Original Article

The SUPER reporting guideline suggested for reporting of surgical technique: explanation and elaboration

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Background: Surgical technique plays an essential role in achieving good health outcomes. However, the quality of surgical technique reporting remains heterogeneous. Reporting checklists could help authors to describe the surgical technique more transparently and effectively, as well as to assist reviewers and editors evaluate it more informatively, and promote readers to better understand the technique. We previously developed SUPER (surgical technique reporting checklist and standards) to assist authors in reporting their research that contains surgical technique more transparently. However, further explanation and elaboration of each item are needed for better understanding and reporting practice.

Methods: We searched surgical literature in PubMed, Google Scholar and journal websites published up to January 2023 to find multidiscipline examples in various article types for each SUPER item.

Results: We explain the 22 items of the SUPER and provide rationales item by item alongside. We provide

69 examples from 53 literature that present optimal reporting of the 22 items. Article types of examples include pure surgical technique, and case reports, observational studies and clinical trials that contain surgical technique. Examples are multidisciplinary, including general surgery, orthopaedical surgery, cardiac surgery, thoracic surgery, gastrointestinal surgery, neurological surgery, oncogenic surgery, and emergency surgery etc.
Conclusions: Along with SUPER article, this explanation and elaboration file can promote deeper understanding on the SUPER items. We hope that the article could further guide surgeons and researchers in reporting, and assist editors and peer reviewers in reviewing manuscripts related to surgical technique.

Keywords: Surgical technique; surgery; SUPER; reporting checklist; guideline

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Introduction

Background

Surgery is an integral and indispensable part of healthcare and a prerequisite for achieving the goals of local and global health (1). Several basic surgical interventions are proved cost-effective, especially in low-resource areas (2). The volume of surgical procedures performed worldwide is estimated at 321 million (1). Up to February, 2022, in the Clarivate Journal Citation Reports category of 'Surgery', there were over 200 Scientific Citation Index Expanded journals with around 48,000 citable items, and 60 Emerging Scientific Citation Index journals with over 6,000 citable items (3). Moreover, the clinical outcomes of patients undergoing the same surgical procedures vary, at least in part explained by the variation in surgeons' technical skills. Patients operated by surgeons who have mastered a surgical technique have lower rates of postoperative complications and reoperations (4,5). However, surgical technique is often complex, difficult to standardize and reproduce, and its reporting is often largely inconsistent, incomplete, insufficiently detailed, and unclear (6-10). These situations interfere with surgeons to learn, to refine their technical skills, and objectively interferes with the evaluation of surgical technique's effectiveness and safety. Though evidence suggests that reporting guideline can improve the quality of reporting (11), the reporting quality of surgical technique remains unsatisfactory (12). Most of the studies related to surgical technique lack complete and detailed descriptions of the surgical interventions, and some even only inform the names of the interventions (8,9,13). Such unsatisfactory reporting not only affects the reproducibility of the surgical technique, but also has the potential to bias the evaluation of treatment options involving the surgical technique.

We have developed the surgical technique reporting checklist and standards (SUPER) (14) to address the issue of unsatisfactory reporting of surgical technique. The SUPER was developed by 42 surgeons, methodologists, and journal editors from 18 countries/areas around the world, following the Delphi method. The SUPER contains a total of 22 items in 6 sections, which describe in detail what we consider sufficiently detailed, complete, and transparent reporting of surgical technique. Appendix 1 provides a summary of the items in the SUPER. Of note, the SUPER can be applied to a broad range of articles related to surgical technique, regardless of the surgical specialty, novelty level of surgical technique (new, modified, or conventional), article type (case report, randomized controlled trial or others), or stage of surgical innovation.

Highlight box

Key findings
- This manuscript provides detailed rationale, explanation and elaborative examples for the 22 items of the SUPER.

What is known and what is new?
- We previously developed the SUPER reporting guideline suggested for reporting of surgical technique. However, the previous publication concentrates on the rationale, results and discussion of the development without providing explanations and elaborations for each item of the SUPER.
- This manuscript further provides detailed explanations and elaborations.

What is the implication, and what should change now?
- Users of the SUPER are strongly suggested to read this file to gain deeper understanding and to achieve optimized use of the SUPER.

Rationale for this explanation and elaboration document

The guidance for developing reporting guidelines (15) and our published protocol (16) both have emphasized the importance of developing explanation and elaboration document for reporting guidelines. Previous reporting checklists also highlight the necessity of publishing explanation and elaboration documents (17,18). However, although the SUPER has been published (14), there is currently no detailed explanation or examples for each SUPER item. This may lead to significant differences in the understanding of SUPER items from authors, editors and reviewers, and pose practical challenges to SUPER endorse.

Objective and how to use this explanation and elaboration document

We aim to draft this SUPER explanation and elaboration document (SUPER EE), a user's manual for the SUPER, to provide explanations, rationales, and rich examples for each item.

Here are a few reminders: (I) both the SUPER EE and SUPER are only tools to facilitate better reporting of surgical technique, not to assess the quality of surgical technique. Also, no mandatory requirements exist for reporting placement, reporting order, or reporting format. (II) The examples given in the SUPER EE only suggest that they are well reported in one item or in partial requirements of one item, but do not imply that they are uniformly well reported or of high credibility or that the conclusions of the article are valid. (III) SUPER EE recommends authors report on all items rather than just some of them. It is also recommended to report as much as possible of what is mentioned in an item rather than just partial information in an item, whether in the manuscript or in the supplementary file. (IV) When reporting articles related to surgical technique, it is highly recommended to include the following statement in the article 'This article was prepared following the SUPER' and include a citation of the SUPER publication (14).

Of note, we planned to provide users with explanations from multiple perspectives, including explaining item by item, as well as providing example articles on novel, refined, and conventional surgical technique. However, as it is only months after the SUPER is published till publishing this explanation and elaboration document, we only found one published article on a novel surgical technique that has endorsed the SUPER (19). Therefore, this article is explained from the perspective of each item. It is not explained according to the degree of surgical innovation or the type of articles. Readers could further find a large number of novel, refined, and conventional surgical technical literature, and literature with different article types related to surgical technique, that have endorsed SUPER on the SUPER website "Endorse SUPER" (https://www.thesuper.org/endorse#endorse_super).

SUPER explanation and elaboration

The SUPER EE will provide an item-by-item explanation, rationale, and examples (Appendix 2).

Section one: background, rationale, and objectives

Item 1: background

Describe the background of the disease or condition (e.g., its definition, classification, clinical manifestations, epidemiological characteristics, and natural history).

Give sufficient background knowledge of the disease or condition to enable the reader to understand its burden, fundamental information about the disease, and priorities. Key indicators should be included, such as disease definition (e.g., diagnostic criteria), disease classification (e.g., acute or chronic, congenital or acquired), significant clinical manifestations, epidemiological information (e.g., global prevalence, endemic areas, morbidity, mortality), and natural history (e.g., length of illness, patient survival). These can also assist in understanding the scope of application in context (Appendix 2, Examples 1–3).

Item 2: rationale

(I) Describe the pros and cons of existing treatments for the disease or condition, including currently used single or combined surgical techniques. (II) Explain whether the proposed surgical technique is a novel or modified procedure, including whether any modifications have been made to key devices or materials. If only a conventional surgical technique is used, a brief description should be accompanied by a citation of a source which describes the surgical technique in detail.

Before describing a surgical technique, it is necessary to give the reader an overview, especially the pros and cons, of the existing treatment options, whether they are medication, surgery, or other treatments. It is also important to describe the rationale for mentioning the surgical technique (Appendix 2, Example 4). As the surgical technique is often a complex intervention, such a rationale can facilitate the recognition of which elements are critical rather than optional or incidental (20).

The SUPER divides articles involving surgical technique into three scenarios: (I) Scenario 1. The author proposes a novel surgical technique; (II) Scenario 2. The author modifies one/several aspects of the previous procedure(s), including modifications of surgical steps, devices, materials, etc.; (III) Scenario 3. The authors use the existing conventional surgical technique to achieve a certain research objective, e.g., to compare the safety and effectiveness of several established surgical techniques. The authors should indicate which of the above three scenarios the proposed surgical technique belongs (Appendix 2, Examples 5–7). Of note, in Scenario 2, the authors would ideally also state what modifications were made and why. In Scenario 3, the authors could briefly describe the surgical technique involved, but need to cite the literature that has a detailed description of the surgical technique involved. This allows for more transparent studies, less variation across inter-group comparisons, and greater intra-group consistency, making the results more reliable. Particularly in studies involving international and national multicenter collaborations, the lack of a clear, detailed, and consistent scheme for the conduct of the surgical technique is likely to result in substantial geographical variation in its conduct, with potential implications for the results of the study.

Item 3: objectives

State what objectives and challenges the proposed surgical technique will address. Introduce what the surgical technique figure and video will cover.

A clear description of the objective allows the reader to clearly understand and judge whether the aim has been achieved. Hence, the statement of the objective should be specific, for example by describing the classical PICO (population, intervention, comparator, outcome) approach. The author could also state the objectives by proposing a hypothesis or research question, which also needs to be described as clearly as possible (Appendix 2, Examples 8,9). Of note, the objective of the proposed surgical technique may be different from the objective of the research, especially for the research that contain surgical technique but focused on comparing the surgical technique with other treatments. For instance, in a randomized controlled trial that compares the safety and effectiveness of a surgical technique and a medication, the objectives for the surgical technique and the randomized controlled trial may be to improve the survival by removing the tumor through surgery and to find out which treatment is better, respectively. In this case, we recommend also reporting the objective of the surgical technique, in addition to the research objective, if applicable.

Furthermore, when explicitly stating the objective, authors are advised to disclose in advance what key points the article will contain (Appendix 2, Example 10). In the case of articles focusing on the surgical technique, this is what item 15 of the SUPER calls for authors to provide visual diagrams of key points or video highlights. This allows for a framework of thought for readers to read and view and aids understanding.

Item 4: classification

Classify the surgical technique, either by: (I) surgical approach: open, minimally invasive (e.g., thoracoscopic, robotic), or hybrid; or (II) treatment goal: curative or palliative.

The purpose of reporting the classification of surgical technique is to clarify and clearly define the nature of the surgical technique. If authors do not report this, in some cases the reader may have difficulty in telling which category the surgical technique belongs to, whether it is open, minimally invasive, curative, or palliative (Appendix 2, Examples 11,12). Note that although two classifications are given in the item, namely by surgical approach and treatment goal, the authors are not restricted to these two when reporting the classification.

For classifications other than surgical approach and treatment goal, authors need to find a recognized classification in the area of specialty to which they belong such as the Iwate criteria (21) and Hallas-score (22) for liver surgery (Appendix 2, Example 12). It would be inaccurate to use controversial, unspecified classifications and classification criteria that are not clearly defined. For example, during the development of the SUPER, we initially addressed the classification by degree of difficulty, which was not included in the final SUPER due to the lack of a universally agreed categorization of difficulty across disciplines.

Item 5: name

Report the names of all involved surgical techniques in the title or abstract. If the surgical technique is the focus of the paper, also include ‘surgical technique’ in the title.

Identifying literature as a specific article type and clearly reporting the interventions involved is very useful, as it helps with indexing in databases and facilitating search results. As with randomized controlled trials and systematic reviews, identification in electronic databases relies largely on how it is indexed, and indexers may not classify the article as such if the author does not report this information exhaustively. Therefore, to ensure that the surgical technique is appropriately indexed and easily identified, authors should use the term ‘surgical technique’ in the title if the surgical technique involved is at the core of the article (Appendix 2, Example 13). Whether or not the surgical technique covered is the focus of the article, the title or abstract should clearly and completely describe the full name of the surgical technique covered (Appendix 2, Examples 14,15). For example, when comparing effects of two regimens using medicine A and medicine B after surgery using a certain surgical technique, the focus is on the two medication regimens. Then, although the word ‘surgical technique’ may not be used in the title, the full name of the surgical technique involved should also be clearly reported in the title or abstract.

Section two: preoperative preparations and requirements

Item 6: setting

(I) Report information or requirements of the surgical environment (e.g., the name of the hospital, the hospital grade such as tertiary hospital, the degree of cleanliness, and whether the procedure must be performed in an operating theatre). (II) List and provide details of any special surgical equipment, supplies, drugs, or software used (e.g., the manufacturer, product model, quantity, dosage, route, duration, and parameters).

Surgical environment is critically important to ensure surgical quality. However, most surgical literature published to date has ignored the description of surgical environment and its related elements. This is like a recipe without a description of ingredients and seasonings, which will fail to achieve its goal. A literature review of 20 surgical clinical trials found that although the overall reporting quality has improved in the past decade, <40% of studies provided sufficient details regarding hospitals, medical staff, and surgical intervention, which compromises evidence level and generalizability (23).

(I) Before describing the surgery, the authors should first report the name of the hospital and primary or tertiary care setting of the operation (Appendix 2, Examples 16,17) and explain whether it is performed in the operating theatre as well as the cleanliness level (class I–III). For example, major surgeries like cardiac surgery and neurosurgery requires cleanliness level class I, whereas the cleanliness level of surgical debridement and endoscopy procedures is class III (24). Generally, surgical setting refers to the collection of all resource elements that allow for safe conduct of the surgery, including health personnel, medical equipment, anesthesia, sterility, and safety protocols (25). According to different medical needs, a single surgical procedure or operation can be performed in different surgical environments such as operating theater, outpatient surgery, ward, intensive care units, emergency room, etc. As the availability of medical resources differ between different operating environments, we suggest that authors focus on describing key information related to patient safety in the surgical environment, including cleanliness, anesthesia configuration, operation safety protocols, with emphasis on any measures to prevent medical errors. The importance of surgical environment is especially notable in some bedside procedures that are performed in wards, intensive care units, or emergency rooms, such as tracheotomy, emergency sternotomy, etc. In these clinical scenarios, a detailed description of the surgical environment can provide readers with the key information needed to create a safe environment for saving the lives of critically ill patients (Appendix 2, Example 18). Under special circumstances, such as emergency surgery for Corona Virus Disease 2019 patients, it is particularly important to describe how to create an environment that can fully protect the surgical team from infection (Appendix 2, Example 19).

(II) If the surgery has special requirements for medical equipment, supplies, drugs, or software, the authors should describe this relevant information in their article. Of note, we do not expect all routine information to be reported, but rather focus on describing the key information so that readers can be informed of the necessary conditions to perform the surgery. For instance, when reporting the utilization of a new surgical equipment for an operation, information regarding the name, the model, advantages, characteristics, and parameters of the equipment should be provided (Appendix 2, Example 20). If a drug needs to be used, the name, dosage, and route of administration should be described (Appendix 2, Example 21).

Item 7: operators

Provide information about the surgical team personnel, including their role (e.g., surgeon, anesthetist, nurse), learning curve (e.g., the number of cases), and training needed if applicable.

The paradigm of modern surgery relies increasingly on teamwork. A surgical team usually includes surgeons, anesthesiologists, other specialists, operating room nurses and medical technicians related to the surgery. The close cooperation and explicit assignment of responsibility between different team members is key to ensure patient safety and surgical quality. We suggest that the authors should report the information of surgical team members in their articles, including the tasks undertaken by different roles (such as surgeon, anesthesiologist, nurse, etc.), learning curve, elements related to training, etc., because this information is particularly important for promotion of innovative surgical techniques. In the field of surgery, training should be broadly interpreted as a term that include surgical training of the technique, the conduct of good teamwork, communication skills and supervision of responsibility, with a common goal of achieving patient safety and team efficiency (26). When describing the roles of team members, report the specific responsibilities of surgeons, nurses, and other auxiliary health personnel, as well as whether team members need to master specific skills and receive relevant training (Appendix 2, Example 22).

The reporting of learning curve is helpful to promote the adoption and application of surgical technique (27). A typical surgical learning curve can be divided into the initial stage (determined by the doctor's initial experience and technical level), the learning slope (the speed of mastering new surgical technique) and the plateau stage (the mature stage of surgical technique) (28), providing such important information for surgical training and can be used to evaluate the technical level of young surgeons. Graphically, surgical learning curve is defined as the time or number of cases (plotted on x-axis) required for surgeons to operate independently with reasonable results (plotted on y-axis, such as operation time, intraoperative blood loss, postoperative survival rate, complications, and other clinical outcome variables) (29). For example, in laparoscopic colorectal surgery, if the proportion of conversion to open surgery, the incidence of complications and the operation time are used as evaluation indicators, surgeons usually need 55–80 cases to reach the plateau stage of technical maturity (30). An ideal learning curve analysis should use a multivariable model to explain the effects of factors such as surgeons, surgical team, and the complexity of surgical cases (Appendix 2, Example 23). We suggest the authors adopt multiple clearly defined intraoperative indicators (e.g., operative time, blood loss, quality indicators related to the surgical technique) and postoperative indicators (e.g., complications, recurrence, mortality) to comprehensively evaluate the technical level of surgeons (28,29) (Appendix 2, Example 24). In surgical randomized controlled trials, surgeon-level characteristics are potential confounding factors that affect the interpretation of study results and conclusions. To minimize the impact of such confounders, we suggest that the authors describe the technical proficiency of the surgeons involved in their study (e.g., the active time in relevant surgical practice, the number of completed operations, etc.) in combination with description of the surgical learning curve (Appendix 2, Example 25).

