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Technical Considerations of Bariatric Surgery in the Superobese

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Bariatric surgery (or surgery for obesity) is now well accepted as an effective means of weight control in selected patients with morbid obesity. Recently, we at the Mayo Clinic in Rochester, Minnesota, had the opportunity to operate on a patient weighing 780 lb (355 kg). An operation performed on so heavy an individual raised a number of technical factors and safety considerations we had not previously encountered. By careful multidisciplinary planning, the operation was carried out uneventfully. It would be wise for operating room personnel to develop a preconceived, preoperative care plan to deal with these very heavy patients, both under elective and emergent conditions.

The goal of bariatric surgery is to offer the patient with morbid obesity the possibility of a longer, healthier life and an improved quality of life. Morbid obesity is defined as obesity complicated by medical "morbidity" such as premature degenerative arthritis, type II diabetes mellitus, hypertension, hyperlipidemia and its associated cardiac disease, potentially life-threatening sleep apnea, and other weight-related medical problems.[1,2] Obesity is termed "morbid obesity" when one's weight is greater than 100% above ideal body weight or at least 100 lb above ideal body weight. The goal of bariatric surgery in this patient population is to alter the anatomy of the upper gastrointestinal tract in such a way that it either physically prevents one from overeating at one sitting or bypasses segments of the stomach and/or small intestine so that much of the ingested food is malabsorbed. The final result is that the patient effectively loses weight. While not a cure-all by itself, bariatric surgery is now a well-accepted functional adjunct to assist the motivated patient with weight loss.[3,4]

While bariatric surgery in patients weighing 250 to 450 lb (115 to 205 kg) is performed routinely, operations in the superobese patient (weighing more than 600 lb) are extremely uncommon.[5] Operating on a patient weighing 780 lb (355 kg), introduced many unusual technical, practical, and challenging considerations we had not experienced previously. Not only did we need to consider the type of operation performed, but we had to plan for multiple preoperative and postoperative concerns as well, such as safe patient transport to and from the operating room, construction of a safe and satisfactory operating room table set-up with specially designed instrumentation used to provide maximal exposure of the operative field, and safe transfer (both for patient and staff) of the patient to and from the operating room table.

This article should be most useful to CSTs, registered nurses, physicians, anesthesiologists, and other health care providers in the operating room environment by providing an idea of the type of problems encountered and a framework for possible solutions to these difficult problems. By combining our individual skills with careful and thoughtful planning preoperatively, our team was able to carry out an uneventful surgical procedure with minimal unforeseen complications.

Preoperative Multidisciplinary Planning Session (1 Week Preoperatively)

One week prior to the proposed operation, we met as a team to discuss potential problems, cares, concerns, and safety measures of importance with so heavy a patient. The team consisted of CSTs, nursing personnel from the operating room, recovery room, intensive care unit, and postoperative unit settings, anesthesiology personnel, the surgeon, and representatives from engineering and facilities. Each discipline constructively addressed their individual concerns not considered or anticipated by others. Plans were made to address the problems identified to assure the safety of patient and staff and to maximize patient comfort before, during, and after the operation. The same day, the entire team met with the patient to allow him not only to meet the health care providers but also to allow him to voice his concerns and to reassure him of our interest in him and his well being.

Trial Run (3 Days Preoperatively)

At the planning session, we and the patient decided to have a trial run preoperatively for several reasons: first, to be certain we could safely transport him; second, to determine the level of assistance we could expect from the patient in transferring him from the stretcher to the operating room table and vice versa; and third, to try out the operating

Figure 1. Hausted Model 626 DHC stretcher able to support up to 1,000 lb.

table set-up we had planned. Three days preoperatively, our management team met in the operating room to go over any last-minute details.

The patient was transported to the operating room by the surgical orderlies on a specially constructed heavy duty stretcher (Hausted Model 626 HDC) designed to safely support up to 1,000 lb (455 kg) (Figure 1). In the operating room, the wheels on the stretcher were locked. Several staff members were positioned on either side of the stretcher and the operating table set-up while the patient moved himself over with minimal assistance. We had previously bolted together two AMSCO 2080 operating beds with three specially designed "C" clamps constructed by our engineering department. Most of our operating room beds are the AMSCO 1080 type, which safely support weights of only up to 300 pounds. The AMSCO 2080 type will individually hold weights of up to 400 pounds safely. The beds were oriented with the head of one bed to the foot of the other (Figure 2). This orientation positioned the hand cranks of the beds to be on the outside, thereby allowing a reverse Trendelenburg position to be obtained by simultaneously tilting the head of one bed and the foot of the other. Because there was a gap between the individual beds when clamped together, we spanned the beds with a sheet of plastic (0.4 cm thick); the cushions were then placed on the plastic and could be approximated even with the beds in such a way that no effective gap existed.

