Difficult Conditions in Laparoscopic Urologic Surgery

Ahmed Al-Kandari
Inderbir S. Gill
Editors

Springer

Difficult Conditions in Laparoscopic Urologic Surgery

Ahmed M. Al-Kandari • Inderbir S. Gill
(Editors)

Difficult Conditions in Laparoscopic Urologic Surgery

Springer

Editors
Ahmed M. Al-Kandari
Department of Surgery (Urology)
Faculty of Medicine,
Kuwait University, Jabriyah
Kuwait

Inderbir S. Gill
Department of Urology
University of Southern California,
Los Angeles, CA
USA

ISBN 978-1-84882-104-0 e-ISBN 978-1-84882-105-7
DOI 10.1007/978-1-84882-105-7
Springer London Dordrecht Heidelberg New York

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Cover design: eStudioCalamar, Figueres/Berlin

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Laparoscopic surgery has changed the way that many surgical conditions are managed. Urologists are among the specialists who pioneered the field of laparoscopy and continued to improve and explore more technical methods that have led to successful procedures, with excellent functional outcome and minimal morbidity. The collaborative efforts that we, the editors, have had together from the live transmission of a laparoscopic conference by Dr. Gill from the United States to operating together on multiple visits have resulted in this book.

When I suggested this book idea to Dr. Gill two years ago, he supported it immediately since he and I felt the need to educate junior and even senior urologists about the safest ways to do laparoscopic urologic surgery. Laparoscopic urologic procedures have recently duplicated most open surgical procedures in an efficient and accurate way with the least morbidity, confirming that it is minimally invasive surgery. This has led more urologists and patients to request laparoscopic surgery to deal with their conditions. Subsequently, we felt an essential need to educate junior urologists, like residents and fellows, as well as urologists interested in learning and performing laparoscopic urologic procedures.

This book is unique in that it will review common, useful information about certain laparoscopic procedures, including technique and instruments, and then discuss common difficulties faced during each operation. We also discuss the uncommon and occasionally even anecdotal cases and the safest ways to deal with them.

We are honored to have a group of world experts in laparoscopic urologic surgery valuably contribute to our book. This book is medium sized and includes a good number of illustrative pictures, drawings, and images that aim to make reading it informative, educational, and interesting. This book is good preoperative refresher reading that will remind the surgeon regarding important steps and possible difficulties.

We hope that this book will continue to accumulate experiences of difficult conditions in laparoscopic surgery and add to the literature in a more instructive way in the future.

Ahmed M. Al-Kandari
Inderbir S. Gill

Contents

Contributors

Amr M. Abdel-Hakim, MBBcH MSc Urol MD Urol
Department of Urology,
Cairo University, Cairo,
Egypt

Mahmoud A. Abdel-Hakim, MD Dr. med. PhD FEBU
Department of Urology, Cairo University,
Sahafeen, Cairo, Egypt

Angus G. Alexander, MBBCh FCS (SA) Cert. Paeds. Surg. (UCT)
Department of Pediatric Urology,
The Hospital for Sick Children,
Toronto, ON, Canada

Ahmed M. Al-Kandari, BM BCh FRCS(C)
Department of Surgery (Urology),
Faculty of Medicine, Kuwait University,
Jabriyah, Kuwait

Alireza Aminsharifi, MD
Department of Urology,
Shiraz University of Medical Sciences,
Shiraz, Fars, Iran

Juan C. Astigueta Pérez, MD
Department of Urology,
Instituto Regional de Enfermedades Neoplasicas Norte, Trujillo, La Libertad,
Peru

Mohamed A. Atalla, MD
The Arthur Smith Institute for Urology,
Hofstra University Medical School,
North Shore LIJ Health System,
New Hyde Park, New York, USA

Andre Berger, MD
Department of Urology,
University of Southern California,
Los Angeles, CA, USA

Ricardo Brandina, MD
Department of Urology,
University of Southern California,
Los Angeles, CA, USA

David Canes, MD
Department of Urology,
Lahey Clinic Hospital, Burlington,
MA, USA

Sanket Chauhan, MD
Department of Urologic Surgery,
Global Robotics Institute,
Florida Hospital-Celebration Health,
Celebration, FL, USA