Patient safety is always a priority issue in surgical training. Technically demanding specialties like cardiothoracic surgery have particularly high standards for surgical expertise, and thus following a traditional "learning cure" is not practically and ethically acceptable for the patient. To balance between patient safety and training efficiency, various simulation-based training modalities have been adopted in the training of modern surgeons, including computer-based virtual learning, hands-on 3D-printed models, surgical simulators such as cadaveric, animal, virtual reality (VR) and robotic simulators (31). In surgical technique, we encourage authors provide key information regarding the use of any specific simulation-based training modality that promotes training efficiency without compromising patient safety. Relevant information can include training curriculum and modules, the role of coaching mentors, the use of assessment tools, etc. (Appendix 2, Example 26).

Item 8: recipients

Report detailed indications and contraindications.

(I) Disease or condition: type, etiology, the location, shape and size of the lesion, etc.
(II) Recipients: age, sex, clinical manifestations, disease stage and severity, comorbidities and related complications, surgical history and relevant family

history, preoperative tests, pre-intervention, and other factors pertinent to successful practice.

All surgical literature should clearly and explicitly state the indications and contraindications of the reported surgery, which is helpful for surgeons to determine whether and when to perform the surgery. By definition, surgical indications refer to a disease or pathological state requiring surgical treatment; contraindications refer to all scenarios in which surgery should not be performed due to potential harm and further classified as relative and absolute contraindications: relative contraindications refer to scenarios in which the clinical benefits may outweigh the risks in carefully selected patients, whereas absolute contraindications refer to scenarios in which the surgery may endanger the lives of patients (32). The authors should describe the surgical indications and contraindications in the two following aspects:

(i) Disease or condition. The authors should follow common practice of different subspecialties and provide a detailed description of the characteristics of disease or condition that demands for certain surgical treatment, including disease stage and classification, severity, pathological characteristics, anatomical characteristics, imaging standards, etc. (Appendix 2, Examples 27,28).

(ii) Recipients. Some demographic and clinical characteristics, including age, gender, prior medical or surgical history, comorbidity, nutritional status, and other variables, may affect the selection of different surgical approach and the timing of the operation, and may become contraindications in certain cases. For example, age is an important index variable of physiological reserve and surgical risk. For heart valve replacement surgery, age is an important influencing factor in the selection of biological valve or mechanical valve (33). Body mass index is a widely used biomarker to evaluate patients' systemic nutritional and metabolic status. In morbidly obese patients, body mass index is an important index variable to determine whether to perform bariatric surgery (34). Frailty state as indicated by very low body mass index may be a relative contraindication for some tumor surgeries. In surgical literature, it is worth noting that inclusion/exclusion criteria are not identical to indications/contraindications of the surgery. In surgical randomized controlled trials or observational studies, the authors should clearly state the indications/contraindications of the surgery while reporting the inclusion/exclusion criteria of the study population to show the important differences between these concepts, which helps to avoid misunderstanding by readers (Appendix 2, Example 29).

Item 9: recipients

Provide detailed generic information and preparations.

(I) Generic information: de-identified demographic information, symptoms and signs, imaging findings, staging, comorbidities, and relevant therapy history, etc.

(II) Preparations: cardiovascular, gastrointestinal and respiratory tract preparation, urinary catheterization, skin preparation, blood product preparation, anesthetic procedure and management, and patient positioning, etc.

Authors should provide detailed generic information that summarize patient demographics (age, gender, race), clinical characteristics (symptoms and signs), imaging studies (ultrasound, computed tomography, magnetic resonance imaging, nuclear medicine imaging, etc.), comorbidities, prior medical history, medications in use, etc. This information provides important clinical contexts to help readers understand the risks and outcomes of the reported surgery (Appendix 2, Examples 30,31). When describing patient features, it is critically important to protect patient privacy. All information must exclude identifiable information, including name, telephone and address, medical record number, social security number, date of birth, operation date, discharge date, and other information that may identify the surgical patients (35). If imaging studies and photos regarding body feature are presented, informed consent should be obtained from the patient, and attention should be paid to avoid exposing any identifiable information.

Adequate preparations before surgery are key to ensure patient safety and achieve the expected surgical results with minimized risk of postoperative complications. The author should report the details of preoperative preparation in a systems-based approach that accords with the preoperative timeline. We do not require the author to describe all details regarding preoperative preparations, but rather focus on patient's preoperative clinical risk factors, co-morbidities and necessary prevention measures that reduce potential adverse events related to the surgery.

(I) Clinical management of preoperative risk factors and comorbidities. For example, patients with cardiovascular diseases and risk factors, including coronary disease, hypertension, diabetes, atrial fibrillation, smoking status etc. are important causes of cardiovascular adverse events after non-cardiac surgery (36). Preoperative preparation for such patients should focus on cardiovascular related examinations, such as ECG, cardiovascular imaging, and biomarkers, etc. If cardiovascular medications are used for prevention before operation, the name, dosage and duration should be described; if patients have medications in use at baseline, authors should describe whether and when to stop the medication before operation or whether and how the dosage is adjusted (36). Preoperative preparations for other organ systems are not listed here in details due to space constraints.

(II) Clinical management and prevention of surgery-related adverse events. Common preparations include nutritional support, preventive use of antibiotics, gastrointestinal preparation, etc. Attention should be paid to preoperative preparation in some special patient groups, including pregnant women, elderly patients, and children. Importantly, the authors should describe specific preoperative preparation measures to reduce the risk of certain adverse events related to the surgery. For example, cardiac surgery under cardiopulmonary bypass increases the risk of postoperative renal injury, which can be prevented by optimization of hemodynamics and avoidance of nephrotoxic medications (37). If special requirements for anesthesia management exist, the authors should describe the key points of anesthesia in the reported surgery (Appendix 2, Example 32). Patient positioning is another key point in preoperative preparation. If the patient positioning in certain innovative surgeries is different from that in conventional surgery, the author should describe it in detail (Appendix 2, Example 33, refer to item 10 for more details). In summary, preoperative preparations are usually completed by surgeons and anesthesiologists with different specialty emphasis, and we encourage authors to share their experiences in preoperative preparations to improve patient safety in their article.

Section three: surgical technique details

Item 10: surgical approach, key anatomic landmarks, and adjacent structures

(I) Describe in detail how to establish the surgical approach (e.g., devices and equipment used, the position of the surgeons, anatomic localization, and the incision type, length, size, depth, angle, and number). (II) Describe the essential anatomic landmarks and adjacent structures, including areas, structures, blood vessels, and nerves, etc. (e.g., 'use the Louis angle between the sternal manubrium and the sternal body to find the second costal notch').

A surgical approach (or access) is where the surgeon enters the patient's body from the surface (Appendix 2, Examples 34–36). For ease of remembering, these can be broadly divided into natural or artificial openings. Trans-natural approaches include natural orifices (such as gastroscopy and laryngoscopy) and interventional procedures with a percutaneous approach. These procedures are usually minimally invasive approaches. The artificial opening approach, which requires an incision on the surface of the body or through the mucosa to gain access to the interior of the body (usually more invasive than the natural opening), can be further divided into minimally invasive procedures such as laparoscopic appendectomy, and open procedures such as a median abdominal incision for gastrectomy. The open surgical incisions are also categorized by size further, such as a full sternotomy or an upper sternotomy. There are some procedures that may use multiple approaches, also known as hybrid surgery (38). It is important to note that the concept of 'minimally invasive' is becoming increasingly popular when describing surgical access but is inherently ambiguous as the size of trauma is a relative rather than an absolute concept and the definition of 'minimally invasive' may vary between disciplines. The International Statistical Classification of Diseases-10 Procedure Coding System describes the detailed classification of surgical approaches (39): open, percutaneous, percutaneous endoscopic, via natural or artificial opening, via natural or artificial opening endoscopic, via natural or artificial opening with percutaneous endoscopic assistance, and external. There may be several surgical approaches to the same disease, and the surgical approach may evolve over time (40). Innovations in the surgical approach have also been reported independently (41). For any operation, the surgical approach is the first step, and in many cases the first step that determines the difficulty of the operation and even its success and efficacy.

The surgical approach contains several important points that should be clearly described in the surgical technique. For example, the instruments (Appendix 2, Example 36), the position of the patient (Appendix 2, Examples 34,36), the position of the surgeon and assistant (for instance, the surgeon is usually on either side of the patient in general surgery, but on the foot side in transurethral resection of the prostate), the characteristics and number of incisions (even in thoracoscopy, there is single-port approach and double-port approach, etc.). Another key point is the anatomical features (Appendix 2, Example 35), including anatomical landmarks (how to ensure accurate placement of the incision) and the surrounding critical structures (how to avoid damaging important vessels and nerves adjacent to the incision, etc.). In fact, the creation of a surgical approach can be seen as a relatively complete operation itself, especially given that in practice the surgical approach is usually performed by a junior surgeon. We recommend that medical illustrations are also provided for the surgical approach whenever possible, especially for unconventional approaches (refer to Item 15).

Item 11: intraoperative monitoring

Describe intraoperative monitoring specifically related to the surgical technique (e.g., near-infrared spectroscopy in aortic arch surgery).

Intraoperative monitoring ensures smooth and safe surgery, improves perioperative outcomes, and reduces adverse events by using constantly calibrated data on the cardiopulmonary, neurological, and metabolic functions to guide pharmacological and physiological therapy. Anesthesia is an integral part of the surgery. While the surgeon concentrates on the operation, the anesthetist is primarily responsible for the intraoperative monitoring of the patient. All patients undergoing any form of anesthesia are monitored to some degree. American Society of Anesthesiologists has set out basic monitoring standards for anesthesia (42). The patient's oxygenation, ventilation, circulation, and temperature should be continuously assessed during all anesthetic periods. For the surgical technique report, detailed coverage of unconventional monitoring techniques should be highlighted. This includes the monitoring equipment used, parameters, abnormal values, and clinical significance. For example, near-infrared spectroscopy is used to monitor cerebral perfusion during aortic arch surgery, somatosensory-evoked potentials, or motor evoked potentials used to monitor spinal cord function during spinal surgery, etc. For more elaborations, please see Appendix 2 Examples 37–39.

Item 12: step-by-step description

Include all relevant details of each operative step in a step-by-step manner along with both quantitative and qualitative description. (I) Details may include the intraoperative findings, timeline, histomorphology, exposure of vital structures, extent of lymph node dissection, determination of surgical margins, suture pattern (running suture or single stitches; spacing of stitches), anastomosis, knot-tying, specimen handling, and devices/supplies/drugs/blood products used, etc. (II) Note the operative time. (III) If a non-conventional maneuver was applied, specify the reason.

Surgery, as a complex operation, is carried out in chronological order. Each complex operation can be divided into a number of sessions. We recommend a step-by-step method for the description of the operation (Appendix 2, Example 40), i.e., a chronological description of the procedure. In this way, the description is consistent with the actual development of the procedure and is clearly organized and easily understood by the reader. This step-by-step description also breaks down the entire complex surgical procedure, making it easier to remember. We believe that a clear description should contain at least the following details: intraoperative findings, timeline, histomorphology, exposure of vital structures, the extent of lymph node dissection, determination of surgical margins, sutures pattern (running suture or single stitches; spacing of stitches), anastomosis, knot tying, specimen handling, and devices/supplies/drugs/blood products used, etc. Note that the above elements do not apply to every type of surgery, and there may be some important elements that we have not listed. Our crude examples are only intended to inspire the reader for more detailed reporting. Of course, we should not go from the extreme of cursory to the extreme of detail.

To give a detailed description of a procedure is not to keep a running account of every detail well-acknowledged in the surgical community, such as the six-step handwashing and the wearing of sterile gloves, making the article a tasteless pile of details. It is worth covering in detail the core aspects of the operation, where the operation can go wrong, where there are variations from traditional operations, and details that readers care about or find interesting. Also, in our experience, it is rare for surgical technique reports to mention the duration of the operation (Appendix 2, Example 41), especially when the technique is first reported. Surgical duration and surgical difficulty are positively correlated and can even affect the prognosis of the patient. Also, operative duration reflects the learning curve. We recommend that the authors report this variable. Finally, surgery is a process of clinical challenge and resilience. During surgery, some non-conventional maneuvers may be performed due to unforeseen circumstances, and the reasons for this should be fully explained. Of course, non-conventional maneuvers may also be performed because the operation has advantages that traditional operations do not have (Appendix 2, Example 42), or simply because of the surgeon's personal preference, all of which should be stated.

Item 13: quality and consistency

Describe tips and skills for ensuring surgical quality and consistency, especially for the key steps and any conditions or variations that require uniform management (if applicable). For example, using standardized training, establishing quality control teams, and organizing multidisciplinary consultations.

Most of the current surgical technique articles do not actually report on quality and consistency controls. We believe that this section is important and part of clinical practice, needing to be reported. The Affordable Care Act of 2013 (43) has invested heavily in the development of outcome measures to better evaluate the quality of care. The Institute of Medicine has also proposed 'To Err is Human' (44) and 'Crossing the Quality Chasm' (45). Good quality and consistency of the procedure mean that the stability of the procedure is greater and the confidence of the operator and the patient in the procedure is higher. In order to assess quality and consistency, the surgical technique report should clearly define the purpose of the procedure and the indicators to be evaluated. Although most of the indicators are qualitative, it would be useful if quantitative indicators were available, such as the Pulsatility Index and flow (Appendix 2, Example 43) measured by transient flow after coronary artery bypass grafting. The surgeon can assess whether the procedure is difficult or easy and whether the outcome is good to poor. There are various methods of quality control, such as standardized training (Appendix 2, Example 44), quality control teams, multidisciplinary consultations, Cumulative Sum analysis (46), and Medical Errors Reporting System (47), subspecialty or disease-specific scores (e.g., EuroScore) (48), etc. Surgical simulation models can also help ensure consistency in training by providing standardized and repeatable scenarios for trainees to practice on. This can help to ensure that all trainees are exposed to the same level of training and can develop their skills in a consistent and measurable way.

Item 14: safety

Describe tips and skills for ensuring safety. For example, how to prevent or deal with possible intraoperative complications and emergencies, or when and how to undertake a surgical conversion.

There is some overlap between this entry and quality and consistency, but there are also different nuances. 'Quality and consistency' places more emphasis on 'do more good', while 'safety' emphasizes 'do less harm'. Although the aim of surgery is to save lives, unsafe surgical management can also cause considerable suffering. Mortality rates after major surgery are reported to be 0.5–5%; up to 25% of patients experience complications following inpatient surgery; nearly half of adverse events in hospitalized patients in industrialized countries are related to surgical treatment; at least half of surgical injuries are considered preventable; and in some parts of sub-Saharan Africa, the mortality rate from general anesthesia alone is as high as 1 in 150 (49). In an effort to systematically improve the safety of surgical procedures, the World Health Organization (WHO) also published the WHO Surgical Safety Checklist in 2008 (50). In addition to systematic risk prevention mechanisms, the disclosure of problems and solutions that may be encountered during surgery is essential for the surgical learner to have a more comprehensive understanding of the procedure and to complete it successfully (Appendix 2, Examples 45–47). For example, thyroid surgery can damage the recurrent laryngeal nerve and carotid artery. In addition, there may be multiple surgical treatments for each disease, and each has its own advantages, disadvantages, and indications. We should plan well in advance of surgery to choose the best surgical option. However, many decisions can only be made intraoperatively under direct inspection. When a procedure is found to be unsuitable intraoperatively, it is advisable to transfer to another procedure to ensure the safety of the operation. For example, laparoscopic cholecystectomy with uncontrollable hemorrhage requires urgent conversion to open surgery; trans-aortic valve replacement valve release affecting the coronary opening should be converted to open aortic valve replacement. The information on these special circumstances will enable the learner to anticipate and be aware of them.

Item 15: visualization

(I) Visualize the key steps in a step-by-step and self-explanatory manner. Consider using narrated video(s) and anatomic illustration(s) with designated symbols and illustrated text. (II) The key information in item 12 should be visualized; it can either be presented as a stand-alone figure or embedded in the video(s). (III) Visualization of the key information in items 10, 13, and 14 is encouraged as appropriate. (IV) After peer review, add clips into the video(s) to present the video title, operator name, and operation date at the beginning, and the informed consent and the ethical approval statements at the end.

The surgical illustration (Appendix 2, Examples 48–50) is the artwork to showcase complex surgical details in an engaging, visual, and efficiently understandable way. Surgical procedures are very complex and contain many details, some of which are difficult to describe in words, and the existence of many languages around the world makes it even more difficult to communicate surgical techniques in words. As the saying goes, a picture is worth a thousand words, and visualization allows people to better understand the essence of what the text is trying to convey. Mavroudis *et al.* have summarized seven practical visualization tips: (I) hovering technique; (II) hidden anatomy, ghosted views, or transparency; (III) centrally focused perspective; (IV) action techniques to give life to the procedure; (V) use of insets to highlight one part of the drawing; (VI) human proportionality using hands or known objects to show relative size; and (VII) step-by-step educational process to depict the stages of a procedure (51). Surgical visualization can take a variety of forms, as long as the procedure is clearly communicated, including images, hand drawings, videos (Example 2), and even advanced visualization techniques such as 3D visualization, augmented reality, and virtual reality. Surgical visualization has a certain degree of subjectivity and freedom but is by no means without rules. We believe that there are some basic elements that must be included: the key information in Item 12 should be visualized; it can either be presented as a stand-alone figure or embedded in the video(s). Visualization of the key information in Items 10, 13, and 14 is encouraged as appropriate. After peer review, add clips into the video(s) to present the video title, operator name, and operation date at the beginning, and the informed consent and the ethical approval statements at the end. The primary reason for doing this is that surgical videos can spread independently from the article. Adding clips containing the required information to the video allows minimizing the loss of important information even when the video is disseminated independently. Of note, although SUPER's scope is peer-reviewed articles on surgical technique, given surgeons' enthusiasm for sharing non-peer-reviewed videos on multimedia platforms, we also appeal to surgeons to consider adopting the above recommendations for surgical videos in social media sharing.

