JUNE 2023 VOLUME 55 NO 6

THE SURGICAL TECHNOLOGIST

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Hand Surgery: Improving Efficiency between the Surgeon and Surgical Technologist

UDAYAN BETARBET, MD

Though hand surgery is typically focused on the distal upper extremity, hand surgeons perform a wide variety of procedures with variable complexity in a single operative day. Knowledge and understanding of the range of hand surgeries is essential to anticipate the resources needed in the operating room with a varying case line-up.

In This Issue

In Every Issue

The Importance of Taking a Time Out Every Time

KATIE NOYCE, CST, CSFA, CSA, FAST

BOARD MESSAGE

We have all experienced time out in our lives one way or the other. As a child we sit in time out as a punishment and are given the opportunity to think about our actions. In sports we take a time out to pause and think about our next play. In life many of us take a time out to reset and realign. Surgery is no different. We take a time out prior to every surgery to take that time to reflect, confirm, and acknowledge the patient, procedure, and needs of the surgeon. As we approach national Time Out Day on June 14th, we all need to take the opportunity to recognize our positions in the operating and the importance.

Each year wrong-site surgeries are performed. You have to ask yourself "How did this happen?" How did so many people not recognize a wrong-site surgery during a time out. That's where the importance of the time out is truly recognized. We are the advocates for the patient. We stand at their side as a protector during their most vulnerable times. We are their voice when they do not have one.

The importance of participating in the time out as a team member can mean the difference in a catastrophic outcome for an unsuspecting patient. I encourage each one of you to remember that. A simple surgery gone wrong can be life altering. During the time out the basics need to be identified such as patient name, birthday, medical record number, allergies, consented procedure, special needs, etc. Some are more elaborate, and some are basic. However, they are all very important. In this moment identifying the laterality and expected procedure is incredibly important. I've personally dealt with the consent that says left and then the right is marked.

We are the advocates for the patient. We stand at their side as a protector during their most vulnerable times. We are their voice when they do not have one.

As you stand in your operating room on June 14, take time to appreciate the process — know you are making a difference in that patient's life by ensuring they are getting the best care. We should always speak up when needed and pay attention. Remember that the person on the table is someone's mother, father, daughter, son, husband or wife and we are there to make a difference. I am honored every time I scrub with a fellow certified surgical technologist as we stand there engaged and seeing our process as we make a difference on a team. So, take your time before every case and reflect, plan, and confirm!

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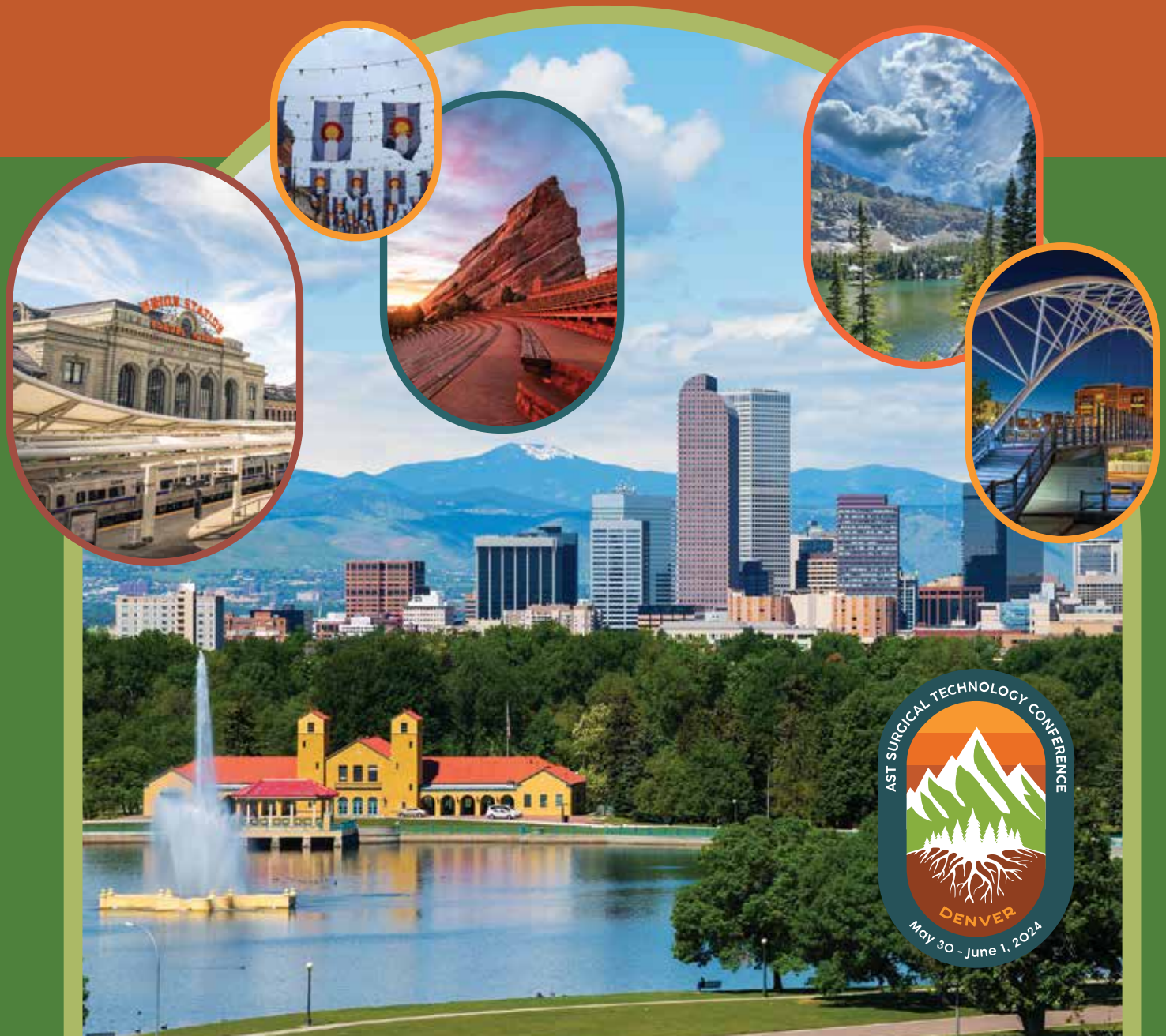
MAY 30 - JUNE 1, 2024



AST News

AT A GLANCE

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- An article submitted for CE must have a unique thesis or angle and be relevant to the surgical technology profession.
- The article must have a clear message and be accurate, thorough, and concise.
- It must be in a format that maintains the Journal's integrity of style.
- It must be an original topic (one that hasn't been published in the Journal recently).

Ready to get started? Email us at communications@ast.org.

CALL FOR SPEAKERS

Interested in giving a clinical presentation or know someone who would? AST is actively accepting applications to present in our webinar series, Educators Conference or National Conference. Interested? Complete our speaker package by visiting our website – ast.org – Educators – Speaker Application.

SAVE THE DATE

Educators Conference

Mark your calendars as we prepare to head to Orlando for AST's 2024 Educators Conference.

Stay tuned as the agenda will be released soon!

February 15

Second Annual Leadership Symposium for Educators, limited to 75 attendees: $125, AST Member; $150, nonmember

February 16-17

Educators Conference: $275 – AST Member; $480, nonmember (includes one-year membership)

The Florida Hotel and Conference Center
1500 Sand Lake Road
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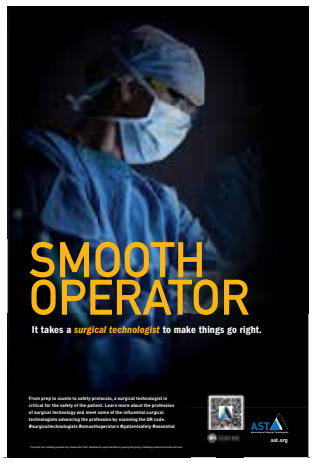
BEHIND THE MASK

Profiles of a Surgical Technologist



Submit your profile as part of AST's Essential Surgical Technology Campaign and you may be featured in upcoming marketing and advertising campaigns promoting the profession. Share your story and help AST promote the profession! For how to share your story and for more information, scan the QR code on the poster in the middle of this Journal.

And while you're at it, hang the poster in a public area so everyone can start learning about the critical role you play in their lives.

MILESTONES

Happy Anniversary!

Congratulations to the following state assemblies as they celebrate anniversaries this month! AST appreciates your hard work, dedication and all your years of service for making our state assemblies the backbone of this organization.

- Colorado/Wyoming – 22 years
- Nevada – 20 years

FOUNDATION *for* SURGICAL TECHNOLOGY

What is The Foundation for Surgical Technology?

The Foundation is a 501c3 organization comprised of representatives from the Association of Surgical Technologists (AST) and the National Board of Surgical Technology and Surgical Assisting (NBSTSA). This type of organization also means any donation you give to the Foundation is tax deductible.

Who does The Foundation support?

- The Foundation provides scholarships to the following:
- Students
- Educators
- Military personnel
- and CSTs who have helped others by serving on medical mission trips

When are the annual deadlines for the scholarships?

- Students scholarships - March 1
- Military scholarships - March 1
- Constellation (Eduscator) Awards - December 1
- Medical mission reimbursement - December 31

Learn more at www.ffst.org and give today!

Can Healthcare Facilities Require CST Certification in States without Regulation? Yes. Here's Why …

LEGISLATIVE NEWS

Healthcare facilities are legally responsible for the actions of their employees. When healthcare facilities hire unlicensed professionals, they still must demonstrate their surgical technologists are current and competent. This guide helps healthcare leaders, such as management and risk managers, to understand the importance of accredited education, the CST credential by the National Board of Surgical Technology and Surgical Assisting (NBSTSA), and surgical technologists' vital role in patient safety and costs. Certified Surgical Technologists in states without surgical technology laws: give this information to your employer's leadership such as the risk manager and operating room managers.

In states where Certified Surgical Technologists (CSTs) are not licensed or certified, CSTs fall within the employer's (healthcare facility or physician) jurisdiction and must meet the employer's requirements as allied health professionals. Generally, CSTs work under the delegatory authority of physicians, specific provisions for which vary slightly from state to state. The underlying principle is that "physicians/surgeons may delegate to non-physicians those tasks normally carried out by another physician when performed under the direct supervision and in the physical presence of the physician and the physician and/or employer has made a reasonable determination that the person to whom those tasks are to be delegated has the appropriate skills and knowledge to perform those tasks safely."