With the patient positioned on the operating table set-up, we checked the safety and comfort concerns of the patient, answered his questions, and practiced activating the hand cranks to obtain the reverse Trendelenburg position. We also checked to be certain that the extra-long metal crossbar constructed by our engineering department would fit appropriately in the side attachments of our bariatric retractor (Pilling Instruments).

This trial run was considered very helpful for several important reasons: (1) it reassured us that we could safely transfer the patient to and from the operating table set-up; (2) it assured us that technically the bed set-up worked and all specially designed equipment was functional; and (3) the anesthesia team went over their anesthetic considerations and explained these details to the patient. This trial run went smoothly with little or no difficulty.

The Operative Day

We specifically scheduled this patient's operation as the last procedure of the day in that operating room. Because there was no way to move this superobese patient safely from the operating table to the stretcher without his active help, we planned to recover the patient in the operating room rather than in the recovery room; this approach was the most cost-effective use of the operating room.

When the patient arrived, with rather minimal assistance from operating room personnel, he was positioned supine with both arms extended laterally and secured on padded arm boards.[6] An extended hip strap was placed across the lower torso for extra safety, and a warm blanket was used to cover him for comfort and warmth and to minimize patient embarrassment.

Initially, an attempt was made to place an epidural catheter for postoperative analgesia, but it was unsuccessful for technical reasons related to his size and an inability of the anesthesiologist to palpate appropriate anatomic landmarks. Appropriate anesthetic monitoring devices were placed (ie, ECG monitors, transcutaneous oxygenation monitor, intraarterial catheter). Anesthetic induction began with a controlled awake-intubation using a fiberoptic-assisted technique. No central venous access was deemed necessary because of the patient's overall excellent cardiovascular health, the potential morbidity of a central venipuncture in so large a patient, and excellent large-bore peripheral venous access. The patient had been given preoperative prophylactic antibiotics intravenously to minimize the risk of infection and prophylactic subcutaneous heparin (5,000 U) in an attempt to prevent postoperative deep vein thrombosis. In addition, lower extremity external compression balloon devices were placed to attempt to provide another means of prophylaxis against deep vein thrombosis and because the patient had severe lymphedema of the lower extremities (Figure 3). These external compression devices were used to minimize progression of lymphedema and augment the return of blood from the lower extremities during the operative procedure. These devices (Jobst Extremity Pump), custom-made by the Jobst Company for so large a

Figure 2. Operating room dual bed set-up. Two AMSCO 2080 operating room beds were bolted together with head of one bed to foot of the other bed (width of dual bed was 44 in).

Figure 3. Jobst extremity pump for bilateral leg compression during operation and postoperatively.

patient, were alternated between 30-minute inflation and 30-minute deflation cycles throughout the operation and postanesthesia recovery period.

Next, a temperature-regulating blanket and body hugger (Augustine Medical, Inc.) were placed over the upper chest and neck and extended over both arms to minimize heat loss due to the large surface area. A cautery pad was placed, a Foley catheter inserted into the bladder, a nasogastric tube positioned, and the abdomen prepared with a povidone-iodine soap and prep solution from sternal notch to symphysis pubis. This latter maneuver required two additional people to hold up the huge abdominal panniculus to permit satisfactory disinfection of the lowermost part of the abdomen.

The patient was draped with wide double ortho sheets measuring 67 inches in width by 72 inches in length and the abdomen squared off with soft absorbent towels. Two suction set-ups were handed off, one for the surgeon and another for the assistants.

The instrumentation required for a gastric bypass in the patient with morbid obesity is similar to that of a major abdominal exploration except for several custom-designed instruments (Table 1).[7] These special instruments include extra-long dissecting scissors and vascular needleholders, two 12-inch specially designed tissue forceps, and four extra-long (Adson) right-angled clamps. Optimal exposure requires a self-retaining retractor; we prefer the Pilling bariatric retractor because of the attachments available, especially the deep notched Gomez liver retractor that allows maximal exposure of the esophagogastric junction. For this patient, because two operating room tables were necessary, our engineering department fashioned an extra-long crossbar, which enabled us to use the same side attachments for fixation of the crossbar support (Figure 4). The usual retractors that come with this bariatric retaining retractor are quite satisfactory.