Section four: postoperative considerations and tasks

Item 16: evaluation

(I) Define the criteria for success and failure, and evaluate the efficacy or effectiveness of the surgical technique from both the technical aspect and the clinical outcome perspective (e.g., length of stay, improvements in short- and long-term mortality, recurrence, survival time, and patient impairment). (II) When possible, include the perspective of the patient (e.g., symptoms and signs, postoperative pain, and aesthetic results).

(I) Postoperative evaluation is an important stage to judge whether the surgery meets the expected goal. The authors should clearly define the success/failure criteria of the surgery and pre-specify evaluation metrics accordingly (Appendix 2, Example 51). The evaluation of the efficacy or effectiveness of the surgical technique should focus on these two aspects: technical aspect and clinical outcomes. Commonly used criteria for surgical evaluation should align with the expected objectives of the surgery, including obtaining a diagnosis, restoring physiological or anatomical functions, improving survival, relieving pain, and improving the quality of life. From the surgical perspective, evaluation criteria should cover indicators related to specific surgical techniques. For example, for valvuloplasty and valve replacement procedures, valvular function should be evaluated postoperatively using cardiac echocardiography (52). In addition, common variables such as operative time, intraoperative blood loss, usage of blood products, and tissue injuries can be adopted for evaluation. The evaluation of postoperative outcomes commonly includes length of hospital stay, death, disease recurrence, etc. Notably, the author should distinguish between efficacy and effectiveness when describing surgical evaluation.

Surgical efficacy is usually used in exploratory studies to evaluate whether a surgical technique can achieve the expected surgical results under ideal conditions, whereas surgical effectiveness is usually used in empirical studies to evaluate the actual clinical benefits of the surgical technique in a real-world environment (53). The authors should choose which term to use according to the nature of their studies.

(II) Surgeons should not only care about surgical outcomes and treatment effects, but also pay more attention to the overall physical, psychological, and social health status of their patients. When evaluating surgical outcomes, we encourage the authors to collect patient reported outcomes in addition to conventional endpoints for a more comprehensive evaluation the clinical benefits of a surgical technique. The patient reported outcomes are reported directly from the patient about his or her own health status, without explanation by the clinician or anyone else (54). In recent years, the evaluation of patient reported outcomes had become an important tool to assess the efficacy and effectiveness of surgery (55) and it generally includes disease-related symptoms, level of pain, and physiological and anatomical functions of affected organs. For example, after surgical correction for complex humeral fractures, surgeons would evaluate the anatomical function and mobility as well as the pain score of the affected limb (Appendix 2, Example 52). A more general evaluation of patient reported outcomes is the evaluation of health-related quality of life, which is usually completed by doctors using well-designed questionnaires that include the assessment of physiological function, mental health status, and social interactions (56). At present, different clinical specialties have developed well-recognized standardized tools to evaluate and quantify health-related quality of life. For example, health-related quality of life assessment in patients with heart failure can be completed by Kansas City Cardiomyopathy Questionnaire (57). The health-related quality of life of cancer patients can be evaluated using European Organization for Research and Treatment of Cancer-Core Quality of Life Questionnaire (58). We suggest that the author choose specific evaluation tool according to the clinical needs of different patient groups and report the contents, measurement, method, and frequency of postoperative patient reported outcomes evaluation (Appendix 2, Example 53).

Item 17: postoperative monitoring

Describe in detail postoperative monitoring specifically related to the surgical technique (e.g., monitoring indicators, devices, frequency or duration, examination, and nursing required).

Postoperative monitoring is an important part of surgical quality control. After defining the evaluation criteria for surgical success or failure, the author should describe in detail how to monitor indicators during postoperative period and/or after discharge, especially indicators related to the surgical technique. For example, in patients with endovascular aneurysm closure by chimney technique, multiple computed tomography angiography and specific software are used to monitor the displacement of endovascular stent (Appendix 2, Example 54). If a specific medical device is used in postoperative monitoring, we suggest that the author report the name, the model of the device, the timing as well as duration or frequency for monitoring. For example, in patients after cardiac surgery for atrial fibrillation, Holter device (a specific medical device that continuously monitors cardiac electrical activity in real time) is utilized by physicians to monitor the number and frequency of recurrence of atrial fibrillation (Appendix 2, Example 55).

Item 18: complication prevention and management

Report the possible or observed postoperative complications and their prevention and management, especially complications that differ from those related to conventional techniques.

There is a risk of complications in any surgical operation. In general, postoperative complications refer to any adverse event that may require medical treatment or surgical, endoscopic and radiological intervention, resulting in the deviation of postoperative rehabilitation process (59). In recent years, although advances in perioperative management have significantly improved surgical safety, the occurrence of postoperative complications still causes substantial burden in the health care system. In patients over 45 years old who underwent major non-cardiac surgery, more than 10% would develop serious complications, and more than 1% would die in hospital or within 30 days after operation (60). Given its importance, the authors should report prevention and management measures related to postoperative complications.

Common complications are related to anesthesia, suture, and postoperative physiological status, including fever, wound bleeding, and infection, etc. The author should provide a focused description of the prevention and treatment measures in a systems-based approach. For example, analgesia helps to reduce the risk of surgical complications, and good pain control and management can facilitate rapid postoperative rehabilitation (61). If possible, the author should report whether the postoperative pain assessment is performed and if there is any relevant pain management plan, including the start time of analgesia, drug name and dosage, duration, and discharge medication (Appendix 2, Example 56). More importantly, the authors should focus on prevention and intervention measures for complications specifically related to the surgical technique. For example, complex congenital heart surgery and valvular replacement surgery may lead to heart block, which requires the insertion of cardiac pacemaker (62). The authors should report all possible and common complications related to the surgical technique. If possible, the differences in postoperative complications between new and traditional technique can be compared. Of note, the authors should consider adopting standardized tools in their fields to classify postoperative complications and describe the advantages and values of such tools (Appendix 2, Example 57). For example, Clavien-Dindo classification system (59) and its Comprehensive Complication Index (63) has been proposed to classify surgical complications into I–V levels based on the need and the level of medical intervention. This classification system has been widely used in many surgical specialties and provides a standardized tool to evaluate and compare surgical outcomes, perioperative management quality, and medical expenditure (64).

Item 19: follow-up

(I) Report the details of follow-up visits, including pathway, frequency, duration, and indicators (e.g., pathway-'telephone follow-up'; frequency-'radiological examinations every 3 months'; duration-'up to 3 years'; indicators-poor outcomes, complications, quality of life, and unexpected events). (II) If applicable, compare the information in Item 19a with those of conventional techniques.

Postoperative follow-up is the continuation of surgical management and an important stage to observe short-term and long-term surgical effects. The frequency, time, mode, and content of postoperative follow-up are determined by many factors, such as the natural history of the disease, surgical characteristics, patient compliance, availability and accessibility of medical resources, etc. We suggest that the author report the details of follow-up visits, including pathway, frequency, duration, and indicators. If necessary, the difference in outcomes between new and conventional technique during follow-up should be compared.

All follow-up events (or so-called study endpoints) should be clearly defined in advance. Compared with in-hospital evaluation, postoperative follow-up focuses on the long-term effects after surgery. Generally, the content of postoperative follow-up is usually divided into those related to surgical technique and clinical outcomes. For outcomes related to surgical technique, surgeons can evaluate long-term impact of the surgery, monitor temporal changes in anatomical and physiological functions, observe trends of improvement or deterioration in disease or condition, and assess the necessity of reoperation and the timing of intervention. For patients' clinical outcomes, endpoints such as long-term mortality, complication rate, emergency hospitalization and quality of life are commonly emphasized (Appendix 2, Examples 58–60).

The mode of postoperative follow-up and collection of relevant data deserves additional attention. In fact, follow-up mode is one of the key factors that determines the quality of follow-up. Common follow-up modes include regular outpatient clinic visit or telephone interview. In recent years, wearable devices and telemedicine technology have become increasingly important in postoperative follow-up in some specialties, which helps to reduce the risk of lost to follow-up and improve the accuracy of data collection. The diversity of follow-up modes is also reflected in the different data sources. For example, researchers from developed countries can track survival status, emergency medical treatment and admissions of patients after surgery by linking multiple administrative databases to achieve the purpose of long-term follow-up (Appendix 2, Example 61). We encourage the authors to disclose the follow-up mode and methodology of data collection based on their study design.

Section five: summary and prospect

Item 20: strengths, limitations, and outlook

Discuss the main strengths and limitations of the surgical technique, and provide detailed suggestions for improvement and future outlooks.

It is essential to report on both the strengths and limitations of the surgical technique, especially the transparent reporting of the limitations. This allows the reader to grasp the main points without being overly optimistic and can provide a key orientation for further refinement and improvement. In terms of strengths, these can be as varied as improved patient survival or quality of life, improved operation duration or convenience, increased safety, reduced costs, etc. For limitations, specifically, the author needs to mention the requirements to achieve good results, the conditions in which the surgical technique may not be suitable, whether the surgical technique is carried out seeking multidisciplinary or patient values and preferences and provide information on how these limitations may have specific implications (e.g., which steps are difficult to achieve stability). Also, where possible, consider comparing the results and implementation with results and implementation from other techniques. In addition, the author should propose directions for future improvement and provide a vision for the future application of the surgical technique (Appendix 2, Examples 62,63). This would motivate the authors to improve and not to be satisfied with the status but would also give readers from different contexts more room for learning and possibilities for optimization.

Item 21: impact and cost

(I) Summarize the key points and take-away lessons of the surgical technique and its impact in the clinical setting and on society (e.g., the economic cost). (II) Consider in context the predominant cost and its potential impact on the implementation and adoption of the surgical technique.

A clear reporting of the clinical and social impact of the surgical technique is of utmost importance to promote better allocation of healthcare resources and priority setting. Authors are encouraged to think about the multidimensional impact of the surgical technique based on the rationale and objectives in Items 2 and 3. For clinical impact, the authors can consider several clinical perspectives, which could be a reduction in the length of the procedure, an increase in the safety of the procedure, an increase in patient survival, a reduction in complications, etc. For social impact, the authors need to consider the technique in a wider context such as politics, economics, and culture. For example, if patients with certain religions refuse to undergo certain procedures, could the technique be a good solution to this issue so that more people can benefit? Another example is the social benefits of a technique, i.e., if a surgical technique requires fewer blood products and can be performed without a complex team and is suitable for certain situations, such as war zones. Specifically, the impact statement should be developed in relation to the key points and take-away lessons of the surgical technique and should be considered in context (Appendix 2, Example 64). The take-away lessons are summaries of the author's advice to colleagues, considering a combination of key points, settings, and other factors. Contextual considerations are crucial for judging the scope of applicability and impact, including which settings the surgical technique is primarily used in, for example, general practice (primary care), low and middle-income countries, community versus specialty hospitals, or inpatient versus outpatient settings (also refer to Item 6).

The SUPER pays particular attention to the cost issue, especially the cost of novel surgical technique and modified surgical technique. Health needs are vast and healthcare resources are limited. Authors need to take into account the cost factors that limit the development and adoption of the surgical technique (Appendix 2, Example 65). It is preferable when cost-effectiveness data and analysis are available (e.g., disability adjusted life years avoided per cost). Even if cost-effectiveness information is temporarily unavailable, the impact of cost on the implementation of surgical techniques should be considered. This can be a key consideration for the health policymaker. For example, if the implementation of a surgical technique requires new and expensive device or equipment, this may be an important obstacle to its implementation in low- and middle-income areas. An example is the trans-aortic valve replacement procedure, which meets the clinical needs of some patients who are unable to undergo surgical aortic valve replacement, but the high cost and high price of trans-aortic valve replacement treatment makes it a major challenge to reach more patients, and thus its social impact is greatly limited. In addition to economic cost, the authors can think outside the box to consider other factors that may affect the development and adoption of surgical technique, such as safety, efficacy, resources needed, equity, feasibility, acceptability, etc. These all provide important information to assess the applicability of the surgical technique to specific settings of the end users and the main barriers faced.

Section six: other information

Item 22: conflicts of interest, ethical approval, and informed consent

(I) Specify any potential conflicts of interest; (II) include the ethics committee or institutional review board approval (and the number when applicable); and (III) provide the informed consent for publication.

Conflicts of interest disclosures have the potential to reduce bias, yet the current disclosure of conflicts of interest is worrying (65,66). Every author should disclose their conflicts of interest, both financial and non-financial, as defined by the International Committee of Medical Journal Editors (67) and as required by each journal. For example, if a new device is introduced in a surgical technique, the relationship between the manufacturer and the authors should be disclosed (Appendix 2, Example 66). Another example is that if the project is supported by a funder, the funder's involvement and role in the development of the project should be disclosed (Appendix 2, Example 67).

The authors need to ensure that the ethics committee has approved the project and provided an ethics approval number (Appendix 2, Example 68). Research has found that in the field of surgical technique, many surgeons underestimate the importance of obtaining and reporting ethical approval and that there is much room for improving the reporting of ethical approval (66,68,69). Research conducted without ethical approval or even falsified ethical approval documents is at great risk (70).

Authors should also obtain informed consent signed by the patient for writing and publishing the article (Appendix 2, Example 69). If this cannot be obtained from the patient, it should be obtained from the patient's relatives, when local regulations permit. The article should clearly give the statement 'Signed informed consent was obtained from the patients'. When informed consent could not be obtained, the author needs to ensure that all possible attempts have been made and clearly give the reason and the statement 'Signed informed consent was not obtained after all possible attempts were made' or 'Signed informed consent was not obtained due to ...'.

Discussion

Surgical technique serves the individual patient, as it is an important component of the evidence-based medicine and individual patient care; it also serves clinical science, as a good description of surgical technique can potentially contribute to the formulation of new scientific hypotheses; and it definitely serves education, as a high level of surgical technique can promote critical thinking and create skills for lifelong learning. Through the SUPER, we hope the reporting quality of surgical technique will improve, thus facilitating better patient care, science, and education.

To the best of our knowledge, SUPER was the first to provide a comprehensive list of items to define the detailed reporting of surgical technique. Hopefully, this SUPER EE document can be of practical use for surgical technique developers and adopters. Moreover, reviewers, editors, and readers may find it beneficial. We welcome feedback, comments, and suggestions from readers on how to improve the SUPER.

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Footnote

Peer Review File: Available at https://gs.amegroups.com/article/view/10.21037/gs-23-76/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://gs.amegroups.com/article/view/10.21037/gs-23-76/coif). KZ, GSL, XT and SDW are staffs of AME publishing company (the publisher of *Gland Surgery*). The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Appendix 1

SUPER Surgical techniqUe rePorting chEcklist and standaRds

Surgical techniqUe rePorting chEcklist and standaRds (SUPER)

Section/Topic	Item No	Recommendation	Reported on Page Number/Line Number	Reported on Section/Paragraph
Background, Rationale, and Objectives				
Background	1	Describe the background of the disease or condition (e.g., its definition, classification, clinical manifestations, epidemiological characteristics, and natural history).		
Rationale	2a	Describe the pros and cons of existing treatments for the disease or condition, including currently used single or combined surgical techniques.		
	2b	Explain whether the proposed surgical technique is a novel or modified procedure, including whether any modifications have been made to key devices or materials. If only a conventional surgical technique is used, a brief description should be accompanied by a citation of a source which describes the surgical technique in detail.		
Objectives	3	State what objectives and challenges the proposed surgical technique will address. Introduce what the surgical technique figure and video will cover.		
Classification	4	Classify the surgical technique, either by: (i) surgical approach: open, minimally invasive (e.g., thoracoscopic, robotic), or hybrid; or (ii) treatment goal: curative or palliative.		
Name	5	Report the names of all involved surgical techniques in the title or abstract. If the surgical technique is the focus of the paper, also include “surgical technique” in the title.		
Preoperative Preparations and Requirements				
Setting	6a	Report information or requirements of the surgical environment (e.g., the name of the hospital, the hospital grade such as tertiary hospital, the degree of cleanliness, and whether the procedure must be performed in an operating theatre).		
	6b	List and provide details of any special surgical equipment, supplies, drugs, or software used (e.g., the manufacturer, product model, quantity, dosage, route, duration, and parameters).		
Operators	7	Provide information about the surgical team personnel, including their role (e.g., surgeon, anesthetist, nurse), learning curve (e.g., the number of cases), and training needed if applicable.		