Mahesh R. Desai, MS FRCS(Edin) FRCS(Eng)
Department of Urology,
Muljibhai Patel Urological Hospital,
Nadlad, Gujarat,
India

Philip J. Dorsey, Jr., MD MPH
Department of Urology,
Tulane University School of Medicine,
New Orleans, Louisiana, USA

Ahmed S. El-Feel, MD Dr. med. PhD FEBU
Department of Urology, Cairo University,
Dokki, Cairo, Egypt

Ahmed R. El-Nahas, MD
Department of Urology,
Urology and Nephrology Center,
Mansoura, Dakahlia, Egypt

Walid A. Farhat, MD FRCS C
Department of Surgery,
Sickkids Hospital, University of Toronto,
Toronto, Ontario, Canada

Golena Fernández Moncaleano, MD
Department of Urology,
Fundación Universitaria de Ciencias de la Salud–Hospital de San José (University Foundation of Health Science–Saint Joseph Hospital), Bogotá, Columbia

Arvind P. Gapule, MS(Surgery) DNB(Genitourinary surgery) MNAMS
Division of Laparoscopic Surgery,
Department of Urology,
Muljibhai Patel Urological Hospital,
Nadlad, Gujarat, India

Ahmed E. Ghazi, MD, MSc FEBU
Department of Urology,
Krankenhaus der Elisabethinen Linz,
Linz, Austria

Camilo Andrés Giedelman Cuevas, MD
Department of Urology,
Centro de Cirugía Robotica y de Invasion Minima, Instituto Medico La Floresta,
Caracas, Venezuela

Inderbir S. Gill, MD
Department of Urology,
University of Southern California,
Los Angeles, CA, USA

Raj K. Goel, MD
Department of Urology,
University of Western Ontario Schulich School of Medicine, Windsor, ON,
Canada

Khurshid A. Guru, MD
Department of Urology,
Roswell Park Cancer Institute,
Buffalo, NY, USA

Ahmed M. Harraz, MD
Department of Urology,
Urology and Nephrology Center,
Mansoura, Dakahlia, Egypt

Hamdy M. Ibrahim, MD
Department of Urology,
Fayoum University, Fayoum, Egypt

Günter Janetschek, MD
Department of Urology,
Medical University of Salzburg,
Salzburg, Austria

Jihad H. Kaouk, MD
Center for Laparoscopic and Robotic Surgery, Cleveland, OH, USA

Louis R. Kavoussi, MD
The Arthur Smith Institute for Urology,
Hostra University Medical School,
North Shore LIJ Health System,
New Hyde Park, NY, USA

Rakesh V. Khanna, MD
Glickman Urological and Kidney Institute,
Cleveland Clinic, Cleveland,
OH, USA

Ahmed M. Mansour, MD MRCS
Department of Urology,
Roswell Park Cancer Institute,
Buffalo, NY, USA

Shashikant Mishra, MD
Department of Urology,
Muljibhai Patel Urological Hospital,
Nadlad, Gujarat, India

Akbar Nouralizadeh, MD
Department of Urology,
Shahid Labbafinejad Hospital, Urology and Nephrology Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Kenneth Palmer, MD
Department of Urologic Surgery,
Global Robotics Institute,
Florida Hospital-Celebration Health,
Celebration, FL, USA

Manoj B. Patel, MD
Department of Urologic Surgery,
Global Robotics Institute,
Florida Hospital-Celebration Health,
Celebration, FL, USA

Vipul R. Patel MD
Department of Urologic Surgery,
Global Robotics Institute,
Florida Hospital-Celebration Health,
Celebration, FL, USA

Amr M. Sayed, MD
Department of Anesthesia, Intensive Care Medicine and Pain Management,
Ain Shams University, Cairo, Egypt

Hani S. Shaaban, MD MSc
Department of Surgery, Adan Hospital,
Reqqa, Ahmadi, Kuwait

Shrenik Shah, MCh
Department of Urology,
Civil Hospital and B J Medical College,
Ahmedabad, India

Ahmed A. Shokeir, MD PhD FEBU
Department of Urology,
Urology and Nephrology Center,
Mansoura, Egypt

Nasser Simforoosh, MD
Department of Urology,
Shahid Labbafinejad Hospital,
Urology and Nephrology Research Center,
Shahid Beheshti University of Medical Sciences, Tehran, Iran