Healthcare Facility Responsibility to Demonstrate Current Competence for Surgical Technologists

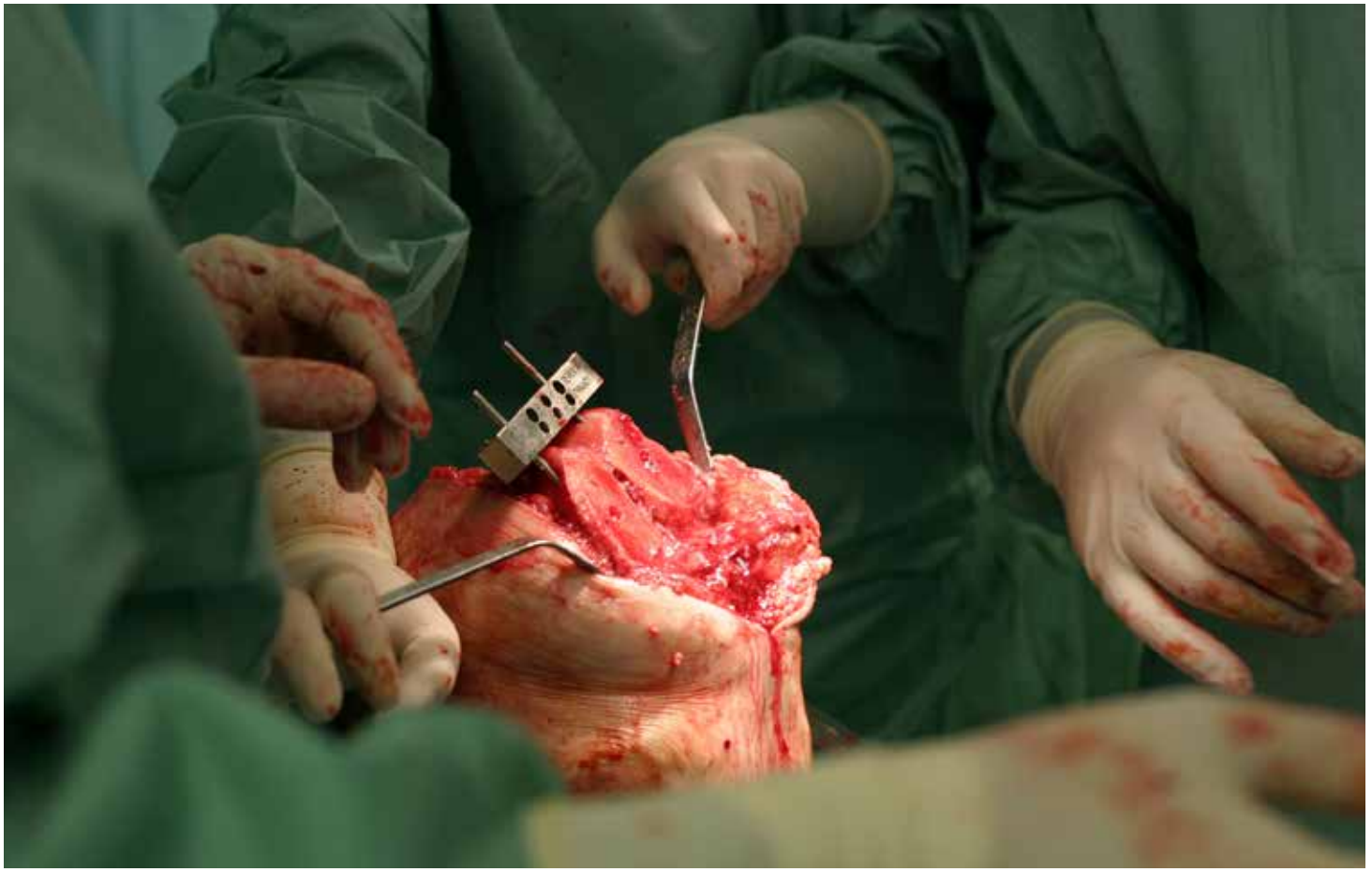
Certified Surgical Technologists not only serve as the surgeon's co-pilot and provide instruments and supplies to the surgeon, but they also prepare the operating room for each surgery, ensuring all needed equipment, instruments, and supplies are available, prepare power equipment such as drills, manage sterile medications, prepare surgical implants, operate robotic equipment, manage cancer specimens, fulfill a prominent role in patient outcomes during trauma procedures, and maintain the sterile surgical field to ensure members of the surgical team adhere to sterile technique to prevent surgical site infections.

As essential surgical team members, CSTs must perform very effectively to prevent "never events," including medication errors, surgical implant errors, unintended retained surgical items, patient burns, and incorrect site surgery. CSTs also play a critical role in preventing surgical fires. For example, a recent study demonstrated that 78% of surgical fires were due to electrocautery (Day et al., 2017).

Healthcare facilities' policies provide credentialing requirements regarding who can provide surgical technologist services. Healthcare facilities would expose themselves to considerable liability by allowing inadequately trained personnel to perform the role of a CST. The law can hold employers liable for acts of employees performed during their employment. Healthcare facilities' exposure to liability for surgical errors or healthcare-associated infections resulting from insufficiently trained employees performing the duties of the CST, as well as the healthcare costs associated with those errors, are incentives for healthcare facilities to ensure the individuals hired to work as a surgical technologist are graduates of an accredited program and have maintained the CST credential from the NBSTSA.

AST Recommends Graduation from an Accredited Program and Certification as a Certified Surgical Technologist to Demonstrate Current Competency

The Association of Surgical Technologists' Recommended Standards of Practice urges that any individual employed as a surgical technologist graduate from an accredited sur-



gical technology program and maintain the CST credential administered by the NBSTSA. In their *Statement on Surgical Technologist Training and Certification*, the American College of Surgeons (ACS) recognizes accredited education and the NBSTSA. The NBSTSA was founded with the support of ACS, the American Medical Association, and the American Hospital Association. The NBSTSA is accountable to the surgical community. To apply for the CST, one must graduate from a CAAHEP- or ABHES-accredited program.

Accredited surgical technology educational programs appropriately reflect the time it takes to learn surgical technology, protect patients, protect themselves and protect other staff members.

Education and Training from an Accredited Program Is Essential to Create Competent and Safe Entry-Level CSTs

Education for surgical technology has grown to nearly 400 accredited colleges, technical schools, hospital-based, and military programs because of the demand from healthcare facilities. Employers need to understand that during didactic education, surgical technologists learn:

- medical terminology
- anatomy
- the physical environment
- chemical hazards
- surgical wound management
- infection control
- hemostasis
- patient care concepts
- disinfection & sterilization
- electrical, radiation, & laser safety
- fire prevention
- legal responsibilities
- professional standards of conduct
- infection control
- disaster preparedness
- stress management
- OSHA standards & appropriate PPE usage
- bloodborne pathogen prevention
- surgical medications
- equipment, instrumentation, & supplies

Surgical Procedures & Techniques for:

- general surgery
- OB-GYN
- orthopedics
- urology
- cardiothoracic
- ENT/oral and maxillofacial surgery
- plastic and reconstructive
- vascular
- ophthalmic
- spine
- neurosurgery
- endoscopic, interventional radiology, laser, & robotic-assisted surgery

Accredited education also teaches critical thinking. The escalating rate of new technologies in the operating room requires CSTs to apply critical thinking skills in learning new technologies, including multitasking skills and the ability to anticipate the surgeon's needs many steps in advance.

Skills Lab in Accredited Programs

Employers need to understand didactic education prepares the student for the skills lab, also called the mock operating room. Programs invest significant resources into skills labs. In an accredited skills lab, students have 225 hours to practice away from the hectic, fast-paced, high-pressure operating room environment and, most importantly, away from the patient. Skills labs provide a safe learning environment without putting patients and surgeons at risk. Students gain the automaticity and speed needed to assist the surgeon during unanticipated situations such as rapid bleeding or trauma procedures. They learn sharps safety, including how to rapidly handle scalpels and needles without causing a sharps injury to themselves or others, and appropriately assemble power equipment like neurosurgery drills. The CST is responsible for ensuring all equipment is correctly assembled to prevent serious surgical errors.

Clinical Rotations in Accredited Programs

Didactic education and skills lab provides the foundation for clinical rotations. Diverse clinical

rotations not only teach surgical team interactions and embed physical safety habits, but they also teach an immense amount about each specialty. ***Every specialty has unique, critical safety issues and unique equipment, instruments, supplies, and processes.***

Even seemingly simple specialties like ENT have important patient considerations, such as cancer specimens and preventing surgical fires. Even though surgery fires are rare, they happen, and the consequences to the patient are devastating (Day et al., 2018).

CST Certification Demonstrates Mastery of Entry-Level Skills and Current Competence

Graduation from an accredited program and CST certification ensures that Certified Surgical Technologists are ready for the intense and demanding environment of the OR.

A high level of performance is needed from day one for patient safety, surgical outcomes, their own safety, and the safety of their colleagues.

After earning CST certification, Certified Surgical Technologists maintain and demonstrate current competence by completing continuing education to maintain CST certification. Competent performers contribute to the entire team's morale, *staff retention,* surgeon satisfaction, patient safety, and better surgical outcomes for the patient.

Studies on Certification Show Certification Enhances Staff Retention & Patient Outcomes

Though peer-reviewed academic studies on surgical technologists are limited, one study demonstrated that surgical care certifications "contributed significantly to improved surgical patient outcomes" (Boyle et al., 2014, p. 526).

Another study showed that certification has correlated with *staff retention* and "improved quality care, patient satisfaction, and knowledge" (Valente, 2010, p. 219).

Educated and Certified Surgical Technologists and Joint Commission Compliance

The Joint Commission reports that 36% of accredited hospitals were noncompliant with its standards to reduce the risk of infection associated with medical equipment, devices, and supplies (Pyrek, 2013). Certified Surgical Technologists prevent infection and increase compliance by properly decontaminating instruments before sending them to sterile processing. For a substantial number of instruments, proper decontamination requires skillful techniques learned as a student.

Educated and Certified Surgical Technologists' Impact on Healthcare Costs

Surgical technologists significantly impact healthcare facility costs. For example, the Hospital-Acquired Condition Reduction Program incentivizes hospitals to reduce hospital-acquired conditions. If a hospital falls into the top 25% of hospital-acquired conditions for the previous year, then the hospital faces an additional 1% reduction in Medicare reimbursement payments. Many CMS hospital-acquired conditions are surgery related, such as surgical site infections and a foreign object retained after surgery. Surgical technologists' role in preventing surgical site infections readily demonstrates their impact on healthcare costs.

The U.S. Department of Health and Human Services, in its Action Plan to Prevent Healthcare-Associated Infections, cited that surgical site infections result in an estimated 13,088 deaths per year and cost hospitals approximately $25,546 per infection. Certified Surgical Technologists also save facilities money by preventing long delays and not throwing away expensive equipment. A single mistake of accidentally throwing away equipment, such as robotic

equipment, can cost more than a car. Many non-disposable surgical items look disposable to the untrained eye.

Conclusion

Healthcare facilities require Certified Surgical Technologist certification from the NBSTSA for liability protection. AST recommends graduation from an accredited program and certification as a Certified Surgical Technologist from the NBSTSA. Certified Surgical Technologist certification demonstrates graduation from an accredited program, mastery of entry-level skills, and current competence. Studies show certification improves patient outcomes, staff morale, and staff retention.

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Students Are Our Future

Raetta Coleman, CST, FAST

STATE ASSEMBLY

Wow! Chicago was amazing and conference was amazing. I cannot believe that it is already over. There are no words to describe the unforgettable experiences that took place in Chicago. Every year, I treasure the time spent with old friends and new ones, seeing familiar faces and representing an organization that I love! It's a time to be rejuvenated and recharged for our profession and share it with others. The opening ceremony was phenomenal, the educational sessions were well attended and enjoyed, and the exhibit at the International Museum of Surgical Science, well, I cannot praise it enough! I took pride as I walked through, taking in every detail. It confirms my calling as a certified surgical technologist.