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Recipients	8	Report detailed indications and contraindications. (i) Disease or condition: type, etiology, the location, shape and size of the lesion, etc. (ii) Recipients: age, sex, clinical manifestations, disease stage and severity, comorbidities and related complications, surgical history and relevant family history, preoperative tests, pre-intervention, and other factors pertinent to successful practice.		
	9	Provide detailed generic information and preparations. (i) Generic information: de-identified demographic information, symptoms and signs, imaging findings, staging, comorbidities, and relevant therapy history, etc. (ii) Preparations: cardiovascular, gastrointestinal and respiratory tract preparation, urinary catheterization, skin preparation, blood product preparation, anesthetic procedure and management, and patient positioning, etc.		
Surgical Technique Details				
Surgical approach, key anatomic landmarks, and adjacent structures	10a	Describe in detail how to establish the surgical approach (e.g., devices and equipment used, the position of the surgeons, anatomic localization, and the incision type, length, size, depth, angle, and number).		
	10b	Describe the essential anatomic landmarks and adjacent structures, including areas, structures, blood vessels, and nerves, etc. (e.g., “use the Louis angle between the sternal manubrium and the sternal body to find the second costal notch”).		
Intraoperative monitoring	11	Describe intraoperative monitoring specifically related to the surgical technique (e.g., near-infrared spectroscopy in aortic arch surgery).		
Step-by-step description	Include all relevant details of each operative step in a step-by-step manner along with both quantitative and qualitative description.			
	12a	Details may include the intraoperative findings, timeline, histomorphology, exposure of vital structures, extent of lymph node dissection, determination of surgical margins, suture pattern (running suture or single stitches; spacing of stitches), anastomosis, knot-tying, specimen handling, and devices/supplies/drugs/blood products used, etc.		
	12b	Note the operative time.		
	12c	If a non-conventional maneuver was applied, specify the reason.		
Quality and consistency	13	Describe tips and skills for ensuring surgical quality and consistency, especially for the key steps and any conditions or variations that require uniform management (if applicable). For example, using standardized training, establishing quality control teams, and organizing multidisciplinary consultations.		

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Safety	14	Describe tips and skills for ensuring safety. For example, how to prevent or deal with possible intraoperative complications and emergencies, or when and how to undertake a surgical conversion.		
Visualization	15a	Visualize the key steps in a step-by-step and self-explanatory manner. Consider using narrated video(s) and anatomic illustration(s) with designated symbols and illustrated text.		
	15b	The key information in item 12 should be visualized; it can either be presented as a stand-alone figure or embedded in the video(s).		
	15c	Visualization of the key information in items 10, 13, and 14 is encouraged as appropriate.		
	15d	After peer review, add clips into the video(s) to present the video title, operator name, and operation date at the beginning, and the informed consent and the ethical approval statements at the end.		
Postoperative Considerations and Tasks				
Evaluation	16a	Define the criteria for success and failure, and evaluate the efficacy or effectiveness of the surgical technique from both the technical aspect and the clinical outcome perspective (e.g., length of stay, improvements in short- and long-term mortality, recurrence, survival time, and patient impairment).		
	16b	When possible, include the perspective of the patient (e.g., symptoms and signs, postoperative pain, and aesthetic results).		
Postoperative monitoring	17	Describe in detail postoperative monitoring specifically related to the surgical technique (e.g., monitoring indicators, devices, frequency or duration, examination, and nursing required).		
Complication prevention and management	18	Report the possible or observed postoperative complications and their prevention and management, especially complications that differ from those related to conventional techniques.		
Follow-up	19a	Report the details of follow-up visits, including pathway, frequency, duration, and indicators (e.g., pathway-”telephone follow-up”; frequency-”radiological examinations every 3 months”; duration-”up to 3 years”; indicators-poor outcomes, complications, quality of life, and unexpected events).		
	19b	If applicable, compare the information in item 19a with those of conventional techniques.		
Summary and Prospect				
Strengths, limitations, and outlook	20	Discuss the main strengths and limitations of the surgical technique, and provide detailed suggestions for improvement and future outlooks.		
Impact and cost	21a	Summarize the key points and take-away lessons of the surgical technique and its impact in the clinical setting and on society (e.g., the economic cost).		
	21b	Consider in context the predominant cost and its potential impact on the implementation and adoption of the surgical technique.		

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Other Information				
Conflicts of interest, ethical approval, and informed consent	22	(i) Specify any potential conflicts of interest; (ii) include the ethics committee or institutional review board approval (and the number when applicable); and (iii) provide the informed consent for publication.		

SUPER website: https://www.thesuper.org/

Zhang K, Ma Y, Wu J, Shi Q, Barchi L, Scarci M, et al. The SUPER reporting guideline suggested for reporting of surgical technique. Hepatobiliary Surg Nutr 2023. doi: 10.21037/hbsn-22-509

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Appendix 2

SUPER item examples

Item 1. Background

Describe the background of the disease or condition (e.g., its definition, classification, clinical manifestations, epidemiological characteristics, and natural history).

Example 1:* *Outcomes after anomalous aortic origin of a coronary artery repair:* A *Congenital Heart Surgeons' Society Study (1)
'Anomalous aortic origin of a coronary artery (AAOCA) is a rare congenital cardiac anomaly that may be associated with myocardial ischemia and has an estimated prevalence of 0.01% to 2% of the population. There are numerous anatomic variants wherein 1 or both coronary arteries arise from the contralateral sinus of Valsalva or with a high (supra-sinus) origin, with or without ostial abnormalities, and most often with an abnormal course. Most commonly, the courses are interarterial and/or intramural or intraconal. Patients may present with symptoms of ischemia or sudden cardiac events, including death, but most are asymptomatic and diagnosed incidentally. Numerous knowledge gaps remain, including the prevalence in the general population, the mechanism of sudden cardiac events, the morphologies predictive of ischemia, and which patients may benefit from surgical repair.'

Example 2:* *Resected metachronous renal metastasis of pancreatic cancer after pancreaticoduodenectomy—a case report (2)
'Pancreatic cancer harbors high malignant potential with high frequency of local invasion and distant metastasis, with the 5-year overall survival of approximately 7% in Japan. Even after curative pancreatectomy, most of them would experience metastasis, commonly to the liver, peritoneum or the lungs'.

Example 3:* *Reoperative repair of adult aortic coarctation with explantation of thoracic stent-graft:* a *case report (3)
'Coarctation of the aorta (CoA) is a congenital heart abnormality that involves luminal narrowing of the aorta most commonly in close proximity to the ductus arteriosus, distal to the left subclavian artery. CoA is a relatively common abnormality, with a reported incidence of 6–8% in patients with congenital heart disease. It is associated with bicuspid aortic valve, which is present in up to half of patients, as well as intracranial aneurysms.'

Item 2. Rationale

(a) Describe the pros and cons of existing treatments for the disease or condition, including currently used single or combined surgical techniques. (b) Explain whether the proposed surgical technique is a novel or modified procedure, including whether any modifications have been made to key devices or materials. If only a conventional surgical technique is used, a brief description should be accompanied by a citation of a source which describes the surgical technique in detail.

Example 4:* *Comparison of oncological outcomes after open and laparoscopic re-resection of incidental gallbladder cancer (4)
'The recommended treatment for patients with a T1b (or higher T category) incidental gallbladder cancer in the absence of disseminated disease is oncological extended resection. Oncological extended resection (re-resection) comprises resection of the gallbladder fossa or liver segments IVb–V, regional lymph nodes and, in selected patients, the com- mon bile duct. The goals of re-resection are to identify and remove any residual cancer that remains after the index cholecystectomy and to permit accurate staging of disease. Residual cancer, an important prognostic factor, is found in up to 39 per cent of patients at re-resection, the most common locations being the gallbladder fossa and lymph nodes. The presence of residual cancer at re-resection has been shown to portend a dismal prognosis akin to stage IV disease. Although laparoscopic liver resection is frequently per- formed at selected centres, and has been associated with less bleeding, fewer complications, and better quality of life compared with open liver surgery, laparoscopic re-resection for incidental gallbladder cancer has rarely been performed or described in the literature. Laparo- scopic re-resection for cancer is technically challenging, requiring advanced laparoscopic skills. More specifically, laparoscopic re-resection for incidental gallbladder cancer includes a complete lymphadenectomy and a IVb – V biseg-mentectomy or gallbladder fossa resection. In this context, concerns exist that laparoscopic re-resection may not meet the standards of open surgery, and lead to tumour cell dis-semination and inadequate removal of all residual cancer. However, improvements in surgical technique have led to some reports of appropriate quality laparoscopic re-resection for gallbladder cancer.'

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Example 5 New tubeless video-assisted thoracoscopic surgery for small pulmonary nodules (5)

'In this article, we reported the feasibility of using this new tubeless VATS approach (i.e., no tracheal intubation, post-operative chest tube and urinary catheterization) for solitary pulmonary nodules (SPNs) which required minor/sublobar resections.'

Example 6 Short-term outcomes of a simple and effective approach to aortic root and arch repair in acute type A aortic dissection (6)

'We modified the direct repair technique using fine suture (5-0 Prolene with a small needle) and adding the reinforcement around the coronary ostia if the aortic dissection extends around the coronary ostia.'

Example 7 Comparison of oncological outcomes after open and laparoscopic re-resection of incidental gallbladder cancer (4)

'The surgical procedures for open and laparoscopic re-resection were described in detail previously9,13,14,28. Briefly, re-resection was undertaken in all patients with tumours of category T1b or greater. Re-resection in all patients included open or laparoscopic exploration and intraoperative frozen-section analysis of aortocaval lymph nodes, specifically station 16b1; limited resection of the liver bed or anatomical resection of liver segments IVb and V or, on rare occasions, major liver resections, and dissection of the hepatoduodenal ligament, common hepatic artery and retropancreatic lymph nodes as a standard approach for gallbladder cancer. The laparoscopic approach involved four steps that were shared across institutions.'

Item 3. Objectives

State what objectives and challenges the proposed surgical technique will address. Introduce what the surgical technique figure and video will cover.

Example 8: T***otal artificial heart:*** s***urgical technique in the patient with normal cardiac anatomy (7)***

Surgical technique objective: 'The SynCardia Total Artificial Heart (TAH, SynCardia Systems, United States) was created to provide biventricular support.'

Example 9: O***utcomes of atherectomy for lower extremity ischemia in an office endovascular center (8)***

Study objective: 'The purpose of this study was to evaluate the safety and effectiveness of infrainguinal artery revascularization using atherectomy supplemented with other endovascular techniques in an office endovascular center (OEC) setting.'

Example 10: A ***step-by-step guide to trans-axillary transcatheter aortic valve replacement (9)***

Preview: 'we discuss important aspects of TAx-TAVR within the framework of the following sequential steps: (I) patient selection; (II) imaging; (III) preparation; (IV) vascular access; (V) axillary access; (VI) valve deployment; (VII) closure.'

Item 4. Classification

Classify the surgical technique, either by: (i) surgical approach: open, minimally invasive (e.g., thoracoscopic, robotic), or hybrid; or (ii) treatment goal: curative or palliative.

Example 11: N***egative Impact of Endoscopic Submucosal Dissection on Short-Term Surgical Outcomes of Subsequent Laparoscopic Distal Gastrectomy for Gastric Cancer (10)***

'Endoscopic submucosal dissection (ESD) has been accepted as an optional treatment for EGC without the risk of lymph node metastasis. Given that ESD is less invasive and less expensive than gastrectomy, it may help to improve the quality of life of gastric cancer patients. However, the rate of noncurative resection after ESD was reported as 6.6–28.4%, and additional treatment including radical gastrectomy is required for these patients. In this study, we analyze the clinical factors of gastric cancer patients who underwent additional laparoscopic distal gastrectomy after ESD, which may affect short-term surgical outcomes.'

Example 12: A ***Match-Pair Analysis of Open Versus Laparoscopic Liver Surgery (11)***

'To confirm comparability of laparoscopic and OLRs, the Iwate score was applied to all cases: the localization and size of the tumor, the proximity to major blood vessels, the extent of surgery, the underlying liver function (Child score) and the use of a pure laparoscopic or hand-assisted surgery is assigned individual scores. The sum of these scores depicts an objective measure of the complexity of the procedure and defines the difficulty of surgery (score 0–3, low; 4–6, intermediate; 7–9, advanced; and

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10–12, expert).'

Item 5. Name

Report the names of all involved surgical techniques in the title or abstract. If the surgical technique is the focus of the paper, also include 'surgical technique' in the title.

Example 13*, *where the focus is on surgical technique:* *Total artificial heart: surgical technique in the patient with normal cardiac anatomy (7)

Title: 'Total artificial heart: surgical technique in the patient with normal cardiac anatomy'

Example 14*, *where the focus is on the effectiveness and safety of the surgical technique:* *Banded Versus Nonbanded Sleeve Gastrectomy: A Randomized Controlled Trial With 3 Years of Follow-up (12)

Title: 'Banded Versus Nonbanded Sleeve Gastrectomy: A Randomized Controlled Trial With 3 Years of Follow-up'

Abstract: 'The aim of this study was to compare silicone-banded sleeve gastrectomy (BSG) to nonbanded sleeve gastrectomy (SG) regarding weight loss, obesity-related comorbidities, and complications.'

Example 15*, *where the focus is on the effectiveness and safety of the combined medication:* *Are Postoperative Intravenous Antibiotics Indicated After Laparoscopic Appendicectomy for Simple Appendicitis? A Prospective Double-blinded Randomized Controlled Trial (13)

Title: 'Are Postoperative Intravenous Antibiotics Indicated After Laparoscopic Appendicectomy for Simple Appendicitis? A Prospective Double-blinded Randomized Controlled Trial'

Abstract: 'There is limited evidence for the use of postoperative antibiotics for simple appendicitis (SA) in children. Our aim was to conduct a prospective double-blinded randomized controlled trial to investigate this after a laparoscopic appendicectomy.'

Item 6. Setting

(a) Report information or requirements of the surgical environment (e.g., the name of the hospital, the hospital grade such as tertiary hospital, the degree of cleanliness, and whether the procedure must be performed in an operating theatre). (b) List and provide details of any special surgical equipment, supplies, drugs, or software used (e.g., the manufacturer, product model, quantity, dosage, route, duration, and parameters).

Example 16 Outcomes of atherectomy for lower extremity ischemia in an office endovascular center (8)

'In this retrospective study, a total of 352 lower extremity atherectomy revascularization procedures were conducted between 2011 and 2016 at an office endovascular center by five board-certified vascular surgeons.'

Example 17: Associating Liver Partition and Portal Vein Ligation for Staged Hepatectomy for Unresectable Hepatitis B Virus-related Hepatocellular Carcinoma (14)

'Consecutive patients with HBV-related HCC who underwent ALPPS at our center in Zhongshan Hospital of Fudan University between April 2013 and September 2017 were retrospectively studied.'

Example 18 Open bedside tracheostomy: routine procedure for patients under prolonged mechanical ventilation (15)

'...The ICU bed is a particular problem, since sometimes its width makes exposure difficult, compelling the surgeon to assume a very uncomfortable position. All ICU beds were of standard size (2.35 m x 0.90 m x 0.45-0.70m). In all procedures, a 4-bulb mobile surgical operation light (12 000 lux per bulb) was used, allowing good anatomical visualization even in deep incisions. The material was standardized and checked before every procedure.'

Example 19 An Emergency Surgery in Severe Case Infected by COVID-19 With Perforated Duodenal Bulb Ulcer (16)

'...a detailed surgical plan was established with the help of multidisciplinary experts, including the way of surgery, the requirement of the surgical room, the route of transporting patient, the protective measures of medical staffs, and so on. Specifically, all medical staffs who might contact the patient should be prepared with level 3 protection; special transit channel and negative pressure operating room (negative pressure < -5Pa) met level 3 protection standards were used. Disposable consumables and equipment were used as much as possible during surgery; a skilled laparoscopy expert was assigned to perform the surgery to minimize operating time and reduce the exposure risk. Medical staffs were not allowed to leave the

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operating room during the surgery.'

Example 20 The First Human Trial of Transoral Robotic Surgery Using a Single-Port Robotic System in the Treatment of Laryngo-Pharyngeal Cancer (17)

'…the DaVinci SP system was developed as a single-port system more suitable for use in a long narrow working space because all the robotic arms can be inserted through a single port with a diameter of 2.5 cm. In addition, two joggle joints in the robotic arms and endoscope play the same role as the elbow joint in the human arm, allowing the robotic arms to be arranged in a triangular shape toward the target surgical site within a limited working space.'

Example 21 Effect of Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy on Quality of Life in Patients with Peritoneal Mesothelioma (18)

'Via a closed technique perfusion circuit, hyperthermic intraperitoneal chemotherapy (HIPEC) was perfused for 90–120 min, with a target flow of 1 L/min and a target outflow temperature of 40℃. Cisplatin was the preferred agent, but mitomycin C was also utilized in select cases.'

Item 7. ***Operators***

Provide information about the surgical team personnel, including their role (e.g., surgeon, anesthetist, nurse), learning curve (e.g., the number of cases), and training needed if applicable.

Example 22 Open bedside tracheostomy: routine procedure for patients under prolonged mechanical ventilation (15)

'The surgical team comprised 5 senior thoracic surgeons with airway expertise (endoscopy and airway surgery training). In all tracheostomies, 2 surgeons scrubbed and performed the procedure. The procedure was assisted by an ICU nurse and a respiratory therapist. Both of them were previously trained and knew of all necessary materials and surgical steps. An intensivist was present to sedate and monitor the patient.'

Example 23 The learning curve on uniportal video-assisted thoracic surgery: An analysis of proficienc (19)

'...we ran a multivariable linear regression model predicting procedure time based on procedure number, learning phase, and the interaction between the 2 variables with further adjustments on age, sex, tumor size, and CCI using proc Glimmix. Using the regression equation, we are able to test the impact of an additional procedure in each learning curve phase, and using the interaction we are able to test if that impact is different in each phase.'