The abdomen was entered through a previous midline incision. Hemostasis was obtained using electrocautery. Two lateral and two subcostal retractors of the bariatric retractor were positioned. The abdomen was initially explored to rule out any intraabdominal pathology that was unknown preoperatively. Anesthesia personnel then placed the patient in a reverse Trendelenburg position, which allows the omentum and mobile intraabdominal viscera to fall away from the esophagogastric region. At this time, the previously placed 16F nasogastric tube was removed, and a 32F Edlich tube was passed orally and into the stomach. This intraesophageal tube aids the surgeon in mobilizing the gastric cardia. Next, the large notched epigastric Gomez liver retractor was positioned in the midline to retract the left lobe of the liver anteriorly, with the notch in the retractor serving to expose the anterior esophagogastric junction.

The gastric cardia was stapled across completely with a TA 90B stapler (Autosuture, U.S. Surgical Instruments), which applies four linear rows of staples. This leaves a proximal pouch of cardia with a volume of less than 10 ml. Just distal to this staple line, a disposable linear TL 90 stapler (Ethicon, Inc.) was also fired across the cardia. The stomach between the staplers was transected with a No. 10 blade on a long No. 3 knife handle to completely separate the proximal and distal gastric pouches (Figure 5). Physically separating the proximal gastric pouch from the remainder of the stomach prevents the future possibility of staple line dehiscence, which would functionally abolish the partitioning of the stomach into a small pouch

Table 1. Special instruments and supplies for bariatric surgery.

Instruments
Pilling bariatric retractor (with custom-made crossbar*)
TA 90B metal stapler
4 extra-long Babcock clamps
2 Gemini right-angled clamps
4 extra-long Adson right-angled clamps
Extra-long Metzenbaum scissors
2 custom-made 12-inch vascular forceps*
No. 3 long knife handle
Supplies
TL 60 disposable stapler (Ethicon)
TL 90 disposable stapler (Ethicon)
TA 90B 4-row staple cartridge (Autosuture)
EEA-21 disposable stapler (Autosuture)
GIA 60 disposable stapler (Autosuture)
Edlich gastric lavage tube - 32F
Foley catheter 22F with 5-ml balloon
Feeding jejunostomy kit (Vivonex)
10-mm flat drains (Jackson Pratt)
4 x 4-inch clear plastic adhesive dressing

*For the superobese patient

that limits ingestion of a large volume. A Roux-en-Y limb, fashioned from the proximal jejunum, was brought retrocolic, but antegastric, and anastomosed to the proximal pouch of cardia with a No. 21 EEA (Autosuture) disposable stapler inserted through the open end of the Roux loop. The end of the Roux limb was then closed with a TL 60 (Ethicon) stapler. An end-to-side jejunoileostomy was created 100 cm proximal to the ileocecal junction, leaving the Roux-en-Y limb to be 450 cm.

Using a 22F 5-ml balloon Foley catheter, a gastrostomy tube was placed in the distal gastric pouch to prevent gastric distention during the ileus that occurs for several days postoperatively. This gastrostomy tube remains in the stomach for approximately 6 weeks. A needle catheter (Vivonex) was placed in the proximal Roux-en-Y limb to allow tube feedings with an Osmolyte solution at 90 cc/hr. This feeding jejunostomy tube remained in place until the patient was discharged from the hospital.

We also routinely perform a cholecystectomy as part of the operation to prevent the need of another operation for cholelithiasis. Patients with morbid obesity who undergo a bariatric operation and lose weight have a higher risk of developing gallstones (approximately 30%) and subsequent cholecystitis. Although not routine, an appendectomy was also performed at the patient's request to prevent future appendicitis.

After the operating room personnel has documented a correct sponge and instrument count, the abdomen was irrigated with 2,000 ml of a dilute Neomycin solution and closed. The surgeon prefers to close the fascia with No. 1 polydioxanone. The subcutaneous fat was not approximated but was irrigated with 500-ml Neomycin irrigation to help reduce the number of bacteria left in the wound and to remove any free devitalized fat. The skin was closed with 4-0 polyglyconate in a running subcuticular manner. Sterile 4 x 4 gauze dressings were placed over the wounds and a clear plastic adhesive dressing applied to the exit site of the needle catheter jejunostomy.

Postoperative Care

Postanesthesia recovery was conducted in the operating room on the same operating room bed because we could arrange no safe means (both for patient and staff) of transferring the patient to the stretcher while still obtunded. Our patient was taken to the intensive care unit after he could physically aid the transfer of himself onto the stretcher. His bed in the intensive care unit and later on the routine floor was constructed by bolting two regular hospital beds together and spanning the beds with a special double-size mattress. An overhead trapeze set-up was attached to the bed to aid self-help patient transfer. A special bench/seat commode built to hold up to 900 lb allowed the patient to sit upright and to have controlled bowel movements.