During conference, I noticed the students that were in attendance. They were excited about all that was happening around them. They were also full of questions. This brought to mind "mentorship." Mentorship is defined as the guidance provided by a mentor, especially someone that is experienced in a working environment or in an educational setting. I immediately thought, what better way to get involved in your state assembly than mentoring the students within your state. These students are the future leaders of the Association of Surgical Technologists. This is also a way of getting the students involved too. Ask a student to serve on a committee. This will enable the chair or another committee member to mentor the student. This will also attract other students who would like to serve and get involved.

Scholarships come in different forms. Other than mentoring, offering scholarships can benefit the student as well as the state by getting the students involved and attending meetings. A scholarship can be monies to assist with school tuition, or it could come in the form of assisting with the costs of attending the national conference. Is your state assembly actively recruiting students to attend your meetings? Ask students to attend and offer "free" or reduced-cost registration. It is important to remember that students are on a budget; some cannot afford the cost of attending, even at a reduced rate. Asking students to volunteer is another great way to get them to the meetings. This provides an opportunity to mentor the student in the happenings of your state assembly meetings.

Asking students to volunteer is another great way to get them to the meetings. This provides an opportunity to mentor the student in the happenings of your state assembly meetings.

Mentoring can also take place in the hospital setting. This opportunity should present itself often while students are doing their clinical rotations. Step up! If you are precepting have the student accompany you outside of the operating suite. Take time to answer their questions or ask if they have any. Introduce them to other staff at your facility. This will also help with the nervousness of the student and put them at ease. Talking isn't always required while mentoring. The student wants to be included and has an interest taken in them.

Students are our future. We need to invest in them. What we put in is what we will get out. I cannot think of a more fulfilling way to get students active within our state assemblies. Be the light that brightens a student's day. Be the reason that they aspire to be a Certified Surgical Technologist!

SAVE THE DATE

National Surgical Technologists Week

September 17-23, 2023

AST
Association of Surgical Technologists

Speak Up!
to Promote Safe Practices

National Time Out Day is June 14, 2023

National Time Out Day encourages everyone to speak up for safe practices in the operating room. The Joint Commission, the World Health Organization and the Council on Surgical and Perioperative Safety (CSPS) all promote the efforts to increase awareness for all surgical team members to make it a habit to practice safe surgical protocols each and every time patients undergo surgery.

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BATMAN

Hand Surgery: Improving Efficiency between the Surgeon and Surgical Technologist

Udayan Betarbet, MD

Efficiency in the operating room (OR) is centralized around the communication between the surgeon, surgical technologist, circulating OR nurse and anesthesia. All members of the OR team must understand the planned procedure to allow critical steps to be performed safely and to decrease operative time.

Though hand surgery is typically focused on the distal upper extremity, hand surgeons perform a wide variety of procedures with variable complexity in a single operative day. Knowledge and understanding of the range of hand surgeries is essential to anticipate the resources needed in the operating room with a varying case line-up. Surgical procedures range from a simple trigger finger release with minimal equipment to free flap reconstruction from the knee to the wrist. Additionally, hand surgeons routinely treat conditions for children as well. Still, there are fundamental principles of hand surgery that are shared by surgeons, but each surgeon may have a different approach to a similar surgical pathology and different procedures for the same diagnosis. This article details common principles of hand surgery operating room etiquette that are subject to modification based on operating team preferences and experience.

PRE-SURGERY CHECKLIST

A few keys to preparation for hand surgery procedures are understanding the anatomic location of the surgery, the need for bony

LEARNING OBJECTIVES

- Detail the procedural tips for hand procedures
- Examine the details of patient positioning and draping
- Evaluate where arthroscopic procedures are performed in hand surgery
- List which items are needed prior to the procedure
- Discuss ways the surgical team can increase efficiency when performing hand surgeries

fixation, and type of operative exposure. Addressing these aspects of a hand surgery will aid in minimizing equipment needs and improve operative flow.[4] The anatomic location of the surgery is commonly described by radial, ulnar, dorsal, or volar aspect of a digit, palmar surface, or the wrist. In addition to dictating draping, the anatomic location will decide the type of tourniquet (digit or upper arm) to be used and if positioning adjuncts such as a Padgett hand table or lead hand will be needed. Though the hand or wrist is primary surgical site, the surgical team must discuss if other anatomic areas need to be surgically prepped into the field if a skin, nerve or bone graft is required. If arthroscopy is planned, the correct system will be needed and appropriate screen placement in the OR. A wrist arthroscopy will require a traction system which may sit on top of the hand table or clamp onto the OR bed and will likely require using finger traps. If the procedure is planned under monitored anesthesia care (MAC) or wide awake with local and no tourniquet (WALANT) instead of general anesthesia, the local anesthetic is administered in the pre-operative holding area.

Next, if the case requires bony fixation, it is important to know if the procedure will require percutaneous pinning with Kirschner wires (K-wires), require plates and screws or some other device. Some procedures may require multiple methods of bony fixation. The appropriate company representative will need to be contacted ensuring the correct implants are available. If bony work is planned, a large or mini C-arm must be requested from the radiology department and required drape collected. The use of fluoroscopy and radiation exposure in hand surgery has been studied extensively. The radiation exposure during hand surgery from the more commonly used mini-C arm is lower than a large C-arm.[2] Furthermore, radiation exposure from the mini-C arm during hand surgery without the use of lead protection significantly below the annual limits for whole body exposure, eye exposure, and hand exposure set by the National Council on Radiation Protection and Measurements.[3] This risk is further reduced with the use of lead aprons, thyroid shields, and eye projection.[2,3] The decision to use radiation-protective equipment should be considered

Figure 1: Applying Mini C-arm Drape over Limbs

Figure 2: Securing Mini C-arm Drape to Limbs

prior to each case. If more radiation protection is required, a mobile lead barrier should be requested for the OR.

Finally, the surgical exposure will guide patient positioning and types of skin and soft tissue retractors required for the procedure. For example, open reduction and internal fixation (ORIF) of a metacarpal uses very shallow retractors like a spring while a radial tunnel release needs much deeper retraction such as an Army-Navy. Other procedures such as nerve repair may require nerve allografts, conduits and microsurgical instruments.

The surgical team should meet to discuss these aspects of the upcoming cases to limit confusion regarding surgeon preferences during and between cases. Familiarity with these aspects of a hand surgery will allow a certified surgical technologist to assist in creation of case specific instrument trays to improve OR efficiency.[4]

POSITIONING, TOURNIQUET, AND LOCAL ANESTHETIC

Once in the room, the patient may either remain on the stretcher or be transferred to the operating room table. Currently, most hand surgery procedures can be performed on the stretcher with an easily removable slide-in hand table. Remaining on the stretcher allows it to be easily rotated 90 degrees, limits movement of the patient before and after the procedure and saves about 4 minutes of turnover time.[4,5] If using a large C-arm, then the surgeon may prefer the patient be placed on the operating room table with a hand table attachment without a standing leg. This allows for complete mobility of the C-arm under the hand table.

Next, a tourniquet is placed on the upper extremity. Tourniquets come in multiple sizes with common sizes for adults being 18 inches and 24 inches. Soft roll is wrapped around the upper extremity at the planned area of tourniquet placement. The tourniquet is then applied, and the distal aspect of the tourniquet is secured with foam tape or a 1010 Steri-drape. A digit tourniquet may be used in certain cases.

If the procedure is under general anesthesia, local anesthetic will be given at the end of the case. Local anesthetic may not be required if the patient received a pre-operative regional anesthetic block.

DRAPING AND POSITIONING

After the patient is prepped according to surgeon preference, a medium sheet is placed on the hand table. A blue towel folded lengthwise into thirds is then wrapped around the upper extremity around the tourniquet and secured with a penetrating towel clip. If other areas of the body are required for adjunctive procedures, then these prepped areas are surrounded with sterile towels. Finally, an upper extremity drape is applied (with holes cut out over additional prepped areas if needed.) If a C-arm or mini-C arm is required, then it should be draped appropriately. Since the mini-C arm is more frequently used, learning to drape the mini-C arm is most useful to start. The two limbs of the mini-C arm are the X-Ray head, which typically has button controls, and the flat X-Ray detector plate. The mini-C arm drape will have two separate parts for each of the limbs. First, the mini-C arm should be either completely vertical or horizontal. The surgical technologist will then place a single hand into each part of the drape meant for the limbs. The drape can then be placed over each arm simultaneously. The end of the drape facing the main body of the mini-C arm can then be advanced with the help of the surgical nurse. The drape is the secured to the min-C arm limbs using rubber bands or ties on the drape. The mini-C arm will then be placed as positioning and space allow with the screen facing the surgeon. See Figures 1 and 2 for reference.

Currently, most hand surgery procedures can be performed on the stretcher with an easily removable slide-in hand table.

Next, for exsanguination of the upper extremity, an Esmarch bandage is wrapped around the hand from distal to proximal until the level determined by the surgeon and the tourniquet is inflated to 250 mmHg or 100mmHg above the systolic blood pressure. The surgeon may instead elevate the hand for two minutes prior to inflating the tourniquet if the patient has traumatic fractures or there is concern for infection. If fracture management is planned, the appropriate K-wires for provisional fixation and/or plating system or other implants for definitive fixation should be

Figure 3: **Operating Room Setup with Instrument Table**

confirmed and on the sterile field. If arthroscopy equipment is part of the procedure, the appropriate camera should be set up and connected to mobile equipment and screen tower. (Arthroscopic procedures will be discussed in a separate section.) The primary instrument table should then be moved in line with the hand table to allow for ease of instrument passing and mini-C arm use (Figure 3 and 4).

PROCEDURAL TIPS

Though the procedural steps may be variable, there are commonalities between hand surgeries. Most outpatient procedures will start with the incision and soft tissue dissection over the surgical site. A tenotomy scissor is a preferred tool for dissection, and a beaver style blade is used to incise deeper structures. Small retractors such as Heiss, small Weitlaner, Senn, and Ragnell are commonly used to maintain operative exposure. For improved visualization, the surgeons will often use surgical loupes to magnify the operative field between 2.5 and 4.0 times. Though the field appears enlarged, the surgeon's field of view is narrowed. The surgeon will be more sensitive to changes in their field of view. Safe passing of instruments is crucial since the surgeon will not be able to see the instrument placed into their hand. In some procedures requiring anastomosis of blood vessels or delicate nerve repair, a surgical microscope will be necessary and appropriate draping will be needed. When using a microscope, the surgeon will require a set of fine microsurgery instruments, micro-suture, and small surgical clips. If an arthroscopic or fracture plating system is being used, familiarity with the systems prior to the procedure is critical to avoid passing of incorrect instruments. When aiding in fracture fixation, the surgical technologist must confirm plate size, screw size and type (locking, non-locking, or rescue), and type of drill or screwdriver to be used. When passing a drill or K-wire driver, ensure the surgeon is ready to accept the instrument to avoid an inadvertent sharps injury. Care must be taken when passing small screws to avoid losing them in the surgical field. Implant representatives should be immediately available for any questions regarding company specific instrument adjuncts. Most procedures on the upper extremity will use polyglactin 910 suture for deep closure and nylon suture for skin closure. In addition to the surgeon's preferred dressings, splinting material should also be available. For prefabricated splints, timing is critical to have the splint ready at the appropriate time but not so early that it hardens or dries out prior to application.

ARTHROSCOPIC PROCEDURES

Within hand surgery, arthroscopic procedures are performed at the wrist to diagnose and treat several pathologies including carpal tunnel syndrome, ligament disruption, and wrist fractures. Endoscopic carpal tunnel release and diagnostic wrist arthroscopy are two common procedures in a general hand surgery practice today.

