be maintained as long as possible, under any circumstances and he affirmed that his wife felt the same way.

The court favored on the side of Mr Wanglie, being consistent in the opinion that affirmed the right of the family to make decisions about life-sustaining treatment. Guardianship was granted to Mr Wanglie, and the judge felt the important message was who made the decision, not what decision was made. Since Mrs Wanglie was in a persistent vegetative state, she was not suffering. This eliminated the argument that her best interests were being violated by the continued use of the respirator. The hospital argued the case that the use of the respirator failed to serve her best interests and should not be continued. This argument allowed for victory for the hospital. If Mr Wanglie had won the court case, then it would mean that patients or families could demand treatments they wished, regardless of its efficacy. The media called attention to the fact that the expense of maintaining a patient on life support should be looked at when those resources could be used for people who would clearly benefit.[1]

References

1. Angell M. The Case of Helga Wanglie. *New England Journal of Medicine.* 1991;325(7):512-514.
2. Miles SH. Sounding Board. *New England Journal of Medicine.* 1991;325(7):512-514.

** Editor's Note: Karen Ann Quinlan was another landmark right-to-die case. The 21-year-old suffered brain damage and became PVS after drinking alcohol and taking tranquilizers at a party in 1975. After the family won a long legal battle to remove life support, Quinlan stunned the nation by breathing on her own after the respirator was unplugged. She continued to live without aid until 1985.*

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menting the outcome of treatment will establish whether a treatment is futile or not.

Establishing guidelines

In the 16th and 17th centuries, Roman Catholic moral theology created a distinction between ordinary and extraordinary care that states treatment was no longer obligatory, when it was extraordinary.[4] One defines extraordinary care as treatment that is inappropriate. Administering CPR to a person with a cardiac rupture would be futile and inappropriate treatment. Guidelines for medical futility should begin with the cessation of inappropriate treatment.

The process of death is different today than it was 100 years ago. End-of-life care was regularly administered at the bedside of the patient in their residence, but the advancement of technologies has moved the location to the health care setting. It is possible to prolong life due to the significant advances of medical technology, yet this intervention may not lead to a meaningful realization of goals for the patient.[12]

Another complication is the fact that the majority of patients have not designated advanced directives to guide their end-of-life care, thereby challenging the physician administering care to act in the patient's best interest.

It is also plausible that surrogate decision making and family disagreements will cause further debate when determining medical treatment by caregivers. The acceptance of medical futility by the physician, patient and family should not lessen medical care.

Futility has been established as a concept to guide physicians in avoiding the provision of inappropriate care that could be harmful.[4] Guidelines of futility should incorporate considerations for the chance of success, cost, life expectancy and the quality of life after treatment into the decision-making process when determining whether therapeutic treatments should be offered to patients.[4] Once treatment is deemed futile, a shift in the continuum of care should be initiated with attention to the provision of palliative care. Palliative care can improve the quality of a patient's life even though it may not prolong it. While assuring the patient's autonomy is respected, the issue of pain management should be considered the standard of care. Hospice care can be instituted to deal with end-of-life pain and symptom management.

In establishing guidelines, a patient's physician should possess initial authority to consider treatment futile, although it should not be solely a unilateral decision. When the physician deems treatment futile, written guidelines will clarify issues that could arise, since each physician has different thresholds for determining futility. First, established treatment options should guide the physician when explaining the reasons supporting the futility judgment. Second, written procedures should be established for the family, if they choose to challenge the futility judgment. Also, educating the family to the conditions of medical futility is essential before a policy can be enforced. Finally, ultimate authority to determine if treatment is futile should be decided by the medical profession and should conform to the well-established standards of care.[8]

The institution should also recognize the need to address the core element of the American health care system which asserts that all Americans will be provided with adequate health care. Good communication with the family is essential to promoting beneficence and nonmaleficence. The design of a medical futility policy should meet the needs of a community as a whole and not be construed as a custom-designed policy for a particular hospital. Many hospitals are afraid of any futility policy that could be construed as a method of saving money over providing quality health care. If possible, the medical community should establish a community-wide policy that would eliminate the possibility of hospitals being accused of practicing health care rationing and cost containment as the basis of their medical futility policy.

In 1991, the Patient Self Determination Act established advance directives to give patients and surrogates a voice in the determination of care. While this aided patients, it also opened

the door for a new set of problems. With this principle, a new trend evolved as families began demanding treatment and aggressive interventions that a physician deemed inappropriate. A policy that includes conflict resolution guidelines would aid physicians in cases where they arrive at a decision of futility when the family is in complete opposition. A physician making a judgment of futility might use documented empirical evidence that reveals the outcome of an intervention for the different groups of patients.[8] The evidence in futility should show that no significant likelihood exists for a significant benefit.[8]

This approach should be supplemented with continual dialogue with the family throughout the course of treatment. According to Solomon, studies show that physicians who are involved in decisions with end-of-life care find improvement in advance care planning, quality of end-of-life decision making and lower resource utilization, when they have established an institutional routine that requires conversation about the goals of care.[15] Without these guidelines in place, medical staff often communicate unrealistic hope to the family when they fail to provide honest information regarding the patient's condition. This can produce extremely harmful discord and lack of trust between the family and caregivers.

Goals of care assessment tool (GCAT)

"The use of structure instruments that gather and organize data needed to make judgment about appropriate goals of care can be beneficial for clinicians and families."[15] The Goals of Care Assessment Tool (GCAT) is used to collect relevant clinical and narrative information crucial to the formulation of rational goals of care at the end of life.[15] The GCAT directs the clinician to estimate the patient's prognosis and convey whether the patient or surrogate knows the diagnosis and prognosis. It also lists the presence or absence of do-not-resuscitate orders and advance directives, family support and involvement, as well as pertinent psychosocial or cultural issues.[15] Pain and symptom management are also addressed. Once the information is assembled, the caregiver is instructed to formulate goals for care and interventions that will help achieve the goals. The GCAT can also be utilized when a change occurs in the patient's prognosis. Directions prompt for information about patient or surrogate knowledge regarding a terminal diagnosis or prognosis, preferences for palliative care and whether there is an expressed desire for death. It also includes information to complete a do-not-resuscitate order.

Instruments like the GCAT can promote a collaborative process for end-of-life decision making in institutional settings by providing a structure for caregivers to work with patients and families. This will assist clinicians in obtaining pertinent information that is essential to adequate decision making to minimize futility disputes and facilitate palliative care interventions.[15]

Conclusion

As the medical community struggles to establish acceptable medical futility guidelines, it is important to incorporate community values in the continuum of care and emphasize the quality of life that will be provided by that treatment. It is possible to provide care for the medically futile patient and yet maintain the patient's right for autonomy? Physicians or institutions should have the right to refuse treatment they deem to be inappropriate or extraordinary as long as the patient's family has been informed of these guidelines. Physicians should be honest with their patients and family members, as this would direct treatment that would be most conducive to the patient and alleviate much of the unrealistic hope family members have as they accept the reality of treatment being medically futile.

Even though it has been unfeasible to agree on the terms and guidelines of medical futility in the past, the medical community should continue to pursue this goal. As medical technology advances, it provides opportunity to treat the untreatable and thus it will become even more important to carefully designate care only to those who will benefit and not provide oppor-

tunity to those by treating medically futile patients, forcing physicians to spend valuable medical resources on patients who cannot benefit from them. Perhaps, health care professionals can look to Aristotle for wisdom when creating a discipline for medical futility, for it is he who said, "What lies in our power to do, it lies in our power not to do."[2]

About the author

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References

1. Ardagh M. Futility has no utility in resuscitation medicine. *Journal of Medical Ethics.* 2000 October;26(5):396-9.
2. Cyber Nation International. Aristotle. 1999. ***www.cyber-nation.com/victory/quotations/authors/quotes_aristotle.html*** Accessed 7/10/03
3. Doty DW and Walker RM. Medical Futility. *Clinical Cardiology.* 2000;23 (Suppl. II): II-6-II-16. ***www.clinicalcardiology.org/supplements/Cc23S2/cc23.2doty.html*** Accessed 4/19/03
4. Engelhardt Jr HT. Rethinking Concepts of Futility in Critical Care. Center for Medical Ethics and Health Policy Baylor College of Medicine. October 23, 1996. ***www.mediscene.com/medpub/futile.htm*** Accessed 7/10/03
5. Ewer M. The definition of medical futility: Are we trying to define the wrong term? *Heart and Lung.* 2001;30(1).
6. Federwisch A. Medical Futility: Who has the power to Decide? *Nurse Week.* July 2, 1998. ***www.nurseweekcom/features/98-7/limits.html*** Accessed 4/21/03
7. Fins JJ and Solomon MZ. Communication in Intensive Care Settings: the Challenge of Futility disputes. [Review]. *Critical Care Medicine.* 2001 Feb;29(2 Suppl):N10-5.
8. Jecker NS. Futility: Ethical Topics in Medicine. University of Washington School of Medicine. 2000 Feb. ***edserver.hscer.washington.edu/bioethicstopics/futil.html*** Accessed 4/20/03
9. Jonsen AR. *The Birth of Bioethics.* New York: Oxford University Press; 1998.
10. McCullough LB, Jones JW. Postoperative Futility: a clinical algorithm for setting limits. *British Journal of Surgery.* 2001 September;88(9):1153-4.
11. Medical Futility in End-of-Life Care. Council on Ethical and Judicial Affairs. *JAMA.* 1999, March;10:937.
12. Rivera S, et al. Motivating Factors in Futile Clinical Interventions. *Ethics in Cardiopulmonary Medicine.* 2001 June;119(6):1944-7.
13. Schneiderman L, Jecker NS, Jonsen AR. Medical Futility: Response to Critiques. *Annals of Internal Medicine.* October 15, 1996;125:669-674.
14. Shelton W. A Broader Look at Medical Futility. Albany Medical College. Union Online [login required]. ***online.union.edu*** Accessed 4/25/03
15. Soloman MZ, Fins JJ. Communication in intensive care settings: the challenge of futile disputes. New York Presbyterian Hospital and Weill Medical College of Cornell University. *Critical Care Medicine.* 2001 February;29(2Suppl):N10-5.
16. Weijer C. Cardiopulmonary resuscitation for patients in a persistent vegetative state: futile or acceptable? *Canadian Medical Association Journal.* 1998, February 24;158(4):491-3.

An historical look at the origins and early years of general anesthesia

Denise L Roberts, cst

There have been many momentous occasions throughout the course of history that have led to vast improvements in the well being of humanity. Arguably, the appearance of general anesthesia with its attendant reduction in suffering is near the top of those events. This article examines the plight and suffering of people during the years just before and the years following the introduction of anesthesia. It will also discuss the direct and indirect changes that occurred, and the discovery of the agents of anesthesia, their discoverers, their development and the process of their acceptance.

The road from drug to general anesthesia and its acceptance was, in most cases, slow and erratic. It is interesting that the discovery of such a powerful tool for reducing human suffering should be so slow in coming to fruition.

A painful past

"Surgery was forced to remain a social concern not a scientific one, because what mattered preanesthesia was first deferring the agonies of the mind and secondly tending to the ills of the body. Surgery was tied to the inescapable fact of pain."[9]

A review of the years prior to the advent of modern anesthesia will provide a better appreciation of this pivotal development and a complete understanding of the elation of the medical community.

The chief reason that people were subjected to surgery was tumors. Amputation was the second most frequently performed operation during the preanesthesia period (Figure 1). A recording of an amputation noted that most of the medical students in the theater watching the procedure were unable to continue witnessing the event. The pain, agony, and the suffering were more than they could handle. The cutting of the skin, the sawing of the bones and the blood that pooled around him was a horrific sight and shock usually followed.[9] Charles Darwin abandoned his medical career on seeing an operation during this period.

Some patients could actually prepare for surgery mentally and endure the procedure without as much as a flinch. Surgeons called these patients (usually men) stoics, after the Greek philosophers noted for controlling their emotions. Family and physicians alike congratulated them. Most people, however, had to be held down, kicking and screaming, and hope their surgeon would be quick and precise.

Before general anesthesia was introduced on October 16, 1846, operations were infrequent. Massachusetts General Hospital, the third most active center in the United States, performed possibly two per week from 1820 through the mid-1840s. Surgery was considered a very special event at that time.[9] The number of procedures grew rapidly over the next few years. St Bartholomew's Hospital in London recorded approximately 1,000 operations using inhalation anesthesia, 340 in 1860.[11]

Surgical theaters were constructed so that other patients in the hospital could not hear the noise. They were often located on the top floor in a cupola where the light was best, or in the basement, where the sounds of agony could be muffled. Some patients preferred to suffer the pain their malady produced, and some, who refused surgery, died by suicide.

From wine and herbs to ether

The need to relieve pain has been a constant pursuit throughout human history, and early efforts were as diverse as their results. In antiquity, remedies were mostly limited to wine and herbs. Rituals of relaxation and prayer provided too little relief. Opium became the most important single agent of pain relief until the debut of ether (Figure 2). Alcohol was also widely used.

Cocaine was first utilized by the Peruvian Indians. By chewing the coca leaves and spitting into the affected area, they numbed the site of the operation, often for trephination. When it was introduced in Germany, the alchemists crystallized the coca leaves into a white powder and called it cocaine. Cocaine later became the leading local anesthetic in surgery. In 1880, Carl Koeller and Sigmund Freud used it as an eye anesthetic, and in 1885, JL Corning used cocaine as a spinal anesthetic in humans and became the first to operate on a patient using spinal anesthesia.[1,8]

Mechanical methods also attempted to relieve pain during surgery. One used compression bands of rubber, rope, and other materials as a tourniquet. This would cause some degree of numbness and the surgeon could proceed to amputate the diseased limb. Another method attempted to cause excess bleeding, causing the patient to faint and allowing the surgeon to proceed. During the winter months of the Crimean War (1854-1856), a surgeon noticed that amputees complained less of pain during near freezing conditions. Ice became another method of numbing the area before surgery.

Hypnosis had also been used widely around the world. Most doctors rejected this method because it often took several hours to initiate an adequate trance (Figure 3). Others thought it to be a form of quackery and would have nothing

FIGURE 1
Gangrene amputation without anesthesia (1618).

to do with it. Less effective methods also accompanied the crude operative procedures of the time. Some patients chose to die rather than endure the pain of an operation.[5,6,9]

It is paradoxical to note that, it is likely that ether parties were being held near hospitals using the very gases that could have provided humane relief from the suffering. Little did anyone know, the cure was literally just around the corner.

The discovery of ether

The earliest attempts to use inhalation anesthesia by the medical community provided a number of roadblocks and criticisms slowing its implementation. There were many false starts and troublesome research studies. As early as 1804, an American chemist, Sluth AM Mitchell, administered nitrous oxide to animals with dire results. He concluded that the gas was poisonous and could be the cause of epidemics. His opinions were accepted with few reservations, and no doctor seemed brave enough to investigate otherwise.

In 1820, Dr Henry Hill Hickman of England tried to publish his findings on suspended animation by delivering carbon dioxide gases to animals, but because of the prejudices of the era, he was encouraged not to tell physicians of his

findings that pain could be alleviated during surgery.[1]

Although ether was not new to the scientific world, it had yet to be introduced to the medical world. "Ether Frolics" and "laughing gas parties" were part of both social circles and the scientific community that was studying the work of gases in laboratories. Itinerant lecturers would lecture on the properties and effects of the ether and nitrous oxide gases. Afterward, the chemist would give the audience a chance to experience the effects of the laughing gases.

The public was soon using ether and nitrous oxide without the lectures. An 1877 article written by Dr J Marion Sims in the *Virginia Medical Monthly* stated that children in rural Georgia were demonstrating with ether at a social function as early as 1832. In his recording of this event, he explained how a party got out of hand when a few of the boys held down another, who was big but shy, and forced ether on him. He then lost consciousness and did not awaken for 30 minutes, during which time the boys were terrified. They quickly fetched a country doctor who revived him, and perhaps delivered the first lecture on the risk of playing with ether.[2]

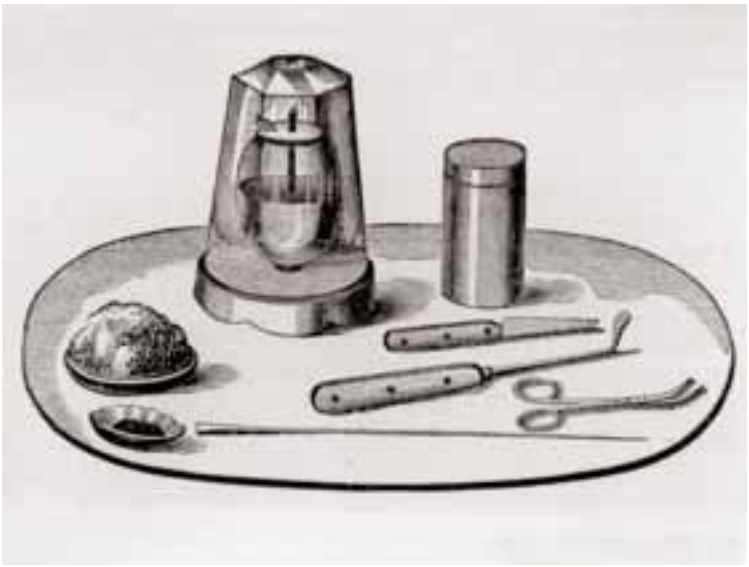

FIGURE 2 Articles for smoking opium. 1882 *Gallards Medical Journal.*

While the discovery of anesthesia was mainly an American phenomenon, the actual discovery of ether had its roots in Europe under different names. As early as the 13th century, the alchemist Raymond Lully called it "white fluid." Later Paracelsus called it "sweet vitriol" (circa 1530), and tested it on his chickens. He observed that they became unconscious, only to awaken unharmed a short time later. He wrote, "I think it especially noteworthy, that its use may be recommended for painful illnesses." Still later, in 1792, a German apothecary, Frobenius, changed the name to ether. It was by this name that other scientists continued to study its benefits.[4]

Dr Humphry Davy of England recognized in 1800 that ether, with nitrous oxide, could be helpful in alleviating physical pain. Additionally, he was credited for changing the name of nitrous oxide to "laughing gas", which is what it was called when students who had studied in Europe brought it to America.[5]

When Joseph Priestley, the pioneer who discovered oxygen and nitrous oxide, came to America in 1790 to escape the ravages of the French Revolution, he introduced the idea that oxygen and nitrous oxide might be useful for diseases of the lungs. Charles U Jackson, who studied at the Sorbonne in Paris, returned to America and began his career as an itinerant lecturer on these and other gases. Doctors, such as Crawford W Long, Horace Wells, and William TG Morton, came to realize that these gases might render a patient insensible during a surgical procedure.[1] Of course, each first tried the gases on themselves numerous times, as well as on their colleagues, before trying to prove the merits of ether to the medical community.

Crawford W Long was the first recorded medical doctor to use ether on his patients. He began in 1842, but did not report his findings and experiments until 1849. His early efforts primarily received scorn.

The first successful application

Horace Wells, a dentist, used ether in his practice and proposed its use for surgery at Massachusetts General Hospital in 1845. His first experience, however, was clumsy because his volunteer was a very large man, and Wells did not have enough of the anesthetic agent to put him under. As a result, Wells was driven from the operating

theater with jeers, hisses and "humbugs" from students in the audience. He left a dejected man.[6]

In spite of the ridicule, Wells continued to practice dentistry and administered ether to the many patients who flocked to his office for painless procedures. William TG Morton, his partner, pushed onward and perfected the techniques.

Twenty-two months after Wells' effort, Morton asked the famous surgeon, Dr John C Warren, if he could give another demonstration, noting that it had nothing to do with Wells or his method. On October 16, 1846, he successfully demonstrated that ether inhalation could render a patient insensible during an operation (Figure 4).[2]

Warren was known to be stern and, after practicing for over 20 years, avoided showing emotion. However, following this demonstration, he had tears in his eyes at the realization that he would no longer have to watch helplessly as his procedures provoked such pain.[3]

With great admiration, Dr Henry J Bigelow, assistant to Warren, addressed the students in the operating theater by saying "Gentleman, this is no humbug!"[7] "Today we have witnessed something of the utmost importance to the art of surgery, our craft has once and for all been robbed of its terrors."[4]

In a letter to Morton following the demonstration, Dr Oliver Wendell Holmes first coined the term, anesthesia.

"The state should, I think, be called anesthesia. This signifies insensibility, more particularly to objects of touch. The adjective will be anesthetic."[1]

The positive results

One month after the discovery of ether inhalation, the US Patent Office gave Morton patent number 4,848 for his version of ether, called "Letheon".[10] It took longer to get a patent than it did for the news to travel to Europe. Dr Robert Liston was the first to operate in London while his patient was under ether inhalation, which was administered by Dr John Snow. Snow had already been interested in gases; however, like the rest of the medical community, he was awaiting approval to administer ether to humans. Although the techniques needed to be refined, the European medical profession quickly accepted this scientific breakthrough. Snow devoted his entire life to improving the administration of ether and nitrous gases.

Another English doctor from Edinburgh, Sir James Young Simpson, began using ether in January of 1847 for the relief of labor pain during childbirth. A major drawback was the smell; it often made people vomit and cough. He decided to seek a less pungent gas and turned to articles on chloroform by Eugene Soubeiran of France and Justus von Liebig of Germany writ-

FIGURE 3

This engraving, titled *The Mesmerist and Mathias,* shows a hypnotic trance.

ten in October 1831. (The actual credit for its formula and name went to Jean Baptiste Dumas in 1835.)

Simpson found that chloroform was much more pleasant to use, and patients did not mind the smell.[1] Another advantage over ether was the decreased quantity—it did not take as much chloroform to achieve the same results. Chloroform was easier to transport, which was an additional benefit for physicians who made many house calls. He used chloroform in more than 50 cases with splendid results.[3] Although Simpson did not discover chloroform, he perfected its qualities and believed himself to be "victo dolore" (conqueror of pain).

Chloroform also became the favored choice of Snow at St George's Hospital in London, where he administered it to outpatients and major surgical patients. He gave up his regular practice so that he could administer anesthesia full time.[9]

American reactions were not so positive. The *Philadelphia Medical Examiner* attacked Warren and Bigelow in Boston for giving succor to quackery and stated that if such actions continued, it would constitute a fraternity of both physicians and quacks together as one. Bigelow retorted that the paper had rebutted mesmerism, and that had been approved in 1831.[13]

Still, there was much evidence of success. Morton delivered anesthesia to over 200 people without complications or fatalities.[11] In its first year, not one single fatality caused by anesthesia was recorded.

The discovery of these gases gave surgery the one thing it needed to flourish and develop, a method of alleviating pain. Women especially were early benefactors of general anesthesia. Both ether and chloroform were given to women while in labor, dramatically reducing the trauma of childbirth (Figure 5). Doctors found that ether and chloroform did not prolong labor and reduced the amount of pain the mother would experience.