Rene J. Sotelo Noguera, MD
Department of Urology,
Centro de Cirugía Robotica y de Invasion Minima, Instituto Médico la Floresta,
Caracas, Venezuela

Robert J. Stein, MD
Center for Laparoscopic and Robotic Surgery, Glickman Urological and Kidney Institute, Cleveland Clinic, Cleveland,
OH, USA

Gerald Y. Tan, MB ChB (Edinburgh) MRCS (Edinburgh) M Med (Surgery) FAMS (Urology) FICS
Department of Urology, Tan Tock Seng Hospital, Singapore

Ashutosh K. Tewari, MD MCh
Ronald P. Lynch Professor of Urologic Oncology and Director, Lefrak Institute of Robotic Surgery Brady Foundation,
Department of Urology Weill Medical College of Cornell University, New York Presbyterian Hospital, New York, USA

Wesley M. White, MD
Division of Urologic Surgery,
The University of Tennessee Medical Center, Knoxville, TN, USA

Eboni J. Woodard, MD
The Arthur Institute for Urology,
Hofstra University Medical School,
North Shore LIJ Health System,
New Hyde Park, NY, USA

Introduction

1

Ahmed M. Al-Kandari and Inderbir S. Gill

Minimally invasive therapy is evolving as a newly accepted modality for different surgical specialties. This is due to improvements in equipment and techniques of different procedures. Urology has been at the forefront of developing these minimally invasive surgical procedures.

Laparoscopic urologic procedures are now the result of decades of improvements, starting with inspection, ablation, and reconstruction, and moving towards robotic-assisted and single-port techniques. The learning curve for each procedure is an important aspect of improvement and mastering.

It is essential that beginners in laparoscopic urologic procedures know all the steps and laparoscopic anatomy for common, straightforward cases. They should master these procedures before doing more difficult ones. In each laparoscopic urologic procedure, there are some difficult steps that the surgeon must be aware of and understand how to deal with in order to accomplish the procedure safely.

In this book, the editors aim to collect the experience of worldwide experts in laparoscopic urologic procedures. The format of the chapters is easy-to-read, with an introduction and description of the difficulties, and then examples illustrated with pictures. The solutions that the authors have used to overcome difficulties are also discussed. Finally, a conclusion summarizes the chapter. The purpose of this book is to serve as a practical guide for residents, fellows, and urologists at the beginning of their experience in laparoscopy. It may also be useful to experienced laparoscopic urologists who wish to learn more about what their colleagues from different institutions and different countries are doing.

It is the editors' hope that the illustrations, in addition to the website with samples of video materials, will be a great help in fully understanding the material included in this book.

In this introductory chapter, we provide comments to supplement the information provided in other chapters in order to enhance the book's insights.

A.M. Al-Kandari (✉)
Department of Surgery (Urology), Faculty of Medicine, Kuwait University, Jabriyah, Kuwait
e-mail: drakandari@hotmail.com

A.M. Al-Kandari and I.S. Gill (eds.), *Difficult Conditions in Laparoscopic Urologic Surgery*,
DOI: 10.1007/978-1-84882-105-7_1, © Springer-Verlag London Limited 2011

Chapter 3: Difficulties in Anesthesia for Urologic Laparoscopy

- The urologist willing to start or advance in their laparoscopic procedure should develop a good relationship with the anesthetist. Communication with the anesthetist during lengthy laparoscopic surgery is important, especially during the initial learning curve.
- Careful preoperative general medical evaluation, especially for patients with pre-existing medical problems, is essential for a successful and safe post laparoscopic outcome.
- Careful patient positioning and padding of pressure areas are important to avoid post-operative position-related complications.

Chapter 4: Difficulties in Urologic Laparoscopic Instrumentation

- Detailed knowledge of all the necessary laparoscopic instruments should be completely mastered by the surgeon and the surgical team to prevent avoidable instrument problems.
- Access-related problems can be safely avoided with thorough surgical anatomical knowledge and specific preparation for each case.
- Particular care is required when obtaining laparoscopic access in obese, thin, and pediatric cases.
- Good laparoscopic access should allow for easy visualization and reach of the target organs with ergonomic instrument handling.