Endoscopic carpal tunnel release can be performed with a variety of different systems that each have a series of dilators and a hand piece incorporating a small blade and camera. Each part of the system is used in a specific order that maintains safety and efficiency for the surgical team. Once the endoscopic hand piece assembled and ready to be used, the surgeon will ask for the series of dilators

Knowledge and understanding of the range of hand surgeries is essential to anticipate the resources needed in the operating room with a varying case line-up. Surgical procedures range from a simple trigger finger release with minimal equipment to free flap reconstruction from the knee to the wrist.

to widen the initial incision made. Each dilator should not be removed until the next dilator is handed to the surgeon. Next, a scaping tool is used clear subcutaneous tissue from the field of view. Frequently, the camera will blur and require removal from the hand piece in order to use a special cleaning pad. Additionally, debris in the hand piece can be easily removed by placing the suction tubing over the most distal aspect of the hand piece. The endoscopic hand piece will then be used to visualize and incise the transverse carpal ligament.

Diagnostic wrist arthroscopy is performed to evaluate wrist pathology directly using several viewpoints without the morbidity of an open procedure. Special equipment for wrist arthroscopy includes a wrist tower, a 2.7 mm 30-degree angled arthroscope, and a 3 mm hook probe.[1] The surgeon's preferred wrist tower will be used to aid with distraction of the wrist for better visualization of structures. The wrist tower will be attached to the operating room bed or placed on the hand table. The wrist tower may be sterile or nonsterile but does routinely require assembly. Next, sterile finger traps are attached to the wrist tower. The patient's elbow will be flexed to 90 degrees, and the surgeon will place the patient's fingers in the finger traps for adequate traction. The surgeon will be positioned facing the dorsal aspect of the wrist with the video screen facing them at the foot of the bed. There are several "portals" the surgeon will use to visualize different anatomy of the wrist. Wrist arthroscopy is commonly performed by injecting saline into the wrist for internal visualization though some providers may not use any fluid. The saline is typically injected using an 18G needle. Next, a 15 blade is used for the incision to minimize risk to the deep structures and a hemostat is used to dilate the portal incision to allow entry of the arthroscope.[1] The surgeon will then progress through several different portal incisions depending on the wrist pathology.

Figure 4: Operating Room Setup with Mini-C arm

Hand surgery is often high volume and fast-paced and the surgical technologist is the hub of an efficient team. Whether it is the advanced preparation to have all the necessary equipment, familiarity with the procedure to anticipate the surgeon's needs or efficiently turning over the instruments and the room, the scrub is central to a successful enterprise.[6]

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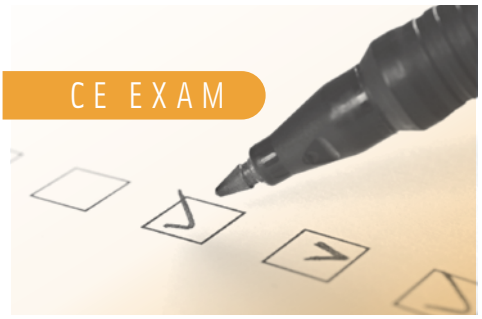

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Hand Surgery: Improving Efficiency between the Surgeon and Surgical Technologist

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1. **A case is planned for an open reduction and internal fixation of a distal radius fracture. Which of the following needs to be done preoperatively?**
a. Discuss with the surgeon regarding a preferred plating system
b. Determine whether a large or mini-C arm is required for the case
c. Discuss with OR staff if a product representative will be present
d. All of the above

2) **When can local anesthetic be administered to the surgical site prior to prepping and draping?**
a. Open reduction internal fixation of a metacarpal fracture
b. Procedure under monitored anesthesia care
c. Wrist arthroscopy
d. Procedure under general anesthesia

3) **Which of the following is NOT a common soft tissue retractor in hand surgery?**
a. Heiss
b. Small Weitlaner
c. Richardson
d. Senn

4) **The primary instrument table should have which orientation with the operative hand table?**
a. Perpendicular
b. 60 degrees
c. 45 degrees
d. In-line

5) **Which of the following statement is false?**
a. An Esmarch is used for all hand surgery cases.
b. A common setting for tourniquet pressure is 250mmH.
c. Vicryl suture is commonly used to close deeper structures.
d. Implant representatives should be available at the time of a procedure.

6) **What is an important consideration when a surgeon is using surgical loupes?**
a. The surgeon's field of vision is widened.
b. The loupes need to be sterilized before the procedure.
c. The surgeon's field of vision is narrowed.
d. The surgeon's field of vision is magnified 8.0X.

7) **Which is not typical equipment needed for diagnostic wrist arthroscopy?**
a. A 2.7 mm arthroscope
b. 3 mm hook probe
c. Wrist tower
d. Small Weitlander

8) **What is the correct sequence of instruments for an endoscopic carpal tunnel release?**
a. Dilators, scraping tool, then endoscopic hand piece
b. Scraping tool, dilators, then endoscopic hand piece
c. Dilators, Heiss retractor, then endoscopic hand piece
d. Scraping tool, Heiss retractor, then endoscopic hand piece

9) **What piece of equipment is used to keep the wrist in a vertical orientation?**
a. Sterile bandage dressing
b. Sterile rubber bands
c. Unsterile finger traps
d. Sterile finger traps

10) **During a diagnostic wrist arthroscopy, what fluid is injected into the wrist?**
a. Fluorescent dye
b. Methylene blue
c. Saline
d. Sterile water

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Review Focuses on How Nutrition Plays a Part in Surgical Recovery and Space-Based Activities

OF INTEREST IN THE MEDICAL ARENA

For humans to survive, there is a reciprocal relationship between the environment, economy, food and health. The correlation between food and health is very important as food is a source of energy as well as medicine. If the environment is unfavorable, such as in space or in the hospital, proper nutrition is necessary to maintain good health. Space nutrition and nutritional orthopedics are created from research in nutrition sciences specializing in adverse environments. Nutritional orthopedics stems from the need to improve the treatment path of orthopedic patients after surgery. Most orthopedic patients are persons of an advanced age often with comorbidities such as osteoporosis or heart conditions. Hospital conditions like stress and lengthy bed rest exacerbate the situation. space nutrition was born from the need to counteract the effects of deep space on a person such as poor food systems and malnutrition as well as zero gravity complications. There are similarities between these two disciplines that are evident such as the poor environments and the food adversity. However, this article explores other commonalities between nutritional orthopedics and space nutrition through an extensive review of the literature published between 1950 and 2020.

Pre-Operative (Home-Based) vs. Pre-Launch (Earth-Based) Nutritional Issues: Malnutrition as a risk for negative post-surgical outcomes has been researched since the mid-1990s. Therefore, recommendations exist to optimize nutrition for all surgical patients regardless of nutritional status prior to surgery. Conversely, it is much debated on whether fasting prior to surgery is necessary. Some research suggests that the chances of vomiting or aspiration are high during surgery so fasting is recommended and others indicate that administration of a calorie-loaded supplement up to a few hours prior to orthopedic surgery is safe for the patient. Providing diet and supplements tailored to the individual based on age, sex and disease condition; exercising; ensuring psychological support is available; and abstaining from smoking and reducing alcohol consumption are necessary prior to surgery. Astronauts require good nutrition prior to launch to avoid vitamin deficiencies and improve immune systems. Many foods and drinks do not work well in space or cause ill-effects on the person (nausea, disorientation, etc.). Most food must be freeze-dried and individually packaged in space to ensure good quality and aid in consumption. Ultimately, astronauts need to grow their own food to sustain in space. The following similarities are present between pre-operative and pre-launch issues: "good nutritional status; the importance to acquire nutrition-derived immunocompetence; the significance of food abstention before stressful situations; the goal of giving up/reducing bad habits; the need to opt for tailored nutrition and advanced dietary preparations."

Post-Operative (Hospital-Based) vs. Space Station (Planetary) Nutritional Issues: There are two types of food service models utilized by hospitals – prepared elsewhere, chilled, reheated and served or prepared at the hospital and served. The second model is preferred to allow for

> Nutritional orthopedics and space nutrition have much in common and the researchers may be able to help each other to improve nutrition for our aging population and astronauts in space.

last-minute meals for patients as well as serving employees and visitors. In both models, it is important to ensure that patients can wash their hands before eating and the food temperature is accurate. Special diets to accommodate allergies and preferences need to be addressed as well and prepackaged meals are a good option. Hospitals often have a food research laboratory where the use of supplements, alternative forms of heating, and other issues are studied. In space there are two forms of food systems available – prepared on Earth and transited and grown in space. Low gravity, water recycling, air regenerations, etc. affect plant growth in space; however, perseverance may allow for new systems and subspecies that are resistant to emerge. It is necessary to use light-emitting diodes to provide light due to the harmful effects of direct solar flares. Farming animals for food purposes is difficult in space due to high food consumption and room restrictions. Food research laboratories for space are necessary to explore farming options, food storage, quality and consumption. The commonalities between post-operative and space station issues include "the use of single-serving prepackaged meals; the need to establish demand-driven systems that crosstalk and reduce food waste; the importance of guaranteeing food safety and human engagement throughout the process; the need to support the musculoskeletal health; the interest in some nutrients (i.e., proteins, calcium, iron, vitamin D); the need for boosting food flavors to increase appetite, palatability, hedonic appreciation, and food intake."

Hospital vs. Deep Space Hazards and Illnesses: The process of aging inherently corresponds with physical and psychological detriments which are exacerbated by hospitalization. Bedrest, acute stress and isolation are risk factors for hospital-associated deconditioning. Bedrest affects circulation, bone and muscle strength, and gastrointestinal functions. Acute stress from surgical wounds causes issues at the incision site as well as throughout the body. Isolation impacts mental and psychological well-being. In space, microgravity, radiation and confinement influence the musculoskeletal, cardiovascular and neuro-vestibular systems. Microgravity changes the composition of muscles and the capillary network. Radiation affects plant growth as well as bone durability. Confinement in an enclosed environment that is exposed to multiple light emissions creates cognitive decline and circadian disturbances. The nutritional similarities between hospitals and deep space are as follows. "The interest in protecting the musculoskeletal system from reduced mechanical forces that expose the individual to an increased risk of fractures; the environmental consequences on the cardiovascular system; the relevance of stressful situations in causing metabolic and neurobehavioral disturbances; the potential consequences of prolonged periods of solitude."

Hospital-Associated vs. Space-Associated Deconditioning: Osteosarcopenia is a concern in the aging population as well as with astronauts. As a person ages, the bones begin to deteriorate and decrease in mass (osteoporosis) and the muscles lose mass, strength, and function as well (sarcopenia). When astronauts move from low to high gravity environments, they are more likely to break a bone due to the effects on the body. To increase nutritional resilience in the aging orthopedic patient, there must be good communication between the food service team and the physicians. It is important to not only provide good nutrition in the hospital but to teach the patient to continue this at home. Physicians need to ensure that the patient has access to appropriate food that is appetizing and balanced, does not interfere with medications, and is served in a timely manner. This is imperative to keep the patient healthy and healing properly. Astronauts also need balanced and appetizing meals supplemented with vitamins to ensure good nutrition to keep them in top physiologic and psychologic states. "The nutritional commonalities between hospital-associated vs. space-associated deconditioning/resilience are the significance of having an efficient food system that contributes to the maintenance of the individual's good nutritional status; the goal of reducing nutritional deficits and the intake of counterproductive substances; the importance of meal timing; the need to balance the musculoskeletal involution; the goal to avoid the recurrence of osteosarcopenia-related traumas."