In London, Snow recorded that he administered chloroform and other gases in about 450 cases in 1852. In 1853, he was asked to give chloroform anesthesia to Queen Victoria during the birth of her fourth child, Prince Leopold. Snow was subsequently knighted for his service.[6] Upon hearing the news, women flocked to his office to find out how the queen reacted under anesthesia. With the success of the queen's anesthetized delivery, they clamored for the same.[6]

Soldiers in battle carried chloroform in bottles so, if wounded, they had instant relief. As technology improved, the inhalation machines began to appear in operating rooms and dentist offices.[12]

Drawbacks and criticisms

While the advances promised by the new gases were becoming more evident, dangers relating to their usage were also being noted. Deaths occurred because of faulty equipment or the lack of training of the person administering the gases.

For the most part, the Americans utilized ether, while the Europeans favored chloroform. Both agents were found to be dangerous as usage increased. Dr Flourens from France noted that chloroform would cause toxicity if given in high quantities and could cause death. Dr James Syme of Edinburgh began to use ether because he felt the deaths of his patients could be attributed to chloroform use, which, in high dosages, caused the patients to stop breathing altogether.

In general, ether was thought to have been safer than chloroform, probably due to its reduced potency.[1] The first death recorded was a 15-year-old girl in Newcastle, England, January 28, 1848, who was undergoing removal of a toenail, while breathing chloroform.

But, there were also problems associated with the use of ether. It was highly flammable, which became a major problem because a fireplace often provided the light for a room. As Wells discovered during his failed 1845 demonstration, obesity was also a problem, as obese patients did not go under nor did they recover as quickly.[3] In some cases, doctors speculated that convulsions, prolonged stupor, intense cerebral excitement, depression of the vital powers and asphyxia were caused by etherization. Less frequently, cases of bronchitis, pneumonia and

inflammation of the brain were attributed as effects of anesthesia.

The first meeting of the American Medical Association in 1848 considered various anesthesia agents and their reactions within the medical field. Some surgeons were afraid to use the new anesthesia, even though it supplied great pain relief. They tried to consider both the risks and the advantages of an anesthetic. Some rejected it totally, believing it was too dangerous and not yet established. No one wanted to be the first to have complications.[1]

Over the next 10 years, Snow reported 50 cases of anesthesia related deaths, and for reasons unknown at the time, they occurred in young patients.[1] Chloroform deaths had reached such a formidable total by 1863 that the Royal Medical and Chirurgical Society appointed a special committee to investigate the causes.[12]

As the deaths began to mount, there was a surge of new techniques of administration of the gases. The medical community speculated that established failures were not due to the ineffectiveness of the ether, but to the improper techniques used to administer it or the apparatus itself.[6] In Zurich, Switzerland, by the end of 1847, the government prohibited the use of ether anesthetics by those who practiced dentistry, bleeding, those who performed minor surgical operations, or any other inexperienced persons. In Darmstatdt, Germany, officials prohibited the administration of ether by untrained medical practitioners, dentists or midwives.

Not all the criticisms of anesthesia were founded in medicine. During this period, Simpson was highly criticized by the Scottish Calvinist Church for eliminating the pain during childbirth. The church found it immoral to reduce women to a state of unconsciousness at such a critical time in their lives, because pain was punishment for their sins.

Simpson's clever rebuttal quoted straight from the *Bible* (Genesis 11:21) which states that God caused Adam to fall into a deep sleep while he took out his rib to make Eve. He concluded

Administration of anesthesia

Methods of administration used varied with each location and, from 1844 to 1900, some 69 different discoveries had been made.[6] In London, Snow developed a machine that regulated the dose of the gases and the percent concentration of the anesthetic and oxygen.[11] In the United States, Morton used an inhalation apparatus made from a sponge soaked with ether placed in the bottom of a globe with a mouthpiece attached to it. It enabled him to pinch the nose while the patient placed his or her lips

An apparatus used for purifying nitrous oxide (1896).

over the attachment. This method was abandoned quickly because there was no control on how much the patient would inhale. Most just used a moistened sponge and applied it directly to the face.

"The simpler, the better" was often the rule. They applied ether and chloroform on a handkerchief or linen towel and placed it on the face, covering both nose and mouth. The amount of the anesthetic agent that was being received remained a difficult determination, and they just kept adding it until reaching the desired state of anesthesia.

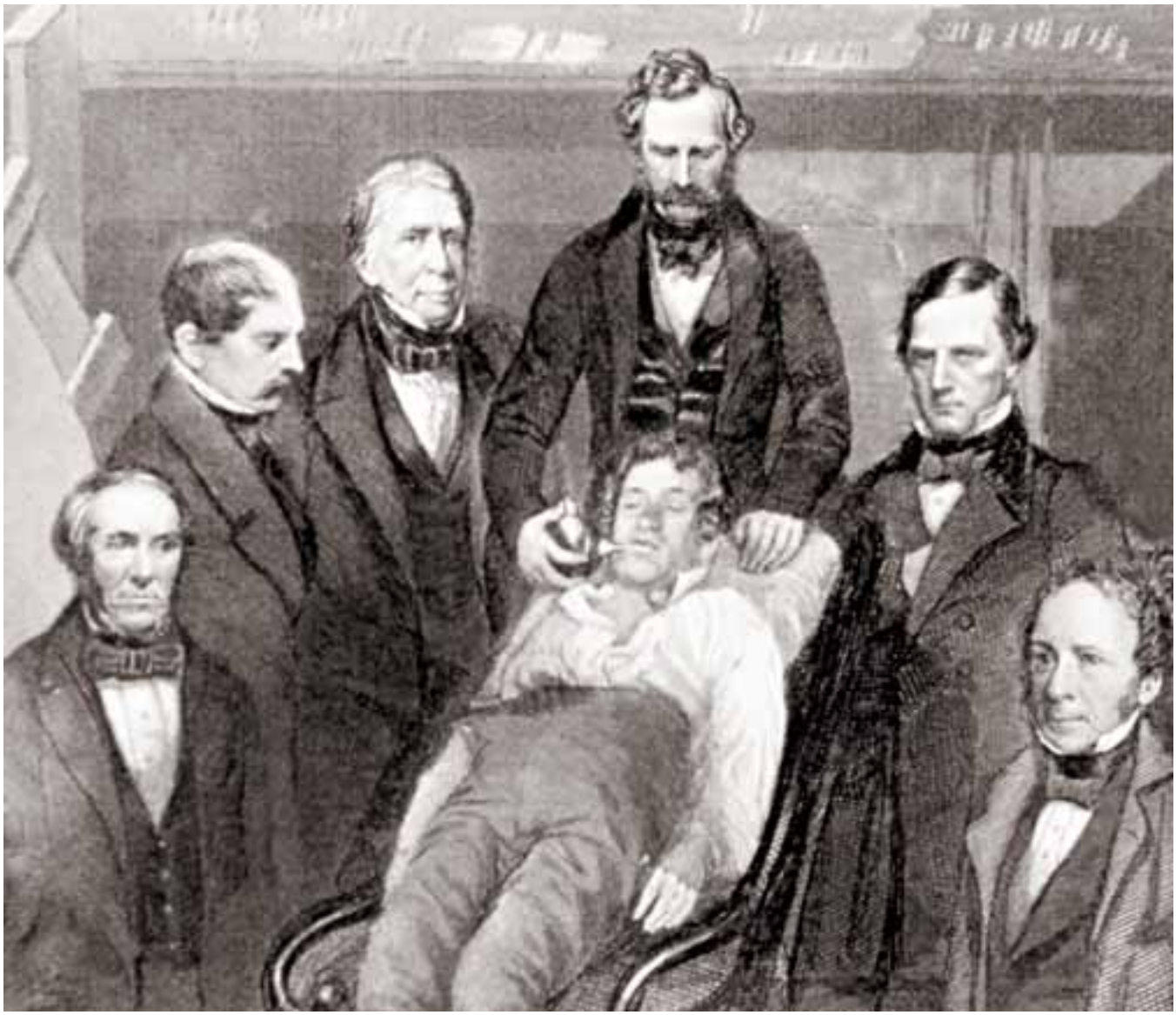

FIGURE 4

Morton successfully demonstrates the administration of ether at Massachusetts General Hospital, October 16, 1846.

that God himself was the first true anesthesiologist and surgeon. The church had to agree with this literal interpretation. Then, after the queen had chloroform administered for the birth of two children, the church modified its stance regarding anesthesia for women.[4]

Other criticisms came from the abuses of ether and chloroform. Wells became addicted to ether and eventually committed suicide. Other doctors from several different fields, such as chemistry and dentistry, as well as those who experimented with these gases, became addicted and often died. Ether frolics and laughing gas parties were instrumental in this addiction. In Ireland, ether drinking became a fad with disastrous results. Drinking too much resulted in death, in some cases by combustion when a drinker would light a pipe.[9]

The development of the profession

With the increasing use and knowledge of the inhalation agents, progressive changes were seen in the profession of administering them. In the early days, administering ether or other gases was primarily the surgeon's job, although as a practical matter, he left this task to either his assistant or an operating room clerk under his supervision. Morton was the first to administer anesthesia, and might be considered the first anesthesiologist. He wrote *On Chloroform and*

Other Anesthetics about the proper ways to deliver anesthesia.[6]

In the United States, nurses and assistants provided most of the anesthesia, while in England in 1850, only physicians were used to deliver anesthesia in the hospitals. Various medical personnel administered anesthesia in other countries and no standards were set. It was not until 1892, when Dr JFW Silk of London pleaded for tuition for the study of anesthesia, that organized study programs were first conceived for the field of anesthesia.

In 1901, the Society of Anesthesia was founded, and compulsory education during medical school and instruction of instrumentation of anesthesia followed.[11] By 1905, a group of doctors on Long Island, New York, formed the Long Island Society of Anesthesia to promote the science and art of anesthesia. It became the New York Society, then, in 1915, the American Association of Anesthetists. By 1936, the society petitioned for its own certifying board, and, by 1940, the Board of the American Medical Association had completely accepted the field of anesthesiology. Certification soon followed.[13]

Nurse anesthetists were women (very often nuns) with special training in anesthesia. Training first occurred at the Mayo Brothers Clinic in Rochester, Minnesota. Sister Mary Bernard was the first nurse anesthetist in 1877, and she later founded a school in Wichita, Kansas, for nurse anesthetists. Nurses were used in the United States, in part because doctors were often in short supply, particularly during times of war. They continue to practice today in many states.[12] Interestingly, Massachusetts General Hospital, where Morton performed the first demonstration, uses nurse anesthetists, with anesthesiologists overseeing their work.

Other pioneers in the field included Dr Mary Botsford who, in 1897, was the first woman doctor to practice solely in anesthesia at Children's Hospital in San Francisco. In 1900, Dr Sydney O Golden of New York was the first to charge as a professional for anesthesia. Golden called for equality between surgeon and the anesthesiologist.[14] By 1914, the University of Wisconsin Medical School awarded the first American academic position to Dr Ralph Waters. He was also named the first president of the American Society of Anesthetists.[15]

Conclusion

Today, patients take for granted that pain will not be a major accompaniment to childbirth or surgery. Prior to the advent of general anesthesia, this was not the case. Indeed, the horrors provoked by the unbridled pain associated with these events are hard to envision. Modern medical practitioners owe a great deal to men, such as Lully, Paracelsus and Frobenius, who first identified ether and to others, like Davy, Priestley and

FIGURE 5

The discovery of anesthesia reduced the pain of childbirth without prolonging delivery.

Jackson, who postulated that ether and chloroform could be used for medical advantage. Perhaps to an even greater extent our gratitude should encompass those who first used those agents and persisted in the face of strong resistance from the church, the medical community and the general public at large. These men of vision included Long, Wells and Morton.

There were certainly stumbling blocks that made the development of this marvelous tool slower than one might imagine. Complications from primitive delivery systems, inadequate training of the providers, and fire hazards took time to overcome. Surgery was in its infancy, barely past the history of bloodletting barbers. The introduction of general anesthesia launched hundreds of possibilities for surgery, and the profession exploded. Hospitals that were performing one or two cases weekly are now performing 100-200 per day.

The story of anesthesia, from its discovery and primitive usage to the modern product experienced today, is one of the most fascinating in history. Anesthesia was indeed "no Humbug!"

About the author

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References

1. Keys TE. *The History of Surgical Anesthesia.* New York: Schuman's Inc; 1945: 14-25, 29-37, 39, 74, 230.
2. Sims JM. The Discovery of Anesthesia. *Virginia Medical Monthly.* 1877:IV(2) 38:20-23.
3. Thorwald J. *The Century of the Surgeon.* New York: Pantheon Books; 1956: 109-111, 129-131, 152.
4. Shane SM. *Out of this World.* New York: American Book-Stratford Press, Inc; 1947: 97, 103, 107.
5. Anesthesia. *Companion Encyclopedia of the History of Medicine.* Bynum WF and Porter R, eds. London: Routledge; 1993: 14-15.
6. Robinson V. *Victory Over Pain.* New York: Henry Schuman Inc; 1946: 104, 163, 225-226, 260.
7. Bigelow HJ. Insensibility During Surgical Operations Produced by Inhalation. *Boston Medical and Surgical Journal.* November 1846; XXXV(16): 309-316.
8. Bacon DR. August Bier's Legacy: More Than Just a Pioneer in Regional Anesthesia. *Journal of Clinical Anesthesia.* 2000;12(7):501.
9. Fenster JM. *Ether Day.* New York: Henry Schuman, Inc; 2001: 1, 23, 114, 165, 171.
10. *United States Patent Office:* Reprint from Wood Library—Museum of Anesthesiology. 1996: no page.
11. Sykes WS. *Essays of the First One Hundred Years of Anesthesia.* Edinburgh: E & Livingstone LTD; 1960: 65, 100-102, 146-147.
12. Thatcher VS. *The History of Anesthesia.* New York, London: Garland Publishing, Inc; 1984:17-26, 55-57.
13. Miller RD. *Anesthesia.* Philadelphia: Churchill-Livingstone; 2000: 6-8.
14. Brash PG. *Clinical Anesthesia.* Philadelphia: Lippincott-Williams and Wilkins; 2001: 21-22.
15. Bacon DR. Ralph Waters and the Beginning of Academic Anesthesiology in the US. *Journal of Clinical Anesthesia.* 1995; 7:534.

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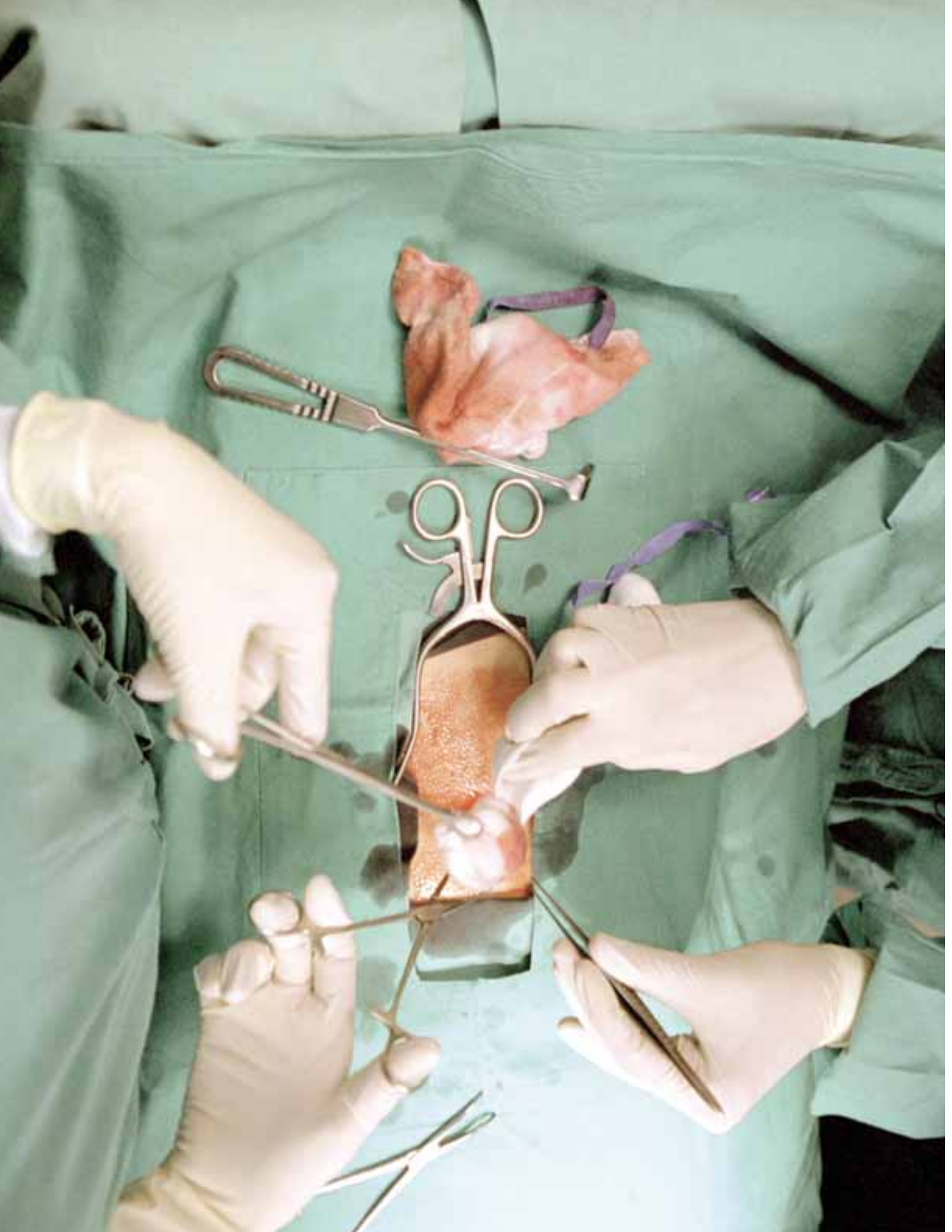

IBD AND ABDOMINAL SURGERY:
A PATIENT'S PERSPECTIVE

GREGORY ADAM HAAS, BS

Every surgical technologist should know the AST motto: Aeger Primo or the patient first. The modern operating room is cold and bright, full of machines, furniture, instruments and more. But on the operating table is a living, breathing and hopefully vibrant human being. Over the years, surgeons have become known to be somewhat lacking in the "patient relations" department. It's therefore critical that the Certified Surgical Technologist (CST®) bridge the gap between the operative team and the patient.

Major abdominal surgeries, especially those resulting from Inflammatory Bowel Disease (IBD), can be one of the most traumatic events in a person's life at any age. Patients often ask questions such as: "Will I be normal after surgery?" and "Will I be able to do the same activities I've always done, like skiing and scuba diving?" Following surgery, patients may go for months or even years with these and other questions unanswered.

Even though the resources for these people are abundant, many factors preclude patients from procuring them. With one brief statement, the CST can ascertain whether or not an abdominal surgery patient needs specific resources. Information is power, and an informed patient is more apt to be a happy and healthy person. Two minutes of your time can prevent months or years of patient confusion, queries, doubts and worries. CSTs are a vital part of the operating room and, if well-informed, can play an essential role in the patient's life. Remember AST's motto and keep the patient first.

Disease overview

Ulcerative colitis

Ulcerative colitis (UC) is a chronic inflammation of the mucosal lining of the colon. It is an autoimmune disease so, when a person is afflicted, his body perceives its own intestine as foreign and fights it off.[1] UC was first recognized as a disease entity in 1859 by Sir Samuel Wilkes in Great Britain,[2] but has probably been around for thousands of years.

UC is a chronic disease of the colon, often affecting the rectum and anus. The disease is marked by inflammation, sometimes severe, and perforating ulcers that affect the mucosal lining of the colon. Another characteristic of the disease is its ability to cover the colon and rectum in full. When the disease is active, common symptoms include frequent diarrhea, profuse rectal bleeding, severe stabbing and cramping pain, marked weight loss and anemia.[3]

Pain associated with the disease ranges from mild to excruciating and severity from minimal to extreme. Where and to what degree the patient experiences pain is directly proportional to the current location of inflammation, the amount and size of ulcerations, and other related factors. A UC patient with numerous bleeding ulcers, affecting the colon from transverse through sigmoid and into the rectum, would perceive pain in the upper and lower left abdominal quadrants. Conversely, a patient with active UC, whose pathology is most pronounced in the right colic flexure, might only experience right upper-abdominal quadrant pain and have little blood in the stool. In these scenarios, both patients have active disease, although signs, symptoms and perceptions vary.

Frequent bowel movements, possible anemia, vitamin deficiencies and a myriad of other factors may intensify the exacerbation and further hinder the patient's overall quality of life.

One common subcategory of UC is ulcerative proctitis (UP). In approximately 30% of UC patients, the disease originates as UP and manifests into UC over time. UP is a milder form of UC and is further divided as follows:

- Proctosigmoiditis: Colitis affecting the sigmoid colon and rectum.
- Left-sided colitis: A continuous disease pattern that begins at the rectum and extends as far as the splenic flexure.
- Pan-ulcerative colitis: Affects the entire colon.[3]

Crohn's Disease

Crohn's disease is named after Burrill B Crohn, MD. In 1932, a landmark paper was published with a complete description of the disorder known today as Crohn's disease. The paper was authored by Crohn and two colleagues, Leon Ginzburg, MD, and Gordon D Oppenheimer, MD.[8] Crohn's disease is more severe and complicated than UC. Because the symptoms of these two illnesses are so similar, a definitive diagnosis is sometimes difficult to obtain. In fact, current data suggests that approximately 10% of treated cases are undiagnosed and are therefore categorized as Crohn's indeterminate or indeterminate colitis.[4]

Crohn's most commonly affects the ileum and cecum, but may involve any part of the digestive tract from the mouth to the anus. Other characteristics of Crohn's include:

- Skip patterns: Healthy areas of intestine are sandwiched between diseased sections without any continuity or pattern.
- Finger-tip clubbing: Tips of the fingers retain a boxy look. Unfortunately many gastroenterologists are still unfamiliar with this anomaly.[4]
- String sign: Marked narrowing or stricture of the bowel, resulting from the inflammation process and scarring.[5]

Both Crohn's and UC patients experience complications resulting from vitamin and nutritional deficiencies. As both illnesses cause frequent bowel movements, the normal tendency is to deprive the body of a meal's full nutritional value. Furthermore, anemia, B12 deficiency and subsequent fatigue are not uncommon, as blood is lost via intestinal ulcerations.[4] Five types of Crohn's have been identified and are listed below with their affected anatomy:

- Ileocolitis: The most common form of Crohn's, affecting the ileum and colon.
- Ileitis: Crohn's affecting the ileum.
- Gastroduodenal Crohn's: Affects the stomach and duodenum.
- Jejunoileitis: Patchy inflamed areas in the jejunum.
- Crohn's colitis: Affects the colon and rectum only.[4]

Cause and cure

To date, there is no cause or cure for IBD. However, much research and data collected have strengthened theories and are helping to unlock the mysteries of the disease. In both UC and Crohn's disease, there is a marked increase in response by the body's immune system. In people with IBD, the immune system acts erroneously and autoimmunity metastasizes. Food, normal flora, and even the intestines themselves are seen as foreign. Consequently, the body starts the process of attacking its own organs as invaders. Once this process begins, harmful products generated by the body lead to intestinal ulcerations and injury.[4]

Further studies regarding IBD's cause focus on the interrelation between inherited genes, environment and the immune system. Environmental antigens may directly cause inflammation. Researchers believe that once the immune system is activated, the body may not have the ability to deactivate it. Hence, the IBD process begins and progresses until medical intervention is received.[4] Only 25 years ago, IBD was thought to be psychosomatic, caused by stress, emotional problems and other related factors. That is simply not true. Physical and emotional stressors cannot cause the disease; although once a flare-up starts, they can certainly exacerbate its magnitude.