Chapters 7–8: Laparoscopic Radical Nephrectomy

- Preoperative preparation of vascular anatomy and a tumor in relation to adjacent structures is a helpful method to avoid difficulties.
- The use of all possible helpful equipment and respect for oncological principles is essential for safe surgery.

Chapter 9: Difficulties in Laparoscopic Live Donor Nephrectomy

- Preoperative planning with computed tomography (CT) angiography is essential for safe surgery.
- The editors prefer the transperitoneal access, which provides more operative room.
- Hem-o-lok® (Teleflex Medical, Research Triangle Park, NC) clipping for the artery is safe and the editors use the endovascular stapler for the vein after complete kidney mobilization.
- Careful dissection of the ureter with the gonadal vessels is important to avoid ischemic damage to the ureter.

Chapter 12: Difficulties in Laparoscopic Adrenalectomy

- Both retroperitoneal and transperitoneal accesses are used; one must choose their preference according to experience and comfort level with the approach.

- In the transperitoneal approach, full mobilization of the spleen on the left side and the liver on the right side are important and helpful movements that will expose the adrenal efficiently.
- Thermal energy instruments are helpful tools for adrenal dissection and mobilization.

Chapter 14: Difficulties in Laparoscopic Simple Prostatectomy

- This technique is definitely less invasive than open prostatectomy.
- Intraperitoneal, extraperitoneal, and transvesical techniques can be used in this procedure.
- Traction on the middle lobe with traction suture is helpful in facilitating the enucleation.
- The use of thermal energy devices, such as ultrasonic devices, can be helpful in minimizing oozing when enucleating the adenoma.

Chapter 16: Difficulties in Robotic Radical Prostatectomy

- The the transperitoneal approach is preferred because it provides a larger working space.
- The editors prefer the descending approach, in which seminal vesicles and vas are dissected first.
- Managing the dorsal vein complex can be done with suture as well as an endovascular stapler.
- Avoiding thermal sources in nerve sparing cases is essential for better potency outcomes.
- Currently more robotic-assisted radical prostatectomies are done in the USA, which suggests that they may replace standard laparoscopy.

Chapter 19: Difficulties in Laparoscopic Retroperitoneal Lymph Node Dissection

- This technique should be performed by experienced laparoscopic surgeons.
- This technique is far less invasive than open surgery, and the patient should be offered this option when an experienced surgeon is available.

Chapter 21: Difficulties in Laparoscopic Pyeloplasty

- The editors prefer transperitoneal access, which allows more operative room to suture, although the retroperitoneal route is quite acceptable if the surgeon feels comfortable with it.
- In thin individuals and on the left side, the transmesocolic approach is very helpful.
- Careful dissection of the ureteropelvic junction (UPJ) and handling of the important crossing vessels are essential.
- Traction suture on the pelvis can be a helpful trick for good exposure.
- Delicate handling of the UPJ is important while suturing to avoid ischemic injury due to tissue crushing.

- Pre- or intra-operative ureteral stenting is equally acceptable and depends on the surgeon's experience.

Chapter 22: Difficulties in Laparoscopic Surgery for Urinary Stones

- Most stone interventions utilize shockwave lithotripsy, percutaneous nephrolithotomy or ureteroscopy, and to lesser extent laparoscopy, and, rarely, in some centers, open surgery.
- Complete stone removal with careful dissection of the ureter or renal pelvis and accurate incision are important technical issues in laparoscopic stone surgery to minimize postoperative difficulties and morbidities.

Chapter 27: Difficulties in Laparoscopic Pediatric Urologic Surgery

- It is important to know that not all laparoscopic surgeons will deal with pediatric cases. However, if one decides to take on pediatric cases, then knowledge of the detailed technical steps and instruments is crucial.
- Inserting trocars in children should be carefully assessed to avoid trocar-related injuries since children have small organ anatomy with shorter distances in comparison to adults.

Chapter 30: Difficulties in Laparoscopic Training, Mentoring, and Medico-Legal Issues

- If a surgeon is keen to learn laparoscopy and has the required skills, then it is not too late.
- Various worldwide courses of laparoscopy are very helpful in learning about laparoscopy, from beginner to advanced levels.
- Visiting experts or inviting them to your institution and assisting them while performing laparoscopic procedures can help one to learn important steps.

These are just a few comments about some of the aspects of laparoscopic urologic procedures that the editors wanted to share with readers. It is our hope that, by adding them, readers will find the book more informative and helpful.