Nutritional orthopedics and space nutrition have much in common and the researchers may be able to help each other to improve nutrition for our aging population and astronauts in space. The two disciplines share knowledge in several areas including environmental risks and negative consequences of malnutrition in hospitals and deep space. A nutrition professional who specializes in the musculoskeletal system may be able to bridge the gap between these two fields allowing for shared research to improve the lives of the aged and astronauts.

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Robotic single-port surgery: Preliminary experience in general surgery

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Abstract

Background: We aim to analyse the safety and feasibility of the DaVinci Single Port (SP) platform in general surgery.

Methods: A prospective series of robotic SP transabdominal pre-peritoneal inguinal hernia repairs (SP-TAPP) and cholecystectomies (SP-C) (off-label) were analysed. Primary endpoints were safety and feasibility defined by the need for conversion and incidence of perioperative complications.

Results: A total of 225 SP procedures were performed; 84 (37.3%) SP-TAPP (70 unilateral, 7 bilateral), and 141 (62.7%) SP-C. There were no conversions or additional ports placed. Mean console time was 17.6, 31.9, and 54 min for SP-C, unilateral, and bilateral SP-TAPP, respectively. There was no mortality, intraoperative or major postoperative complications. Mean LOS was 2.7 h for elective SP-TAPP and 2.3 h for SP-C.

Conclusion: Robotic SP surgery is safe and feasible for two of the most performed general surgery operations. Further experience might allow expanding the applications of robotic single-incision surgery for other procedures.

KEYWORDS
cholecystectomy, Da Vinci SP, inguinal hernia, robotic surgery, single port surgery, single-incision surgery

1 | INTRODUCTION

As part of the minimally invasive surgery revolution, single incision laparoscopic surgery (SILS) represented a step forward in the direction of reducing invasiveness and surgical trauma. SILS has demonstrated to be a safe and feasible alternative for both cholecystectomies and inguinal hernia repairs.[1–5] Reduced postoperative pain, recovery time, improved cosmesis and body image were some of the reported advantages of SILS when compared to standard multiport laparoscopy.[5–11] However, SILS never achieved large popularity in the surgical community due to technical limitations such as a reduced ability to triangulate, internal and external clashing, and ergonomic discomfort.[12] In 2011, specialised instruments for the Da Vinci surgical system (Da Vinci Single-Site) were developed to perform robotic-assisted single-incision procedures.[13] Although this technology improved some of the technical constraints of traditional

SILS, the instrument's excessive flexibility, lack of endowrist, and limited strength prevented its widespread adoption.

Recently, a completely redesigned single port (SP) robotic platform has been specifically developed for single-incision surgery and reignited the interest in the approach as it carries potential to overcome many of the above-mentioned limitations and allow a wider range of surgical applications. This platform provides the surgeon with similar capabilities as the DaVinci multiport platform, with the exception that 3 multi-jointed, wristed instruments and a 3D-HD articulating scope are introduced through a SP. This improved technology allows distal instrument triangulation, excellent internal and external range of motion, and 360°multi-quadrant access through a single 2.5 cm skin incision. The DaVinci SP has already been FDA-approved for transoral endoscopic head and neck surgery and urology with promising results.[14,15]

In this manuscript, we report the first results of the DaVinci SP platform applications in general surgery (SP transabdominal preperitoneal inguinal hernia repair [SP-TAPP] and SP cholecystectomy [SP-C]) conducted under an IRB approved protocol.

2 | MATERIALS AND METHODS

2.1 | Da Vinci single port technology

The surgical system used was the DaVinci SP, SP 1098 Surgical System (Intuitive Surgical Inc, Sunnyvale, California). This system is composed of a surgeon console, a patient-side cart, and a vision cart. The surgeon's console has two 3D-HD screens and a tridimensional superimposed image which functions as an instrument guidance system that tracks the location of the robotic port, camera, and the instruments in real time during the procedure. The patient-side cart is equipped with a single arm with four instrument drives that control the 12 × 9 mm articulating camera and three 6-mm double-jointed articulating endowristed instruments. The instruments are connected to the SP arm drive in a similar fashion to the Da Vinci Xi platform. Afterwards, they are introduced into the abdominal cavity through a single metal cannula. The cannula has an entry guide with one oval lumen (9 mm, for the scope) and three circular lumens (6 mm, for the instruments). The camera and the instruments are introduced in the abdominal cavity through a 25 mm multichannel port (Figure 1). The system is provided with a 3D high definition fully wristed endoscope. The robotic arm can be manipulated independently of the individual robotic instruments. These features allow virtually 360° anatomical (multi-quadrant) access through the fulcrum of the SP. The available instruments for the SP platform include cadiere forceps, round tooth retractor, medium-large clip applier, needle driver, fenestrated bipolar forceps, maryland bipolar forceps, monopolar curved scissors, monopolar cautery hook, and monopolar cautery spatula. The hand controllers of the Da Vinci SP system are the same as the previous multiport Da Vinci platforms. The instruments are also controlled in a similar way. The camera is controlled differently (due to its articulation). The scope clutch activates three different camera modes. The adjust mode, which allows to move the camera and navigate in the workspace while maintaining the instruments in the same position; the camera control mode, which allows to move the camera and the joints without moving the instruments; and the relocate mode, which allows to reposition the camera and the instruments simultaneously by moving the entire instrument cluster.

FIGURE 1 Robotic single port camera and instruments

2.2 | Study design and population

This study was conducted under an Institutional Review Board (IRB) approved protocol (IRB #2021-0520). A review of a prospectively collected database of all patients who underwent single-incision surgery with the Da Vinci SP surgical system from July 2019 to September 2021 was performed. This article was written following the standards of the STROBE guidelines for observational studies.[16]

During the study period, procedures performed with the SP platform included: cholecystectomy, TAPP inguinal hernia repair, ventral/incisional hernia repair, Nissen fundoplication, and partial gastric resection. SP-C and SP-TAPP were included in the analysis.

The surgical procedures reported in this article were performed by one surgeon (FMB) with previous experience in robotic multiport and Da Vinci single site surgery. Before starting the SP cases on humans, training was completed on the SP platform using simulation, 2 days dry and wet laboratories, and case observation. For the first three cases, an internal proctor from the Urology department with SP experience was present. All the nursing staff and scrub techs involved had previous experience with the system. All procedures were assisted by general surgery residents. A senior resident who also received training in the laboratory was present for the first two cases. The senior resident was shadowed by a junior resident who eventually took over the following cases. All new residents were proctored by a previously trained resident before assisting autonomously.

Case selection (elective cases in patients without super-obesity or previous abdominal operations) was performed for the first 15

procedures (cholecystectomies). After that, all cholecystectomies were booked SP. SP-C was indicated for symptomatic cholelithiasis, acute cholecystitis, chronic cholecystitis, porcelain gallbladder, gallbladder polyps, choledocholithiasis, and gallstone pancreatitis. Patients with suspected choledocholithiasis underwent preoperative magnetic resonance cholangiography and if positive, a preoperative endoscopic retrograde cholangiopancreatography (ERCP) for bile duct stones removal was done. After the first 20 cholecystectomies we started performing inguinal hernia repairs. SP-TAPP was indicated for femoral, unilateral, and bilateral inguinal hernias. Similarly, during the first 10 cases inguinoscrotal, recurrent hernias (laparoscopically approached) and/or patients with previous prostatectomy were avoided. After the first 10 cases, all inguinal hernias were enroled except large inguinoscrotal hernias with chronically incarcerated bowel. After the first 120 cases, we started to include selected gastric resections, hiatal hernias, and ventral hernias.

The procedure and the innovative nature of the approach were explained to the patients, along with the expected outcomes and potential risks. Moreover, the patients were informed about the alternative approaches (laparoscopic and robotic multiport) before written consent was given.

Follow-up was performed in the office on postoperative week 2 and with phone calls at variable intervals. A modified version of the PINQ telephone questionnaire (previously validated for inguinal hernia recurrence detection) was used to screen inguinal hernia recurrences and umbilical port incisional hernias.[17] If the telephone screening was positive, patients were scheduled for an in-persons physical examination at the office. Moreover, satisfaction with cosmetic results were addressed during the follow-up calls by a 1 (unsatisfied) to 10 (extremely satisfied) scale.

2.3 | Procedure details

The operation starts by creating a single access through a vertical 2.5 cm skin incision immediately lateral to the umbilicus. The subcutaneous space is dissected bluntly and with monopolar energy. The fascia and peritoneum are opened, and an army navy retractor is used to lift-up the wound while the single-port is advanced horizontally gently stretching the fascial incision. The dissection starts after the pneumoperitoneum is established, the robot is docked, and the articulated camera and 3 double-jointed instruments are connected to the single arm.

2.3.1 | SP cholecystectomy

The gallbladder is retracted cephalad using a cadiere forceps in the third robotic arm reaching from the top of the port. The gallbladder infundibulum is retracted laterally using a bipolar forceps and the Calot's triangle is dissected with the monopolar hook. The cystic duct and artery are identified, skeletonised, and divided between hem-o-lok clips (Figure 2A). The gallbladder is detached from the liver bed with the robotic monopolar hook and extracted within the SP device. In cases of acute cholecystitis and difficult retraction, the gallbladder is decompressed with a suction device (argyle suction catheter) which is inserted through the instrument port or between the skin and the SP canula. In case of infection or perforation, the gallbladder is retrieved in a 5-mm endobag introduced through one of the robotic ports.

2.3.2 | SP TAPP inguinal hernia repair

The peritoneum is incised with the monopolar hook to access the preperitoneal space. The hernia sac is reduced, and the lower epigastric vessels and elements of the spermatic cord or round ligament are identified (Figure 2B). The bipolar forceps is used for retraction and haemostasis and the hook for electrocautery dissection. Once the preperitoneal space is fully dissected, a 3D BardTM mesh is introduced through the SP and fixed immediately above the Cooper's ligament. Finally, the peritoneum flap is closed with a running absorbable suture. In some cases (short-torso patients) a floating dock is used to facilitate the flap closure, as a minimum distance of 10 cm from the target anatomy is required to fully deploy the instruments inside the abdominal cavity. Floating dock is obtained placing an Alexis wound retractor and tying a suture around the retractor and the port.

At the end of the procedure, the SP device is removed, and the fascia defect is closed with figure-of-eight polydioxanone 1 sutures. The subcutaneous space is closed with vycril sutures and the skin with subcuticular interrupted sutures of monocryl 4–0 (Figure 3). The same closure technique was used after cholecystectomies and inguinal hernia repairs.