Example 24 Learning curve of laparoscopic living donor right hepatectomy (20)

'To analyse the learning curve, procedures were divided into four quartiles, and bile duct openings and operating times were compared among the quartiles. Surgical videos were reviewed by two surgeons and the time spent on each phase of the procedure was measured. To analyse bile duct openings, patients were categorized as having more openings than expected, or equal or fewer openings than expected, based on bile duct type and number of bile duct openings in the grafts. Patients with a type I bile duct should have a single bile duct; those with a single bile duct after surgery were categorized as having equal or fewer openings, whereas those with two or more openings were considered to have more openings than expected. In contrast, patients with type II, III, IV and V bile ducts were categorized as having equal or fewer openings if there were one or two bile duct openings, but more than expected when there were three or more bile duct openings.'

Example 25 Closure of the fascial defect during laparoscopic umbilical hernia repair: a randomized clinical trial (21)

'Five study-dedicated experienced laparoscopic surgeons performed the hernia repairs. Before the start of the study, each surgeon had performed more than 30 intracorporeally sutured laparoscopic hernia repairs.'

Example 26 Simulation-Based Training in Cardiac Surgery (22)

'Each task-specific assessment tool included numerous Likert items that addressed performance on specific skills. For example, the aortic valve replacement assessment tool (AVRAT) evaluated seven Likert items such as "root setup," "valve excision," and "suture placement". As complexity and breadth of simulations increased, component tasks from earlier sessions were represented as single Likert items (instead of multiple item Likert scores) in the overall procedure. For example, for the component task of venous cannulation in the early part of the CPB module, Likert items in the venous cannulation assessment form were basic skills, such as "needle angle," "spacing," or "needle holder use." During the final three sessions of complete CPB, the ability to place the venous cannula was evaluated as a single Likert item (venous cannulation) in the overall cardiopulmonary bypass assessment tool (CPBAT).'

Item 8. Recipients

Report detailed indications and contraindications.

(i) Disease or condition: type, etiology, the location, shape and size of the lesion, etc.

(ii) Recipients: age, sex, clinical manifestations, disease stage and severity, comorbidities and related complications, surgical history and relevant family history, preoperative tests, pre-intervention, and other factors pertinent to successful practice.

Example 27 A New Aortic Arch Inclusion Technique With Frozen Elephant Trunk for Type A Aortic Dissection (23)

'The aortic arch inclusion technique was indicated for all patients admitted for Type A aortic dissection treatment after screening for the following exclusion factors: (1) age>75 years without a primary tear in the aortic arch; (2) a primary tear involving the orifices of the 3 brachiocephalic vessels; (3) a primary tear located between the innominate artery and left common carotid artery in the greater curve of the aortic arch.'

Example 28 Long-term Results of the Side-to-side Isoperistaltic Strictureplasty in Crohn Disease: 25-year Follow-up and Outcomes (24)

'Patients were selected for the SSIS based on an algorithm which considered contraindications to a strictureplasty and impact that a bowel resection would have on total bowel absorption. In brief, strictures were not considered for an SSIS if they were associated with an inflammatory mass, harbored dysplasia or carcinoma, had a very thick and friable small bowel mesentery (which is challenging to transect and then slide the proximal intestinal loop over the distal one for sufficient length without undue tension), extended over a long segment with a thick, unyielding intestinal wall (garden hose appearance) or could be handled by simpler strictureplasty techniques. Preoperative anti-TNF treatment was not considered a contraindication to a SSIS...... 2 indications to the performance of an SSIS have emerged: 1) short segments (shorter than 2 feet) where the length of the affected small bowel was more than 10% of the length of the entire small bowel and the performance of multiple conventional strictureplasties over such short segment would create an overly deformed intestinal segment. If the percentage of affected bowel was less than 10%, a limited small bowel resection and primary anastomosis was the preferred surgical option; also, if conventional strictureplasty techniques were feasible without creating an overly deformed loop of bowel,

they were the preferred surgical option; 2) extensive (longer than 2 feet) primary or recurrent Crohn Disease.'

Example 29 A step-by-step guide to trans-axillary transcatheter aortic valve replacement (9)

'Contraindications for trans-axillary transcatheter aortic valve replacement

Absolute contraindications

- Inadequate vessel size (subclavian or axillary artery diameter ≤5 mm for self-expanding and ≤5.5 mm for balloon-expandable valves)
- Severe vessel calcification
- Excessive tortuosity of the subclavian or axillary artery
- Preexisting vascular injury (i.e., dissection)
- Steep subclavian to arch angulation (>80 degrees)
- Significant calcification involving the aortic arch
- Significant aortic root angulation (<70 degrees for the left subclavian artery and <30 degrees for the right)

Relative contraindications

- Patent ipsilateral internal thoracic artery graft
- Ipsilateral A/V fistula
- Morbid obesity (soft tissue depth of 10 cm from skin to axillary artery for percutaneous access)
- Presence of ipsilateral permanent pacemaker'

Item 9. Recipients

Provide detailed generic information and preparations.

(i) Generic information: de-identified demographic information, symptoms and signs, imaging findings, staging, comorbidities, and relevant therapy history, etc.

(ii) Preparations: cardiovascular, gastrointestinal and respiratory tract preparation, urinary catheterization, skin preparation, blood

product preparation, anesthetic procedure and management, and patient positioning, etc.

Example 30 A midterm analysis of patients who received femoropopliteal helical interwoven nitinol stents (25)

'From October 2011 to September 2018, a total of 315 patients (198 males), 117 females, median age of 78 years (range, 46-100 years), with 360 cases of symptomatic femoropopliteal lesions were enrolled in this study to receive primary angioplasty and stenting using the biomimetic Supera stent at our institution. For male patients, the mean age of hospital admission was 73.2 years (range, 46-96 years), and for female patients, the mean age of admission was 80.9 years (range, 49-100 years). Cardiovascular risk factors were prevalent: 77.5% (279 cases) were on regular antihypertensive medication, 32.2% (116 cases) were active smokers, 61.9% (223 cases) were diabetic, and 41.7% (150 cases) had hyperlipidemia on statins'

Example 31 Off-pump versus on-pump redo coronary artery bypass grafting A propensity score analysis of long-term follow-up (26)

'More than 90% of the study population consisted of patients who were at their second cardiac surgery. Out of 304 patients, 269 (88.5%) had undergone a previous CABG operation. The remaining 35 patients had either an isolated valve procedure (19 patients [6.2%]), a combined CABG and valve surgery (12 patients [3.9%]), or a corrective operation of a septum defect (4 patients [1.3%]) as previous cardiac surgery.'

Example 32 C***losure of the fascial defect during laparoscopic umbilical hernia repair:*** a ***randomized clinical trial (21)***

'At the induction of anaesthesia, 16mg methylprednisolone succinate and 1500mg cefuroxime were given intravenously. Patients were anaesthetized using propofol 3–5mg per kg per h and remifentanil 1 µg per kg per h.'

Example 33 The First Human Trial of Transoral Robotic Surgery Using a Single-Port Robotic System in the Treatment of Laryngo-Pharyngeal Cancer (17)

'The patient's cart with robotic arms and a surgical bed were placed perpendicular to one another. The robotic system was aligned with the center of the patient's mouth, and the cannula was placed approximately 10 cm outside the mouth. The height and angle of the single arm then were adjusted so the axis of the single port was parallel to the axis of the oral cavity. Two or three robotic instruments were inserted through the single port, and the endoscopic arm also was inserted into the oral cavity through the same port. Both the first and second joggle joints of the robotic arm could be placed in the patient's mouth when the cannula was 10 cm from the mouth.'

Item 10. Surgical approach, key anatomic landmarks, and adjacent structures

(a) Describe in detail how to establish the surgical approach (e.g., devices and equipment used, the position of the surgeons, anatomic localization, and the incision type, length, size, depth, angle, and number). (b) Describe the essential anatomic landmarks and adjacent structures, including areas, structures, blood vessels, and nerves, etc. (e.g., 'use the Louis angle between the sternal manubrium and the sternal body to find the second costal notch').

Example 34: M***inimally invasive mitral valve repair:*** t***he Liverpool Heart and Chest Hospital Technique—t***i***ps for safely negotiating the learning curve (27)***

'The patient was positioned with the right chest rotated 30° anteriorly by a roll under the right scapula and with the pelvis flat on the table. The right arm was padded and held at the patient's side with the shoulder extended. Prior to skin preparation, the port sites were marked. The femoral vessels are always exposed first for a primary procedure to ensure they are >6.5 mm and thus able to support femoral arterial perfusion; for a redo procedure, the minithoracotomy incision should be performed first to ensure that the right pleural cavity is not obliterated. A 2-3 cm right groin skin crease incision was performed preserving all lymph nodes to reduce the risk of seroma formation post-operatively and 4/0 prolene pursestrings placed.

A 7 cm right anterolateral minithoracotomy in the 4th intercostal space was performed and a soft tissue retractor deployed. A pledgetted 2/0 ethibond suture was used to retract the diaphragm inferiorly. A 5 mm camera port with CO2 at 4 L/min connected to the side arm was inserted in the 3rd intercostal space anterior to the shoulder. A 7 mm suction port was placed in the 6th intercostal space just anterior to the anterior axillary line and a LA retractor (HV retractor, USB Medical, PA) was inserted in the 4th intercostal space just lateral to the sternum under videoscopic control to avoid injury to the right internal mammary artery.'

Example 35: O***pen Repair of Thoracoabdominal Aortic Aneurysm:*** S***tep-b***y***-S***t***ep (28)***

'Immediately prior to positioning, a CSF drainage catheter is inserted. (A, B) The patient is placed on top of a beanbag in

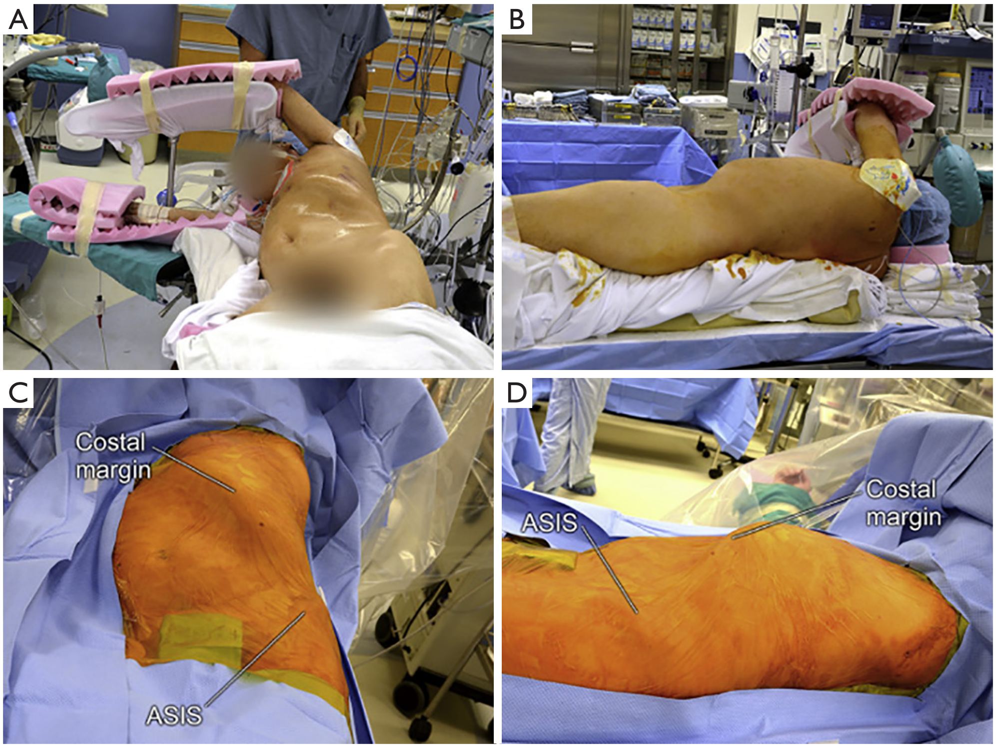

Figure S1 Positioning, prepping, and draping. Immediately prior to positioning, a CSF drainage catheter is inserted. (A,B) The patient is placed on top of a beanbag in a modified right lateral decubitus position, with the shoulders rotated to 60° from horizontal and the hips rotated to 30° from horizontal, which ensures that both groins are accessible. An axillary roll is placed under the patient's right axilla, and the beanbag is suction-deflated and made firm to maintain the patient's position. The patient's left arm is placed on top of an elevated arm board and extended at an angle above the shoulders in a freestyle-swimming-stroke position. (C,D) The patient's left chest and back, abdomen, groins, and upper thighs are prepared and draped in a sterile fashion. An adhesive antimicrobial drape is placed over all exposed skin. ASIS, anterior superior iliac spine; CSF, cerebrospinal fluid.
Reuse with permission. Ouzounian M, LeMaire SA, Weldon S, *et al.* Open Repair of Thoracoabdominal Aortic Aneurysm: Step-by-Step. Operative Techniques in Thoracic and Cardiovascular Surgery 2018;23:2-20.

a modified right lateral decubitus position, with the shoulders rotated to 60° from horizontal and the hips rotated to 30° from horizontal, which ensures that both groins are accessible. An axillary roll is placed under the patient's right axilla, and the beanbag is suction-deflated and made firm to maintain the patient's position. The patient's left arm is placed on top of an elevated arm board and extended at an angle above the shoulders in a freestyle-swimming-stroke position. (C, D) The patient's left chest and back, abdomen, groins, and upper thighs are prepared and draped in a sterile fashion. An adhesive antimicrobial drape is placed over all exposed skin (*Figure S1*). Incision and exposure. (A) A left thoracotomy is made, and the chest is entered through the fifth or sixth intercostal space. The incision is then curved inferiorly and extended across the costal margin and toward the umbilicus. Medial visceral rotation is performed through a transperitoneal approach; electrocautery is used to dissect along the line of Toldt. (B) The diaphragm is divided circumferentially, and a 3- to 4-cm rim of diaphragm is left attached to the lateral and posterior chest wall, with 2-0 silk retraction sutures along the edge of the divided diaphragm.'

Example 36: F***ully endoscopic transsphenoidal surgery for functioning pituitary adenomas:*** a ***retrospective comparison with traditional transsphenoidal microsurgery in the same institution (29)***

'Patients in group A underwent a fully endonasal endoscopic surgery using a rigid endoscope 300 mm in length and 4 mm in diameter (Olympus, Hamburg, Germany) with angled lenses of 0°, 30°, and 70°. A pneumatic powered holder with easy

https://dx.doi.org/10.21037/gs-23-76

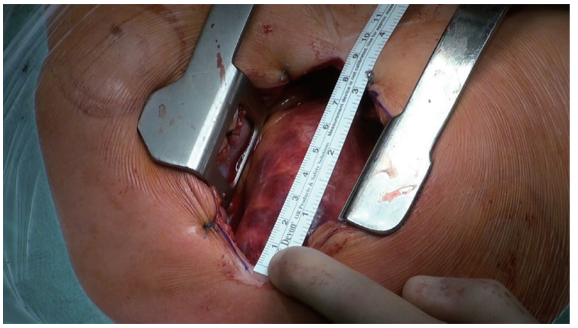

Figure S2 Minimally invasive access through upper mini-sternotomy (with 8 cm skin incision).
Reuse with permission. Shrestha M, Krueger H, Umminger J, *et al.* Minimally invasive valve sparing aortic root replacement (David procedure) is safe. Ann Cardiothorac Surg 2015;4:148-53.

control of the joints by the release of a single button for locking and unlocking the endoscope holder (Aesculap, Tuttlingen, Germany) made it possible to move the endoscope quickly during surgery and offered surgeons the possibility of using both hands to handle the surgical instruments and perform delicate dissections.'

Item 11. Intraoperative monitoring

Describe intraoperative monitoring specifically related to the surgical technique (e.g., near-infrared spectroscopy in aortic arch surgery).

Example 37: ***Sun's procedure for complex aortic arch repair: total arch replacement using a tetrafurcate graft with stented elephant trunk implantation (30)***

'Blood pressure in the left radial artery and left femoral artery is monitored. We use transcranial Doppler sonography and electroencephalogram to monitor the flow velocity and electrical activity of the brain throughout the procedure.'

Example 38: Aortic arch surgery using moderate hypothermia and unilateral selective antegrade cerebral perfusion (31)

'Transcutaneous cerebral oximetry (INVOS 3100-SD; Troy, Mich) and electroencephalogram monitoring were routinely performed in all cases.'

Example 39: The prevention of neural complications in the surgical treatment of scoliosis: the role of the neurophysiological intraoperative monitoring (32)

'All stimulation and recording of SEPs and TES-MEPs were performed using a commercially available neurophysiological monitoring workstation (Protektor, Xltek). A neurophysiological change was defined significant (i.e., an "alert") when it consisted of a persistent unilateral or bilateral reduction in amplitude C50% for SEPs and C65% for TES-MEPs compared with baseline. Response latency shift was not considered an alert suggestive of emerging spinal cord injury, unless it was associated with a notable reduction in amplitudes.'

Item 12. Step-by-step description

Include all relevant details of each operative step in a step-by-step manner along with both quantitative and qualitative description. (a) Details may include the intraoperative findings, timeline, histomorphology, exposure of vital structures, extent of lymph node dissection, determination of surgical margins, suture pattern (running suture or single stitches; spacing of stitches), anastomosis, knot-tying, specimen handling, and devices/supplies/drugs/blood products used, etc. (b) Note the operative time. (c) If a non-conventional maneuver was applied, specify the reason.