A current hypothesis about its cause involves a possible link between Crohn's and bacteria in milk, as speculated by researchers at St George's Hospital Medical School in London. In August 2003, researchers proposed that *Mycobacterium avium paratuberculosis* (MAP) found in milk causes the disease. Their findings indicate that 92% of patients with Crohn's have MAP. Previous findings by the same group of scientists found MAP in 2% of the pasteurized milk sold in British stores.[6]

Since UC and Crohn's have no cure at this time, disease management is primarily accomplished via drug therapy. A healthy diet, exercise, and other similar modalities are adjuncts to medications, and many physicians are including nontraditional alternative therapies to their regimens as well. The primary goal of drug therapy is to suppress the symptoms and keep the disease quiescent.

Several groups of drugs are used for treatment and are utilized interchangeably between UC and Crohn's. They are:

- Aminosalicylates (5-ASA): A class of anti-inflammatory drug, including sulfasalazine and oral mesalamine.

Cutting through the confusion

Our gastrointestinal tracts are limited in the types of responses available to various stimuli. Many different conditions create similar responses, which can be confusing. Just because a surgical patient suffers from what they call a "spastic colon" does not mean they have IBD.

Irritable Bowel Syndrome (IBS)

IBS is one of the top 10 most frequently diagnosed conditions among US physicians, and may affect up to 20% of all adults in America. It is surpassed only by the common cold in employee absenteeism.[12] Unlike IBD, which is a disease, IBS is a syndrome (group of symptoms) that causes diarrhea, constipation (or both alternating), abdominal bloating and/or distention, gassiness, cramps, urgency to defecate and mucus in the stool. IBS has been called a number of other names, which leads to confusion: mucous colitis, spastic colitis, spastic colon and irritable colon.[12]

IBS does not cause inflammation or damage to the bowels, intestinal bleeding, anemia, weight loss or fever-all associated with IBD. IBS sufferers are not more likely to develop colon cancer, IBD, or other gastrointestinal diseases, and are not treated with steroids, immunosuppressives or surgery.[12]

IBS is not an immune disorder, but patients with this syndrome are more likely to have other disorders, such as fibromyalgia, chronic fatigue syndrome, chronic pelvic pain or TMJ disorder. Triggers for an attack include eating, stress, hormonal changes, and certain medications.[12]

The cause of IBS is not known, but the syndrome is exacerbated by stress.[12] Its treatment varies. Some patients respond after dietary changes, relaxation therapies, or stress management. Others need medications to help control symptoms. Acupuncture and hypnotherapy have shown some positive results.[12]

Celiac sprue

As many as one in 133 have celiac sprue, but approximately 3% of those, more than 2.1 million, have not been diagnosed.[13] Celiac sprue is an autoimmune disease caused by a reaction to the proteins (gluten) in wheat, rye, barley, oats and other grains. Other names for this disease are gluten-induced enteropathy and nontropical sprue.[13,14]

Celiac disease is inherited and, like IBD, can damage the small intestine and lead to anemia, weight loss and other problems from malnutrition. It is diagnosed through blood tests and a biopsy of the small intestine.[13,14]

Symptoms vary by person and age and may or may not involve the intestinal tract. Symptoms include: recurring abdominal bloating and pain, chronic diarrhea, foul-smelling stool, unexplained anemia, gas, weight loss, missed menstrual periods, bone pain, irritability (especially in children), behavior changes, fatigue, delayed growth, joint pain, muscle cramps, seizures, tingling numbness in the legs, dermatitis herpetiformis, aphthic ulcers, tooth discoloration, and loss of enamel.[14]

Unlike IBD, celiac disease can be controlled easily and without surgery. Symptoms will improve dramatically within days of beginning a gluten-free diet. Damage to the bowel and body can be reversed in most cases, if the patient adheres to the diet. The gluten-free diet is a lifelong commitment, as there is no cure for the allergy.[13,14]

Patient Resources

- National Digestive Diseases Information Clearinghouse (National Institutes of Health), ***digestive.niddk.nih.gov/index.htm***
- International Foundation for Functional Gastrointestinal Disorders, Inc, ***www.aboutibs.org/index.html***
- Celiac Sprue Association, ***www.csaceliacs.org***

- Corticosteroids: Prednisone orally suppresses the immune system nonspecifically.
- Immune modifiers: Helps decrease corticosteroid dosage. Examples are Imuran®, 6-MP and Remicade®. Mounting evidence based on clinical experience suggests Remicade® may help patients taper off steroids. Remicade® is an antibody that binds to tumor necrosis factor (TNF), a protein in the immune system that plays a role in inflammation.
- Antibiotics: Cipro® and Flagyl® have proven quite useful in IBD treatment.[4]

Diagnosis

Traditional methods include: X-rays, barium studies, CT scan, colonoscopy and a wide array of other techniques. Of specific interest is the IBD FIRST STEP℠ by Prometheus Laboratories, a sensitive serological panel of antibodies optimized to detect IBD.[7] Every IBD patient

needs to be familiar with this test, unfortunately most are not.

Surgical intervention

Surgery is always the last resort for IBD and varies dramatically between UC and Crohn's. Common indications for surgery include, but are not limited to: disease complications, obstruction, toxic megacolon, failure of drug efficacy for disease maintenance, and electively, when the disease becomes unbearable.[8] For the UC patient, proctocolectomy (removal of the colon and rectum) is the only cure. Removing these areas ensures the disease will never return. The possible variations of surgeries are numerous but fall under the following categories:

- *Brooke ileostomy:* A stoma is created on the abdominal surface by bringing through the terminal ileum. A small section is then turned inside out and sutured to the skin. An external appliance collects fecal matter.[9]

  The Brooke ileostomy has minimal complications. Skin irritations and the social stigma associated with wearing a bag pose problems. The wafer which secures the appliance to the skin can leak or fall off. By and large, however, complications are minimal.

- *Continent ileostomy:* Numerous procedures in which a pouch is created inside the abdomen by cutting and suturing together sections of small intestine. A small section is then brought through the skin; a stoma and nipple valve are created and sutured in place. These procedures alleviate the need for an external appliance, since the internal pouch is intubated and manually drained. The continent ileostomy was developed in 1962 by Niles Kock, MD, (Kock pouch) and has been greatly modified over the years.[2] Variations include the J-pouch, W-pouch, S-pouch and Barnet continent intestinal reservoir (BCIR).

  The continent ileostomy poses unique problems. Blockage and drainage problems from the nipple valve can occur. An inflammation inside the pouch, called pouchitis, is not uncommon and is easily treated with Flagyl® within two weeks.

- *Pull-thru procedures:* An internal pouch may be created or an ileum connected straight to the rectum (ileorectal-anastamosis). In either of them, the patient defecates as normal without the need to intubate and drain.[4]

  The pull-thru procedure is also prone to pouchitis, strictures, and adhesions. Frequent bowel movements are not uncommon, and infection can occur from intubating.

Surgical philosophies for Crohn's patients are quite different. Although indications remain basically the same, the overall goal is to keep the integrity of as much intestine as possible. Intrinsically (and unfortunately) unique to Crohn's is its ability to metastasize healthy intestine over time. For this reason, the continent ileostomy is never indicated in patients with Crohn's.

Common surgical interventions for Crohn's include, but are not limited to:

- Brooke ileostomy
- Resection: Diseased areas of intestine are excised, and the remaining sections anastomosed.[8]

Constraints following surgery

People with ileostomies have few constraints regarding sports and leisure activities. Of major concern would be activities like karate. Although some ostomates do take karate, care must be taken to protect the stoma from blunt trauma, which could be catastrophic.

After healing, a relatively normal life can be expected. Everyday sports and leisure activities pose little problem, as long as care is taken to prevent blunt trauma to the abdomen.

Internal pouches and pull-thru procedures have varying limitations as compared to their ileostomy counterparts. Extreme care must be taken when intubating the internal pouch to prevent perforation. The patient should always have clean intubation supplies accessible and be wary

of blunt trauma. Pull-thru procedures can fail, and stress or illness can lead to an increase in the number of bowel movements. During such times, staying near a bathroom is advisable.

Of major concern to people who have had a resection or any internal pouch procedure is scuba diving. The Professional Association of Diving Instructors (PADI) teaches to dive when in good health. Smoking, excessive alcohol consumption and physical illness are factors which can increase the risk of decompression sickness (DCS).[10] According to Divers Alert Network (DAN), small bowel obstructions, adhesions or anything causing intestinal gas-trapping must be considered when diving.[11] Although diving is not contraindicated, prospective divers must receive medical clearance from their physician beforehand.[10]

At sea level, the atmosphere exerts 14.7 psi. As a person descends underwater, the pressure increases by one atmosphere (14.7 psi) every 33 feet. At 33 feet below sea level, the total pressure on the body equals two atmospheres or 29.4 psi. When scuba diving, nitrogen is pulled out of the air solution and embedded in the body's tissue compartments. When ascending from a dive, all nitrogen must be expelled from the body or DCS can occur.[10] In theory, nitrogen can become trapped in the suture lines where areas of intestine have been modified and joined. When this occurs, the chance of getting DCS increases.[11] DAN, which is affiliated with Duke University, has no documentation of problems between DCS and divers with abdominal surgery.

Conclusion—the CST's role

Life after surgery can be challenging. For the patient with UC, surgery means living disease-free forever. Crohn's patients, however, may experience repeated disease flare-ups and additional surgeries. For anyone who has had surgery for IBD, the most important factor is having good information and resources. These people can do nearly anything they've done in the past, but they must have respect for their new intestinal network. Talk with and listen to your abdominal surgery patients. Often they'll remain quiet, even when asked if they have any questions or concerns. Make a statement they can't refuse to respond to such as: "I read about ostomates who scuba dive." This simple statement might be the catalyst to alleviating the patient's concerns.

Since the CST plays a vital role in the care of the patient, always remember *Aeger Primo.* Be aware of and pass along the following valuable resources:

- Crohn's and Colitis Foundation of America (CCFA). 800-932-2423, ***www.ccfa.org***
- United Ostomy Association (UOA). 800-826-0826, ***www.uoa.org***
- Divers Alert Network (DAN). 800-446-2671, ***www.diversalertnetwork.org***
- Prometheus Laboratories. 888-423-5227, ***www.prometheuslabs.com***

About the author

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References

1. Patient information: Crohn's disease. American Autoimmune Related Diseases Association online. ***www.aarda.org/patient_information.php*** Accessed 7/16/04
2. Sackier J and Wood C. Ulcerative Colitis and Polypois Coli. Surgical Options. *The surgical clinics of North America.* 1988 Dec;68(6):1319-1324.
3. Introduction to ulcerative colitis. Crohn's and Colitis Foundation of America. ***www.ccfa.org/research/info/aboutuc*** Accessed 7/12/04
4. Introduction to Crohn's disease. Crohn's and Colitis Foundation of America. ***www.ccfa.org/research/info/aboutcd*** Accessed 7/12/04
5. *Professional Guide to Diseases,* 5th ed. Springhouse, Penn: Springhouse Corp; 1995:683-4

6. Study links Crohn's and bacteria in milk. CBC News [online]. August 8, 2003. ***www.cbc.ca/stories/2003/08/08/Consumers/Crohns_030808*** Accessed 7/12/04
7. IBD FIRST STEP℠. Promethius Laboratories. ***www.prometheuslabs.com/212d.asp?nav=products*** Accessed 7/12/04
8. Greenstein A. The Surgery of Crohn's Disease. *The surgical clinics of North America.* 1988 Dec;68(6):573-576.
9. Miller B and Keane C. *Encyclopedia and Dictionary of Medicine, Nursing and Allied Health.* Philadelphia: Saunders; 1987:623.
10. *PADI Open Water Diver Manual.* Rancho Santa Margarita, California: PADI International; 1994:183-186.
11. Vote D. Gastrointestinal issues: Consider Them Before Returning to Diving. Divers Alert Network. ***www.diversalertnetwork.org/medical/articles/article.asp?articleid=41*** Accessed 6/25/04
12. "IBS and IBD: Clearing up the confusion." Focus. [online] Spring/Summer 2003. Crohn's and Colitis Foundation of America. ***www.ccfa.org/media/pdf/ibsibd.pdf*** Accessed 8/12/04
13. What is Celiac Disease? Celiac Sprue Association. ***www.csaceliacs.org/celiac_defined.php*** Accessed 8/12/04
14. Celiac Disease. National Digestive Diseases Information Clearinghouse (NDDIC). ***digestive.niddk.nih.gov/ddiseases/pubs/celiac/index.htm*** Accessed 8/12/04

Role of the surgical technologist in bariatric surgery

Bobbie Moore, CST

Obesity has reached epidemic proportions in the United States. According to a 1999-2000 survey of adults 20 years of age and older, 64% of adults in the United States are considered overweight for their height (BMI of at least 25). Of them, 30%, 59 million Americans, are categorized as obese (BMI 30+). Numerous research studies confirm the connection between overweight and obesity and the increased risk of health conditions such as Type 2 diabetes, hypertension, ischemic stroke, coronary artery disease, osteoarthritis, and cancer, such as colon cancer, postmenopausal breast cancer and endometrial cancer. Annual medical costs attributed to overweight, obesity and their associated health problems are in the billions of dollars.

Gastric bypass surgery is becoming the most common tool to treat this disease. As a result, there is a need for a dedicated and skilled surgical team. The American Society of Bariatric Surgeons has emphasized the importance of having a designated team of professionals on each and every gastric bypass case. With this in mind, it is more important than ever that surgical technologists be prepared for their role in this procedure.

Bariatric surgery or gastric bypass surgery is becoming the tool of choice in treating clinically severely obese patients. The word bariatric is derived from the Greek word *baros,* which means pressure or weight (excess weight or obesity is implied). Doctors have used various procedures in bariatric surgery over the years; however, the three procedures that have been performed most often during the past 20 years are the biliopancreatic diversion with duodenal switch (BPD–DS) (Figure 1), adjustable band gastroplasty (Lap Band) (Figure 2), and the Roux-en-Y Gastric Bypass (RNY) (Figure 3). The Roux-en-Y gastric bypass is considered the gold standard by the American Society of Bariatric Surgeons (ASBS). The gastric bypass can be performed as an open or laparoscopic procedure. This article will discuss the latter.

Considerations

The standards for performing gastric bypass surgery have been set by the ASBS and Association of periOperative Registered Nurses (AORN). In these standards, both groups have identified the importance of a multidisciplinary team approach to the gastric bypass. This multidisciplinary team includes, but is not limited to, representatives from the surgery, pulmonary, radiology, physiology, nutrition services, psychology departments and the postanesthesia care unit (PACU). In the operating room (O.R.), the team consists of the bariatric surgeon, anesthesia provider, circulator, surgical technologist, and an assistant surgeon or a nonphysician surgical assistant.

While surgical technologists normally do not interact with patients prior to their arrival in the operating room suite for the procedure, they should understand the events that have influenced the decision to undergo surgical intervention. The decision is complex and is impacted by many personal, physical, financial and social factors.

The bariatric surgery patient undergoes extensive preoperative education and evaluation. Comprehensive laboratory testing and numerous consultations may be performed. In addition, each patient must fit within the guidelines set by the National Institutes of Health (NIH) and individual insurance company standards to be considered for surgical intervention. These include a body mass index (BMI) greater than 40 or BMI of 35 with significant comorbidity such as Type II diabetes, hypertension, gastroesophageal reflux disease (GERD), sleep apnea or others. Insurance companies may also mandate specific medical weight-loss parameters for patients prior to surgical consideration. Postoperatively, follow-up care, including monthly support groups, is recommended for patients for a minimum of five years.

Instrumentation

The surgical technologist should open laparoscopic instruments, such as those used on a laparoscopic colectomy, along with some additional extra long instruments to accommodate the bariatric surgery patient. Disposable endomechanical staplers and their various disposable cartridges for reloading are also needed for the transection of the bowel and stomach tissue.

The surgical technologist needs to be aware of each surgeon's specific needs so that the procedure flows smoothly. He or she must also know the size and length of staple (eg, 2.0 mm for mesentery or thin tissue, 2.5 mm for the bowel, and 3.5 mm or 4.8 mm for the stomach or other thick tissue) and the number of staple reloads (30 mm, 45 mm, or 60 mm linear length) used during each portion of the procedure. Surgeons have a specific staple length that they prefer and a specific order in which they use them. The surgical technologist should understand the rationale for using a 2.5 mm staple on bowel and a 3.5 mm or 4.8 mm on the stomach. If the incorrect size is used, a staple-line leak could occur and cause the patient to return to surgery. If a staple is not long enough, it could cause a disruption in the staple line that would result in various complications.

Trocars will also be used in the laparoscopic procedure. Although trocar preference will vary, most surgeons will use two 5 mm, two 10 mm, and one 12 mm. In addition, a liver retractor will also be utilized.

Keep in mind the possibility of conversion to an open procedure due to technical considerations and ensure that the appropriate laparotomy supplies are available.

Positioning, Prepping and Draping

Proper positioning, prepping and draping is essential with the bariatric patient, not just for gastric bypass surgery, but for the other surgical/diagnostic procedures this patient population may undergo. Although generally seen as a major role of the circulating nurse, ensuring proper patient positioning is the responsibility of the entire surgical team. Understanding the importance of proper body alignment, support and the correct use of positioning aids and other equipment will assist in recognizing potential intraoperative complications before they occur. Key points are noted below for reference and review.

Special Considerations

- If a urinary catheter is ordered, several assistants may be needed to provide retraction of the panniculus and thighs for access to the urethra during catheter placement.
- Properly fitted sequential compression devices should be utilized to prevent formation of deep vein thrombosis.
- Surgical team members may need step stools to work within the sterile field.
- A bariatric operating table, with side attachments specifically made for the table, should be utilized.
- A padded footboard is also needed.

Positioning

- The patient is placed in the supine position to provide good joint support.
- The team should assess the following potential pressure point areas: elbows, heels, and areas of safety strap placement.
- Arms should be secured with padding and fastening straps.
- Avoid the hyperextension of the patient's shoulder or forearm on the armboard.
- If the arm is tucked to the side, ensure good circulation and alignment.
- Place a pillow under the patient's knees to decrease back strain.
- Abduct thighs with comfortable physiological external rotation.
- Avoid pressure on the lateral aspect of the lower leg.
- Use safety straps to secure the legs.

Prepping

- Pay special attention to skin folds under the panniculus to ensure that all surgical site areas are clean and adequately prepped.

Draping

- Standard draping for an abdominal incision is used.

Procedure

- The patient is placed on the table in the supine position with his or her arms extended on armboards, if possible. The prep extends from the mid-chest line to the mid thigh and laterally as far as possible. A grounding pad is placed and, if ordered, a Foley catheter is inserted.
- The primary surgeon will stand on the patient's right side, and the surgical technologist and the assistant will stand on the patient's left. Two video towers should be used, so that the surgeon and the assistant will each have a monitor.

Incisions

- A subumbilical incision is initiated and a blunt tip trocar is placed and used to create the pneumoperitoneum.
- Four to five additional trocars are placed as described below.

Port Placement

- Right anterior axillary line (AAL)
- Left AAL
- Right midclavicular line (MCL)
- Left MCL
- Subxiphoid, if necessary for liver retraction

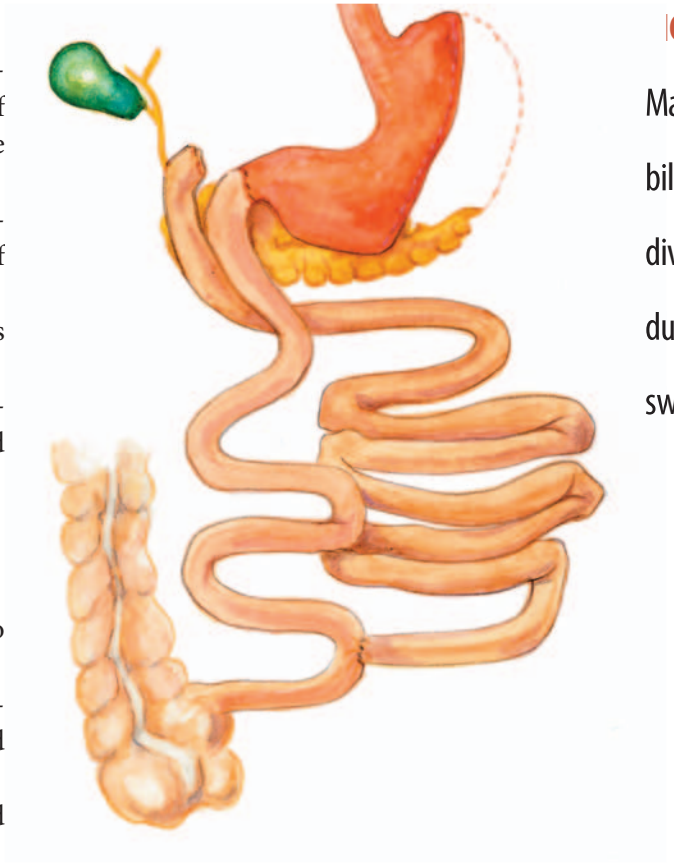

FIGURE 1

Malabsorptive: biliopancreatic diversion with duodenal switch.

FIGURE 2

Restrictive: adjustable band gastroplasty (illustration shows one type of lap band).

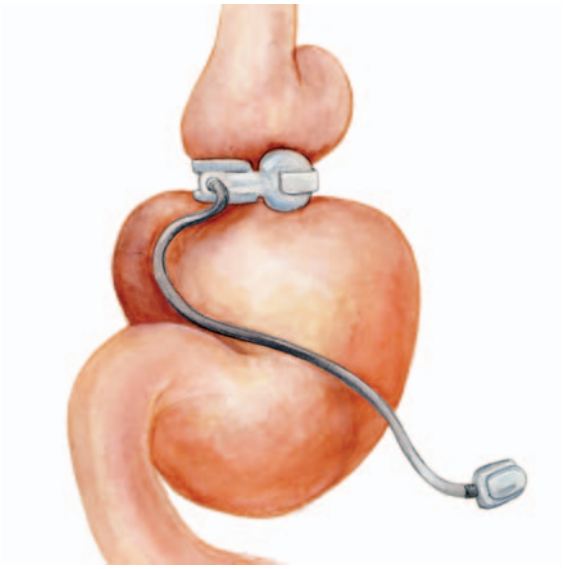

FIGURE 3

Combination: Roux-en-Y gastric bypass.

Exploration and Retraction

- Free the omentum of adhesions.
- Retract the omentum cephalad or use a Trendelenburg's position to exposure the ligament of Treitz.

Gastric Transection

- Place liver retractor if necessary for visibility purposes.
- Measure pouch size (approximately 30 cc using a 34 mm bougie or sizing balloon).
- Incise the gastrophrenic ligament at the Angle of His for better accessibility.
- Dissect starting from the lesser curve to the lesser sac.
- Transect the gastric pouch using an endo GIA (either a 3.5 [Blue] or 4.8 [Green] staple length) requiring two to three loads (ie cartridges) depending on linear length used (eg, 30 mm, 45 mm, or 60 mm).
- Use one "firing" (ie placement of staples) across, and one to two firings upward toward the Angle of His to create a pouch approximately 30 cc in size.