2.4 | Variables and outcomes

Perioperative information was collected using standardized case report forms and entered prospectively into an institutional database. Data collected included age, gender, body mass index (BMI), American Society of Anaesthesiologists (ASA) classification, presence of comorbidities, previous abdominal surgeries, and hernia repairs. Perioperative variables such as hernia type (according to Nyhus classification), associated procedures, intraoperative complications, conversion (to multiport laparoscopy or to open surgery), additional port placement rate, and blood loss were also registered. Operative time metrics included: skin incision to port placement time, port placement to docking start time, docking time (time necessary to dock the robot and connect the required instruments to start the operation), end of docking to first instrument movement time, time to first clip (interval time between the first instrument movement and the first cystic clip application), first clip-gallbladder detached time (interval time between the application of the first cystic clip and full dissection of the gallbladder from liver's bed), time to mesh placement (interval time between the first

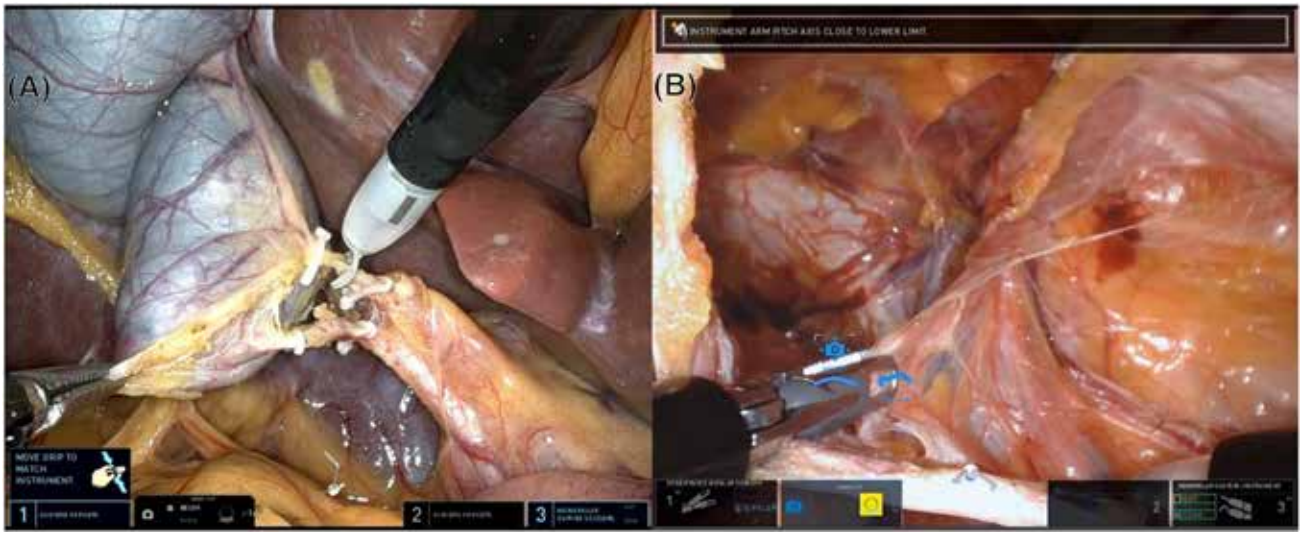

FIGURE 2 Intraoperative pictures: Single Port cholecystectomy (A) and Single Port transabdominal preperitoneal (TAPP) inguinal hernia repair (B)

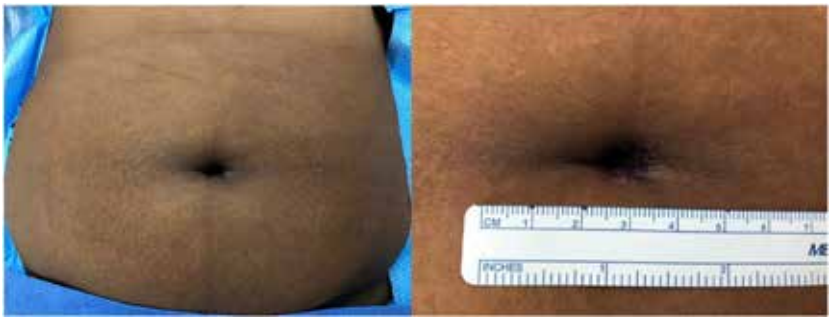

FIGURE 3 Umbilical incision closure

instrument movement and deployment), mesh placement-flap closure time (time necessary to close the peritoneal flap), console time, undocking time, undocking to fascia closure start time, fascia closure time, time from skin incision to fascia closure, skin closure time, and total operative time. Recovery parameters such as recovery time, length of hospital stay (LOS), overall 30-day morbidity (according to Clavien-Dindo classification), major morbidity (defined as Clavien-Dindo ≥3a), urgent reoperations, 30-day readmission, inguinal recurrence, and umbilical port incisional hernia rates were also considered for analysis.

Primary endpoints were safety and feasibility defined by the need of conversion and incidence of perioperative complications. Secondary endpoints included mean operative time, console time, length of hospital stay (LOS), and port-site incisional hernia rate.

3 | STATISTICAL ANALYSIS

For descriptive statistics, continuous data were summarised by reporting mean, median, range, and standard deviation. Categorical data were summarised using frequency and percentage.

4 | RESULTS

During the study period, 222 patients underwent 230 robotic SP operations. Procedures performed included 141 SP-C and 84 SP-TAPP. The remaining four patients underwent a SP partial gastrectomy, hiatal hernia repair with Nissen fundoplication, ventral hernia repair, and an incisional hernia repair and were excluded from the analysis (Figure 4).

Demographics and preoperative variables are shown in Table 1. In the SP-TAPP group, the mean age was 52.1 years and 93.5% of patients were male. Most patients were ASA class 1–2 (80.5%), and the mean BMI was 27.3 (19.5–41.6) kg/m^2. In the SP-C cohort, 74.5% of patients were female with a mean age of 41 years. Most patients (72.4%) had low anesthesiologic risk (ASA 1–2). Obesity (BMI > 30 kg/m^2) was present in 62.4% of the patients and in this sub-group the average BMI was 38.8 kg/m^2. Moreover, 48 (34%) patients from the SP-C group and 20 (26%) patients from the SP-TAPP group had previous abdominal surgeries.

Indications for SP-C included 101 (71.6%) symptomatic cholelithiasis, 27 (19.1%) acute cholecystitis, 3 (2.1%) chronic cholecystitis, 3 (2.1%) gallbladder polyps, 2 (1.4%) choledocholithiasis, 2 (1.4%)

FIGURE 4 Cases performed with the robotic single port platform

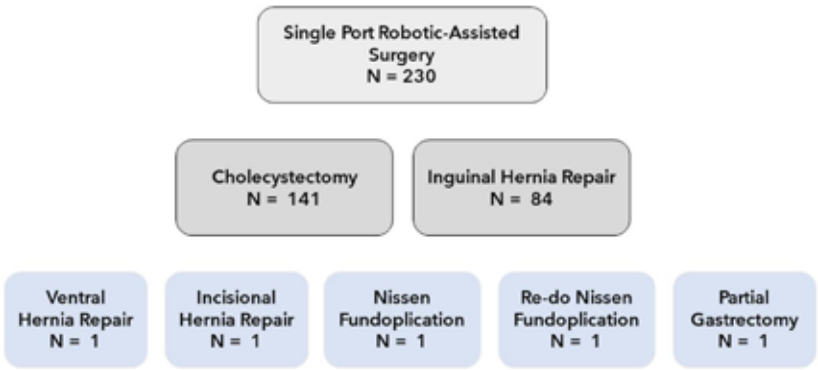

TABLE 1 Demographics and preoperative variables

	SP-TAPP *n* = 77	SP-C *n* = 141
Gender		
Female, *n* (%)	5 (6.5)	105 (74.5)
Male, *n* (%)	72 (93.5)	36 (25.5)
Mean age, years (range)	52.1 (15–80)	41 (18–85)
Mean BMI, kg/m^2 (range)	27.3 (19.5–41.6)	33.9 (14.8–71.8)
ASA, *n* (%)		
I	17 (22.1)	19 (13.5)
II	45 (58.4)	83 (58.9)
III	15 (19.5)	38 (26.9)
IV	0 (0)	1 (0.7)
Smokers, *n* (%)	33 (42.8)	41 (29.1)
Hypertension, *n* (%)	29 (37.7)	51 (36.2)
Diabetes mellitus, *n* (%)	10 (13)	25 (17.7)
Chronic kidney disease, *n* (%)	4 (5.2)	13 (9.2)
Respiratory disease, *n* (%)	15 (19.5)	29 (20.6)
Previous abdominal surgery, (%)	20 (26)	48 (34)
Supramesocolic	5 (6.5)	7 (5)
Inframesocolic	15 (19.5)	41 (29)

Abbreviations: ASA, American society of anaesthesiologist classification; BMI, body mass index; SP-C, Single port cholecystectomy; SP-TAPP, Single port transabdominal preperitoneal inguinal hernia repair.

gallstone pancreatitis, 2 (1.4%) porcelain gallbladder, and 1 (0.7%) biliary dyskinesia.

SP-TAPP was indicated for 69 (89.6%) inguinal unilateral (43 right and 26 left), 7 (9.1%) inguinal bilateral, and 1 (1.3%) femoral unilateral hernia.

Mean skin incision to port placement was 5.4 min for SP-TAPP and 4.7 min for SP-C. Mean docking time was 2.3 and 2.4 min for SP-TAPP and SP-C, respectively. Mean console time for unilateral and bilateral inguinal hernia repairs was 31.9 and 54 min, respectively. Mean operative time was 79.1 min in unilateral and 111.7 in bilateral inguinal hernia repairs. In SP-C, the mean console time was 17.6 min, and the mean operative time was 65.5 min. Additional operative time metrics can be found in Table 2.

An associated procedure was performed in 18 (23.4%) of SP-TAPP (12 umbilical hernias, 2 prostatectomies, 2 hydroceles, 1 partial nephrectomy, and 1 ventral hernia repair) and 7 (5%) of SP-C (4 umbilical hernia, 1 partial nephrectomy, 1 ventral hernia repair, and 1 liver biopsy).

There were no intraoperative complications, conversions, or additional ports placed (excluding combined cases with urology) in the series (Table 3). The first assistant was a postgraduate year (PGY) 1 resident in 19%, PGY-2 in 18.4%, PGY-3 in 28.4%, PGY-4 in 21.6%, and PGY-5 in 12.6% of the cases.

Most of the operations (SP-TAPP: 97.4%, SP-C: 80.1%) were performed in an outpatient basis with a mean recovery time of 2.7 and 2.3 h for the SP-TAPP and SP-C groups, respectively. The two admitted patients in the SP-TAPP cohort were the combined cases with the urology team (partial nephrectomy and prostatectomy). In the SP-C group, 28 patients did not undergo same-day discharge: 26 were previously admitted due to acute presentations (cholecystitis, suspicious of common bile duct stones, pancreatitis), and 2 were admitted postoperatively due to persistent nausea and vomiting.

Overall 30-day morbidity was 6.5% in the SP-TAPP group and 1.4% in the SP-C group. All the complications were minor (Clavien I-II) and included 3 seromas (resolved spontaneously), 2 prolonged postoperative ileus (managed conservatively), 1 urinary retention (required foley catheter), and 1 urinary tract infection (antibiotic treatment). There were no major complications, urgent reoperations, or mortality. Three patients were readmitted (1.4%), 2 for prolonged postoperative ileus (1 SP-C and 1 SP-TAPP), and 1 for a urinary retention (SP-C) (Table 4).

After a mean follow-up of 8.9 months, there were 3 (1.4%) port-site hernias and no inguinal recurrences. Mean satisfaction with scar cosmesis was 9.2 (4–10).