Example 40: Minimally invasive valve sparing aortic root replacement (David procedure) is safe (33)

'The ascending aorta and the aortic root are exposed via an upper J mini-sternotomy (up to the 3rd intercostal space) (*Figure S2*). When first adopting this procedure and in patients with very large aneurysms (>6 cm), it may be advisable to do

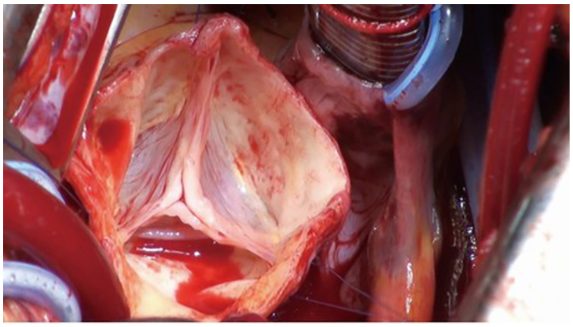

Figure S3 Inspection of the aortic valve showing three leaflets.
Reuse with permission. Shrestha M, Krueger H, Umminger J, *et al.* Minimally invasive valve sparing aortic root replacement (David procedure) is safe. Ann Cardiothorac Surg 2015;4:148-53.

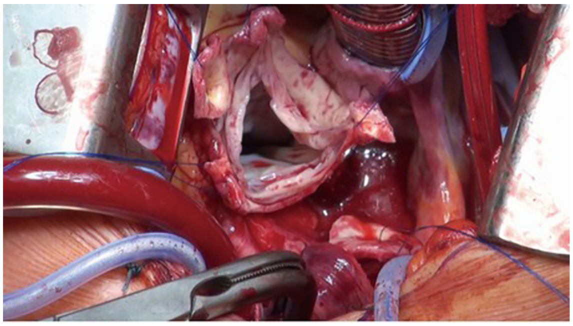

Figure S4 Mobilised aortic root with both ostia cut out as buttons.
Reuse with permission. Shrestha M, Krueger H, Umminger J, *et al.* Minimally invasive valve sparing aortic root replacement (David procedure) is safe. Ann Cardiothorac Surg 2015;4:148-53.

the upper hemi-sternotomy up to the 4th intercostal space. The innominate vein is identified and carefully mobilised. The pericardium is opened and the aorta visualized.

After systemic heparinization, the ascending aorta and the right atrium are cannulated directly via the mini-sternotomy access and the patient is put on cardio-pulmonary bypass (CPB). In the early learning phase, if the ascending aorta was quite large in diameter, pushing the right atrium down, venous access was performed via the femoral vein. Depending upon the extent of surgery, the patient is cooled either to 32 °C in isolated David procedures or 25 °C in case of additional aortic arch replacements.

A mediastinal chest tube and temporary epicardial pacing wires are placed via a small sub-xiphoidal incision. A CO2 sufflation line is placed into the pericardium via the mediastinal chest tube. A vent is placed into the left atrium via the upper right pulmonary vein after fibrillating the heart.

The aorta is cross-clamped and opened. Cardioplegia is given selectively through both coronary ostia. Cold blood cardioplegia (Buckberg) is our preferred method of myocardial protection during David procedures. Cardioplegia is repeated every 30 minutes.

The ascending aorta is transected directly above the commissures and the aortic valve is assessed (*Figure S3*). The aortic root is mobilized from outside to a level immediately below the nadir of the aortic annulus. Small vessels are meticulously cauterized during aortic root preparation. Care is taken to ensure absolute hemostasis at every step of the operation.

The aortic sinuses are resected to leave a rim of approximately 5 mm of the aortic wall and the coronary ostia are excised as buttons (*Figure S4*). If necessary, leaflet repair is performed to optimize the cusp coaptation.

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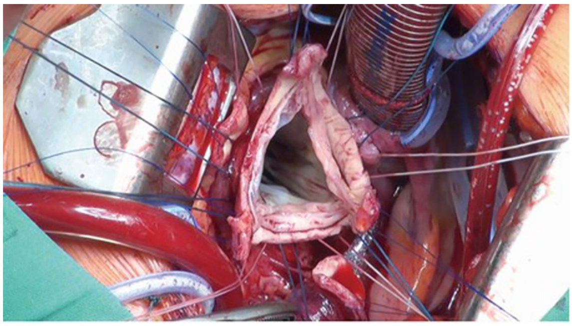

Figure S5 Twelve subvalvular Ethibond sutures placed to anchor the Dacron Prosthesis.
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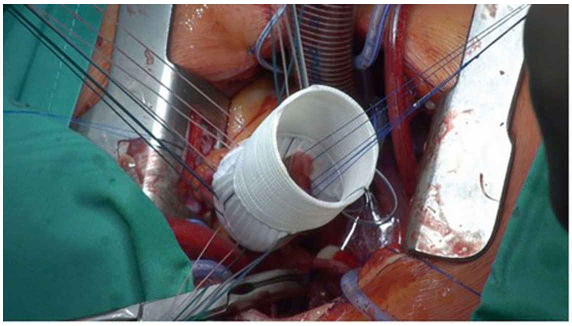

Figure S6 Dacron prosthesis being fixed with aortic valve inside it.
Reuse with permission. Shrestha M, Krueger H, Umminger J, *et al.* Minimally invasive valve sparing aortic root replacement (David procedure) is safe. Ann Cardiothorac Surg 2015;4:148-53.

The diameter of the aortic annulus is determined with a Hegar's dilator. The diameter of the prosthesis is then calculated. The diameter of the Hegar's dilator +2 sizes bigger determines graft diameter. In most of the patients however, the diameter of the Dacron prosthesis is either 28 or 30 mm.

Thereafter, 9-12 unpledgeted threads of 2-0 coated polyester fiber (Ethibond, Ethicon Inc., USA) are placed, inside-out and horizontally, below the valve in a circumferential fashion (*Figure S5*). The Dacron graft (Gelweave or Valsalva graft, Vascutek Inc., Glasgow, Scotland) is anchored with these sutures with the aortic root inside the graft (*Figure S6*). The Dacron graft is fixed by tying these threads loosely to avoid the creation of a subvalvular stenosis.

If a straight tube graft is being used, the commissures are maximally pulled-up without stretching the Dacron graft and then fixed to the Dacron graft. If a Valsalva graft is used, the commissures are reimplanted at the level of the 'neo ST junction'. The mobilised aortic root with remnants of the aortic sinuses are sutured to the inside of the Dacron graft using three 4-0 polypropylene sutures (Prolene, Ethicon Inc., USA). This is the 'hemostatic' suture-line and as such, has to be absolutely 'blood-tight'.

A 'water-test' is performed to test the coaptation of the reimplanted aortic valve (*Figure S7*). Additional aortic valve leaflet repair is performed if necessary.

The coronary ostia are reimplanted to their respective neo-sinuses by using 5-0 polypropylene suture (Prolene, Ethicon Inc.). Hemostasis of the coronary anastomoses and performance of the aortic valve is tested by pressurizing the aortic root with cardioplegia. Glue is not routinely used, except in cases of calcified ostia. For this particular scenario, fibrin or Bioglue may be utilized following 're-implantation' of the ostia.

The distal aortic anastomosis is then performed, and after de-airing the left ventricle, the aortic clamp is removed.

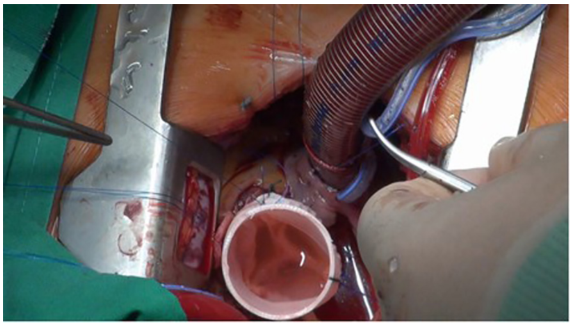

Figure S7 'Water test' to control the valve patency.
Reuse with permission. Shrestha M, Krueger H, Umminger J, *et al.* Minimally invasive valve sparing aortic root replacement (David procedure) is safe. Ann Cardiothorac Surg 2015;4:148-53.

The surgical result is assessed by intra-operative transoesophageal echocardiography. After weaning the patient from CPB, meticulous hemostasis is performed before closing the chest.

Transthoracic echocardiography is again performed before discharge. Patients are anticoagulated with coumadin or aspirin (at the discretion of the individual surgeon) to prevent thromboembolic complications for only two months. Thereafter, anticoagulation therapy is discontinued unless other indications exist.'

Example 41 Bentall Procedure Using Cryopreserved Valved Aortic Homografts (34)

'Relevant surgical data are as follows: the mean aortic cross-clamping time was 95 ± 37 minutes (range, 39–195 minutes).'

Example 42 A New Graft for Total Arch Replacement With Frozen Elephant Trunk in Type A Dissection (35)

'Our center has previously reported total arch replacement (TAR) combined with frozen elephant trunk (FET), also known as Sun's procedure1, for type A aortic dissections involving the aortic arch. However, concern remains that the highly demanding operative techniques and deep hypothermic circulatory arrest (DHCA) may increase mortality and morbidity. In this study, we propose a novel Sutureless Integrated Stented graft (SIS graft) (Central Picture), greatly simplifying the distal aortic anastomosis and reducing the DHCA time.'

Item 13. Quality and consistency

Describe tips and skills for ensuring surgical quality and consistency, especially for the key steps and any conditions or variations that require uniform management (if applicable). For example, using standardized training, establishing quality control teams, and organizing multidisciplinary consultations.

Example 43: Transit-time flow predicts outcomes in coronary artery bypass graft patients: a series of 1000 consecutive arterial grafts (36)

'TTF measurement provides three parameters: PI, mean flow and diastolic filling (DF). Abnormal values for bypass grafts for these three parameters used in this study were as follows: PI >5, flow ≪15 cc min−1 and DF ≪25. A PI value ≤5, as recommended by the manufacturer (MediStim Oslo, Norway), was chosen as the principal measure of graft adequacy. The cut-off value for flow has not yet been defined in the literature and was defined as ≪15 cc min−1 to be consistent with that used in several previous studies. Similarly for DF, an optimal cut-point has not been clarified and, therefore, after consultation with MediStim personnel, it was defined as ≪25, a value well below the accepted range of 45–80 recommended by the manufacturer.

The measurements were performed three times for each graft – after removal of the cross-clamp with a beating heart, off-pump before protamine and then off-pump after protamine administration. Only the post-protamine value was used for the present analysis. Probe sizes were selected to match the largest arterial conduit, skeletonising a small portion of the radial artery when necessary. Grafts were revised if a poorly functioning graft was suspected employing usual clinical criteria (electrocardiogram (EKG) changes, haemodynamic instability and new regional wall motion abnormalities on TEE). For the most part, if the TTF values alone indicated a poor graft, the grafts were not revised. Occasionally, a graft was revised if the TTF value was surprisingly abnormal or corroborated the suspicion of a poor graft. Individual graft measurement for sequential grafts was done whenever possible by measuring the whole graft and the 'in-between segment'. This was usually only possible for grafts on the anterior surface of the heart (left anterior descending coronary artery (LAD) region) because the necessary displacement of the heart (causing blood pressure (BP) drop) precluded measurement of this segment in sequential grafts to the posterior and inferior regions of the left ventricle.'

Example 44:* L*ymphadenectomy during thoracoscopy:* t*echniques and efficacy (37)

'During VATS lobectomy for treatment of NSCLC we perform an accurate mediastinal lymph node staging: this procedure is crucial for selecting therapeutic strategies. According to our experience, developing specific skills and increasing use of minimally invasive technique, every nodal station can be dissected by a thoracoscopic approach but in our opinion nodes in station 4L and 4R are more easily dissected after left and right upper lobectomy respectively. We think that surgeons should follow a learning curve not only for VATS lobectomy but also for lymphadenectomy. After the last stages of this curve, it's possible to face major challenges during VATS lobectomy such as metastatic lymphadenopathy.'

Item 14. Safety

Describe tips and skills for ensuring safety. For example, how to prevent or deal with possible intraoperative complications and emergencies, or when and how to undertake a surgical conversion.

Example 45:* S*urgical management of tricuspid stenosis (38)

'There are several surgical pitfalls associated with replacing the tricuspid valve. Iatrogenic injury to the right coronary artery (RCA) has been described. The RCA runs in the AV groove and closest to the tricuspid valve in the area of the posterior leaflet. Injury to the artery can result from either placing undue tension on the adjacent tissue resulting in a functional stenosis, or by directly suturing the artery. If the complication is noted intra-operatively, release of the culprit stitch or immediate bypass should be performed. Post-operatively, catheter-based approaches have been described for functional stenoses.

Care should also be taken to not injure the AV node. When suturing along the septal leaflet in the region of the anteroseptal commissure, myocardial tissue should be avoided with sutures placed in the base of the leaflet. This minimizes the risk of AV nodal blockade. If performing beating heart TVR, a stitch too close to the AV node would result in rhythm disturbance. This immediate feedback allows the surgeon to re-do the stitch and avoid permanent injury to the node.

Another important consideration is if a concomitant aortic valve procedure is planned or a patient has a prior aortic valve replacement. The anteroseptal commissure of the tricuspid valve is very close to the noncoronary cusp of the aortic valve. If a stented aortic bioprosthesis is in place, anchoring sutures may be difficult to place. Furthermore, a poorly placed commissure suture may inadvertently injure or plicate open the non-coronary cusp, resulting in acute aortic insufficiency.'

Example 46:* M*anagement of Ebstein's anomaly (39)

'The internal anatomy of the right atrium should be carefully scrutinized. Ventral traction on the atrial free edge should identify the 'anatomic' tricuspid annulus. The coronary sinus should also be clearly identified with a dose of cardioplegia. The atrial secundum membrane is excised and the favored patch material is trimmed to the 'anatomic' tricuspid annulus. The patch is sewn into place using prolene sutures, making sure the right coronary is not injured or torsed in the AV groove. Special care is taken around the conduction system and sutures should avoid the mouth of the coronary sinus. Pathologic studies have shown that the AV node may be displaced toward the ostium in Ebsteinoid hearts—frankly, there is no reason to be in that area. If the septal leaflet will hold stitches, we prefer to sew the patch to it and avoid the conduction system altogether. '

Example 47:* S*leeve Gastrectomy:* S*urgical Tips (40)

'The entire greater curve of the stomach is mobilized up to the angle of His including all posterior peripancreatic attachments, and the left crus of the diaphragm is exposed. Care should be taken during this portion of the procedure to identify and preserve the splenic vessels as well as to avoid excessive traction on the spleen. If a hiatal hernia is identified, it should be repaired.'

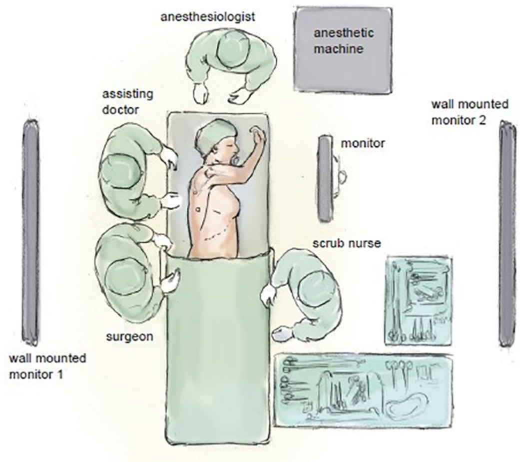

Figure S8 Schematic drawing of the surgical, anaesthetic and nursing teams and the equipment layout.
Reuse with permission. Richards JM, Dunning J, Oparka J, *et al.* Video-assisted thoracoscopic lobectomy: the Edinburgh posterior approach. Ann Cardiothorac Surg 2012;1:61-9.

Item 15. Visualization

(a) Visualize the key steps in a step-by-step and self-explanatory manner. Consider using narrated video(s) and anatomic illustration(s) with designated symbols and illustrated text. (b) The key information in item 12 should be visualized; it can either be presented as a stand-alone figure or embedded in the video(s). (c) Visualization of the key information in items 10, 13, and 14 is encouraged as appropriate. (d) After peer review, add clips into the video(s) to present the video title, operator name, and operation date at the beginning, and the informed consent and the ethical approval statements at the end.

Example 48: Video-assisted thoracoscopic lobectomy: The Edinburgh posterior approach (41)

'Anaesthesia and positioning

Following induction of anaesthesia, the patient is positioned in the lateral decubitus position. The hands are placed unsupported in the 'prayer' position in front of the face and the operating table is manipulated to extend the thorax laterally opening up the intercostal spaces.

As soon as the double lumen endotracheal tube is confirmed to be in the correct position, whilst the patient is still in the anaesthetic room, ventilation is switched to the contralateral lung to optimise deflation of the lung that is to be operated upon. Suction is occasionally used if the lung does not deflate readily. The respiratory rate can be increased to 20 breaths/min or more in order to reduce the tidal volume and hence the degree of mediastinal excursion due to ventilation. This provides a more stable operating field. We rarely use central lines or urinary catheters but always use an arterial line and large bore venous cannulae.

Intercostal nerve blocks are used for perioperative analgesia in preference to epidural anaesthesia. Unless the parietal pleura has been disrupted, a local anaesthetic paravertebral catheter is placed at the end of the operation and remains in place for 48 hours. In addition, a patient-controlled morphine pump is supplied to the patient for post-operative analgesia.