Difficulties in Laparoscopic Access

2

Hamdy M. Ibrahim, Hani S. Shaaban, Ahmed M. Al-Kandari, and Inderbir S. Gill

Introduction

Laparoscopic surgery has developed rapidly over the last few years, and many surgical procedures formerly carried out through large abdominal incisions are now performed laparoscopically. Reduction of the trauma of access by avoidance of large wounds has been the driving force for such development.[1] However, the insertion of needles and trocars necessary for the pneumoperitoneum and the performance of the procedure are not without risk.[2] The technical modifications imposed by surgical laparoscopy are obvious (e.g., number and size of trocars, location of insertion sites, specimen retrieval), and therefore morbidity may be substantially modified. Complications such as retroperitoneal vascular injury, intestinal perforation, wound herniation, wound infection, abdominal wall hematoma, and trocar site mestastasis have been reported.[3]

Laparoscopy currently plays a key role in urological surgery. Its applications are expanding with experience and evolving data confirming equivalent long-term outcome. Although significant port-site complications are uncommon, their occurrence impacts significantly on perioperative morbidity and rate of recovery. The incidence of such complications is inversely related to surgeon experience. Ports now utilize bladeless tips to reduce the incidence of vascular and visceral injuries, and subsequently port-site herniation. Metastases occurring at the port site are preventable by adhering to certain measures. Whether performing standard or robot-assisted laparoscopy, port-site creation and maintenance is critical in ensuring minimal invasiveness in laparoscopic urological surgery. Although patient factors can be optimized perioperatively and port design continues to improve, it is clear that adequate training is central in the prevention, early recognition, and treatment of complications related to laparoscopic access.[4] Despite numerous recent technical advances in minimally invasive surgical technique, the potential exists for serious morbidity during initial laparoscopic access. Laparoscopic access entry injuries are reported at rates of 0.05–0.3%. Such injuries likely occur more frequently than reported and carry a mortality rate as high as 13%.[5,6] Studies have shown that no trocar design, including safety shields

H.M. Ibrahim (✉)
Department of Urology, Fayoum University, Fayoum, Egypt
e-mail: hamdyibrahim4@yahoo.com

A.M. Al-Kandari and I.S. Gill (eds.), *Difficult Conditions in Laparoscopic Urologic Surgery*,
DOI: 10.1007/978-1-84882-105-7_2,

and direct-view trocars, can completely prevent serious injuries.[6–8] Safe access depends on adhering to well-recognized principles of trocar insertion, knowledge of abdominal anatomy, and recognition of the hazards imposed by previous surgery.[9]

Anatomical Considerations

Abdominal wall anatomy should receive special attention prior to laparoscopy because many laparoscopic complications result from trocar placement.

Abdominal Scars

Previous surgery is associated with a greater than 20% risk of adhesions of bowel or omentum to the anterior abdominal wall. Of special concern are incisional scars immediately adjacent to the umbilicus because bowel adherent underneath the umbilicus may be at risk for injury, regardless of the technique used. In addition to location, the width and depth of the scar should be evaluated because a wide or retracted scar may be associated with an increased risk of intra-abdominal adhesion formation, although no data are available to support this observation. If the dome of the bladder is involved, there is increased risk of bladder injury at the time of suprapubic trocar placement.[10]

Abdominal Wall Thickness

Although abdominal thickness correlates with patient weight, short stature or truncal obesity may increase abdominal wall thickness out of proportion to patient weight. Routine evaluation of the abdominal wall prior to laparoscopy is important because the success of trocar insertion may depend on altering the technique based on abdominal wall thickness.[11]

Umbilicus

The umbilicus should be examined for signs of umbilical hernia. Techniques for trocar insertion should be adjusted, and closure of the defect should be considered. In the absence of incarcerated bowel, the skin over the hernia can be carefully incised and the peritoneal cavity entered using an open technique.