5 | DISCUSSION

Since Muhe's introduction in 1985, laparoscopic cholecystectomy has been the treatment of choice for gallbladder disease.[18] Similarly, laparo-endoscopic techniques are now one of the preferred

TABLE 2 Operative time metrics

	SP-TAPP *n* = 77	SP-C *n* = 141
Skin incision to port placement, minutes		
Mean (SD)	5.4 (3.8)	4.7 (3.3)
Median	4	4
Range	1–24	1–7
Port placement to docking start, minutes		
Mean (SD)	3 (1.8)	4 (3.3)
Median	3	4
Range	1–8	1–17
Docking time, minutes		
Mean	2.3 (2)	2.4 (1.9)
Median	2	2
Range	1–10	1–18
Docking end to first instrument movement, minutes		
Mean	2.6 (2.4)	2.5 (2.3)
Median	2	2
Range	0–12	0–16
Time to first clip, minutes	-	
Mean (SD)		7 (6.9)
Median	-	5
Range	-	3–55
Time first clip—GB detached, minutes		
Mean (SD)	-	10.6 (8.5)
Median	-	9
Range	-	4–73
Time to mesh placement, minutes		
Mean (SD)	18.1 (10.7)	-
Median	17	-
Range	7–36	-
Mesh placement-flap closure time, minutes		
Mean (SD)	15.4 (8.5)	-
Median	15	-
Range	5–36	-
Console time, minutes		
Mean (SD)	31.9 (14.4)	17.6 (13.5)
Median	33	14
Range	15–55	6–99
Undocking time, minutes		
Mean (SD)	4.1 (5.6)	2.4 (2.3)
Median	2	2
Range	1–26	1–14
Undocking to fascia closure start time, minutes		
Mean (SD)	3.1 (2.2)	3.7 (2.4)
Median	2	3
Range	1–10	0–18
Fascia closure time, minutes		
Mean (SD)	12.3 (7.5)	9.9 (4.6)
Median	9	9
Range	5–19	2–32
Skin incision to fascia closure time, minutes		
Mean (SD)	65.3 (20.1)	50.7 (28)
Median	67	43
Range	39–118	26–173
Skin closure time, minutes		
Mean (SD)	13.4 (10.9)	14.9 (10.1)
Median	13	14
Range	2–33	4–30
Operative time, minutes		
Mean (SD)	79.1 (35.5)	65.5 (28.7)
Median	84.5	60
Range	45–119	36–177

Abbreviations: GB, gallbladder; SP-C, Single port cholecystectomy; SP-TAPP, Single port transabdominal preperitoneal inguinal hernia repair.

TABLE 3 Operative variables

	SP-TAPP *n* = 77	SP-C *n* = 141
Associated procedure, *n* (%)	18 (23.4)	7 (5)
System errors, *n* (%)	2 (2.6)	3 (2.1)
Recoverable fault	2 (2.6)	1 (0.7)
Camera issue	0 (0)	1 (0.7)
Sterile adaptor error	0 (0)	1 (0.7)
Additional port, *n* (%)	0 (0)	0 (0)
Conversion, *n* (%)	0 (0)	0 (0)
Intraoperative complications, *n* (%)	0 (0)	0 (0)

Abbreviations: SP-C: Single port cholecystectomy, SP-TAPP: Single port transabdominal preperitoneal inguinal hernia repair.

approaches for inguinal hernia repairs.[19] To further reduce operative trauma, SILS was developed. The proposed advantages of single-incision over multiport laparoscopy include a reduced risk of wound infection, less postoperative pain, faster recovery, improved cosmesis, and body image.[5–11] For instance, the multicenter

TABLE 4 Postoperative outcomes

	SP-TAPP $n = 77$	SP-C $n = 141$
Same-day discharge, *n* (%)	75 (97.4)	113 (80.1)
Recovery time, minutes (range)	164.5 (40–352)	136.5 (43–291)
Admitted preoperatively, *n* (%)	0 (0)	26 (18.4)
Admitted postoperatively, *n* (%)	2 (2.6)	2 (1.4)
Mean LOS, days (range)	0 (0–2)	0.3 (0–4)
30-day overall morbidity, *n* (%)	5 (6.5)	2 (1.4)
Clavien-Dindo, *n* (%)		
I-II	5 (6.5)	2 (1.4)
	3 seromas	1 ileus
	1 ileus 1 UTI	1 urinary retention
III	0 (0)	0 (0)
IV	0 (0)	0 (0)
V	0 (0)	0 (0)
30-day readmissions, *n* (%)	1 (1.3)	2 (1.4)
	1 ileus	1 ileus
		1 urinary retention
Mean follow-up, months (range)	8.8 (1–27)	8.9 (1–28)
Inguinal recurrence, *n* (%)	0 (0)	-
Port site incisional hernia, *n* (%)	1 (1.3)	2 (1.4)

Abbreviations: LOS, length of hospital stay; SP-C, Single port cholecystectomy; SP-TAPP, Single port transabdominal preperitoneal inguinal hernia repair.

double-blinded SPOCC-trial randomized 110 patients to SILS cholecystectomy (SILS-C) and laparoscopic multiport cholecystectomy (LMC). SILS-C resulted in better short-term and long-term cosmesis and body image, reduced postoperative pain, and improved quality of life with similar LOS and complication rates.[7] On the contrary, concerns have been raised regarding the steeper learning curve, prolonged operative time, and decreased visualisation/exposure of critical structures. These might result in a higher risk of serious complications such as bile duct injuries.[20] Moreover, Ma and colleagues reported that an additional 3 mm instrument was necessary in 66.6% of SILS-C to properly retract the gallbladder and the operative time of SILS doubled (SILS-C: 88 vs. LMC: 44 min, $p < 0.05$) the multiport technique.[21] In our series of SP-C, no additional ports or extra-corporeal sutures to retract the gallbladder were required to complete the procedure.

SILS has also been proved safe and feasible for inguinal hernia repairs.[4,5,22,23] The randomized controlled trial by Cardinali et al compared 200 totally extraoperitoneal inguinal hernia repairs with the multi-trocar or SILS approach.[4] The authors found similar outcomes regarding postoperative pain, length of stay, overall morbidity, and recurrence rates after 2 years of follow-up. However, operative time was shorter with the multiport approach (SILS: 50.9 vs. multiport: 44.9, $p = 0.01$) and cosmetic satisfaction was higher with SILS repairs (SILS 7.5 vs. multiport: 6.9, $p = 0.003$). A recent meta-analysis of 16 studies that compared SILS with laparoscopic multiport inguinal hernia repairs, found that both approaches were equivalent regarding postoperative outcomes.[23] Despite SILS-C and SILS inguinal hernia repair have proven to be safe and feasible, inherent difficulties of the surgical technique, steeper learning curve, cost-effectiveness concerns, and dubious advantages limited the broad adoption of these techniques.

In 2011, new accessories and instruments for single-incision surgery were developed for the robotic platform (Da Vinci Single-Site). Several authors published their experience with favourable outcomes, some of which showed advantages over the classic SILS technique.[13,24–26] For instance, the randomized trial performed by Grochola et al found similar postoperative morbidity, reduced surgeon's mental, physical stress load, and shorter LOS in patients undergoing robotic single-site cholecystectomy when compared to SILS approach counterparts.[24] Similarly, a recent comparative study showed lower rates of gallbladder perforation and bile spillage with the single-site approach.[25] Despite all, the higher costs, technical drawbacks (external clashing, lack of endowrist), and lack of significant clinical outcomes benefits made the use of this approach questionable.[27]

In 2018, a robotic platform specifically designed for SP surgery was released. The technical improvements of the Da Vinci SP system (multi-jointed instruments and scope, multi-quadrant access, navigation system, lack of external clashing) reignited the interest in the single incision approach. Up to now, this platform has been FDA-approved for urological operations and transoral endoscopic robotic surgery (TORS) for head and neck cancers, with promising outcomes and a fast learning curve.[14,15] Despite not being yet approved for general surgery procedures in the US, a few cases have been described in the literature.[28–31]

To our knowledge, our series represents the largest clinical experience with robotic SP cholecystectomies and the first report on inguinal hernia repairs. The absence of conversion, need for additional ports, intraoperative and major postoperative complications proved the feasibility and safety of the approach. Minor complication rates in SP-C and SP-TAPP are within the reported for the gold standard approach (multiport laparoscopy).[32–34] Mean operative and console time from previous reports on SILS and robotic single-site cholecystectomies ranged from 71 to 101.6 min and 32–53 min, respectively.[7,13,20,21,24,25,27,35,36] Interestingly, using the new SP robotic platform we found a shorter mean operative time (65.5 min) and console time (17.6 min). Mean operative time for unilateral SP-TAPP was within the reported range in the literature (38.7–91.2 min) for SILS and robotic single-site TAPP repairs.[4,22,23,26,37] It is worth to mention, that a significant amount of the non-console time is spent in the subcutaneous tissue and skin closure which is usually performed by medical students at our institution.

Mean LOS after SP-TAPP and SP-C were 2.7 and 2.3 h, respectively. These were lower than reported by previous series of SILS and

robotic single-site approaches.[4,7,22,25–27,35,37] Unlike previous studies on SILS and robotic single site, most of our cases (>75%) were performed without patient selection including emergent indications, recurrent hernias, patients with previous abdominal operations, and super-obesity (BMI up to 71.8 kg/m^2).

A potential drawback of single-incision procedures is the risk of incisional hernias due to the larger fascial incision required for the access. Weiss et al evaluated wound complications in 1145 SILS procedures, and after a median follow-up of 22.1 months, 2.5% of wound complications and 1.4% of incisional hernias were recorded.[38] Similarly, we found 1.4% of port-site incisional hernias in our series. The average length of follow-up is still too short to be able to compare long-term outcomes. However, at this point, these rates are similar to those reported for conventional laparoscopy (up to 5.2% of trocar site hernias).[39,40] Conversely, other authors reported a higher risk of incisional hernia with single-incision surgery when compared to conventional multiport laparoscopy.[41] It seems that the risk of trocar site incisional hernia might be influenced by patient factors (obesity, pre-existent umbilical hernia), operative factors (emergent cases, closure technique, port location), and length of follow-up.[39] Therefore, a proper patient and closure technique selection might help to reduce this undesired complication.

It is the opinion of the authors that the use of a rigid metallic port allows to reduce the real size of the access incision when compared to the traditional single incision compressible silicon ports. The latter require a larger incision to permit to be introduced without damaging the port. Pietrabissa et al reported a 15% silicon port rupture rate.[13] The metallic port can be advanced stretching the fascia obtaining an overall smaller incision. The technique used for closure is also crucial to reduce the incidence of incisional hernias. From our previous robotic and laparoscopic single incision experience, we switched the closure technique from 0 Vicryl™ running to 1 PDS™ figure of eight interrupted stitches and this resulted in a significant decrease in the incisional hernia rate.

Remarkably, in our cohort of patients there was a high prevalence of obesity in the cholecystectomy group (62.4% of patients had a BMI above 30 and, in this group, the average BMI was 38.8 kg/m^2 with a maximum BMI close to 72). This shows that the system is performing well in obese and superobese patients.

The SP platform still has some limitations such as the lack of advanced energy devices, staplers, and suction-irrigation. However, we strongly believe that this platform provides significant improvements and will likely help expanding the indications and applications of single-incision surgery.