The positioning of the surgical, anaesthetic and nursing teams and the equipment is illustrated in *Figure S8*. The surgeon and their assistant stand at the patient's back with the screen directly across the table and the scrub nurse obliquely opposite. We utilise two additional large (55 inch) wall-mounted high definition screens. One is positioned opposite the scrub nurse and provides an operative view, which also allows anaesthetic staff, circulating nurses, students and observers to follow the progress of the operation. The other is positioned opposite the surgeon and provides large-scale high-definition radiology images, which the surgeon can view continuously in order to inform intra-operative decision-making.

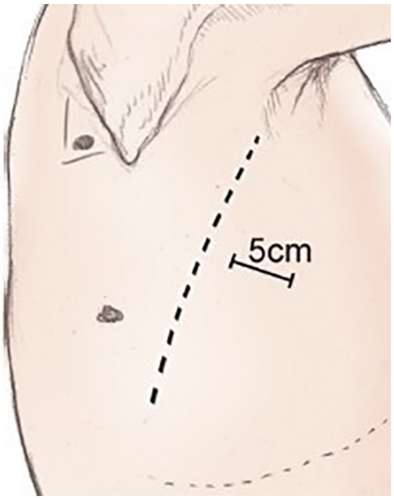

Figure S9 Incisions and port positions in relation to anatomical surface landmarks for the posterior approach, including a 5 cm utility incision anterior to the latissimus dorsi muscle.
Reuse with permission. Richards JM, Dunning J, Oparka J, *et al.* Video-assisted thoracoscopic lobectomy: the Edinburgh posterior approach. Ann Cardiothorac Surg 2012;1:61-9.

Incisions

Three access ports are used and port position is standard irrespective of the lobe to be removed (*Figure S9*). A 5 cm utility port site incision is made in the sixth or seventh intercostal space (whichever is the larger) just in front of the anterior border of the latissimus dorsi muscle. The camera is temporarily introduced through this port to facilitate safe creation of a 1.5 cm incision posteriorly in the auscultatory triangle at the point nearest to the upper end of the oblique fissure. A port is inserted to accommodate the camera, which is positioned in this posterior port for the remainder of the procedure. A further 2 cm port is created in the midaxillary line level with the upper third of the anterior utility port. The anterior and posterior ports lie at opposite ends of the oblique fissure.

Instruments

We prefer a zero degree 10 mm high definition video thoracoscope as this provides a single axis view allowing easy correction of orientation. A combination of endoscopic and standard open surgical instruments is used. Lung retraction and manipulation are performed using ring-type sponge-holding forceps. Long artery forceps (30 cm) with or without mounted pledgets are employed for blunt dissection. These are particularly useful for exposing the PA at the base of the oblique fissure, cleaning structures and clearing node groups. A range of curved forceps and an endodissector are used gently as probes to create a passage between the lung parenchyma and major hilar structures. A right-angled dissector or long curved artery forceps is used to dissect out and pass slings around pulmonary arteries and veins. Endoscopic clips are used to ligate small vessels whilst large vessels and lung parenchyma are divided using endoscopic stapling devices to ensure haemostasis and aerostasis. We have found both endoscopic shears and specific VATS Metzenbaum type scissors to be helpful. The latter have the advantage of curved blade ends which reduce the risk of vascular injury.

Technique

A video-imaged thoracoscopic assessment is performed to confirm the location of the lesion, establish resectability and exclude unanticipated disease findings that might preclude resection. *Video 1* is an edited video clip, which demonstrates several key points of VATS lobectomy via the Edinburgh Posterior approach.

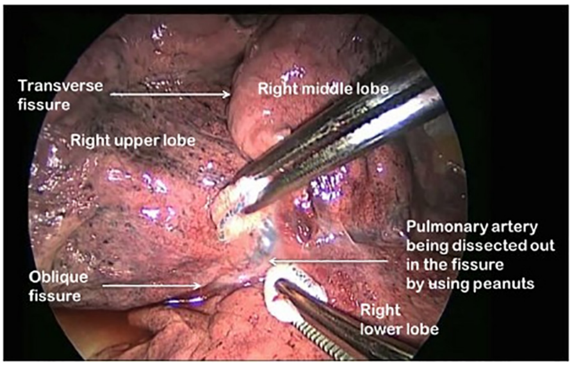

Figure S10 Pledget dissection of pulmonary artery in the oblique fissure on the right side.
Reuse with permission. Richards JM, Dunning J, Oparka J, *et al.* Video-assisted thoracoscopic lobectomy: the Edinburgh posterior approach. Ann Cardiothorac Surg 2012;1:61-9.

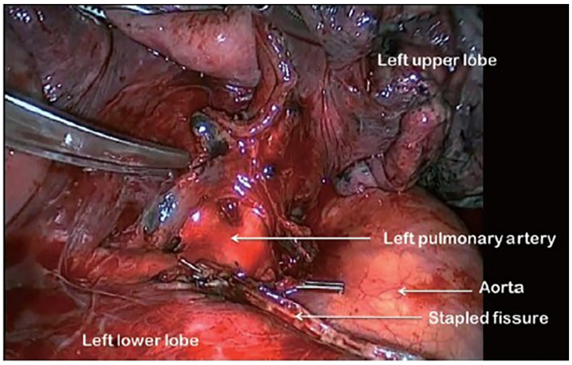

Figure S11 Left pulmonary artery exposed in oblique fissure.
Reuse with permission. Richards JM, Dunning J, Oparka J, *et al.* Video-assisted thoracoscopic lobectomy: the Edinburgh posterior approach. Ann Cardiothorac Surg 2012;1:61-9.

The first step is to identify the PA within the central section of the oblique fissure. In some patients the PA is immediately visible, but in the majority of cases, the PA is revealed by separating the overlying pleura using blunt dissection with mounted pledgets (*Figure S10*). If the fissure does not open easily or is fused, an alternative approach utilising a fissure-last dissection as described below should be considered. Once the PA has been identified, the sheath of the artery is grasped with a fine vascular clamp or long artery forceps and an endoscopic dissector is used to enter the sheath defining the anterior and posterior margins of the artery. The apical lower branch of the PA is often exposed during this dissection.

For all lobectomy procedures excepting middle lobectomy, the lung is then reflected anteriorly and the posterior pleural reflection is divided using sharp and blunt dissection. On the right this process should clear lung tissue away from the angle between the bronchus intermedius and the upper lobe bronchus exposing the lymph nodes in this position. On the left, the lung is swept away from hilum exposing the pulmonary artery (*Figure S11*). From the anterior port site, long artery forceps are then passed gently immediately posterior to the PA where it has been identified in the oblique fissure and central to the fused posterior fissure emerging through the incised posterior pleural reflection. On the right side care should be taken during this manoeuvre not to disrupt the lymph nodes lying along the bronchus intermedius. A sling is passed behind the posterior fissure, which is divided with an endoscopic linear stapling device. The PA is now clearly seen on the right side (*Figure S12*) and the distinction between the upper and lower lobes is established. Dissection then proceeds according to the lobe to be resected.

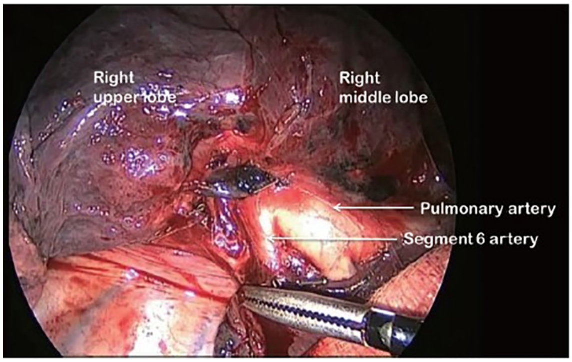

Figure S12 Right pulmonary artery exposed in oblique fissure.
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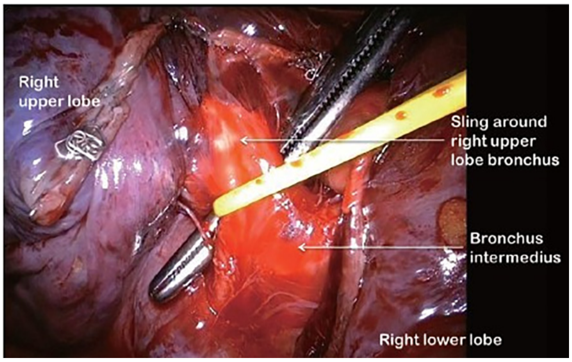

Figure S13 Right upper lobe bronchus ready to be stapled.
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During division of the truncal pulmonary veins we place a central vascular clamp on the vein so that the vein will be secure and unable to retract away in the event of a mishap with the vascular endostaple.

All resected specimens are removed from the thoracic cavity in a retrieval bag to avoid contamination of the wounds with malignant cells.

Right upper lobectomy

Having divided the posterior fissure, the posterior ascending segmental branch of the PA is often evident and if it is should be divided at this stage. It is frequently small enough to clip. The upper lobe bronchus is then identified and dissected out. It is common to find a substantial bronchial artery running alongside the bronchus which should be ligated with clips and divided. Note that clips are only used on the proximal end and the distal end is not clipped since clips in this position may interfere with subsequent stapling of the bronchus.

The upper lobe is then retracted inferiorly and blunt dissection with mounted pledgets is used to free the cranial border of the upper lobe bronchus and define the apico-anterior trunk. The azygos vein is often closely related to the bronchus and can be pushed away using a gentle sweeping motion. A long artery forceps or vascular clamp is passed around the upper lobe bronchus close to its origin in the plane between the bronchus and the associated node packet (*Figure S13*). It should be appreciated that the apico-anterior trunk lies immediately anterior to the bronchus. The bronchus is transected at this level

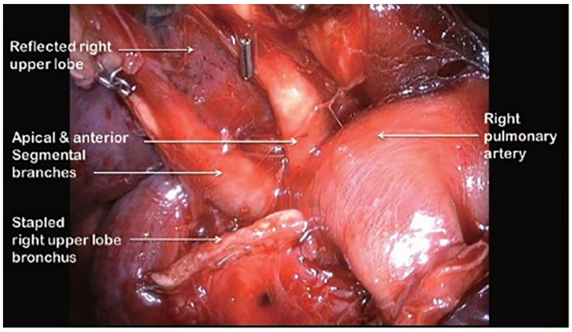

Figure S14 View of apical and anterior segmental arteries after dividing the right upper lobe bronchus and reflecting right upper lobe superiorly.
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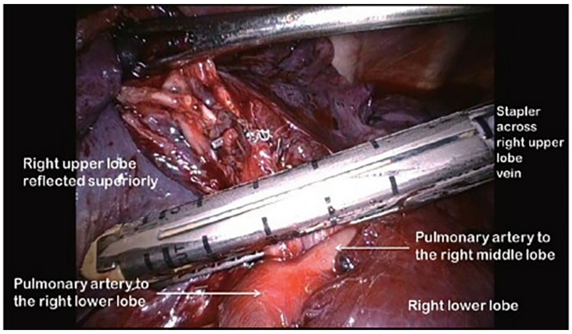

Figure S15 Right upper lobe vein divided using a stapler.
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using an endoscopic linear stapling device. We do not find it necessary to inflate the lung to test that the correct bronchus is being divided as the vision is invariably excellent and the reinflated lung may then obscure the view for remainder of the resection. Following division of the bronchus the feeding vessels to the right upper lobe bronchus node packet are clipped and divided allowing the nodes to be swept up into the operative specimen.

Clasping the distal end of the transected bronchus with an endoscopic toothed grasper, the upper lobe can be reflected upwards. The posterior segmental artery is divided at this stage if not already dealt with and the apical and anterior segmental arteries or common stem artery are carefully cleaned, dissected out (*Figure S14*) and divided with an endoscopic stapler. Finally, the lung is retracted posteriorly facilitating dissection of the superior vein. This can be divided from either the posterior (*Figure S15*) or anterior aspect as convenient, taking care, in either case, to identify clearly and preserve the middle lobe vein. The transverse fissure is then divided. The middle lobe artery is most easily identified and protected if the stapling device is first passed through the inferior port and fired from posterior to anterior. Division of the transverse fissure is then completed passing the stapling device through the anterior port. The inferior pulmonary ligament is divided to facilitate expansion of the right lower lobe.

Right lower lobectomy

Having identified the PA in the oblique fissure and divided the posterior oblique fissure, the pulmonary artery is then divided

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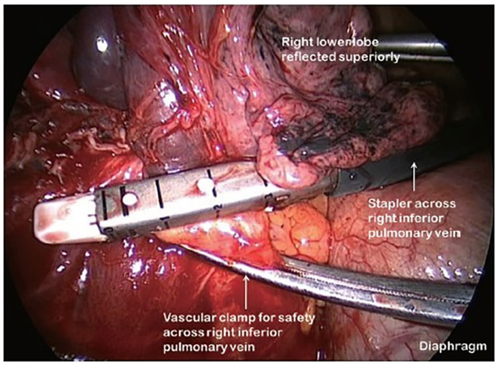

Figure S16 Right inferior vein divided with proximal vascular clamp.
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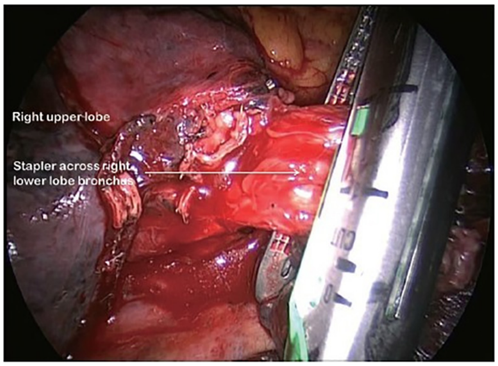

Figure S17 Division of right lower lobe bronchus across apical lower and basal trunk origins.
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either in one or separately as a basal trunk artery and the apical segmental artery to the lower lobe. The space between the superior and inferior veins is developed and a long clamp is passed into this space emerging anterior to the PA in the oblique fissure. A sling is passed into this plane and the anterior oblique fissure is then divided. The lower lobe is mobilised by dividing the inferior pulmonary ligament. The inferior vein (*Figure S16*) is dissected free from surrounding tissue and divided using an endoscopic linear stapling device. The bronchus is identified and the bronchial vessels are clipped proximally. Lymph nodes are cleared from its medial and lateral margins. The lower lobe bronchus (*Figure S17*) is divided through its apical and basal branches preserving airflow to the middle lobe. The middle lobe bronchus must be visualised prior to stapling.

Right middle lobectomy

The PA is identified and the anterior oblique fissure is divided as for right lower lobectomy. The vein, bronchus and arteries are then seen clearly and are divided in sequence. The transverse fissure is divided as described for right upper lobectomy.

Left upper lobectomy

The PA is identified in the oblique fissure and the posterior aspect of the oblique fissure (*Figure 11*) is divided in a similar

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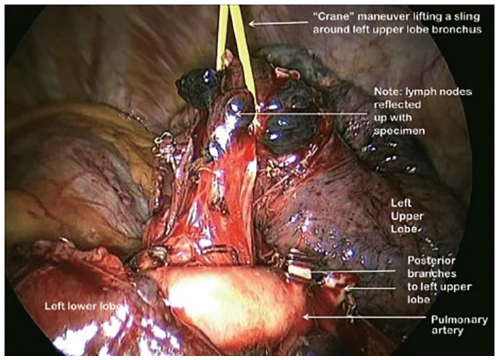

Figure S18 Use of "Crane" manoeuvre to elevate left upper lobe bronchus.
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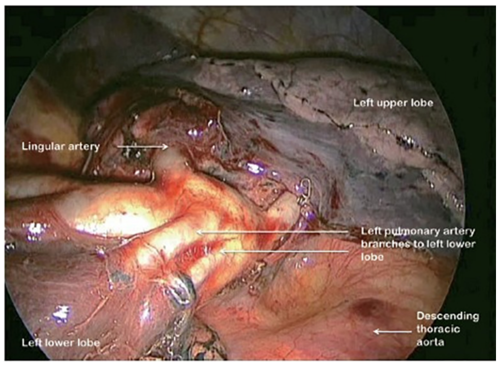

Figure S19 Left pulmonary artery branches to left lower lobe fully displayed.
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way to the right side. The arterial branches to the left upper lobe are then divided sequentially. Division of the anterior aspect of the fissure is completed in similar manner to that on the right side. It is important to develop the space between the pulmonary veins and central to the fused anterior oblique fissure thoroughly. When passing a clamp through the utility incision and under the fused fissure, the surgeon will feel the lower lobe bronchus and should allow the clamp to pass superficial to that so preserving the airway to the lower lobe. Gentle blunt dissection is used to separate the superior pulmonary vein from the anterior surface of the bronchus. A long clamp is passed around the base of the bronchus taking particular care not to damage the PA. Retraction of the PA using a mounted pledget may be helpful. A sling is passed around the bronchus and used to elevate it (crane manoeuvre) in relation to the pulmonary artery and create a space via which an endoscopic stapling device can be inserted to divide the bronchus (*Figure S18*). The superior vein is cleaned and divided. The inferior pulmonary ligament is divided up to the level of the inferior vein to facilitate expansion of the lower lobe.

Left lower lobectomy

As on the right side, having identified the PA and divided the posterior aspect of the oblique fissure, the arterial branches are identified (*Figure S19*). The anterior portion of the oblique fissure is divided as for left upper lobectomy and the arterial

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supply divided with an endostapler. The inferior pulmonary ligament is divided up to the level of the inferior pulmonary vein. The margins of the vein are clearly delineated and it is then divided. Bronchial vessels are clipped proximally and divided and the lymph node chains are cleared off the medial and lateral aspects of the bronchus, which is divided at its base.'