Creating the Roux Limb

- Divide the jejunum approximately 20 cm below the ligament of Treitz.
- Measure the length of the Roux limb approximately 150 cm down the distal portion of the jejunum.
- The jejunojejunostomy is performed by making an enterotomy in both portions of the jejunum, using a side-to-side anastomosis (a 2.5 white, 45 mm or 60 mm load) to create the Roux limb.
- Reattach the biliopancreatic limb to the jejunum farther down in the digestive tract to decrease malabsorption problems.
- Close the enterotomy, using an endo GIA 2.5 load.
- Transect the omentum using staples.
- Position the new Roux limb at the posterior end of the newly formed gastric pouch.

Gastrojejunojejunostomy

- The new Roux limb should be attached to the new pouch using a gastroenterotomy
- Close the gastroenterotomy with suture.
- The creation of the gastrojejunojejunostomy marks the completion of the gastric bypass procedure.

Leak Tests

- Check for leaks at the gastrojejunojejunostomy site.
- Use air or methylene blue to check for bubbles or evidence of dye around gastrojejunostomy site.
- Leak tests are necessary to prevent any complication to the patient.
- Some small leaks will seal themselves if the patient is kept NPO for 72 hours.

Closure and Placement of Drains

- Close the mesentery.
- Place a 10 mm Jackson-Pratt drain to detect leaks, evacuate fluid, signal bleeding, and to provide a route of egress if a leak is detected (70% of detected leaks do not require the patient to return to surgery).
- Close the wounds in the usual manner.

Postoperative Care

After the patient has been extubated and the dressings have been applied, she or he is transported to the PACU and later to the bariatric ward.

Potential Complications

- Cardiac problems related to morbid obesity
- Damage to nearby structures
- Deep vein thrombosis
- Deterioration of gastrointestinal anastomosis
- Diarrhea
- Dumping syndrome
- Enterostomy stenosis
- Hair loss due to insufficient protein intake
- Hemorrhage (to the point of necessitating transfusion)
- Kidney stone formation
- Malabsorption of specific vitamins and nutrients
- Mesenteric hernia
- Pulmonary embolism
- Respiratory insufficiency related to morbid obesity

Conclusion

Although a very technical procedure, the positive results and successful outcomes are enhanced by the presence of a knowledgeable and dedicated surgery team. It is imperative that the surgical technologist's knowledge of the preoperative, intraoperative and postoperative process of the respective bariatric surgery program is all encompassing. This knowledge should be partnered with an in-depth understanding of the specific surgical procedure being performed, as well as the "hows and whys" of the instrumentation being utilized. Failure to possess this procedural and instrumentation knowledge may create a delay in the procedure itself, as well as an atmosphere of frustration and uncertainty in the room. A surgical technologist who demonstrates advanced knowledge of the gastric bypass surgery can readily anticipate the needs of the surgeon and, as such, be prepared should the procedure require conversion from a laparoscopic to an open procedure. These attributes will identify the surgical technologist as a key member of the dedicated surgical team… worth their weight in gold!

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About the author

Bobbi Moore has been a Certified Surgical Technologist for more than 17 years. She is currently a Bariatric Clinical Consultant for Auto Suture, a division of US Surgical Corp/Tyco Healthcare, helping to set up bariatric programs throughout the Rocky Mountain Region. Moore is also the treasurer of the Utah State Assembly.

References

1. Overweight and Obesity Frequently Asked Questions (FAQs). National Center for Chronic Disease Prevention and Health Promotion. ***www.cdc.gov/nccdphp/dnpa/obesity/faq.htm*** (accessed 4/14/2005)
2. Overweight and Obesity Economic Consequences. National Center for Chronic Disease Prevention and Health Promotion. ***www.cdc.gov/nccdphp/dnpa/obesity/economic_consequences.htm*** (accessed 4/15/2005)
3. AORN Bariatric Surgery Guideline. *AORN Journal*. 2004;79(5):1026-1052.
4. Kenneth Champion. ASBS Centers of Excellence, October 2003. ***www.asbs.org*** (accessed 4/15/2005)
5. DeMaria EJ, Latifi R, Sugerman HJ. *Laparoscopic Bariatric Surgery: Techniques and Outcomes*. Georgetown, Tex: Landes Bioscience; 2002.
6. Quilici, PJ. Online Laparoscopic Technical Manual 2003. ***www.laparoscopy.net*** (accessed 4/10/2005)

CASE STUDY:

Treating Colon Cancer Surgically

SHAUNA GLUBIAK, CST

Introduction

Colon cancer is a form of cancer that affects the colon or rectum. With the exception of skin cancers, it is the third most common cancer diagnosed in the United States. The majority of colon cancers are **adenocarcinomas**, which is cancer of the glandular cells that line the inner wall of the colon. These cancerous cells spread outward into the layers of the intestinal wall. The degree of infiltration to outer tissues of the colon indicates the stage of the cancer.[7]

It is common for colon cancer to return after successful treatment. Once a patient develops colon cancer, even if it is completely removed, he is more likely to develop cancer in new areas of the colon, especially if the patient is younger than 60 when the cancer first appeared. As a result, follow-up visits and diagnostic tests, such as colonoscopies, are very important to prevent and treat recurrences.[7]

General biographical information

The patient is a 73-year-old Caucasian female, who is 5 feet ½ inches, and weighs 211 pounds. She is a former smoker and drinks alcohol occasionally. During a routine colonoscopy, a mass was found in the patient's colon. A biopsy was performed, and the specimen tested positive for cancer.

Patient's physical condition

The patient arrived at the hospital on the morning of her scheduled surgery. She was calm, cooperative and did not complain of pain.

Vital Signs

Pulse:	84 beats per minute
Respirations:	16
Blood Pressure:	160/80

Medical and surgical history

The patient is allergic to nizatidine, oxycodone and acetaminophen, cefazolin, and furosemide, and experiences a rash when taking these medications.

Her past medical history includes colon cancer in 1990 and 1999, and gastroesophageal reflux disease (GERD). Previous surgeries include a right colon resection in 1990 and a sigmoid colon resection in 1999; a hysterectomy in the 1970s, and bilateral hip replacements. Details of the hysterectomy and the hip replacement surgeries were not included in the chart.

Preoperative lab work

Preoperative tests included a complete blood count with differential and platelet count, blood chemistry, routine urinalysis, chest X-ray and ECG. The blood work and X-ray were performed five days prior to surgery. (See Table 1)

The patient's blood type was O positive.[5] Results indicated a normal size heart and clear lungs with no evidence of pulmonary disease. However, some degeneration of the dor-

Table 1 Preoperative and Postoperative Lab Values

	Accepted Range	Preoperative Patient Values	Postoperative Patient Values Day 1	Day 2	Day 3	Day 4	Day 5
Blood Count							
WBC	3.9-11.0 k/ul	7.4 k/ul	22.4 k/ul	9.2 k/ul	12.2 k/ul	11.6 k/ul	9.8 k/ul
HGB	11.6-16.3 g/dl	14.6 g/dl	13.3 g/dl	11.6 g/dl	12.2 g/dl	13.2 g/dl	12.0 g/dl
HCT	36-48%	42.7%	38.8%	33.8%	35.7%	38.4%	35.3%
RBC	4.2-5.4 M/ul	4.6 M/ul	4.2 M/ul	3.7 M/ul	3.9 M/ul	4.2 M/ul	3.8 M/ul
MCV	80-99 fl	92 fl	93 fl	93 fl	92 fl	92 fl	92 fl
MCH	27-31 g/dl	32 g/dl	32 g/dl	32 g/dl	32 g/dl	32 g/dl	31 g/dl
MCHC	32-36 g/dl	34 g/dl	34 g/dl	34 g/dl	34 g/dl	34 g/dl	34 g/dl
RDW	11.0-15.2%	12.4%	12.3%	12.8%	12.1%	12.5%	12.2%
PLT	160-392 k/ul	230 k/ul	243 k/ul	175 k/ul	185 k/ul	244 k/ul	250 k/ul
Hematology Differential							
Neutrophils (Poly)	42-75%	65%	84%		73%		
Stab Cells (Stab)	0-5%	Not available			1%		
Lymphocytes (Lymph)	21-51%	23%	10%		8%		
Monocytes (Mono)	0-10%	8%	6%		16%		
Eosinophil (Eos)	0-5%	3%			0%		
Basophils (Baso)	0-2%	1%			0%		
Blood Chemistry							
Sodium (NA)	138-145 mEQ/L	142 mEQ/L	141 mEQ/L	142 mEQ/L	140 mEQ/L	143 mEQ/L	
Potassium (K)	3.7-5.2 mEQ/L	5.0 mEQ/L	3.5 mEQ/L	3.9 mEQ/L	3.8 mEQ/L	3.5 mEQ/L	
Chloride (CL)	103-112 mEQ/L	104 mEQ/L	103 mEQ/L	108 mEQ/L	101 mEQ/L	102 mEQ/L	
Carbon Dioxide (CO_2)	23-33 mEQ/L	27 mEQ/L	27 mEQ/L	32 mEQ/L	26 mEQ/L	29 mEQ/L	
Blood Urea Nitrogen (BUN)	8-21 MG/DL	10 MG/DL	7 MG/DL	4 MG/DL	5 MG/DL		
Creatinine (CREAT)	0.4-1.0 MG/DL	1.0 MG/DL	0.8 MG/DL	0.7 MG/DL	0.7 MG/DL		
Glucose (GLU)	73-107 MG/DL	Not available	188	109			
Calcium (CA)	8.6-10.0 MG/DL	9.6 MG/DL	8.2 MG/DL	8.6 MG/DL	8.6 MG/DL		
Phosphorus (PHOS)	2.7-4.7 MG/DL	Not available		2.7 MG/DL	2.5 MG/DL		
Magnesium (MG)	1.7-2.2 MG/DL	Not available		1.6 MG/DL	1.6 MG/DL		

Note: When estimating blood loss, the amount of irrigation that is in the suction container is taken into consideration. When suctioning occurs during a procedure, blood collects in the suction container (output). Irrigation is poured into the abdomen prior to closing the cavity (input), and suctioned out (output), and flows into the same suction container. The amount of irrigation that is poured into the cavity must be tracked by the first scrub surgical technologist so it can be subtracted from the overall amount of fluids in the suction container and that difference equals the blood loss.

sal spine was found, which was probably due to the patient's age. Results from the ECG indicated a normal sinus rhythm, and a heart rate of 84 beats per minute. A nonspecific T-wave abnormality was noted.

Ventricle Rate:	84 beats per minute
PR interval:	174 milliseconds
QRS duration:	72 milliseconds
QT/QTc:	342/404 milliseconds
P-R-T axes:	62–28 57

Anesthesia

Prior to the administration of anesthesia, the patient received intrathecal infusion after insertion of a needle and catheter into the sheath of the spinal canal. She was placed in a sitting position, with her legs over the side of the bed and asked to slump forward and arch her back. A betadine skin prep was done, and a fenestrated sterile sheet was placed over the area of insertion. The anesthesia provider inserted a 25-gauge needle in the middle of the back between L_3 and L_4. He injected 0.3 mg of morphine initially and subsequently gave 0.7 mg at the end of the procedure for postoperative pain relief.

Intrathecal agents

Morphine, a narcotic analgesic was given for postoperative pain relief.[10] After administration of intrathecal medication, intravenous agents were given to anesthetize the patient.

Intravenous agents

1. Benzodiazepine.[1]
2. Narcotic analgesic[3]
3. Sedative hypnotic[1]
4. Depolarizing muscle relaxant[1]
5. Nondepolarizing muscle relaxant[1]
6. Antibiotic[10]
7. Antiemetic[3]
8. Antibacterial and antiprotozoal[3]

Inhalation agents

1. Oxygen
2. Inhalation anesthetic[10]

Positioning

The patient was placed in the supine position with both arms anatomically positioned and extended on arm boards. Pressure points and bony areas were padded with towels to prevent nerve damage. A donut was used to support her head. A blood pressure cuff was placed on the left arm; a pulse oximeter was placed on the right index finger; and a 20-gauge angiocath was located intravenously in the right hand. ECG leads were placed on her anterior chest wall. An electrosurgical grounding pad was placed on her upper back, because the patient had prior bilateral hip surgery with implants. Sequential compression stockings were placed on the patient's calves to maintain circulation in legs and reduce the risk of blood clots. The safety strap was placed two inches above the knees.

Surgical considerations

After the patient was placed under anesthesia, the anesthesiologist inserted a nasogastric tube to decompress the digestive tract intraoperatively and remove bilious drainage from the patient postoperatively. The tube would be removed when the patient was able to move her bowels on her own, as evidenced by bowel sounds and flatulence.

The circulator inserted a 16 Fr Foley catheter into the patient's bladder to deflate the bladder during surgery and to drain urine postoperatively.[1]

A time-out was initiated prior to incision to verify the correct patient, correct site and correct procedure.

Surgical skin preparation

The circulator visually inspected the skin, donned new sterile gloves, and placed sterile towels around the area to create a sterile boundary, thereby preventing pooling of fluids. After cleaning the umbilicus with cotton swabs, she was ready to begin scrubbing with an iodine solution. The area to be prepped extended from the patient's midchest to midthigh, the standard abdominal skin prep margins. The surgeon completed the skin prep by painting the area with iodine.

Surgical draping

The surgeon used a three-quarter sheet to cover the patient's lower extremities and then utilized four blue incisional towels to outline the surgical site. A chest breastsheet was then placed over the four towels. The surgeon preferred the chest breastsheet, because the larger opening afforded him improved visibility of the surgical site.

Operative procedure

Overview

A transverse colon resection was performed to remove a cancerous portion of colon. First, an exploratory laparotomy was performed by opening the abdomen and exploring the peritoneal cavity for visible signs of cancer metastasis.

Due to prior colon surgery, adhesions had developed and needed to be removed. A lysis of adhesions was carried out by cross clamping the adhesions, cutting them and ligating. This freed the peritoneum of existing scar tissue, which allowed for better visualization and less abdominal pain postoperatively. Intestinal clamps were placed on the colon and stapling equipment was used to cut the colon, while simultaneously closing the open ends.

A small bowel resection was also performed to establish clean margins of healthy tissue, since the right colon was missing due to a prior surgical resection. The surgeon removed a portion of the small bowel by clamping, cutting and simultaneously stapling it to create clean margins of noncancerous tissue.

An ileotransverse anastomosis was then carried out to restore gastrointestinal continuity. This was accomplished by attaching the side of the remaining small bowel to the side of the patient's left colon with a stapler. The wound was then closed and dressed.

Risks and complications

As with any surgery, risks of the procedure include infection and bleeding. More specific to colon surgery are incisional hernias, strictures of the colon lumen, intestinal blockage and stenosis due to scar tissue formation, and leakage at the anastomosis site.[15]

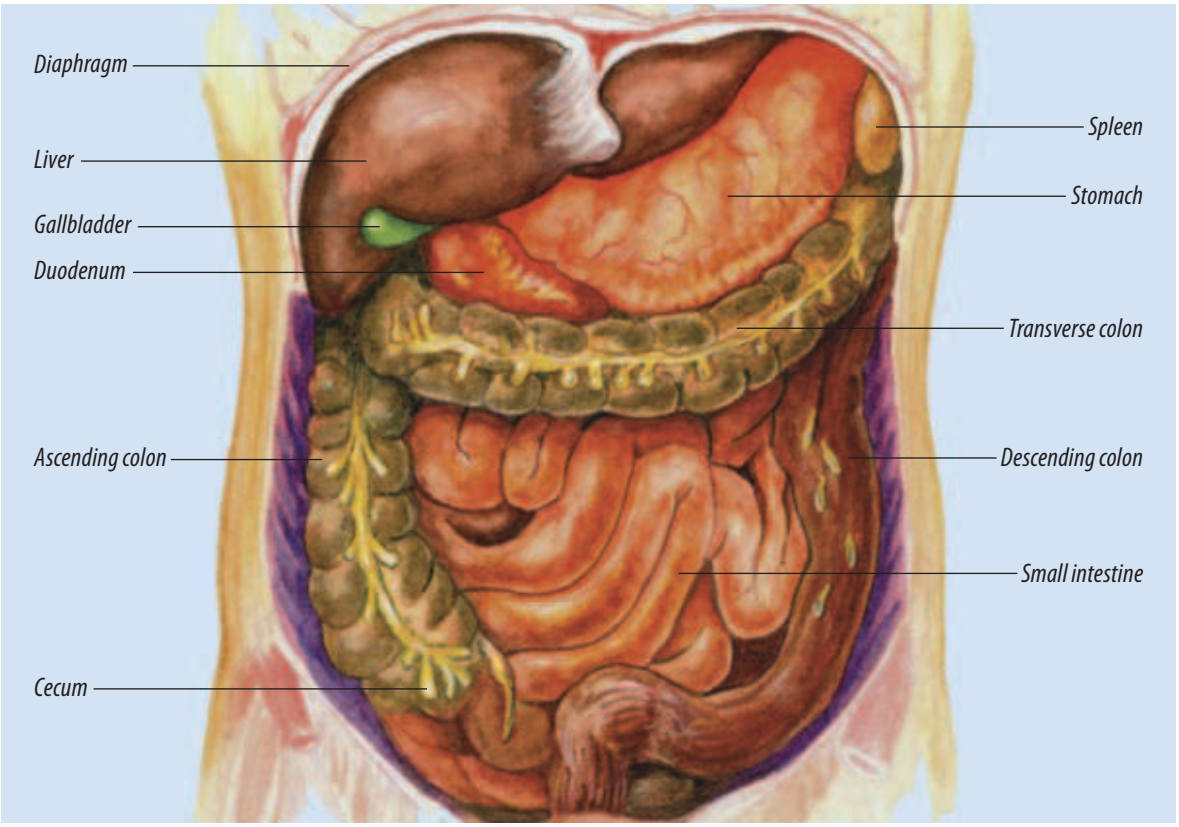


FIGURE 1: Abdominal viscera

Detailed description of procedure

An upper midline incision was made into the skin with a #10 blade on a #3 knife handle. Bleeding was controlled with dry lap pads. The incision was then continued downward through the subcutaneous tissue with the electrosurgical unit (ESU). Bleeding was controlled with Crile clamps and ESU coagulation. The peritoneum was opened with the ESU. Small Kelly retractors were used to retract the wound edges.

At this point, multiple adhesions were observed due to prior colon surgery. The adhesions were lysed by clamping the adhesion with two Kelly clamps, (Criles were also used for smaller, superficial adhesions) and cutting between the clamps with Metzenbaum scissors. The freed ends were tied off with 2-0 pre-cut ties. DeBakey forceps were used to manipulate the tissue around the adhesion and to aid in dissection. Dissection was done with the tip of a Crile clamp. Medium Kelly retractors were used to expose additional adhesion sites. This process was repeated multiple times until all adhesions were free. The surgeon then noticed more adhesions by the right side of the transverse colon caused by a prior right colon resection. He also lysed adhesions, with clamps and scissors. The surgeon, at one point, attempted to use a clip applier, but returned to his former method of clamping. The surgeon used medium and large Kelly retractors based on the location of the adhesion. At one point, a large Harrington retractor was used to visualize adhesions that were hard to detach, but was later replaced by the large Kelly retractor. After all adhesions were completely lysed, the surgeon placed a Balfour retractor in the abdomen to expose the operative site by retracting surrounding structures. Moist lap pads were used with the Balfour to protect wound edges. He mobilized the transverse colon by incising the lateral peritoneum with the ESU, and also mobilized the ileum of the small intestine approximately six to seven inches from the proposed anastomosis site. He detached the ileum from the mesentery by cross clamping with two Kellys, cutting with a Metzenbaum scissors and tying with 2-0 silk ties. Additional adhesions were present between the small intestine and the pelvic cavity and were lysed following the same procedures.

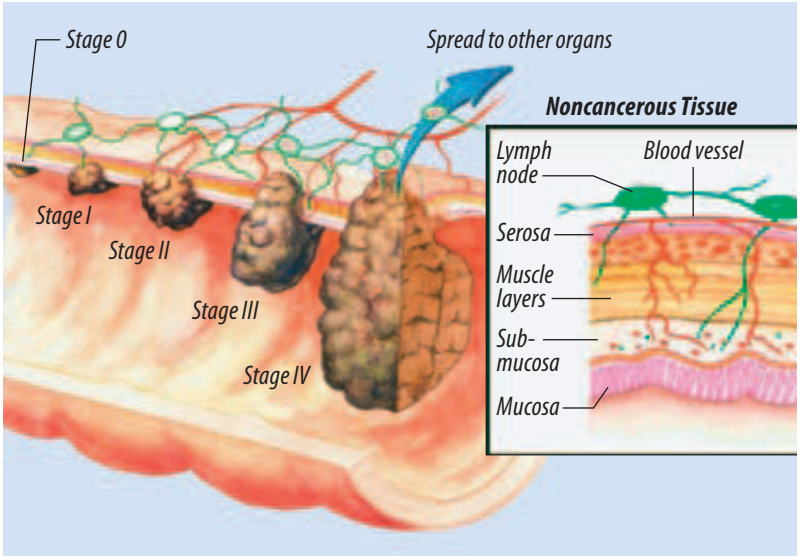


FIGURE 2: Stages of colon cancer

Once all adhesions were freed and enough colon was mobilized, the small intestine was clamped approximately six to seven inches from the tumor site with Kelly clamps. (Normally, the small intestine is not affected during colon surgery. However, either due to the location of the tumor and/or previous colon resection surgery, the small intestine was resected to allow for margins.) A stapler was employed to excise the intestine, while simultaneously stapling on either side of the excision. The transverse colon was then clamped with Kelly clamps and cut with the stapler approximately seven inches from the tumor site. The transverse mesocolon was transected by cross clamping with two Kelly clamps, cutting with Metzenbaum scissors and ligating with 2-0 silk ligatures. After the mesocolon was completely divided and ligated, the specimen was removed. A side-to-side ileotransverse anastomosis was performed by inserting the stapler into the colon and firing it. Bowel technique was instituted at this point. Allis clamps were then used to elevate the stumps of colon, and a second stapler was used to staple the two segments together. A curved Mayo scissors was used to cut off the excess tissue past the staple line. The anastomosis was reinforced with interrupted stitches of 3-0 silk pop-offs on a V-20 needle in order to prevent leakage at the anastomosis site.

At this point, all sterile team members' gloves were changed. The abdomen was irrigated with

warm saline (0.9% NaCl), and excess fluid was suctioned out. The mesocolon and lateral peritoneum were then closed with interrupted stitches of 3-0 silk pop-offs on a V-20 needle. The peritoneum and fascia were then closed in one layer in a running stitch of #1 double-stranded suture on a GS-26 needle. The subcutaneous tissue was then closed with interrupted 0 stitches on a GS-21 needle and 2-0 suture on a GS-21 needle. The skin edges were approximated with a skin stapler. The site was washed, and the wound was dressed with 4x4 gauze and paper tape.