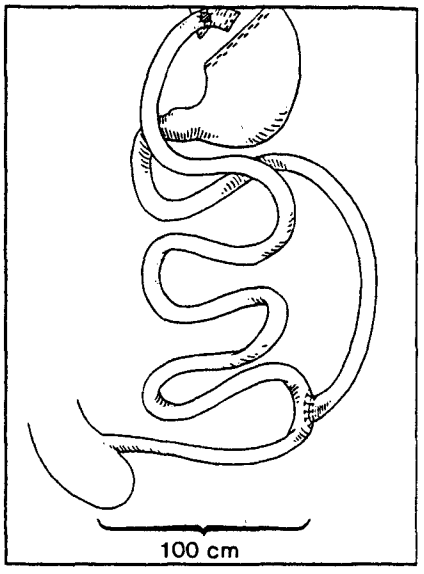

Figure 5. Very long limb gastric bypass, small proximal pouch of gastric cardia, and side-to-side cardiojejunostomy.

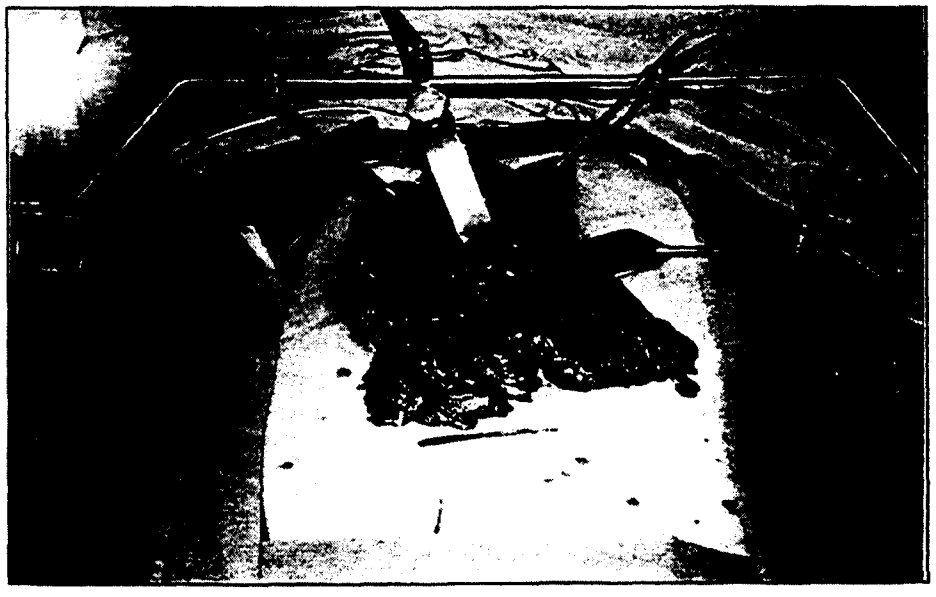

Figure 4. Operative set-up. Note bariatric retractor and extra-long, custom-made crossbar for subcostal and epigastric liver retractor.

Possible Postoperative Complications

This patient's postoperative course was remarkably uncomplicated. Postoperative complications that are most prevalent after bariatric operations include wound infection, anastomotic leak, pulmonary embolism, deep vein thrombosis, and pneumonia, none of which this patient developed.[8] The patient was discharged about 2 weeks postoperatively; his discharge was delayed about 6 days to maximize control of his lymphedema. He returned to work 4 weeks later and currently is about 8 months postoperatively. He

has lost 230 lb, works daily, and feels vastly improved, not only with his sleep apnea, but also with his mobility and his stamina. His lower extremity lymphedema also has been considerably easier to manage. Our final goal with this patient is to obtain a final functional weight of 350 to 400 lb (160 to 180 kg). This would improve the patient's overall health, reverse the obstructive apnea, improve the patient's lymphedema, and thereby facilitate ambulation.

This patient was operated on in 1993. Recently, we performed another similar bariatric procedure on a patient weighing 850 lb. With teamwork, careful planning, and our previous experience, we made it happen without complications or unforeseen problems.

Conclusion

While planning for bariatric surgery in the superobese, one must consider many factors: safe transport and transfer, hospital room furniture and equipment, safety factors, and operating room facilities to perform such an operation. Although many medical institutions are accustomed to managing patients undergoing bariatric surgery for weight control, patients weighing greater than 600 lb (272 kg) present formidable management problems even for experienced bariatric surgical centers. While many surgeons and hospitals do not perform bariatric operations, all must be at least potentially equipped or prepared in principle to deal with the very obese patient who may require an elective or emergency operation. Δ

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