Example 49: Cone repair for Ebstein's anomaly and atrial fibrillation ablation in an adult patient (42)

https://mmcts.org/tutorial/1608(surgical video)

Example 50: Minimally invasive valve sparing aortic root replacement (David procedure) is safe (33) (also see item 12)

Item 16. Evaluation

(a) Define the criteria for success and failure, and evaluate the efficacy or effectiveness of the surgical technique from both the technical aspect and the clinical outcome perspective (e.g., length of stay, improvements in short- and long-term mortality, recurrence, survival time, and patient impairment). (b) When possible, include the perspective of the patient (e.g., symptoms and signs, postoperative pain, and aesthetic results).

Example 51 A Critical Look Into Stapedotomy Learning Curve:* I*nfluence of Patient Characteristics and Different Criteria Defining Success

Success Criteria (43)

'The outcomes of stapedotomy surgery were analyzed according to 3 success criteria existing in the literature and one proposed by the present authors: (1) postoperative ABG ≤10 dB; (2) postoperative ABG ≤15 dB; (3) restoration of interaural symmetry (AC PTA within 15 dB of contralateral ear AC PTA); and (4) postoperative ABG gain >20 dB (calculated as preoperative ABG minus postoperative ABG).'

Example 52 Complications and Long-Term Outcomes of Open Reduction and Plate Fixation of Proximal Humeral Fractures (44)

'In 2017, surviving patients were requested by letter (or telephone for those who did not respond to the letter) to complete an injury-specific questionnaire of patient-reported outcomes. These included the Oxford Shoulder Score (OSS) with scores ranging from 0 (poor outcome) to 48 (excellent outcome); the short version of the Disabilities of the Arm, Shoulder and Hand questionnaire (QuickDASH) with scores ranging from 0 (no disability) to 100 (maximum disability); and subjective assessments of pain, stiffness, instability, satisfaction, and overall level of function. Pain was categorized as none or minimal, mild, moderate, or severe and also was rated on a continuous visual analogue scale (VAS) ranging from 0 (no pain) to 100 (worst pain imaginable) with scores of ≤10 considered to be minimal or no pain. Residual stiffness and instability were recorded as 'present' or 'absent.' Patients were asked to grade their shoulder function as a percentage of the function of their uninjured shoulder on a VAS ranging from 0 to 100 (function equivalent to that of the uninjured arm) with scores of ≥90 considered to be consistent with nearly normal function.'

Example 53 Effect of Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy on Quality of Life in Patients with Peritoneal Mesothelioma (18)

'This QOL survey consisted of the Short Form-36 (SF-36), the Functional Assessment of Cancer Therapy+Colon (FACT-C), the Brief Pain Inventory (BPI), and the Center for Epidemiologic Studies Depression Scale (CES-D). Eastern Cooperative Oncology Group (ECOG) performance status rating, Peritoneal Cancer Index (PCI), resection status, morbidity, and mortality were also analyzed. The PCI is used to assess the extent of cancer throughout the peritoneal cavity. It is determined by dividing the peritoneal cavity into 13 regions (central, right upper, epigastrium, left upper, left flank, left lower, pelvis, right lower, right flank, upper jejunum, lower jejunum, upper ileum, and lower ileum) and using a score of 0–3 for each region (0 is no tumor seen, 1 is largest tumor is smaller than 0.5 cm, 2 is largest tumor is between 0.5 and 5 cm, and 3 is largest tumor is >5 cm).

The FACT-C questionnaire is a combination of the 27-item FACT-General (FACT-G) with a 9-item colon cancer subscale (CCS). The FACT-G is composed of four components: physical well-being (PWB), social well-being (SWB), emotional well-being (EWB), and functional wellbeing (FWB). This survey uses a 5-point Likert scale to rate patient's symptoms for the prior week. The Trial Outcome Index (TOI) is used as a summary index of physical and functional outcomes, and is calculated by adding PWB+ FWB+CCS. Higher scores reflect higher QOL at the time of questionnaire administration.

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The SF-36 survey is a 36-item questionnaire consisting of eight areas of evaluation: physical functioning (PF), role physical (RP), role emotional (RE), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), and mental health (MH). The Mental Component Summary (MCS) and Physical Component Scales (PCS) are calculated from these eight subgroups. Higher scores indicate higher functioning with less psychological or functional limitations.

The CES-D scale is a 20-item questionnaire that assesses how often a person had depressive symptoms in sleep, appetite, or mood during the past week.14 It utilizes a Likert scale of 0 (none), 1 (some), 2 (occasional), or 3 (most of the time). This further uses scores ≥ 16, ≥ 23, and ≥ 28 to screen for possible, probable, and case depression, respectively.

The BPI survey is a 10-item questionnaire that uses a Likert scale of 0 (no pain) to 10 (worst pain imaginable) to assess pain during the past week. It examines whether pain interfered with activity, mood, normal work, relationships, and sleep. ECOG is graded as 0 (normal), 1 (ambulatory with symptoms), 2 (bed rest <50% of daytime hours), 3 (bed rest >50% of daytime hours), and 4 (completely bedridden).'

Item 17. Postoperative monitoring

Describe in detail postoperative monitoring specifically related to the surgical technique (e.g., monitoring indicators, devices, frequency or duration, examination, and nursing required).

Example 54 Assessment of changes in stent graft geometry after chimney endovascular aneurysm sealing (45)

'Dedicated software was used to quantify the migration of the Nellix stent frames, as described by van Veen *et al.* Consecutive CT scans after ch-EVAS were aligned using rigid transformation and six fixed anatomic landmarks: the lower border of the SMA, both renal arteries, the aortic bifurcation, and the left and right iliac artery bifurcations. In the present study, only the migration of the proximal end of the Nellix stent frames (Endologix), relative to the SMA orifice, was determined. The root mean square error was calculated to find the error of the placement of the markers (mm) on the anatomic landmarks caused by differences in the quality of the CTA data sets, changes in anatomy, and the registration process.'

Example 55 Surgical Ablation of Atrial Fibrillation during Mitral-Valve Surgery (46)

'The primary end point was freedom from atrial fibrillation at both 6 months and 12 months after surgery, as assessed by means of 3-day continuous Holter monitoring.'

Item 18. Complication prevention and management

Report the possible or observed postoperative complications and their prevention and management, especially complications that differ from those related to conventional techniques.

Example 56 Closure of the fascial defect during laparoscopic umbilical hernia repair: a ***randomized clinical trial (21)***

'At the end of the hernia repair, pain was controlled with sufentanil 0.15 µg/kg and ketorolac 30 mg, administered intravenously, and 10ml bupivacaine 0.5 per cent was administered into the trocar sites (4ml in the two 12-mm sites and 2ml at the 5-mm site). A surgeon-administered transabdominal transverse abdominis plane block was applied under visual guidance with 30ml bupivacaine after mesh fixation, before the end of the operation, and 10ml in trocar incisions (total 40ml). In the post-anesthesia care unit (PACU), pain was controlled with morphine (0.1mg/kg), administered until the score on the visual analogue scale was less than 20. In the PACU, postoperative nausea and vomiting was treated with intravenous ondansetron 4 mg, on request. At discharge, patients were given prepacked envelopes with paracetamol 1000mg and ibuprofen 400 mg, to be taken four times daily for the first 5 days, and five rescue opioid tablets (morphine 10mg) were packed for self-administration, if needed.'

Example 57 Comprehensive Complication Index Validates Improved Outcomes Over Time Despite Increased Complexity in 3,707 Consecutive Hepatectomy (47)

'Surgical complications were defined as any deviation from the normal postoperative course within 90 days after hepatic resection, graded according to Clavien-Dindo classification, and scored using the comprehensive complication index (CCI). In previous studies, the CCI has been shown to be a more sensitive measure of postoperative complications than traditional indices. A CCI of 26.2, which corresponds to 1 postoperative complication of Clavien-Dindo grade IIIa severity, was used as the threshold between high (CCI ≥26.2) and low (CCI <26.2) complication severity.'

Item 19. Follow-up

(a) Report the details of follow-up visits, including pathway, frequency, duration, and indicators (e.g., pathway-'telephone follow-up'; frequency-' radiological examinations every 3 months'; duration-'up to 3 years'; indicators-poor outcomes, complications, quality of life, and unexpected events). (b) If applicable, compare the information in item 19a with those of conventional techniques.

Example 58 Closure of the fascial defect during laparoscopic umbilical hernia repair:* a *randomized clinical trial (21)

'At the 2-year follow-up, all randomized patients received a telephone call from a blinded primary investigator using a structured questionnaire regarding recurrence and chronic pain. QoL (CCS), and cosmesis (NRS and VRS) were also assessed. The questionnaire has been validated previously for recurrence after ventral hernia repair, with a sensitivity and specificity of 0.86 and 0.78 respectively for finding recurrence. If there was suspicion of recurrence, bulging and/or pain, and/or discomfort in the umbilical region, or if patients had undergone reoperation, clinical examination by a study-blinded surgeon was arranged at the hospital or the patient's home. Recurrence was defined as reoperation for a recurrence or clinical recurrence. Clinical recurrence was defined as palpable fascial defect with protrusion of bowel, omentum or fat. If the clinical examination was inconclusive, abdominal CT with oral contrast was done during a Valsalva manoeuvre. A CT diagnosis of recurrence was defined as any breach in the abdominal wall muscles or fascial visible, with the passage of bowel, omentum or fat. Bulging of the mesh was not defined as a recurrence. The definition of bulging was: intact fixation of the mesh edges, but with small protrusion of the mesh through the hernia defect, diagnosed on CT.'

Example 59 A New Aortic Arch Inclusion Technique With Frozen Elephant Trunk for Type A Aortic Dissection (23)

'CTA was performed before discharge (~3wk postoperatively) and at 6 months postoperatively, with the following variables measured: change in the aortic arch, DTA, and diameters of the TL and FL, measured at their widest points. All patients were followed up postoperatively up to June 2017 by telephone or direct interview. Follow-up CTA was performed before discharge (3wk postoperatively)'

Example 60 Oncoplastic Central Partial Mastectomy and Neoareolar Reduction Mammoplasty with Immediate Nipple Reconstruction:* A*n Initial Report of a Novel Option for Breast Conservation in Patients with Subareolar Tumors (48)

'Patients were admitted for overnight observation postoperatively and had clinical follow-up visits 1–2 weeks after surgery, every 6 months for 2 years, and then annually. As previously described, the operating surgeon assigned cosmesis scores at the 6-month follow-up visit and at subsequent visits using the Harvard Breast Cosmesis Scale. An annual clinical exam, including a comprehensive breast exam and appropriate imaging surveillance, was performed to monitor for locoregional recurrence.'

Example 61 Off-pump versus on-pump coronary artery bypass grafting in moderate renal failure (49)

'Patients were then linked to 4 additional administrative databases: The Canadian Institute for Health Information Discharge Abstract Database was used to determine in-hospital and follow-up outcomes, the Registered Persons Database to identify all-cause mortality, the Ontario Health Insurance Plan database to confirm revascularization technique and number of grafts bypassed, and the Canadian National Census database to determine socioeconomic status and access to health care through income quintile and distance to health care provider, respectively.'

Item 20. Strengths, limitations, and outlook

Discuss the main strengths and limitations of the surgical technique, and provide detailed suggestions for improvement and future outlooks.

Example 62: A step-by-step guide to trans-axillary transcatheter aortic valve replacement (9)

'The primary benefit associated with TAx- TAVR is that it avoids a thoracic incision and eliminates the need for entry into the pericardial space or thoracic cavity. The axillary cut down technique is familiar to cardiac surgeons since it is commonly used as a cannulation site for open heart surgery. Moreover, the percutaneous TAx- TAVR access technique allows for a completely percutaneous approach under conscious sedation.

A major limitation associated with percutaneous TAx-TAVR involves the lack of compressibility of the axillary artery. This can often be dealt with by compressing the vessel against the thoracic cage. However, if the puncture is deep, it is problematic and can be difficult to obtain hemostasis after removal of the sheath. Although life-threatening bleeding and major vascular complications are rare, placement of a peripheral stent may be necessary. In a worst-case scenario, conversion to an open procedure may become necessary. It is vital to maintain wire access in case balloon tamponade is needed. Hematomas at the percutaneous access site are not uncommon and can occur immediately or within a few days after TAVR. In general, they can be managed conservatively and typically resolve spontaneously over time.

Another major disadvantage is the high reported risk of stroke. The TVT registry reported that low-volume centers might have higher complication rates. With operator experience however, the risk may become lower. The use of the Sentinel device may decrease the incidence of stroke, but more data is necessary to draw a conclusion. Other alternative access sites such as trans-carotid and trans-caval approaches have shown promising results and may overcome the disadvantages of TAx-TAVR.

Patients with a past medical history of coronary artery bypass graft and a patent LIMA to left anterior descending artery bypass graft present a technical challenge that must be taken into consideration before deciding to proceed with TAx- TAVR. Our experience has been that if the diameter at the LIMA takeoff is larger than the minimal required diameter for the specific device, the incidence of myocardial ischemia is extremely rare. Nonetheless, electrocardiogram monitoring should be used during the advancement of the large-bore sheath down the subclavian artery to ensure adequate perfusion to the territory perfused by the LIMA. Systolic blood pressure should also be kept higher, ideally greater than 100 mmHg, to maximize perfusion of the LIMA.'

Example 63: Arthroscopic Microfracture for Osteochondral Lesions of the Talus: Second-Look Arthroscopic and Magnetic Resonance Analysis of Cartilage Repair Tissue Outcomes (50)

'Our results provide evidence for the utility of second-look arthroscopy in accurately assessing the status of the cartilage repair tissue beyond use of MOCART and functional outcomes. However, using arthroscopic microfracture alone is limited by the inherent disadvantage that it results in the production of fibrocartilage, which has mechanical and biologic properties that are inferior to those of native hyaline cartilage. Therefore, further improvements in treatment, including the use of biologic adjuncts, should be evaluated.'

Item 21. Impact and cost

(a) Summarize the key points and take-away lessons of the surgical technique and its impact in the clinical setting and on society (e.g., the economic cost). (b) Consider in context the predominant cost and its potential impact on the implementation and adoption of the surgical technique.

Example 64: New tubeless video-assisted thoracoscopic surgery for small pulmonary nodules (5)

'Tubeless VATS approach for SPNs is feasible in carefully selected patients. Intubation, chest drainage, and/or urinary catheterization may not be necessary in all patients. This concept has the potential to improve patient's experience and reduce hospital stay, though further clinical trials are warranted to confirm its potential benefits.'

Example 65: Making Safe Surgery Affordable: Design of a Surgical Drill Cover System for Scale (51)

'If made widely available, the Drill Cover system can play a contributing role in improving surgical outcomes and efficiency in LMICs. For example, in Uganda (where we have focused our work), long bone fractures account for over 15% of hospital admissions. Nearly all patients should receive surgical care in a timely fashion, but in reality, a lack of resources—occasionally specific to the lack of a powered surgical drill—means that patients will long wait times or not receive surgery at all. Long wait times lead to extended periods of disability, reduced income, and a significant socioeconomic trickle-down effect on families and dependents. A widely available Drill Cover system can eventually eliminate surgical inefficiencies because of manual drill use and reduce infections because of the nonsterile hardware drill use.'

'By designing for the needs of end users, we have developed a Drill Cover system that is suitable for use in low-resource settings. The Drill Cover has the potential to scale globally and improve access to safe orthopaedical trauma surgery worldwide.'

Item 22. Conflicts of interest, ethical approval, and informed consent

(i) Specify any potential conflicts of interest; (ii) include the ethics committee or institutional review board approval (and the number when applicable); and (iii) provide the informed consent for publication.

Example 66: Video assisted thoracoscopic (VATS) left main bronchial sleeve resection with intracorporeal bronchial anastomosis using barbed sutures: a case report (52)

'*Conflicts of Interest:* The author has completed the ICMJE uniform disclosure form (available at https://dx.doi.org/10.21037/

jovs-20-120). TA serves as an unpaid editorial board member of *Journal of Visualized Surgery* from June 2019 to May 2023. The author has no other conflicts of interest to declare.'

Example 67: Cerebrospinal fluid drainage complications during first stage and completion fenestrated-branched endovascular aortic repair (53)

'Author Conflicts of interest: J.M.K. has received personal research grants from following nonprofit organizations: Paulo Foundation (Finland), The Finnish Medical Foundation, Orion Research Foundation (Finland), Finnish Surgical Society, and Finnish Society for Vascular Surgery. G.S.O. has received consulting fees and grants from Cook Medical, W. L. Gore & Associates, and GE Healthcare (all paid to Mayo Clinic with no personal income). T.J.K. is a consultant for SpineThera. These organizations did not have any part in this study.'

Example 68: Are Postoperative Intravenous Antibiotics Indicated After Laparoscopic Appendicectomy for Simple Appendicitis? A Prospective Double-blinded Randomized Controlled Trial (13)

'The study was approved by the institutional Human Research Ethics Committee (HREC: REC11282B) and was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12611000919910) before the recruitment of patients.'

Example 69: Video assisted thoracoscopic (VATS) left main bronchial sleeve resection with intracorporeal bronchial anastomosis using barbed sutures: a case report (52)

'All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.'

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