Estimated blood loss:	200 cc
Input:	Lactated Ringers 2600 ml
Output:	Urine 200 ml
Specimen:	Portion of the transverse colon and portion of the small bowel—sent to pathology
Operative Findings:	Transverse colon cancer, multiple adhesions from extensive prior colon surgeries.

Postanesthesia care unit (PACU)

In the operating room, the patient had been extubated. She was awake and talking to the anesthesia provider, but then closed her eyes and became cyanotic. The anesthesia provider inserted a nasopharyngeal airway tube and used an Ambu bag and mask to deliver oxygen. The patient rapidly stabilized and was transferred to PACU, with oxygen being administered through a nasal cannula.

Upon arrival to PACU, the patient's vitals were taken.

Pulse:	106 beats per minute
Respirations:	18 breaths per minute
Pulse Oximeter:	98%
Blood Pressure:	190/80

Oxygen was being delivered through nasal cannula. She was drowsy, but awake, and said she was not in any pain.

She was evaluated by PACU personnel on a score sheet. (See Table 2.)

Table 2

	Arrival	15 minutes	30 minutes	1 hour
Activity	2	2	2	2
Respiration	1	1	1	1
Circulation	1	2	2	2
Conscious	1	1	1	1
Color	2	2	2	2
Total	7	8	8	8

Key

Activity:
2 can move all extremities
1 can move 2 extremities
0 moves no extremities

Respiration:
2 can cough and breathe deeply
1 limited respiratory effort
0 no spontaneous effort

Circulation:
2 +/- 20 from preop blood pressure value
1 +/- 50 from preop blood pressure value
0 more than +/- 50 from preop value

Consciousness:
2 fully awake and alert
1 may be aroused upon calling name
0 not responding

Color:
2 normal skin color
1 alteration in color; pale, dusky, jaundice
0 cyanotic

Postoperative care

Medications

The following medications were prescribed by the anesthesiologist for immediate PACU care after surgery.

- 25 micrograms of narcotic analgesic
- 4 mg of an antiemetic[10]

The following medications were prescribed by the surgical resident for the days following surgery.

- 5000 units of an anticoagulant to be given subcutaneously in the abdomen every 12 hours[10]
- 400 mg of an antibiotic, to be given intravenously every day[10]
- 500 mg of an antibacterial/antiprotozoal, to be given intravenously every eight hours[10]
- 4 mg of an antiemetic, to be given intravenously every six hours as needed [10]
- 2 mg of a narcotic analgesic, to be given intramuscularly (IM) every three hours as needed[6]
- 40 mg of a proton pump inhibitor, to be given intravenously every day to treat GERD.[6]
- 7 Gm sucralfate to protect against pepsin and bile acid, to be placed down the patient's nasogastric tube on the second postoperative day.[6]

Intravenous fluids

125 cc/hour lactated ringers solution given intravenously to prevent dehydration.

Postoperative lab testing

Complete blood count and blood chemistry tests were ordered and administered. The patient's values are shown in Table 1.

Postoperative care

On the morning after the procedure, the Foley catheter and nasogastric tube were still in place. The tube remained attached to intermittent suction. No significant drainage was noted. Lactated ringers were administered intravenously. Oxygen was given via nasal cannula. Sequential compression stockings were still in place.

Two days after surgery, the Foley catheter was still in place; clear yellow urine was draining by gravity, indicating that the Foley could be discontinued later in the day. The nasogastric tube was still in place and attached to suction. It was draining a dark colored fluid; the patient's bandages were clean.

The nasogastric tube was discontinued on the fourth postoperative day, since there was evidence of bowel sounds and flatulence. On the fifth postoperative day, the patient started a clear liquid diet. Since she responded well, her diet was slowly increased to a low-residue diet. At this point, she was feeling stronger and was moving independently. Her IV was discontinued on the sixth postoperative day. She was given discharge instructions and a copy of a diet to follow. She was advised not to bathe but to shower daily and wash the incision site with soap and water. Until permitted, no heavy lifting was allowed. She was prescribed a narcotic analgesic, to be taken every four to six hours as needed for pain and released.

Prognosis

The final pathology report revealed a recurrent, poorly differentiated adenocarcinoma. The tumor had infiltrated into mucosa, submucosa, muscle and serosa of the colon. The distal margins of the specimen were negative for cancer.

The patient's discharge diagnosis was recurrent poorly differentiated adenocarcinoma of the transverse colon. Her tumor was classified as T4, NO, M0, which means the cancer had spread completely through the colon wall and into nearby tissue. Lymph nodes were found negative for cancer. Evidence of distant spread was inconclusive. The patient's tumor classification places her cancer in Stage IIB, meaning she has a slightly less than an 87% chance for a five-year survival rate.[7] Chemotherapy was suggested to the patient as a treatment option.

About the Author

Shauna Glubiak, CST, graduated from the surgical technology program at Nassau Community College in May 2005. Currently, she is working at Winthrop University Hospital in Mineola, New York, and enrolled in science classes at a local university. Her plans include attending the physician assistant program at Tour, Bayshore, Long Island.

References

1. Fortunato N. *Berry and Kohn's Operating Room Technique*. 9th ed. St. Louis: Mosby; 2000: 403, 409–414, 511 and 569.
2. Goldman M. *A Pocket Guide to the Operating Room*. 2nd ed. Philadelphia: FA Davis; 1996.
3. Hitner H, Nagle B. *Basic Pharmacology*. 4th ed. Columbus: Glencoe/McGraw-Hill; 1999: 221, 419, 436, 605–606.
4. Martini FH. *Fundamentals of Anatomy and Physiology*. 6th ed. San Francisco: Benjamin Cummings; 2004.
5. Pagana KD, TJ Pagana. *Manual of Diagnostic and Laboratory Tests*. 2nd ed. St. Louis: Mosby; 2002: 134–136.
6. Pollachek JB. *Nurse's Pocket Drug Guide*. New York: McGraw-Hill; 2004: 126, 179 and 212.
7. Colorectal Cancer Facts and Figures Special Edition 2005. American Cancer Society ***http://www.cancer.org/downloads/STT/CAFF2005CR4PWSecured.pd.*** Accessed 2-9-2006.
8. Gastroesophageal Reflux Disease (GERD). 21 Feb. 2005 ***http://my.webmd.com/content/article/6/1680_51289.htm.*** Accessed 2-21-2005.
9. Bowel Resection. ***http://health.allrefer.com/health/bowel-resection-risks.html.*** Accessed 3-16-2005.
10. E Drug Digest. ***http://www.drugdigest.org//DD/PrintablePages/Monograph/0,7765,507/.../,00html.*** Accessed 3-17-2005.
11. Lab Tests Online. ***http://labtestsonline.org/understanding/analytes/.../multiprint.html.*** Accessed 2-20-2005.
12. ***www.allreferhealth.com.*** Accessed 2-9-2006.

When Unexpected Complications Arise During Surgery—

A Case Study of a Total Abdominal Hysterectomy with Bilateral Salpingo-oophorectomy

Kellie Cardoza Longatti

A total abdominal hysterectomy is defined as the surgical removal of the uterus.

The procedure may be done in conjunction with the removal of one or both of the fallopian tubes and one or both of the ovaries. If all structures are removed, the procedure is called a total abdominal hysterectomy with bilateral salpingo-oophorectomy—or TAH-BSO.

NATIONAL STATISTICS

Total abdominal hysterectomy (TAH) is considered "the most common non-obstetrical procedure for women in the United States."[2] Approximately 500,000 procedures are performed per year with a decrease of about 20% favoring the cervix-preserving supracervical hysterectomy.[13]

SURGICAL INDICATIONS

TAH-BSO can be performed for multiple conditions and pathologies, including:

- "Endometrial, tubal or ovarian malignancies
- Uterine sarcoma
- Uterine fibroids, both asymptomatic (if larger than 12 weeks of gestation size) and symptomatic
- Benign adnexal masses in postmenopausal women
- Dysfunctional uterine bleeding
- Endometriosis, chronic pelvic inflammatory disease and pelvic pain syndromes"[17]

TAH is generally the preferred approach when patients present with malignancies or large uterine fibroids. This approach facilitates easier access to lymph nodes, surrounding structures and large masses.

The abdominal approach is also considered the foundation for treatment of uterine and ovarian cancers, because it allows for extensive inspection of other tissues.[2]

PROCEDURAL OVERVIEW

This article will describe the pre-, intra- and postoperative surgical case management of an 83-year-old female diagnosed with a pelvic mass. The prescribed treatment in this case was an exploratory laparotomy with TAH-BSO.

PATIENT'S MEDICAL HISTORY

The patient's medical history included several surgeries, including a thyroidectomy, cholecystectomy, fixation of multiple upper and lower extremity fractures, cervical spine surgery, breast biopsy and spleenectomy.

The patient had been treated recently for a lower extremity blood clot and acid reflux.

At the time of admittance, the patient was hypertensive with a blood pressure of 180/130 mmHg.

Her medications prior to admittance included:

- Synthroid®, 125 mg daily, to compensate for the removed thyroid gland;
- Nexium®, 40 mg daily, to treat acid reflux; and
- Diovan® HCT, 185 mg daily, for treatment of hypertension.

PATIENT CONDITION UPON HOSPITAL ADMISSION

The patient presented with syncope and emesis. Her syncopal episodes were accompanied by the perception of a halo of light. According to the patient's chart, the patient had been referred to a cardiologist in the past for treatment of syncopal episodes.

The patient also complained of frequent emesis, frequent urination and pelvic pain.

The patient was alert and oriented at the time of arrival at the hospital. A physical examination revealed a soft, smooth cystic mass in the abdomen without ascites.

A pelvic exam revealed postmenopausal vaginal atrophy. The patient's cervix was deemed to be effaced.

The patient was admitted to the hospital for further testing due to the findings of the pelvic and physical exams. Further tests included an ultrasound, which determined the location of the pelvic mass, confirmed that no ascites was present and revealed that the mass was uterine in origin.

Frontal and lateral chest radiographs were taken, which revealed no chest masses, but displayed evidence of recent rib fractures. These were attributed to a fall related to her recent syncopal episodes.

Labwork results showed an elevated white blood cell count and the presence of protein in the patient's blood and urine, but were otherwise inconclusive.

Due to the inconclusive nature of the histology and urologic findings—combined with the presence of abdominal pain, a pelvic mass and syncopal episodes, it was determined that an exploratory laparotomy with TAH-BSO was indicated.

PREOPERATIVE DIAGNOSIS

The patient's preoperative diagnosis was a pelvic mass. The pathophysiology, which was subsequently discovered during the course of surgery,

was determined by pathologists to be advanced squamous cell carcinoma.

During the course of surgery, carcinoma was discovered in several tissues, including the peritoneum, cervix, vagina, bladder and bowel. The carcinoma was so pervasive that some structures—including the ovaries, fallopian tubes and much of the uterus and cervix—were not distinguishable from surrounding structures.

The tissue was found to be dark in color. In some locations, black, depressed spots were visible from a distance. Some of the tissue was stringy and friable, and in some areas—such as the cervical region—the tissue had the texture of thick liquid. The damage caused by the carcinoma was extensive.

ROOM PREPARATION

Surgical intervention began with preparing the room for the procedure. The anesthesia cart and supplies were placed at the head of the operating room table. The back table and Mayo stand were positioned toward the back of the operating room.

The case cart was brought into the room approximately 30 minutes before the procedure was scheduled to begin. For a complete list of equipment and supplies, see "Contents of Case Cart" on pg 163.

Once the case cart was opened, the back table pack was opened, followed by the basin set, the instrument set and the Bookwalter retractor set. A prep stand was prepared for the circulator, which included the Foley catheter and two sterile towels.

The surgical technologist began to scrub approximately 20 minutes before the procedure was scheduled to begin.

Once the surgical technologist was scrubbed in, the Mayo stand was used for gowning and gloving. The circulator disposed of the gown and glove wrappers, so the Mayo stand could be dressed by the surgical technologist.

The Mayo stand cover was placed on the Mayo stand, followed by two sterile towels laid flat and one sterile towel rolled to keep free ties and instruments steady.

The back table was arranged in a practical and useful manner, and the instrument tray was brought to the back table. Once the instruments had been inspected for sterility and all items were laid out appropriately on the back table, the surgical technologist and the circulator performed an initial count.

The count included the abdominal hysterectomy instrument set, the long dissection instrument set, the Bookwalter retractor, the large vein retractor, X-ray-detectable and laparotomy sponges, all three #10 blades, electrosurgical pencil tips and scratch pad, and all of the suture, excluding the free ties.

The items placed on the Mayo stand were positioned according to their order of use. Free ties were taken out of the packaging and placed under the roll towel, with approximately two inches protruding for access and to prevent tangling.

Two of the free ties were clamped within two tonsil clamps in preparation of ties on passes. The instruments on the roll towel included two Kelly clamps, two Mayo clamps, two Pean clamps, two long Aliss clamps, six long Kocher clamps, two tonsil clamps, two right-angle clamps, two Heaney clamps, two curved Ballentine clamps and two straight Ballentine clamps.

The remaining available space on the Mayo stand held one pair of long Metzenbaum scissors, one pair of curved Mayo scissors, one pair of straight Mayo scissors for suture, one long Debakey forceps, one regular Debakey forceps, one pair of Russian forceps, two medium Richardson retractors, two Army/Navy retractors and two X-ray-detectable sponges.

The three #10 blades were loaded onto knife handles. The first blade was placed onto a #3 knife handle for use on skin. The second blade was placed on a #3 knife handle for use on deeper tissues. The third blade was placed on a #3 long knife handle for the cervical incision. All of the #3 knife handles were placed on the Mayo stand as well.

Long Mayo-Hegar needle holders were loaded with 2-0 Chromic suture ligatures and placed on the Mayo stand.

A sterile towel was placed over these instruments. Then two light handles, suction tubing

with Yankauer suction tip attached, a nonperforating towel clamp and the handheld electrosurgical pencil were placed on the Mayo stand.

The Bookwalter retractor was set up on a second prep stand. The items in the Bookwalter set were counted in the intitial count. The items were laid out in such a way that the surgeon could pick out the blades he wanted to use with ease. The oval ring was placed on the back table so that it could be brought up to the field after the peritoneum was opened and the abdomen was packed.

The surgical technologist prepared a pitcher filled with approximately 500 cc of warm normal saline. A small basin was filled with the remaining 500 cc.

Five laparotomy sponges were soaked in the saline-filled basin. The Asepto syringe was filled with approximately 60 cc of warm saline from the pitcher and set aside on the back table.

POSITIONING THE PATIENT

At this time, the patient was brought into the operating room on a gurney. The patient was awake and alert and had been given a sedative.

The patient was asked to aid in positioning herself onto the operating table and was compliant. Once in the supine position, a safety strap was secured approximately six inches above the patient's knees.

The patient's arms were placed on padded arm boards, and a blood pressure cuff and pulse oximeter were secured.

An IV line had been placed while the patient was in the preoperative holding area, and a 1,000-cc bag of lactated Ringers solution was secured to her IV tubing.

The anesthesiologist proceeded with a full induction sequence, and the patient was intubated.

Once under general anesthesia, the patient's vital signs were noted as follows: blood pressure

Procedural overview—Total abdominal hysterectomy with bilateral salpingo-oophorectomy

The steps typically taken in completing a routine TAH-BSO are as follows:

- Open abdomen and retract intestines to expose reproductive organs.
- A tenaculum is placed at the fundus of the uterus for ease of manipulation.
- Heaney clamps are placed around the broad ligaments encompassing the round and ovarian ligaments bilaterally.
- The round ligaments are secured with suture ligatures and then divided with curved Mayo scissors, which creates anterior and posterior flaps—or "leaves"—of the broad ligament.
- The anterior and posterior flaps are then incised with Metzenbaum scissors.
- The bladder is dissected from the uterus and cervix using blunt dissection.
- The broad ligament is dissected from the lateral portions of the uterus using blunt dissection.
- Any bleeding vessels are clamped and tied.
- The posterior portion of the broad ligament is cut with a scissors or scalpel.
- The ureters and external iliac vessels are identified and protected.
- The uterus is manipulated upward and toward the lateral position to facilitate exposure of the uterine vessels and lower ligaments.
- The curved Ballentine clamps are passed, and the vessels are clamped, cut and tied.
- The rectum is freed from the cervix and mobilized out of the way.
- The cardinal ligaments are clamped, cut and tied.
- The uterus is manipulated upward again.
- The uterosacral ligaments are located and then clamped, cut and tied.
- The cervix is amputated from the vagina with a scissors or scalpel.
- The specimen is removed from the pelvic cavity and passed off the field.
- Kochers are passed to elevate and approximate the vaginal cuff, which is then sutured in interrupted fashion.
- The ligament remnants are sutured to the vaginal cuff.
- The peritoneum is approximated over the bladder, vaginal vault and rectum.
- The abdomen is irrigated, and all laparotomy sponges are removed.
- A full count is performed.
- The abdomen is closed, and a final count is performed.

was 180/130 mmHg, O_2 saturation was 96%, and temperature was 97.6° F.

The patient's arms were secured to the arm boards with towels placed around the arm and arm board and fastened with perforating towel clamps.

At this time, the surgeon entered the operating room and began to examine the surgical site. The abdomen was palpated, and the surgical site marked with a sterile marking pen.

The surgeon then left the room to begin his scrub. The patient's legs were put into a slight "frog leg" position.

SKIN PREPARATION

The blanket and gown were pulled back to expose the abdominopelvic area. The abdomen was prepped by the circulator using Betadine® gel and one sterile towel to smooth the gel over the entire abdominal area from just under the breast area to the iliac crests.

A vaginal preparation was performed using Betadine® solution applied to the upper, middle and lower thighs toward the vagina and to the vaginal area from the urethral meatus to the rectum.

The Foley catheter balloon was tested and deemed to be in working order. The Foley catheter was then inserted, and the collection bag was placed below the table in a conspicuous area visible to the circulator. The patient was returned to the supine position.

PROCEDURAL OVERVIEW

Upon re-entering the room, the surgeon was gowned and gloved. The surgeon informed the surgical technologist that an assistant would be assisting him later in the case. The surgical technologist then requested another gown and gloves for the assistant.

Four, folded sterile towels were passed to the surgeon who then used them to square off the surgical site. They were not secured with clamps.

The laparotomy drape was passed to the surgeon, and the tabs were peeled off. The surgeon and the surgical technologist then opened the drape and laid it appropriately on the patient, allowing for the fenestration to reveal the surgical site.

The anesthesiologist clamped the drape to the IV poles, and the Mayo stand was brought up to the field.

The light handles were handed to the surgeon, while the surgical technologist fastened the electrosurgical pencil and suction tubing to the drape with a non-perforating towel clamp.

The electrosurgical scratch pad and holster were placed conspicuously on the field.

Two X-ray-detectable sponges were laid near the surgical site, and the sterile towel over the instruments was removed and placed on the back table. The back table was then brought to the surgical technologist by the circulator, and no contamination was noted.

The anesthesiologist informed the surgeon that the patient was experiencing hypertension, but to proceed.

The circulator called for a "time-out," and the patient's name, surgeon's name and planned treatment were called out and confirmed.

The #3 scalpel was passed to the surgeon, and an eight-inch midline incision was made from approximately four inches below the xiphoid process to the symphysis pubis—avoiding the falciform ligament on the right side of the patient's umbilicus. The cut time was 1:45 pm.

The subcutaneous and adipose tissues were dissected with the electrosurgical pencil. X-ray-detectable sponges and the electrosurgical pencil were used to achieve hemostasis.

The adipose tissue was dissected from the rectus fascia with the electrosurgical pencil, and Army/Navy retractors were passed for retraction of the skin, subcutaneous tissue and adipose tissue.

The second #3 knife was passed, and the rectus abdominus fascia was incised. The curved Mayo scissors were passed to the surgeon, and he cut the fascia vertically toward the xiphoid and then down toward the symphysis pubis.

The underlying rectus muscle was spread with Metzenbaum scissors in an opening and closing motion to create an opening which was then retracted with medium Richardson retractors.

Once the opening was sufficient, two Kelly clamps were passed to grasp the peritoneum at each end of the opening. Once the peritoneum was grasped and lifted off the bowel, Metzenbaum scissors were passed, and the peritoneum was cut.

Once the peritoneum was opened, the skin, subcutaneous tissue, adipose tissue, fascia, muscle and peritoneum were pulled and stretched by the surgeon and the surgical technologist preceptor.

A large opening was created by the stretching and pulling, and the bowel was retracted back by hand. The soaking laparotomy sponges were wrung out and passed to the surgeon and the X-ray-detectable sponges were removed . The surgeon used the sponges to pack away the bowel.

The surgeon then asked for the patient to be placed into a slight Trendelenberg position. This allowed for ease of packing away the bowel and for placement of the Bookwalter retractor.

The oval ring of the retractor was passed, and the preceptor held it in place while the surgeon looked for the blades he preferred.

He picked one Balfour blade with ratchet, and three 2"x4" Kelly blades and ratchets. He placed one Kelly blade at the superior portion of the incision and two Kelly blades at the lateral portions of the incision.

He then identified the uterus and manipulated it upward. Using blunt dissection, the surgeon removed the visceral bladder reflection from the uterus.

A laparotomy sponge was placed over the bladder, and the bladder blade was positioned in a manner that retracted the bladder away from the uterus.

Once the Bookwalter retractor was secured, the surgeon asked the anesthesiologist to return the patient to a level position.

The assistant arrived, and the surgical technologist gowned and gloved him. During this time, the surgeon began to study the anatomy of the patient. The surrounding anatomy appeared abnormal.

The uterine tissue appeared jaundiced and, upon palpation, was able to be depressed with a finger as in the manner of a fluid-filled sac.

The surgeon ordered a washing specimen. The Asepto syringe containing warm, normal saline was passed to the assistant, who expressed the saline into the pelvic cavity.

The surgeon then advised the assistant to collect as much of the fluid as possible for cytologic examination.

The assistant collected approximately 40 cc of fluid and passed it to the surgical technologist. The surgical technologist passed the syringe to the circulator, who labeled it appropriately. The cytologist was then called.

Once the cytologist entered the operating room, the specimen was collected and processed in cytology. During the course of the surgery, the cytologist did not report back to the surgeon, but to the circulator.

The surgeon requested a gallbladder trocar to drain the uterus. The circulator located and passed the trocar onto the field.

Once the trocar was inserted into the uterus, it was discovered that the myometrium of the uterus was no longer intact and had become purulent. The visceral layer of the uterus was the only portion still intact.

The drainage of the uterine contents contained approximately 300 cc of ichorous pus. Strings and masses of tissue could be visualized in the suction canister.

At the surgeon's request, the pathologist was called to retrieve the suction canister and examine the contents of the uterine sac.

The uterine sac collapsed and remained attached to the suspensory ligaments. The anesthesiologist reported maintained hypertension and advised the surgeon to proceed quickly.

Due to the pathology and anatomy of the patient, many of the steps typically performed in a TAH-BSO (see sidebar, pg 160) were not able to be carried out during this procedure.

Upon examination, it was noted that the broad ligament and round ligament were intact. The surgeon and the assistant began the process of dividing the ligaments bilaterally.

Debakey forceps were passed to the surgeon, so he could grasp the round ligament. Then, a Heaney clamp was passed, and the right round

ligament was clamped. Debakey forceps and a Heaney clamp were passed to the assistant for clamping the round ligament on the left side of the uterus.