This preliminary study has several limitations, being the lack of a control group (patients operated with other approaches) the most important. Moreover, a cost analysis was not performed as the main focus was to determine safety, feasibility, and utility of the approach. Further studies and larger series are still needed to evaluate outcomes and cost-effectiveness of this approach.

6 | CONCLUSIONS

Robotic SP-C and SP-TAPP inguinal hernia repair are safe and feasible. This platform might help to expand the applications of minimally invasive single-incision surgery. Further studies are needed to confirm our results and to compare them to the standard laparoscopic and robotic approach.

AUTHOR CONTRIBUTIONS

Study concept and design: All authors. Acquisition, analysis, or interpretation of data: All authors. Drafting of the manuscript: All authors. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: Dreifuss, Chang, Bianco, Cubisino. Administrative, technical, or material support: Dreifuss, Bianco, Schlottmann, Masrur. Study supervision: Dreifuss, Bianco, Masrur, Schlottmann, Giulianotti.

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CONFLICTS OF INTEREST

Nicolas H. Dreifuss, Betty Chang, Francisco Schlottmann, Antonio Cubisino, Alberto Mangano, Yevhen Pavelko, and Mario A. Masrur have no conflicts of interest or financial ties to disclose. Bianco FM and Pier C. Giulianotti have an educational agreement with Intuitive Surgical. The University of Illinois at Chicago has an institutional agreement with Intuitive for training.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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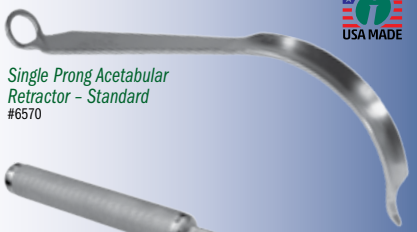

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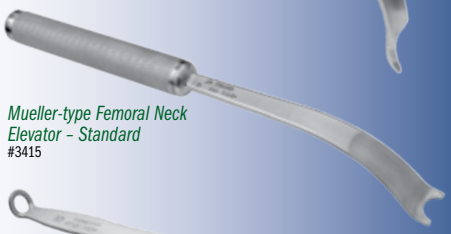

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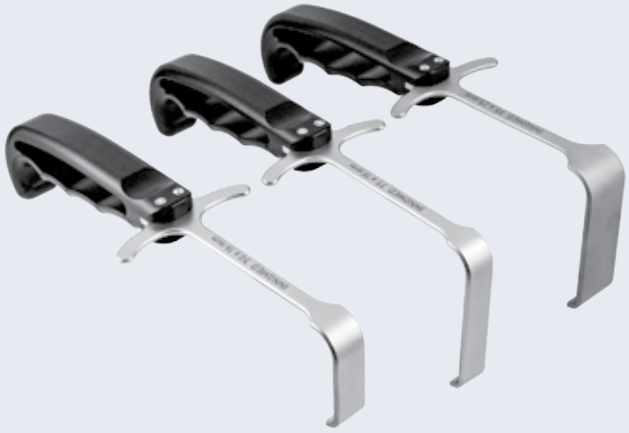

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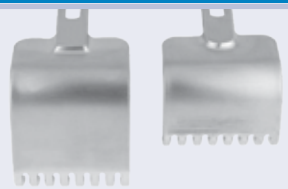

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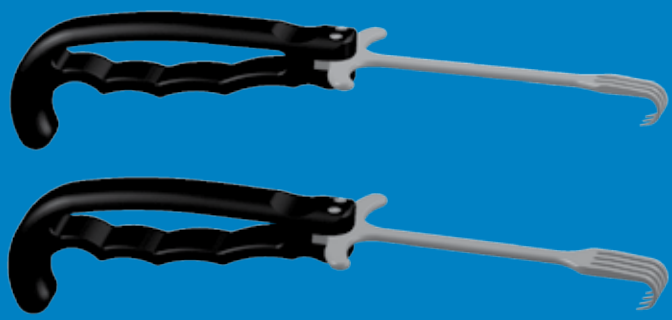

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ARKANSAS STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: October 7, 2023
Title: Mastering the Latest Surgical Techniques and Technologies
Location: TBD, ACHE Building, Fort Smith, AR 72916
Contact: Ashley Smith, PO Box 15772, Little Rock, AR 72231, 479-420-6363, orthowife83@gmail.com
CE Credits: 6

ARIZONA STATE ASSEMBLY

Program Type: Workshop
Date: September 23, 2023
Title: Hands on Orthopedic Workshop
Location: Banner University, 1111 E McDowell Road, Phoenix, AZ 85006
Contact: Maureen Murphy, 22309 S 227th Way, Queen Creek, AZ 85142, 602-316-7251, azsa.assembly@gmail.com
CE Credits: 4

COLORADO/WYOMING STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 16, 2023
Title: Annual Business Meeting & Workshop
Location: Denver
Contact: Jessica Brueggen, 13456 Via Varra, Unit 226, Broomfield, CO 80020, 715-507-0163, information@coloradoast.com
CE Credits: 5

Program Type: Webinar Workshop (Webinar approved for members only of the Colorado/Wyoming State Assembly)
Date: November 4, 2023
Title: Fall Workshop
Contact: Jessica Brueggen, 13456 Via Varra, Unit 226, Broomfield, CO 80020, 715-507-0163, information@coloradoast.com
CE Credits: 3

GEORGIA STATE ASSEMBLY

Program Type: Workshop
Date: September 9, 2023
Title: Surgery Southern Style
Location: Albany Technical College, 1704 S Slappey Blvd, Albany, GA 31701
Contact: Erin Baggett, PO Box 216, Lawrenceville, GA 30046, 678-226-6943, gasawebmaster@gmail.com
CE Credits: 8

IOWA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: October 14, 2023
Title: Iowa State Assembly Fall 2023 Annual Business Meeting and Workshop
Location: Des Moines Area Community College – Urban Campus, 1100 7th St, Des Moines, IA 50314
Contact: Tim Danico, 319-540-6008, timothy-danico@uiowa.edu
CE Credits: 7

LOUISIANA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 23, 2023
Title: Surgical Technology Fall Workshop and State Business Meeting
Location: Woman's Hospital, 100 Woman's Way, Baton Rouge, LA 70817
Contact: Eboni Saurage, PO Box 60445, Lafayette, LA 70596, 225-800-6831, sauragee@mybrcc.edu
CE Credits: 6

MONTANA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 9, 2023
Title: Annual Business Meeting and Elections
Location: Kalispell Regional Medical Center, 310 Sunnyview Lane, Kalispell, MT 59901
Contact: Marsha Lyles, 310 Sunnyview Lane, Kalispell, MT 59901, 406-670-8376, mnmcst@yahoo.com
CE Credits: 6-7

NEBRASKA STATE ASSEMBLY

Program Type: Onsite & Webinar Workshop (Webinar approved for members only of the Nebraska State Assembly)
Date: August 5, 2023
Title: 2023 NESA Summer Workshop
Location: TBA
Contact: Nebraska State Assembly, PO Box 67034, Lincoln, NE 68506, nebraskastateassembly@gmail.com
CE Credits: 6

STATE ASSEMBLY ANNUAL BUSINESS MEETINGS

Members interested in the election of officers & the business issues of their state assembly should ensure their attendance at the following meetings.

ARKANSAS
Fort Smith
October 7, 2023
Annual Meeting
2023 BOD Elections
& 2024 Delegate Elections

COLORADO/WYOMING
Denver
September 16, 2023
Annual Meeting
2023 BOD Elections
& 2024 Delegate Elections

IOWA
Des Moines
October 14, 2023
Annual Meeting
2023 BOD Elections
& 2024 Delegate Elections

LOUISIANA
Baton Rouge
September 23, 2023
Annual Meeting
2023 BOD Elections
& 2024 Delegate Elections

MONTANA
Kalispell
September 9, 2023
Annual Meeting
2022-2023 BOD Elections
& 2024 Delegate Elections

PENNSYLVANIA
Mechanicsburg
September 16, 2023
Annual Meeting
2022-2023 BOD Elections
& 2024 Delegate Elections

SOUTH CAROLINA
Myrtle Beach
October 28-29, 2023
Annual Meeting
2022-2023 BOD Elections
& 2024 Delegate Elections

WASHINGTON
Vancouver
September 23, 2023
Annual Meeting
2023 BOD Elections
& 2024 Delegate Elections

WISCONSIN
Menomonee Falls
October 7, 2023
Annual Meeting
2023 BOD Elections
& 2024 Delegate Elections

Program Approvals: Submit the *State Assembly Program Date Request Form A1* no less than 120 days prior to the date(s) of the program for AST approval. The form must be received prior to first (1st) of the current month for program publication in the next month of the AST monthly journal *The Surgical Technologist*. The *Application for State Assembly CE Program Approval A2* must be received at least thirty (30) days prior to the date(s) of the program for continuing education credit approval. An application submitted post-program will not be accepted; no program is granted approval retroactively.

Contact stateassembly@ast.org or 800.637.7433, ext. 2547.

NEW MEXICO STATE ASSEMBLY

Program Type: Workshop
Date: September 23, 2023
Title: NM State Assembly Fall Workshop
Location: UNMH North Campus; Domenici Center Auditorium, 1001 Stanford Dr NE, Albuquerque, NM 87193
Contact: Ruth Borah, NM-AST, PO Box 66496, Albuquerque, NM 87193, 848-391-3661, ruth.kerrjusinski@gmail.com
CE Credits: 5

PENNSYLVANIA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 16, 2023
Title: PA AST Fall Workshop
Location: UPMC West Shore Hospital – Fredrickson Center; Room G08, 1995 Technology Pkwy Mechanicsburg, PA 17055
Contact: Chris Kapp, 120 Railroad St, Duncannon, PA 17020, 717-856-1278, kappcj@upmc.edu
CE Credits: 6

SOUTH CAROLINA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: October 28-29, 2023
Title: SCSA Fall Workshop
Location: Horry Georgetown Technical College, 950 Crabtree Lane, Myrtle Beach, SC 29577
Contact: Katrina Williams, PO Box 10001, Dillon, SC 29536, 843-615-7454, katrinawilliams89@yahoo.com
CE Credits: 12

VIRGINIA STATE ASSEMBLY

Program Type: Workshop
Date: October 7, 2023
Title: A Little Something about Pediatrics
Location: Children's Hospital of the Kings Daughters – Brickhouse Auditorium, 601 Children's Lane, Norfolk, VA 23507
Contact: Lisa Day, 540-422-9471, ldaycs-fa@gmail.com
CE Credits: 6-7

WASHINGTON STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 23, 2023
Title: 2023 Fall Educational Workshop and Annual Business Meeting
Location: PeaceHealth Southwest Medical Center, 400 NE Mother Joseph Pl, Vancouver, WA 98664
Contact: Trevor Dalrymple, 7700 NE 72nd Ave, Apt B105, Vancouver, WA 98661, 253-548-4214, tdalrymplewast@gmail.com
CE Credits: 5

WISCONSIN STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: October 7, 2023
Title: Fall into Surgery 2023
Location: Froedtert Treiber Conference Center, W180 N8085 Town Hall Road, Menomonee Falls, WI 53051
Contact: Jessica Jacobson, 11901 W Bender Road, Milwaukee, WI 53225, 262-957-6595
CE Credits: 6

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