A long needle holder was passed to the surgeon with a 2-0 Chromic suture ligature. The surgeon tied the suture, and the assistant cut it with suture scissors.

The surgeon requested another suture ligature to finish ligating the round ligament. The suture was tied and then cut with suture scissors.

The round ligament was then divided with curved Mayo scissors. The broad ligament was clamped with a Heaney clamp and incised with a #3 knife. The broad ligament was dissected bluntly away from the lateral boarders of the uterus.

At this time, bleeding began from the vessels of the broad ligament. Electrocautery was used for cessation of the bleeding, but had little effect.

The vessels on both the right and left sides were ligated with approximately ten 2-0 Chromic and 2-0 Vicryl® free ties and stick ties.

Blood loss from the broad ligament was approximately 700 cc. At this time, the surgical technologist requested approximately 20 additional laparotomy sponges to aid in hemostasis.

The anesthesiologist reported that the patient was tachycardic and that the surgery should proceed quickly.

The patient was placed in a slight Trendelenberg position to aid in restoring normal heart rate.

The ovarian ligaments could not be identified, nor could the fallopian tubes or ovaries. There was insufficient mesosalpinx to be noted.

The surgeon manipulated the uterine sac upward to view the posterior sheath of the broad ligament, which was incised using Metzenbaum scissors. At this time, the ureters could not be identified, and bleeding from the uterine vessels became overwhelming.

1 Chromic sutures were passed one after the other in an attempt to stop the bleeding. Laparotomy sponges were passed to apply pressure to the bleeding area.

The case cart used in this procedure contained the following:

- One abdominal hysterectomy instrument set
- One Bookwalter retractor
- One long dissection instrument set
- One large vein retractor
- Gowns and gloves for all team members
- Three six-pack sterile towels, one major abdominal pack, one laparotomy sheet
- One double basin set, one Klenzyme® one-ounce package
- One handheld electrosurgical pencil, one electrosurgical pencil extender tip, one 10" grounding pad
- Two green bed sheets, one case cart cover
- One 3,000-cc suction canister, one canister lid, one biohazard tag
- One 16-FR Foley catheter tray, one uc/cath strip fastener
- One surgical marking pen with sterile labels, one four-ounce specimen container
- One box of 10 X-ray-detectable sponges, one package of 10 18x18 laparotomy sponges
- One plastic Poole suction tip, one Asepto bulb syringe
- One skin scrub tray, one bottle of Betadine gel
- Two Primapore™ 11.5"x4" sterile dressing, one Primapore 8"x4" sterile dressing
- One kidney basin, two specimen cups, one pour pitcher, one small basin
- One back table garbage bag, one Mayo stand cover, one needle safety counter
- One medium Ligaclip applier and Ligaclips
- One large Ligaclip applier and Ligaclips
- One suction tubing, one plastic Yankauer suction tip
- Three #10 blades, two #3 knife handles, one #3 long knife handle
- One 3-wide skin stapler
- Free ties: 1 Chromic 18", 2-0 Silk 18″
- Stick ties: 2-0 Chromic SH 27"
- Peritoneum: 2-0 Vicryl CT-1 36"
- Fascia: 0 Vicryl CT-1 36"
- Uterus: 1 Chromic CT-1 36"
- Vaginal cuff: 1 Chromic CT-1 36"
- One bottle sterile water 500 cc, one bottle 0.9% sodium chloride 1,000 cc
- 0.5% bupivicaine plain 50 cc

The surgical technologist requested 10 more laparotomy sponges and five 1 Chromic sutures.

Once the bleeding had been controlled, the anesthesiologist requested that the circulator call the blood bank to have one unit of type O whole blood sent to the operating room.

At this time, blood loss was estimated at 3,000 cc. The anesthesiologist consulted with the surgeon, and it was determined to proceed with the case.

The bladder was observed, and some abnormal spotting was noted. Using blunt dissection, the bladder was separated from a mass of tissue that had once been the cervix. The external os and the fornix of the vagina were partially intact. The inferior portion of the intact cervix was grasped with a long Allis, and curved Mayo scissors were passed.

The inferior portion of the cervix was amputated from the vagina. When the surgeon prepared to pass the specimen, the tissue frayed and was removed in string-like masses. The surgeon ordered that the pathologist be called to collect the specimen.

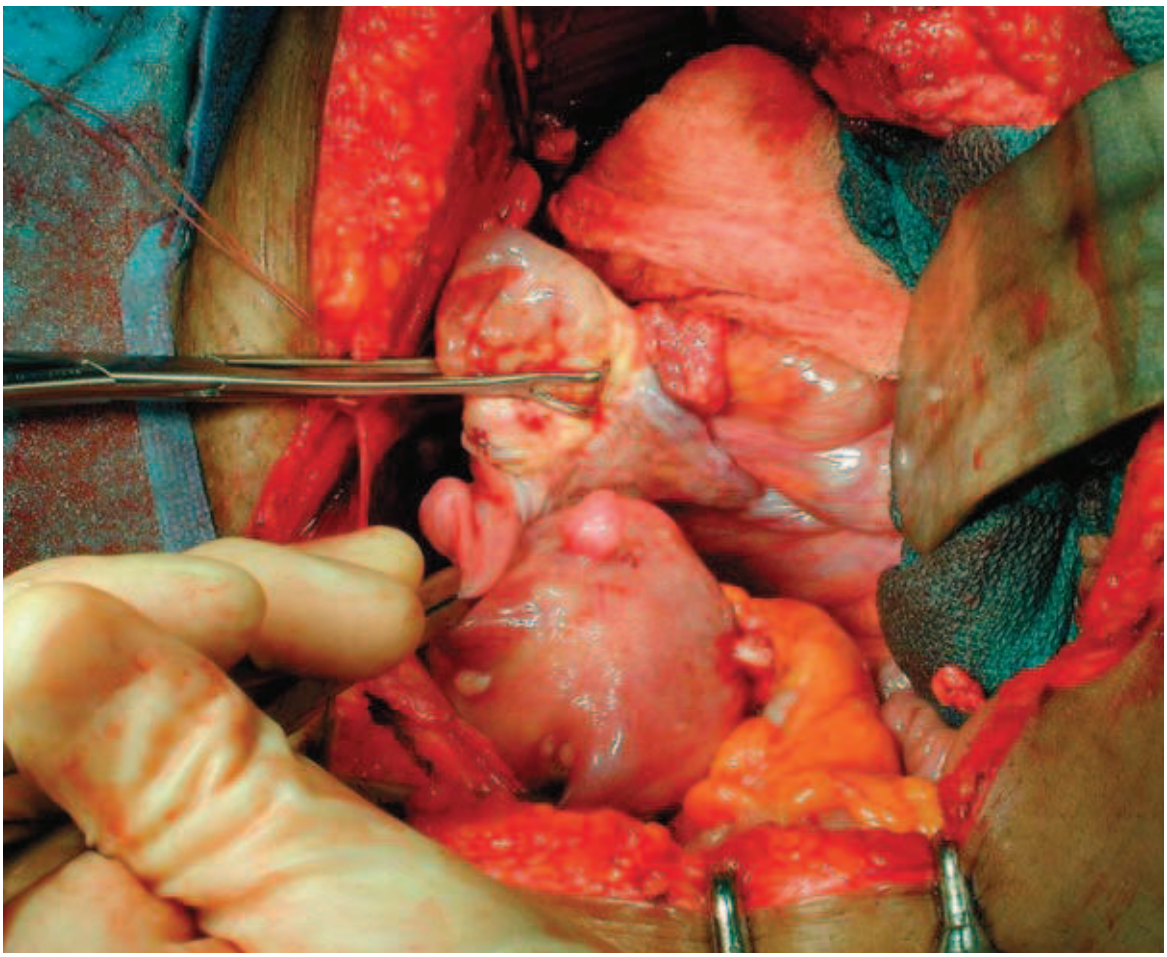
As the vaginal cuff was being grasped with long Kochers, bleeding started again. Several 1 Chromic sutures and laparotomy sponges were passed to aid in hemostasis. The blood loss became so significant that the anesthesiologist ordered the surgery halted.

The abdomen was packed with approximately 10 laparotomy sponges, and pressure was held. Blood loss at this point was approximately 9,000 cc, and the patient was extremely hypotensive with a blood pressure of 60/40 mmHg.

The patient was also bradycardic, pale and diaphoretic. The anesthesiologist began recussitative efforts.

The anesthesiologist ordered four units of packed red blood cells and a blood warmer. The

Figure 1
The right ovary, as viewed during a TAH.



Courtesy Vesalius.com

circulator requested that the OPS manager be present for the remainder of the case, and the crash cart was placed just outside the operating room by a surgical services associate.

The anesthesiologist ordered 2,000 cc of warmed lactated Ringers be given intravenously and began IV drug therapy. The anesthesiologist then began administering dopamine to aid in vasoconstriction and myocardial contractility and to increase heart rate, blood pressure and cardiac output.

With assistance from the OPS manager, the circulator and another RN, the anesthesiologist attained central line access and was able to administer norepinepherine and hydrocortisone for acute adrenal insufficiency.

The blood warmer and four units of packed red blood cells arrived, and the anesthesiologist and circulator immediately began their administration. The anesthesiologist then ordered four more units of packed red blood cells.

Once the patient had stabilized enough to continue, the anesthesiologist gave the surgeon permission to proceed.

At this time, the pathologist reported back to the surgeon that there were no clear margins in the specimen collected earlier and that the tissue could not be identified.

The surgeon removed the laparotomy sponges from inside the abdomen and attempted the suturing of the vaginal cuff again. The vaginal cuff was grasped with Kochers, and 1 Chromic sutures with CT-1 needles were passed on long needle holders. The suture scissors were passed to the assistant.

After the first suture was passed through the tissue, the surgeon noted that the tissue was friable and not capable of holding suture. The surgeon began to pull the tissue out in strings in an attempt to reach viable tissue.

Twenty-seven attempts were made to close the vaginal cuff by suture. At this point, the blood loss warranted halting the surgery again. The time was 5:30 pm, and blood loss was estimated at approximately 15,000 cc.

By this time, 65 laparotomy sponges and 34 1 Chromic sutures had been used. The circulator had wrung out the used laparotomy sponges and collected the blood for measurements.

The surgical technologist and surgical technologist preceptor were relieved for the day. The relief person ordered 20 additional laparotomy sponges and 10 additional 1 Chromic sutures, assisted the surgeon and assistant in hemostatic efforts, and maintained the sterile field.

The anesthesiologist once again began hemostatic, pharmaceutical and cardiac life-saving measures. At 7:02 pm, the patient went into a state of paroxysmal atrial fibrillation, and the anesthesiologist required that the surgery be terminated.

The surgeon packed the vagina and pelvic region with laparotomy sponges and closed the midline incision with a running stitch.

Total blood loss during the procedure was approximately 16,000 cc, and 15 units of packed red blood cells and one unit of platelets were administered. Urine output was approximately 300 cc; gross hematuria was notable.

The patient was transported to the ICU, where several diagnostic tests were performed. Histology results indicated hypothyroidism, stress hypoglycemia and hypokalemia.

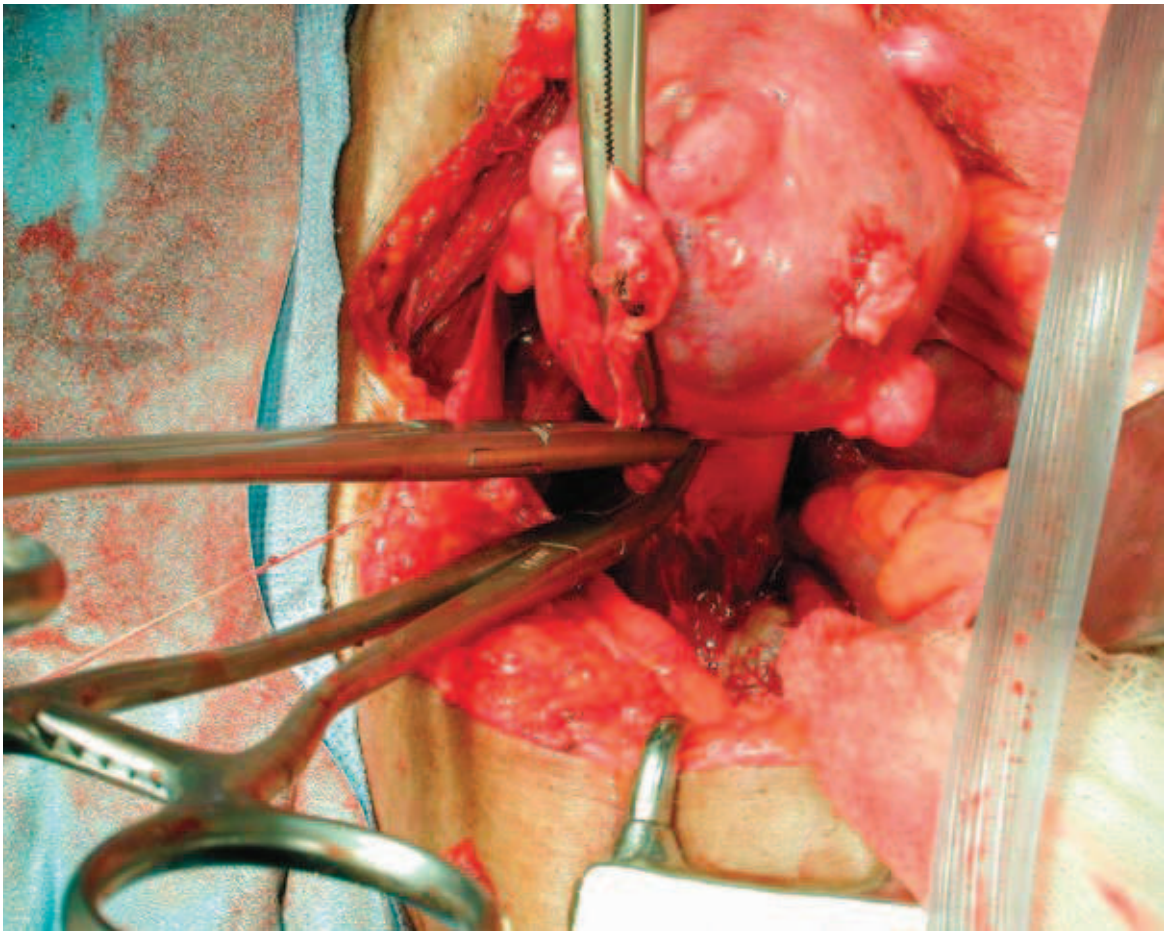
The patient was diagnosed with post-traumatic hypoxia, paroxysmal atrial fibrillation, hemorrhagic shock and advanced squamous cell carcinoma.

While in the ICU, the patient received one more unit of packed red blood cells and six units of platelets.

At 11:42 pm, the patient was deemed stable enough to finish the previous procedure and was taken back to the operating room. She was placed in high lithotomy position, and the vaginal area was prepped with Betadine solution.

Due to the extent of bleeding from the previous surgery, the vaginal cuff was left open and packed with laparotomy sponges. During the second procedure, the laparotomy sponges were removed vaginally and replaced with fresh sponges.

At 12:32 am, the patient was taken to the ICU, where antibiotics were administered by request of the surgeon after noting the presence of thick, white vaginal secretions.



Courtesy Vesalius.com

Figure 2
The uterine artery is clamped during a TAH.

The patient remained intubated, and her airway was managed mechanically. The patient was sedated and restrained due to combativeness and an attempt to extract the endotracheal tube. The patient did not experience wakefulness, but did respond to basic commands, such as raising her arm.

Upon physical examination at 7:30 am the following day, abdominal distention and firmness was noted. However, it was deemed that the patient could not tolerate any further surgical exploration or correction at that time.

The patient was placed on an insulin drip for treatment of hyperglycemia, fluids and electrolytes to correct fluid imbalance, vancomycin for treatment of infection, and phenylephrine hydrochloride and amiodarone hydrochloride for treatment of paroxysmal atrial fibrillation.

The patient had an advanced directive, which gave the patient's spouse the authority to make critical care decisions on her behalf.

In the presence of several of the patient's family members, the final postoperative care performed before the patient died was the administration of the Sacrament of the Sick.

PROFESSIONALISM AMID GRIEF

Although the patient in this case did not have a positive outcome, it is crucial to remember the surgical technologist's motto: *Aeger Primo*—the patient first.

Regardless of a procedure's possible outcome due to the patient's age, pathology or other circumstances beyond one's control, the patient must come first. Every decision that the surgical team makes must be for the ultimate benefit of the patient.

A surgical team must not be mediocre, unsympathetic or thoughtless. Surgical team members must be willing to continually strive for the best for their patients.

Overview of relevant anatomy

The anatomy of the pelvic cavity pertinent to TAH-BSO is quite extensive.

Peritoneum

The peritoneum is a serous membrane made up of epithelial cells. The peritoneum can be divided into two layers: the parietal layer, which lines the cavities, and the visceral layer, which covers internal organs.[1]

The function of the peritoneum includes protecting nearby organs and providing frictionless surfaces for organs to slide over. The peritoneum also carries blood, lymphatic vessels and nerves.[1]

Intestine

While the small and large bowel are typically not disturbed surgically during a TAH-BSO, it is important to note that these structures must be retracted back to expose the pelvic contents. Therefore, a brief description of these structures is necessary.

The large and small intestine are the absorbers of the digestive tract. The small intestine absorbs nutrients, water and minerals from digested food. The large intestine also absorbs water and creates waste products.[1]

The large and small intestine collectively reach between 15 and 25 feet in length and are compressed into a space that measures approximately 16"x12"x8".[1]

Ovaries

The ovaries are the reproductive glands of the female. Typically, females have two ovaries located bilaterally next to the uterus. The ovaries are approximately four centimeters in length and are held in place by the suspensory, broad and ovarian ligaments.[1,8]

The ovaries house approximately 300,000 eggs. The glandular portions of the ovaries—the corpus luteum—produce estrogen and progesterone.[1,8]

The oviducts, also called fallopian tubes, are the passages through which the ova travel to the uterus. The fallopian tubes are made up of smooth muscle and are controlled by peristalsis. They are approximately 5" long and extend from the fundus of the uterus to near the ovaries. The proximal ends are called fimbriae and are "finger-like" projections that produce small, wave-like motions that sweep the ova into the tubes for fertilization.[1,19]

Uterus

The uterus measures approximately three inches long and is considered a hollow organ consisting of three layers of tissue: the endometrium (the interior lining), the myometerium (the muscular layer), and the perimetrium (the visceral layer).

The uterus is supported by several ligaments and suspensory systems.

The broad ligament consists of folded peritoneum housing the ovarian and uterine vessels, the ovarian ligament and cellular tissue. The broad ligament extends from the pelvic wall to the lateral borders of the uterine corpus. The broad ligament also creates the mesosalpinx, mesovarium and mesometrium.[8,19]

Bilaterally, the round ligament extends from inferior to the fallopian-uterine attachment, then connects to the broad ligament and continues through the inguinal ring and downward, terminating at the labia major.[19]

Cervix

The cervix is the opening of the uterus to the vagina. It begins at the internal os, leads through the cervical canal and the external os, terminating in the proximal end of the vagina. The cervix is also considered the neck of the uterus. It is approximately one inch long and its opening measures less than one millimeter in diameter.[19]

Vagina

The vagina is considered the distal portion of the birth canal and measures approximately three inches in length. It is composed of epithelial tissue and is lined with a mucous membrane. The mucous membrane creates folds, called rugae, which increase the surface area of the vaginal canal and expand during childbirth.[1]

Bladder and ureters

The urinary bladder and ureters are important anatomic landmarks during a TAH-BSO. Both structures must be identified and retracted away from the surgical site.

The urinary bladder is the collection point for urine. The bladder consists of many layers such as mucosa, connective tissue, involuntary muscle, and peritoneum. The inner layer of the bladder had mucosal folds or rugae much like the interior of the vagina. These are present throughout with the exception of a triangular spot which is in the inferior portion of the bladder called the trigone. The trigone provides bladder stability and does not allow either urine back-flow or ureteral stretching.[1]

The ureters, although extraperitoneal, are exposed to some danger during a TAH-BSO. They run bilaterally from the kidneys to the urinary bladder and lie exposed during bladder retraction. The ureters are comprised of epithelial tissue and controlled by gravity and peristalsis. They carry urine from the kidneys to the urinary bladder.[1]

Additional

There are several vessels that add vascularity to the pelvic cavity. The smaller vessels include the uterine vessels, the obturator vessels, and the superior vesicle artery, which runs throughout the mesosalpinx and broad ligament.

The larger vessels, which are exposed during a TAH-BSO, are the external iliac vessels. These provide the major blood supply for the pelvic region.[11]

There are also several lymphatic vessels in the pelvic region, including the periaortic lymph nodes, the common iliac lymph nodes, the external iliac lymph nodes and the deep inguinal lymph nodes.[11]

The nerve branches that innervate the pelvic region originate from the hypogastric plexuses and are controlled by the autonomic nervous system.[11]

ABOUT THE AUTHOR

Kellie Cardoza Longatti currently works at a hospital in California. She graduated from San Joaquin Valley College in October, 2007. She wrote this article prior to graduation.

EDITOR'S NOTE:

All procedure-specific clinical information was obtained from the patient's chart and the surgeon's preference card with permission.

References

1. Cohen BJ. *Memmler's The Human Body Health and Disease*. Baltimore, MD: Lippincott Williams & Wilkins; 2005.
2. Crandall CJ. Hysterectomy. Available at: ***http://www.medicineNet.com/hysterectomy/article.htm.*** Accessed May 4, 2007.
3. Doherty GM, Lowney JK, Mason JE, Reznik SI, Smith MA, eds. *The Washington Manual of Surgery,* 3rd ed. St Louis, MO: Lippincott Williams & Wilkins;2002.
4. Dominowski G. Pathology: Squamous Cell Carcinoma. Available at: ***http://www.emedicine.com/ent/topic671.htp***. Accessed May 4, 2007.
5. Lee JA. *Abdominal Exploration Series*. University of Maryland Medical Center. Available at: ***http://www.umm.edu/ency/article/002928.htm.*** Accessed May 4, 2007.
6. Marcucci L. Total Abdominal Hysterectomy (Uterus Removal). Available at: ***http://www.insidesurgery.com/OBGynsurgery.*** Accessed May 4, 2007.
7. National Cancer Institute. *Dictionary of Cancer Terms*. Available at: ***http://www.cancer.gov/Templates/db_alpha.aspx?CdrID=46056.*** Accessed May 4, 2007.
8. Netter F. *Atlas of the Human Body*. New York, NY: Icon Learning Systems;2006.
9. Patient chart and surgeon preference card. Obtained with permission.
10. Price P, Frey K, Junge TL, eds. *Surgical Technology for the Surgical Technologist: A Positive Care Approach*, 2nd ed. New York, NY: Delmar Learning;2004.
11. Rothrock JC. *Alexander's Care of the Patient in Surgery,* 13th ed. St Louis, MO: Mosby Elsevier;2007.
12. Sharma K, Khurana N, Chaturvedi KU. Primary Squamous Cell Carcinoma [Electronic version]. *Journal of Gynecological Surgery*,December 2003.
13. Sills ES. Abdominal Hysterectomy: Trends, Analysis, and Sexual Function. *OBGYN.NET Publications*. Available at: ***http://www.obgyn.net/women/womanasp?page=/ah/articales/special_5-99.*** Accessed May 4, 2007.
14. Spratto GR, Woods AL. *PDR Nurse's Drug Handbook,* 2006 ed. New York, NY: Thomas Delmar Learning;2005.
15. Tighe SM. *Instrumentation for the Operating Room: A Photographic Manual,* 6th ed. St Louis, MO: Mosby;2003.
16. Vilanova Jr, P. Anesthesiology: Sedation of Patients in the ICU. Available at: ***http://www.medstudents.com.br/anest/anest4.htm.*** Accessed May 8, 2007.
17. Webb MJ. *Mayo Clinic Manual of Pelvic Surgery*, 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins;2000.
18. Winter WE, Gosewehr JA. Uterine cancer. Available at: ***http://www.emedicine.com/med/topic2832.htm.*** Accessed May 5, 2007.
19. Venes D, ed. *Taber's Cyclopedic Medical Dictionary*, 19th ed. Philadelphia, PA: FA Davis;2001.

Obesity:
An American Epidemic

Karen L Chambers, CST

America is facing an epidemic of enormous proportions: obesity. Defined as the state of being above one's normal weight,[13] a person once had to be diagnosed as being more than 20 percent of their ideal weight to be considered obese. In the present day, the National Institute of Health (NIH) states that a person with a Body Mass Index (BMI) of 30 and above (which relates to 30 pounds) is now considered obese.[12] A person's height, age, sex and build help establish their ideal weight.

Obesity is a condition in which excess body fat has accumulated to such levels that a person's health can be negatively affected. The US Centers for Disease Control and Prevention (CDC) have ranked obesity as the number one health threat in America, with an estimated 400,000 deaths annually.[3] (Smoking causes an estimated 440,000 deaths annually.[19]) Being simply overweight is not as dangerous as being obese. An overweight person can easily lose a few pounds by monitored diets and exercise, and usually regains a healthy body and mind. Obese people cannot accomplish this as easily, no matter how much effort is exerted.

Obesity not only affects an individual's lifestyle, it also leads to low self-esteem, which leads to depression and discomfort. Negative emotions, such as boredom, sadness, stress and anger, can also jump-start bad eating habits. These and other psychological factors may bring people to use food as medicine.

Numerous research studies have confirmed that poor eating habits, lack of exercise and a sedentary lifestyle are the prime contributors to obesity.[10] Because of on-the-go lifestyles, fast food consumption and microwave meals, people have sacrificed their

LEARNING OBJECTIVES

- Examine the long-term health risks associated with obesity
- Compare and contrast the different types of weight-loss surgery
- Assess the risks and benefits of each surgical option
- Evaluate the different nonsurgical methods of weight loss
- Explain the significance of America's increasing rate of obesity

health. Instead of eating pure, wholesome foods, many people opt to eat a diet of packaged, processed and refined foods.

In 1993, endocrine researchers discovered that leptin, a hormone secreted by fat cells, not only controls food intake, but also impacts other functions that are affected by energy balance that could relate to obesity.[6] High leptin levels trigger growth and readiness for re-accumulation of leptin in the blood. However, obese patients respond poorly to leptin, which suggests the presence of leptin resistance. With this deficiency, an individual will never feel the urge to stop eating, which leads to overeating. Meals that are high in fat and sugar (*ie* fast food) have excessive amounts of calories, more than the body can burn in a single day. Those calories become stored fat, causing the person to gain more weight.

> A normal person should not consume more than 65 grams of fat or 2000 calories a day. One meal from Burger King® (a hamburger and french fries), has 50 grams of fat and 2000 calories, which is practically the entire allotment for fat and calories permitted for a day![11]

Through technological advances, food is now produced in mass quantities, lasts longer and tastes better. Unfortunately, the highly-processed and refined products that pack our supermarket shelves are loaded with sugar, hydrogenated oils, and many ingredients that most of us have never heard of. Many of the meals served at fast food restaurants, while convenient, contain practically no nutritional value. While the selections are inexpensive, fast and appealing to many, the saturated fats, highly-refined carbohydrates, high sodium and sugar are the hidden ingredients

Studies, conducted by researchers at the University of North Carolina, Chapel Hill, examined three large, nationally representative surveys on food consumption conducted from 1977 to 1998. The survey collected data on what more than 63,000 people said that they ate. Salty snacks (crackers, chips, pretzels) increased from 1 ounce to 1.6 ounces, adding 93 calories. Mexican food (burritos, tacos, enchiladas) went from 6.3 ounces to 8 ounces, up 133 calories. The studies concluded that people consumed larger portions of one third of the 107 foods analyzed, which included bread, cookies, cereal, fries, coffee, wine and fresh juices. Also calculated was the average amount of beer consumed by men over 40 years of age, which went from 23 ounces to 32 ounces, an increase of 100 calories. This research was concluded in 1998, so it is quite likely that portions have increased.[20]

Americans are gaining weight at a frightening rate. Fifty nine million people are obese, and that number is likely to increase to 65 million over the next few years.[8] Medical experts now believe obesity to be at epidemic proportions.

Cynthia Ogden, PhD, a CDC epidemiologist, published the results of a study of weight in the United States. The results were startling: 31 percent of adults are obese and 15 percent of children from the ages of 6-19 are obese.[8] This increase will adversely affect the health of these children as they approach adulthood. Childhood obesity is a fast-growing problem. Although Ogden stresses that obesity is a problem for all groups and genders, it is particularly severe among certain ethnic groups, for example, 50 percent of all non-Hispanic black women are obese.[12]

People are eating larger portions of fries, chips and burgers and drinking more soda than they did 20 years ago. According to new research, they are consuming more than 100 extra calories daily than needed![11]

BY THE NUMBERS

- 1500 of us die from cancer every day
- 1 in 3 women and 1 in 2 men will have cancer in his or her lifetime
- 1 in 8 American women will be diagnosed with breast cancer
- Heart disease kills more women than breast cancer
- 1.3 million Americans have a heart attack each year
- 23 percent of Americans have hypertension
- Americans spend $330 billion per year on heart disease
- 64 percent of US adults are overweight or obese
- Diabetes will increase by 165 percent over the next 50 years, with 29 million Americans diagnosed
- 33 percent of Americans suffer from arthritis
- Cancer kills more children than any other disease
- By age 3, children have fatty deposits in their arteries
- By age 12, 70 percent have developed beginning stages of hardening of the arteries
- 1 in 4 children is obese
- Obesity has doubled in the last 20 years
- Nearly 50 percent of obese adolescents remain obese as adults
- In the last 20 years, type 2 diabetes has increased 10-fold
- More than 8 million children have asthma, up 232 percent in the last 40 years
- Less than 7 percent of children and adolescents consume the recommended 2 servings of fruit and 3 servings of vegetables per day[11]

MEDIA/DIETS

The seemingly contradictory reports in the media about what people should and should not be eating confuse the issue. For instance, proponents of protein diets argue that all of the accepted wisdom about eating a low-fat diet is wrong.[10] Most experts do not agree with them, but protein diets are being evaluated in studies now. One thing mainstream nutritionists and protein diet proponents do agree on is that the low-fat recommendations of the 1990s did not work.

"People took the low-fat message and decided that it meant that as long as they ate things that were low fat, they could eat as much as they wanted," says William Dietz, MD, PhD, director for the division of nutrition and physical activity in the National Center for Chronic Disease Prevention and Health Promotion at the CDC. "However, that is not the case, since calories add up, regardless of what form they come in. Even worse, many of the low-fat snacks that companies developed actually contained more calories than their regular fat equivalents," Dietz observes.[12]

According to food-maker Nestle®, the media has a tendency to report results of scientific studies out of context. It argues that the relative stability of the dietary and fitness recommendations over the years to eat less fat, more fruits and vegetables and exercise regularly do not interest people as much as exciting stories about radical diets or the effects of particular miracle foods or vitamins.[6]

Fad diets, pills and liquids, all sold as a quick fix to fit into those "skinny jeans" or new designer clothes just do not work. They are tools to help the market and the retailer make more money with little regard for the potential public harm. Americans must focus on the obesity problem and concentrate on what we should do to be healthy, stay fit, and accept the fact that this is a problem.

We are a great country in many ways. We are also great at pointing fingers to place the blame elsewhere. We blame the over-abundance of fast food chains, work and school for not allowing us to eat a healthy meal. We blame television and video games for corrupting our children – not allowing them to get out and get the proper exercise they need.

We never blame ourselves for not limiting the children's TV time or video game usage; for not encouraging the children to go out and run around outside for a couple of hours every day; for being too lazy to prepare healthy meals; for a lack of determination to stay healthy and fit. The real significance of being overweight is not just a cosmetic issue. The emergence of obesity-related diseases and disabilities is the real threat.

OBESITY-RELATED CONDITIONS

Medical conditions that affect obese individuals include hypertension, blood clots, diabetes, renal failure, sleep apnea, cardiac failure, fatigue, and breast, colon and prostate cancer.[5] Obesity also leads to mental health conditions, such as depression and low self-esteem. Not only does obesity affect the major arteries and organs, but the state of mind as well!

People with an excessive amount of body fat have higher levels of triglycerides and low-density lipoprotein cholesterol, as well as lower levels of HDL cholesterol in the blood,

which may cause inflammation and an increased risk for developing types of cardiovascular diseases, including heart attacks, congestive heart failure, sudden cardiac arrest, angina, and abnormal heart rhythm.[5]

More than 80 percent of overweight people have type 2 diabetes.[5] According to data from the CDC's National Health and Nutrition Examination Survey, "two thirds of adult men and women in the United States diagnosed with type 2 diabetes have a Body Mass Index (BMI) of 27 or greater, which is classified as overweight and unhealthy. Obesity complicates the management of the type 2 diabetes by increasing insulin resistance and glucose intolerance, which makes the drug treatment for diabetes ineffective. In addition, hypertension is twice as common in obese adults versus individuals who maintain a healthy weight.[6]

> The average child sees more than 10,000 food ads on TV each year, most of which are high-calorie, high-fat, and high-sugar meals.[11]

A number of state and local governments are trying to fight the current weight gains in children and adolescents, particularly in the schools. Members of some state legislatures are drafting and adopting laws that reinforce physical education while teaching the importance of nutrition and health in their curriculum.[10] In Texas and California, the struggle to eliminate junk food and soda from being sold in the public school system eventually succeeded.

In 1990, Arnold Schwarzenegger was named chair of the President's Council on Physical Fitness, a program geared toward educating children on the choices they need to make regarding their health with respect to food choices and exercise. These actions to take control over what our children consume are beginning to reach school systems nationwide, but this war is not over.

The trend of being overweight is related to many cultural, economic and environmental factors. The primary concern should be one of health and not appearance. For example, all expectant mothers should be educated about the many benefits that breast fed babies receive, among them that they are less likely to become overweight as they grow older. Breast feeding will also benefit the mother, who returns to her pre-pregnancy weight more quickly.[3]

TREATMENT OPTIONS

The most common treatment for weight loss is nonsurgical: diet and exercise. Eating fewer calories while increasing physical activity is the best way to lose weight. For most adults, a low-calorie diet of 1200-1500 calories per day for women, and 1500-1800 calories per day for men is recommended. It has been proven that limiting calories, not the types of foods that are consumed, causes more weight loss.[7] For example, cutting only carbohydrates or fat will not cause any more weight loss than a healthful and balanced low-calorie diet.

Exercise helps burn more calories. One of the best ways to increase activity levels is walking. Most people can walk safely and routinely alone or with family members, friends, co-workers or pets. It is usually easy to work it into a busy daily schedule. When possible, keep track of steps with a pedometer. Wearing the step counter motivates an individual to walk more during the day.

Supplemental weight loss drugs, such as sibutramine, orlistat and phentermine, promote the feeling of fullness, reduce appetite or limit the amount of fat absorbed.[7] However, without a diet and exercise plan, the weight returns as soon as the medicine is stopped.

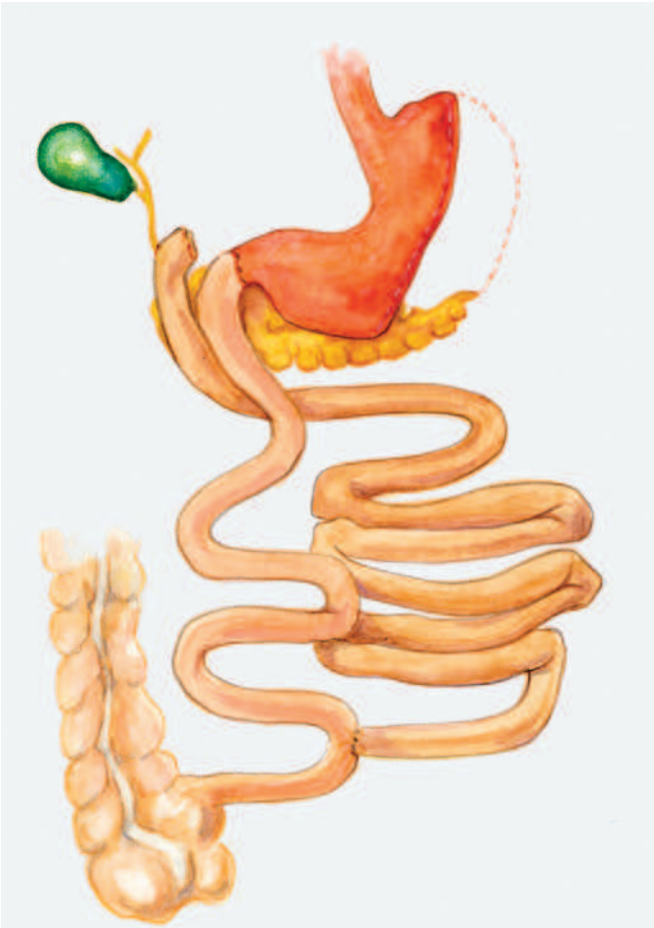
OPTION 2

Medical science and surgery is the second option. Doctors have developed devices and surgical procedures that can help certain candidates with losing weight. These obese candidates have found that their bodies did not respond to the first option of diet and exercise. Doctors today have developed a strict diet and exercise program to be followed after the surgical intervention to keep the weight off.[5]

Obesity surgery is recommended only for patients with a BMI (body mass index) of 40, or a BMI of 35 - 39.9 combined with other serious obesity-related medical conditions.[5] It is important that patients understand all of the risks and benefits associated with these surgical procedures.

PROCEDURES

Liposuction removes fat from deposits located underneath the skin by using a cannula attached to a vacuum, which collects the fat. This procedure is performed quickly. Formerly, general anesthetics or heavy IV sedation were utilized, but with advances in medicine, it can now be done on a lunch break using a local anesthetic. Although liposuction is a quick and easy procedure, it is not in any way a permanent means of weight loss. Those who opt to have this done must still work to keep the weight off.



Malabsorptive: Biliopancreatic diversion with duodenal switch.

Mesotherapy is a common sculpting treatment, which involves the injection of fat-melting drugs into fatty tissues like the buttocks, love handles, back, arms and abdomen.

Bariatric Surgery: There are three kinds of bariatric surgery.

- Restrictive bariatric surgery decreases food intake and makes the patient feel full after meals.
- Malabsorptive bariatric surgery reduces absorption of calories, nutrients, and proteins.
- A combination of both restrictive and malabsorptive is also available.

Bariatric surgeries can be performed open or laparoscopic. After the surgery, the patient must learn not to eat certain foods, such as those high in fat and cholesterol, and to raise their metabolism. The daily routine of changing portion sizes will be a shock, but the patient must adapt to the smaller portions and not revert to old habits.

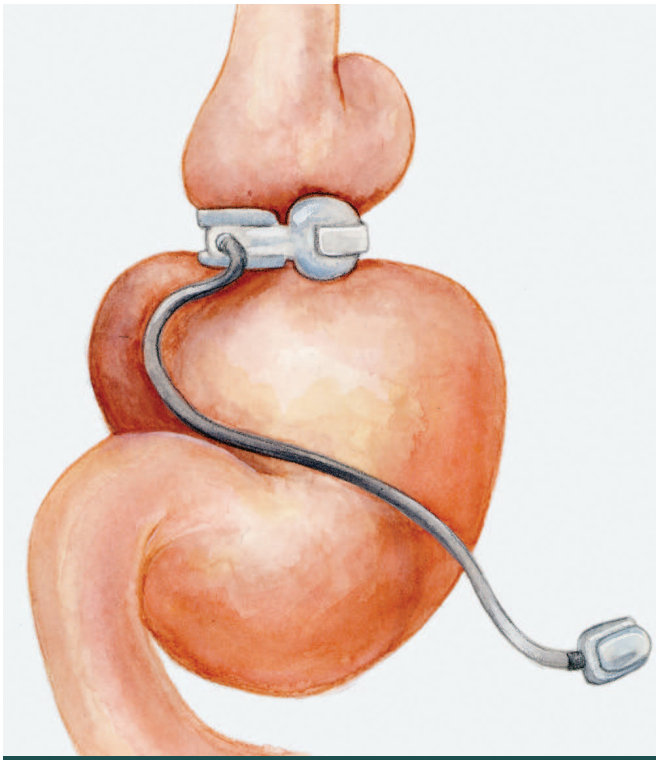
VERTICAL BANDED GASTROPLASTY (STOMACH STAPLING)

The size of the stomach is surgically reduced. Both a band and staples are used to create a small stomach pouch. In the bottom of the pouch is a 1 cm hole, approximately, through which the pouch contents can flow into the remainder of the stomach and then into the remainder of the gastrointestinal tract. Stomach stapling is more effective when combined with a malabsorptive technique, in which part of the digestive tract is bypassed, reducing the absorption of calories and nutrients.

This type of procedure results in less weight loss compared to other surgeries. It is also less commonly used today because of poor long-term prognosis. After stapling, the stomach is still able to stretch past the staples and the person can regain the weight. It was developed in the 1970s as a safer alternative to the Roux-en-Y gastric bypass, which introduced a mechanical stapler to the surgical site.

GASTRIC BANDING

Laparoscopic adjustable gastric banding (LAGB) is a restrictive procedure that uses a gastric band made of silicone and an inflatable balloon. Because it is done laparoscopically,



Restrictive: Adjustable band gastroplasty

Roux-en-Y gastric bypass

there is minimal to no scarring. The balloon connects to a small reservoir placed under the skin of the abdomen. The diameter of the band can also be adjusted. When the balloon is inflated, it increases weight loss and when deflated, it reduces weight loss. This procedure has a lower risk of complications and discomfort compared to an open procedure. The advantage of the LAGB is that the procedure is adjustable, allowing the doctor to make changes during each follow-up examination, depending on the results of the diet. After banding, the stomach can only hold approximately one ounce of food. In some cases, the band may erode into the stomach, or there may be some esophageal dilation, resulting in failure to lose weight. On average, LAGB leads to approximately a 40 percent loss of excess weight.[2]

Considered the least invasive and safest weight loss surgery, the procedure can be reversed if necessary. It has a low complication rate. The most common problem after surgery includes nausea and vomiting. The risk of death is 1 in 2000. It does not interfere with food absorption. For this reason, vitamin deficiencies are rare after gastric banding.

BILIOPANCREATIC DIVERSION

Initially in this procedure, a reduced stomach is created, and then the digestive juices are diverted into the small intestine. The first part of the duodenum is bypassed, because that is where most of the calories are absorbed. The section with the bile and pancreatic juices is anastomosed to the small intestine further down.

ROUX-EN-Y GASTRIC BYPASS

This is the most popular weight loss procedure today.[1] It is simply known as gastric bypass. Similar to the gastric band, the procedure limits food intake, but unlike the band, the surgeon will divide the small bowel about 18 inches below the lower stomach outlet and rearrange it into a y-configuration. This enables the flow of food from the small upper stomach pouch.

The distal version of this procedure moves the y-connection further down the gastrointestinal tract, closer to the distal end of the small bowel, which also reduces the absorption of food, fats, starches, various minerals and fat-soluble vitamins. The unabsorbed starches and fats pass instead through the large intestine, causing some bacterial actions allowing them to produce irritants and malodorous gases, increasing the weight loss. To be fully successful, these procedures must be accompanied by diet and exercise. Lean muscle must be built up to make up for the loss of fat.

The gastric bypass procedure, while one of the most effective and common procedures, comes with a drastic change in lifestyle. Portion control makes the patient eat less than normal, and imposes restrictions on smoking and alcohol consumption. About 140,000 gastric bypass procedures were performed in 2005 in the United States alone.[1]

Restrictive operations lead to weight loss in almost all patients, but they are less successful than malabsorptive operations, which achieve substantial long-term weight loss. About 30 percent of those who undergo vertical banded gastroplasty achieve normal weight, and about 80 percent achieve some degree of weight loss. Studies reveal that 10 years after surgery, only 10 percent maintained the weight

While obesity rates have increased nationwide, it has increased more dramatically in specific areas of the country.

REGION OF THE US	1991 %	2000 %
New England	9.9	16.95
Middle Atlantic	12.7	18.41
East North Central	14.1	21.00
West North Central	12.2	19.82
South Atlantic	11.1	19.52
East South Central	13.1	23.05
West South Central	13.1	22.20
Mountain	9.6	17.10
Pacific	10.0	19.10

Source: CDC Behavioral Risk Factor Surveillance System 1991–2000

FACT VS. FICTION

MYTH #1 People only become obese and overweight because they do not engage in physical activity and have unhealthy eating habits.
FACT #1 It is important to remember that obesity is not always a behavioral issue. Physical activity and eating habits are major contributors, but there needs to be a balanced combination of behavior and medical evaluation and intervention.

MYTH #2 Once committed to a weight-loss regimen, obese individuals should attempt to lose a large amount of weight as quickly as possible.
FACT #2 Rapid weight loss (3 or more lbs per week) will increase risk of developing gallstones. 2 lbs per week over time is more sustainable.

MYTH #3 Weight gain in women over time is healthy and part of a natural aging process.
FACT #3 Although metabolism may change over time, weight gain of more than 20 pounds is not a normal part of the aging process. In fact gaining more than 20 pounds between age 18 and midlife increase risk of disease.

MYTH #4 Osteoarthritis only develops when an individual gains a large amount of weight over a short time period.
FACT #4 Timing is not a major factor in the development of osteoarthritis. For every two-pound increase in weight, the risk of developing arthritis is increased by 9-13 percent.

loss of at least 50 percent of their total excess weight at the time of the surgery.[2]

Some common bariatric surgery complications include pneumonia, infections, incision hernias, and leaks at the surgical site, bloating and diarrhea after eating, and mortality.

Obesity surgery is not a miracle cure and the pounds do not come off by themselves. A weight loss of two to three pounds a week after the surgery is possible, but one pound a week is more likely. Losing weight too quickly creates a health risk and can lead to other problems. The main goal is to have a weight loss that prevents, improves or resolves health problems connected with morbid obesity.

OBESITY'S IMPACT NATIONWIDE

America is home to the greatest number of obese people in the world. According to the CDC, obesity in adults has increased by 60 percent in the last 20 years, and obesity in children has tripled in the past 30 years. Native Hawaiians have alarmingly high rates of obesity, diabetes and heart disease. The number of Hawaiian children suffering from obesity is double that of children throughout the nation. In 2001, the University of Hawaii Kinesiology and Leisure Science Department, along with the Brigham Young University Exercise and Sport Science Department, conducted a local study and found that more than 20 percent of Hawaiian children were overweight.[15] According to Kelly Brownwell, phd, an expert on American diet and health, a study was conducted with the Pima Indians in Mexico and Arizona. It found that the Pima Indians who live in Arizona experienced a much higher rate of obesity than their counterparts living in Mexico, even though both groups shared the same genetic and ethnic backgrounds. This is also true for many migrants to the United States, who demonstrate a much higher obesity rate than their relatives back home.[15]

In Alabama, the US State of Alabama Employees Insurance Board approved a controversial plan to charge obese workers a monthly $25 fee, if they do not make the effort to reduce their weight and improve their health. These measures are set to take effect in January 2010, and apply to those with a BMI of 35 or more, who failed to make improvements in their health after one year.

CONCLUSION

Although the history of American obesity is relatively brief, the outlook for the future seems like a much longer struggle. It appears that the obesity problem in adults will continue to grow. In addition, it has been observed that obese parents

greatly increase the chances of obese children,[11] so it is likely that obesity will be a blemish in American society for more generations to come. However, this does not mean that measures are not being taken to free America from this burden.

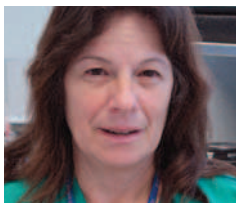
As one of the richest, most progressive countries in the world, America should also be one of the healthiest. The sad truth is that Americans are some of the most unhealthy people in the world. The good news is that obesity can be reversed. Whether through exercise, diet or surgery, the solution is available. All that is required is sound advice, guidance, a strong will, discipline and most important, support.

Media, health care, government and the food industry should join forces to promote health and fitness through responsible education. Parents should make greater efforts to get their children away from the TV and video games and engage themselves in active play. Parents should take active roles in putting their children on strict diets and overseeing a sound exercise regimen. The proper food intake, quality and quantity, plus the right amount of good physical activity will soon show positive results.

The US Government has spent billions trying to find a cure for heart disease, cancer, and other diseases. Their conclusions: disease is easier to prevent that it is to cure! Our government tells us to eat seven to 13 servings of fresh, raw fruits and vegetables everyday; increase your physical activity with wholesome exercise. This is the way obesity will be conquered.

We all must learn to help ourselves in this fight against obesity!

ABOUT THE AUTHOR



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References

1. Lapband.com. ***http://www.lapband.com/life_after_surgery/.*** December 2008. 2008 <
2. ***http://www.lapband.com/life_after_surgery/.*** Flickinger EG, Pories WJ, Meelheim HD. *The Greenville gastric bypass. Ann Surg.* May 1984; 199(5):555-62.
3. General, surgeon. ***www.surgeongeneral.gov/newl/testimony/obesity/07162003.htm.*** April 2008. april 2008 ***www.surgeongeneral.gov/newl/testimony/obesity/07162003.htm.***
4. Medecine.net.com. ***Medecine.net.com.*** December 1998. 2008 ***www.medterm.com/scirpt/mail/art.asp2articlekey=4607.***
5. Orizzi, robert. ***www.robertorizzi.com/obesity-surgery.htm.*** December 2008. 2008 ***www.robertorizzi.com/obesity-surgery.htm.***
6. Atkinson RL, Uwaifo G. In: Goldstein DJ, ed. *Combination therapies for obesity*. 2nd ed. Totowa, NJ: Humana; 2005:277-91.
7. Egger G, Cameron-Smith D, Stanton R. "The effectiveness of popular, non-prescription weight loss supplements". *Med J Aust*. Dec 6-20 1999; 171(11-12):604-8.
8. Harsha DW, Bray GA. *Body composition and childhood obesity. Endocrinol Metab Clin North Am*. Dec 1996; 25(4):871-85.
9. Sugerman HJ. "The epidemic of severe obesity: the value of surgical treatment". *Mayo Clin Proc*. Jul 2000; 75(7):669-72.
10. "Obesity: An American Epidemic" USA TODAY 26 Nov. 2003: Pg 6D
11. "Childhood Overweight" www.obesityinamerica.org. 19 Dec 2008
12. "Obesity rate could reach nearly 40% in five years" USA TODAY 7 Feb 2003: Pg4A
13. ***http://www.webmd.com/diet/weight-loss-surgery/gastric-bypass***
14. ***http://ezinearticles.com/?Obesity-in-America----The-Growing-Epidemic!&id=7567***
15. ***http://www.associatedcontent.com/article/77300/obesity_in_america.html?cat=5***
16. ***http://www.downtoearth.org/articles/obesity_america.htm***
17. ***http://www.time.com/time/subscriber/covers/1101040607/article/how_we_grew_so_big_diet01a.html***
18. ***http://www.obesityinamerica.org/childhoodoverweight.html***
19. Deaths from Smoking. March 31, 2009. Available at: ***http://www.wrongdiagnosis.com/s/smoking/deaths.htm.*** Accessed: April 9, 2009.
20. Nielsen Samara; Popkin Barry. "Patterns and Trends in Food Portion Sizes, 1977-1998." *JAMA*. 2003. 289: 450-453.

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Mark one box next to each number. Only one correct or best answer can be selected for each question.

The Challenges of Medical Futility

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Origins and Early Years of General Anesthesia

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IBD and Abdominal Surgery

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Role of the Surgical Technologist in Bariatric Surgery

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Treating Colon Cancer Surgically

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When Unexpected Complications Arise During Surgery

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Obesity: An American Epidemic

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18.	☐	☐	☐	☐
19.	☐	☐	☐	☐
20.	☐	☐	☐	☐

Mark one box next to each number. Only one correct or best answer can be selected for each question.

Directions: Complete all 8 answer keys for the exams. Include your check or money order made payable to AST or complete credit card information with the appropriate amount and mail to Members Services, AST, 6 W Dry Creek Circle, Ste 200, Littleton, CO 80120-8031. If paying by credit card, you can fax in the answer keys and credit card payment to AST at 303-694-9169.

CE Exams

Blood Components

1. **How many days is the life span of an erythrocyte?**
   a. 60
   b. 90
   c. 120
   d. 150

2. **Plasma accounts for approximately ___ of the blood volume.**
   a. 8%
   b. 45%
   c. 55%
   d. 90%

3. **The formed elements of the blood are called the ___.**
   a. plasma
   b. serum
   c. hemocytoblasts
   d. corpuscles

4. **What is the number of binding sites on hemoglobin molecules?**
   a. 4
   b. 6
   c. 8
   d. 10

5. **Hemoglobin synthesis depends on ___ and serval vitamins.**
   a. antigens
   b. iron
   c. antibodies
   d. Rh factor

6. **Which is a false statement about red blood cells?**
   a. They are not capable of division.
   b. Their life span is only 120 days.
   c. Approximately 2.5 million cells are replaced per hour.
   d. Their production is triggered by a mechanism in the kidney.

7. **Where does the destruction of old, damaged abnormal red blood cells take place?**
   a. Kidneys
   b. Small intestine
   c. Spleen and liver
   d. All of the above

8. **Which statement is false?**
   a. Leukocytes migrate to extravascular tissues.
   b. Eosinophils and basophils destroy cancer cells and parasites.
   c. Neutrophils ingest and destroy bacteria foreign particles and other cells.
   d. Basophils accumulate at the site of infection.

9. **Which is involved in the blood clotting process?**
   a. Thrombocytes
   b. Killer T-cells
   c. Lymphocytes
   d. Monocytes

10. **The largest component of plasma is ___.**
    a. protein
    b. vitamins
    c. water
    d. electrolytes

The Challenges of Medical Futility

1. **Which is not a concept of medical futility?**
   a. Beneficence and physiological
   b. Clinical or overall futility
   c. Imminent demise futility
   d. Religious affiliation

2. **Qualitative futility can be ascertained if:**
   a. The quality of life from treatment is poor.
   b. Treatment involves life-sustaining intervention for patients in PVS.
   c. Treatment results in a quality of life that is unacceptable to the patient.
   d. All of the above.

3. **An example of ___ futility is a doctor who prescribes amoxicillin to treat a patient ill with the flu or virus.**
   a. Strict
   b. Clinical
   c. Quantitative
   d. Qualitative

4. **Guidelines of utility should incorporate**
   a. Chance of success
   b. Considerations of cost
   c. Life expectancy
   d. All of the above

5. **The ___ should possess the initial authority to consider treatment futile.**
   a. Patient's minister
   b. Physician
   c. Family
   d. Personal attorney

6. **The Patient Self-Determination Act resulted in:**
   a. Physicians defining futility of care
   b. Families demanding aggressive treatment deemed inappropriate by physician
   c. Patients dictating their plan of treatment
   d. More patients participating in clinical trials

7. **The GCAT collects relevant information crucial to:**
   a. Formulation of goals of care at the end of life
   b. Tracking DNR orders and advance directives
   c. Administering appropriate pain relief
   d. All of the above

8. **The main argument used to successfully prove the right-to-die in the case of Helen Wranglie involved:**
   a. Cessation of antibiotics
   b. Terminating the respirator
   c. DNR order
   d. Withdrawal of the feeding tube

9. **According to the ___, physicians have no obligation to suggest futile intervention based on beneficence. .**
   a. HIIPPA rules
   b. AMA's Code of Ethics
   c. Hippocratic Oath
   d. GCAT

10. **_____ or ____ should have the right to refuse inappropriate or extraordinary treatment.**
    a. Physicians or institutions
    b. Spouses or children
    c. Ministers or counselors
    d. Lawyers or judges

An Historical Look at the Origins and Early Years of General Anesthesia

1. **Patients who endured early operations without a flinch were called ___.**
   a. controller
   b. stoics
   c. hypnotic
   d. emotionless

2. **In the early 1800s, approximately how many surgeries were performed weekly in hospitals?**
   a. 1-2
   b. One per day
   c. 10-15
   d. 16-20

3. **Which was the first to be used as a local anesthetic?**
   a. Opium
   b. Cocaine
   c. Alcohol
   d. None of the above

4. **Sweet Vitriol was an early name for___.**
   a. opium
   b. cocaine
   c. alcohol
   d. ether

5. **___ was rejected as anesthesia because it often took several hours to take effect.**
   a. Nitrous oxide
   b. Hypnosis
   c. Ice
   d. alcohol

6. **Who coined the term anesthesia?**
   a. Humphry Davy
   b. Horace Wells
   c. Oliver Wendall Holmes
   d. William TG Morton

7. **Who first successfully demonstrated anesthesia at Massachusetts General?**
   a. Horace Wells
   b. Henry J Bigelow
   c. John C Warren
   d. William TG Morton

8. **Which was not an advantage of chloroform over ether?**
   a. Increased quantity
   b. Easier to transport
   c. Better smell
   d. Less flammable

9. **Which is an early criticism of anesthetic gasses?**
   a. Difficult to control dosage
   b. High death rates
   c. Highly addictive
   d. All of the above

10. **Sir James Young Simpson argued ___ was the first true anesthesiologist and surgeon.**
    a. William TG Morton
    b. Paracelsus
    c. Frobenius
    d. God

IBD and Abdominal Surgery: a Patient's Perspective

1. **What did Wilks do in 1859?**
   a. Documented UC symptoms for the first time.
   b. Treated the first UC patient.
   c. Recognized UC as a disease entity.
   d. Treated UC for the first time with sulfadiazine.

2. **Which is a false statement about IBD?**
   a. Complications can result from vitamin and nutrient deficiencies.
   b. Inflammation of the bowel is characteristic.
   c. Stress plays a role in the disease.
   d. IBD is a psychosomatic disease.

3. **UC starts out a ulcerative proctitis in approximately ___ of cases.**
   a. 30%
   b. 20%
   c. 80%
   d. 25%.

4. **What is primary difference between UC and Crohn's?**
   a. UC is more invasive than Crohn's.
   b. Crohn's causes more stress than UC.
   c. Crohn's only affects children.
   d. UC symptoms are contained to the colon and rectum.

5. **What characteristics are unique to Crohn's?**
   a. Disease affects colon and rectum in full
   b. No occurrence of ulcerations
   c. Vitamin C deficiency
   d. String sign and skip patterns.

6. **What surgical intervention is contraindicated for Crohn's?**
   a. Proctocolectomy
   b. Brooke ileostomy
   c. Resection
   d. Continent ileostomy

7. **Which of the following is not an autoimmune disease?**
   a. UC
   b. IBS
   c. Celiac sprue
   d. MAP

8. **Which antibody binds to TNF?**
   a. Remicade
   b. Cipro
   c. Flagyl
   d. Imuran

9. **Which is true regarding karate and the ileostomate?**
   a. Some ileostomate take karate.
   b. Karate should never be taken due to possible blunt trauma
   c. Exercise care and protect the stoma from blunt trauma.
   d. Both A and C are correct

10. **Every 33 feet underwater the pressure increases by ___.**
    a. 12.7 psi
    b. 13.7 psi
    c. 14.7 psi
    d. 15.7 psi

Role of the Surgical Technologist in Bariatric Surgery

1. **In 1999-2000, what percentage of adult Americans were considered overweight?**
   a. 24%
   b. 34%
   c. 54%
   d. 64%

2. **Obesity is defined as a Body Mass Index of:**
   a. 20 or more
   b. 25 or more
   c. 30 or more
   d. 50 or more

3. **Which is not a comorbidity of obesity?**
   a. GERD
   b. Type 2 diabetes
   c. Sleep apnea
   d. All are comorbidities

4. **Which of the following procedures is considered the gold standard by the ASBS?**
   a. Roux-en-Y
   b. Adjustable band gastroplasty
   c. Biliopancreatic diversion
   d. Adjustable biliopancreatic bypass

5. **To be considered a candidate for gastric bypass, the patient must have a BMI of at least:**
   a. 30
   b. 40
   c. 50
   d. 60

6. **Postoperative follow-up programs are recommended for a minimum of:**
   a. 6 months
   b. 1 year
   c. 18 months
   d. 5 years

7. **Which tissue and staple are mismatched?**
   a. Stomach: 4.8 mm
   b. Bowel: 2.5 mm
   c. Mesentery tissue: 2.0 cm
   d. Stomach: 1.5 mm

8. **What percentage of detected leaks will require surgery?**
   a. 50%
   b. 40%
   c. 30%
   d. 20%

9. **Small leaks in the bowel may heal themselves if the patient remains NPO for:**
   a. 24 hours
   b. 36 hours
   c. 48 hours
   d. 72 hours

1. **A potential complication for this surgery is:**
   a. Hair loss
   b. Kidney stones
   c. Pulmonary embolism
   d. All of the above

Treating Colon Cancer Surgically

1. **The majority of colon cancers are ___.**
   a. Lymphomas
   b. Adenocarcinomas
   c. Sarcomas
   d. Basal cell carcinomas

2. **What indicates the stage of adenocarcinomas?**
   a. Infiltration to outer layers of the colon
   b. Metastasis to other organs
   c. Types of cancer cells
   d. Patients physical condition

3. **____ is administered to relieve postoperative pain.**
   a. Morphine
   b. Benzodiazepine
   c. Narcotic analgesic
   d. Propofol

4. **Prior to performing the skin prep, the circulator:**
   a. Visually inspected the skin
   b. Cleaned the incision site with an iodine solution
   c. Placed sterile towels around patient to create a sterile boundary
   d. All of the above

5. **The surgeon lysed adhesions to:**
   a. free the peritoneum from existing scar tissue
   b. establish clean margins of healthy tissue
   c. restore gastrointestinal continuity
   d. prevent infection and bleeding
   e.

6. **Personnel in the PACU evaluate a patient's:**
   a. coordination
   b. speech rhythms
   c. respiration
   d. rye movements

7. **An ___ controls nausea and vomiting.**
   a. Depolarizing muscle relaxant
   b. Antiprotozoal
   c. Antiemetic
   d. Benzodiazepine

8. **Which of these is not a specific risk of colon surgery?**
   a. Incisional hernias
   b. Strictures
   c. Punctured intestine
   d. Intestinal blockage

9. **An important element in staging cancer is:**
   a. Location of the primary tumor
   b. Tolerance of anticancer drugs
   c. White blood cell count
   d. Family history

10. **Time-out procedures verify**
    a. Correct patient
    b. Correct site
    c. Correct surgery
    d. All of the above

When Unexpected Complications Arise During Surgery

1. **Which ligaments hold the ovaries in place?**
   a. Suspensory
   b. Broad
   c. Ovarian
   d. All of the above

2. **What is the glandular position of an ovary?**
   a. Fimbriae
   b. Perimetrium
   c. Corpus luteum
   d. Mesosalpinx

3. **___ attempts were made to close the vaginal cuff by suture.**
   a. 27
   b. 22
   c. 17
   d. 12

4. **Which unexpected surgical instrument did the surgeon request to drain the uterus?**
   a. Jackson- Pratt drain
   b. Hasson trocar
   c. Gallbladder trocar
   d. Red Robinson drain

5. **The round ligament terminates at the _____.**
   a. Anterior cul-de-sac
   b. Vestibule
   c. Labia majora
   d. Fallopian-uterine attachement

6. **Care was taken to avoid the ___ when the initial midline incision was made.**
   a. Falciform ligament
   b. Xiphoid process
   c. Symphysis pubis
   d. Umbilicus

7. **What size and type of suture was primarily used to control bleeding?**
   a. A Chromic
   b. 2-0 Chromic
   c. 0 Vicryl
   d. 2-0 Vicryl

8. **Estimated blood loss up to the first time the patient was transported to the ICU:**
   a. 16,000 cc
   b. 17,000 cc
   c. 18,000 cc
   d. 19,000 cc

9. **The triangular space at the base of the bladder is called ____.**
   a. Trikates
   b. Trielcon
   c. Trigone
   d. Trilabe

10. **The uterine sac was incised with ____.**
    a. Jorgenson scissors
    b. Metzenbaum scissors
    c. KB on #3 KH
    d. Curved Mayo scissors

Automated Anesthesia and Natural Orifice Transluminal Endoscopic Surgery

1. **McSleepy is a _____.**
   a. Car
   b. Robotic system
   c. Computer
   d. None of the above

2. **Closed-loop anesthesia systems utilize complex ___ based on patient data.**
   a. Algorithms
   b. Pharmacokinetics
   c. Biological factors
   d. Computer systems

3. **McSleepy is commonly referred to as an ___ robot.**
   a. Surgery
   b. Anesthesiologist
   c. Anesthesia
   d. Excellent

4. **McSleepy lends itself to revolutionizing patient care by ___.**
   a. Improving patient care
   b. Giving more accurate dosing
   c. None of the above
   d. Both a and b

5. **Natural orifice transluminal endoscopic surgery shows potential to further alter the state of ___ and treatment.**
   a. Surgeries
   b. Disease diagnosis
   c. Recovery
   d. Internal complications

6. **Minimally invasive laparoscopic surgery has enhanced patient recovery and decreases ___.**
   a. Morbidity
   b. Postoperative pain
   c. Healing time
   d. All of the above

7. **The McSleepy anesthesia robot was combined with the DaVinci surgical robot to perform the world's first ____.**
   a. Total-robotic operation
   b. Heart surgery
   c. Knee replacement
   d. All of the above

8. **Natural orifice transluminal endoscopic surgery is a ____.**
   a. Large-scale procedure
   b. Minimally-invasive operation
   c. Laparoscopic procedure
   d. Both b and c

9. **NOTES utilizes the body's natural ___ to access internal abdominal organs and structures without leaving an external scar.**
   a. Fluids
   b. Clock
   c. Orifices
   d. Organs

10. **Five approaches to NOTES peritoneal access have been identified. They include ___.**
    a. Transcolonic
    b. Transgastric
    c. Transvesical
    d. All of the above

Obesity: An American Epidemic

1. **A person's ideal weight is established by his or her ___.**
   a. Height
   b. Sex
   c. Build
   d. All of the above

2. **___ occurs when excess body fat accumulates to such levels that it affects a person's health.**
   a. Obesity
   b. Hypertension
   c. Heat disease
   d. Osteoporosis

3. **According to the CDC, ___ is the number one health threat in America.**
   a. Obesity
   b. Smoking
   c. Heart disease
   d. Cancer

4. **___ is not a cause of obesity.**
   a. Poor eating habits
   b. Lack of exercise
   c. High leptin levels
   d. A sedentary lifestyle

5. **According to Cynthia Ogden's study, __ percent of American adults are obese.**
   a. 65
   b. 59
   c. 31
   d. 15

6. **Medical conditions facing obese people include:**
   a. Hypertension
   b. Diabetes
   c. Cardiac failure
   d. All of the above

7. **More than 80 percent of overweight people have __.**
   a. Heart disease
   b. Type 2 diabetes
   c. High levels of HDL cholesterol
   d. Hypertension

8. **The state of ___ successfully banned junk food from being sold in its public school system.**
   a. Texas
   b. Colorado
   c. Virginia
   d. New York

9. **The diet with the highest success rate is ____.**
   a. Low in carbohydrates
   b. Low in calories
   c. Low in protein
   d. Low in fat

10. **Surgery is recommended for patients with a BMI of:**
    a. 40
    b. 30
    c. 20
    d. 10

Obesity: An American Epidemic – questions cont.

11. ___ involves the injection of fat-melting drugs.

a. Liposuction
b. Mesotherapy
c. Restrictive bariatric surgery
d. Vertical banded gastroplasty

12. ___ removes fat deposits from under the skin by using a cannula attached to a vacuum.

a. Liposuction
b. Mesotherapy
c. Restrictive bariatric surgery
d. Vertical banded gastroplasty

13. ___ was developed in the 1970s as a safer alternative to Roux-en-Y gastric bypass. Liposuction

a. Liposuction
b. Mesotherapy
c. Restrictive bariatric surgery
d. Vertical banded gastroplasty

14. ___ is the most common weight loss procedure today.

a. Roux-en-Y gastric bypass
b. Biliopancreatic diversion
c. Gastric banding
d. Vertical banded gastroplasty

15. On average, ____ leads to a loss of 40 percent of excess weight.

a. Roux-en-Y gastric bypass
b. Biliopancreatic diversion
c. Gastric banding
d. Liposuction

16. ___ is considered the safest and least invasive weight loss surgery.

a. Roux-en- Y gastric bypass
b. Biliopancreatic diversion
c. Gastric banding
d. Vertical banded gastroplasty

17. In ___, a reduced stomach is created and digestive juices are diverted to the small intestine.

a. Roux-en-Y gastric bypass
b. Biliopancreatic diversion
c. Gastric banding
d. Stapling

18. About __ percent of those who undergo vertical banded gastroplasty achieve normal weight, and about __ percent achieve some degree of weight loss.

a. 30, 80
b. 30, 50
c. 50, 30
d. 50, 80

19. __ percentage of Americans are overweight or obese.

a. 44
b. 54
c. 64
d. 74

20. Diabetes is projected to increase by ___ percent in the next 50 years.

a. 100
b. 125
c. 145
d. 165