Abdominal Wall Vessels

The anterior abdominal wall contains two sets of bilateral vessels: the superficial and the inferior (deep) epigastric vessels. These arteries originate from the femoral and external iliac arteries, respectively, and are accompanied by a large vein in most cases. Immediately

above the symphysis pubis, they are both located an average of 5.5 cm from the midline and course either laterally or cephalad. In order to avoid injuring these vessels during lateral trocar placement, the superficial vessels should be visualized by transillumination and the inferior vessels should be laparoscopically visualized whenever possible.[12]

Port Design

Port design has also improved significantly since the beginning of urological laparoscopy. Initially pyramidal cutting trocars were the mainstay. Trocars with shielded blades were then developed and are still the preferred port type in many centers. More recently, non-bladed trocars are increasingly being used as a growing number of studies suggest reduced complication rates. These ports spread muscle and fascia rather than incise it and theoretically allow spontaneous re-approximation after trocar removal. A randomized prospective multicenter trial comparing radially expanding trocars to standard cutting trocars, in gastrointestinal surgery, has shown significantly reduced wound complications in the radial expansion group.[13,14]

Two primary entry systems are available in laparoscopy: the first-generation conventional entry method where the push-through spike principle is applied, and the second-generation entry method where the Archimedes spin principle is employed.

Conventional entry, irrespective of make or model of instrument, requires two components, a central trocar with a sharp cutting, or pointed, distal end and an encasing cannula. Surgeons palm the access instrument with the dominant hand and apply considerable penetration force (PF), generated through the dominant upper arm muscles, axially at port site, to push the spike across different tissue layers towards the intended body cavity. Several versions, modifications, and models have attempted to render this entry system less hazardous while maintaining the spike and cannula design.

The second-generation entry method uses the spin principle, where the entry instrument comprises a threaded cannula only, which ends in a notched blunt tip. No central trocar is required as a laparoscope is mounted into the cannula during insertion and removal. No axial PF is applied; tissue layers part radially and the visually guided cannula pulls tissue up along its outside thread using Archimedes' principle.[15]

Conventional primary port insertion requires application of considerable axial PF to the push through the trocar cannula access unit. The anterior abdominal wall dents towards the viscera; entry is blind and uncontrolled with the probability of overshoot. The compilation of these potentially dangerous performance shaping factors (PSFs) during primary port insertion renders access less forgiving and sets the stage for inadvertent injury.

Second-generation entry systems cushion human error through system redesign and avoid integration of identified PSF. Error recognition is likely when mishaps occur and error recovery is possible before the situation evolves and harms the patient. When specific PSFs of conventional entry are eliminated during primary entry, port placement becomes less hazardous. Interactive and real-time visual entry avoids application of axial force at port site, requires no sharp or pointed trocars, and allows for controlled port placement.[16]

Port Insertion Techniques

Laparoscopic approaches to the urological organs and the prostate can be performed using the retroperitoneal or transperitoneal approach. Each approach has distinct advantages and disadvantages. Laparoscopic radical nephrectomy and adrenalectomy have been performed most commonly via the transperitoneal approach. In general, the retroperitoneal approach is used less frequently because the working space is smaller, landmarks are less easily identified, and the operative strategy requires a steeper learning curve. However, the retroperitoneal location of the kidney and adrenal allows a more direct approach without the need to mobilize or retract the viscera. In addition, it provides greater direct access to the vasculature and drainage systems of the urological organs.[17]

The Transperitoneal Approach

There are three main options for initial port insertion: closed access using the Verres needle, open Hasson technique, or use of an optical port. The site of insertion depends on the procedure and whether the site is approached trans- or retroperitoneally. To avoid the epigastric vessels, the site is generally located lateral to the rectus abdominus or just below the tip of the 12th rib, respectively, in upper renal tract laparoscopy. In pelvic laparoscopy, the site is para- or infraumbilical, according to the type of approach.

Closed Access

Using the Veress Needle

This procedure involves blind insertion of the Veress needle to create a pneumoperitoneum. The needle design allows tactile feedback as it passes through various layers of the abdominal wall. Intra-abdominal pressure is initially set at 15–20 mm Hg for primary port insertion, which is done via inserting a separate port-site system. In upper-tract laparoscopy with the patient in the flank position, the needle can be inserted in the iliac fossa or upper quadrant.[18]

The insertion site should always be away from previous surgical scars to reduce the risk of visceral injury. The Veress needle is placed in the midclavicular line at the level of the umbilicus in patients without previous open abdominal surgery, while in those with previous open surgery the needle is placed in the ipsilateral abdominal quadrant farthest from the previous incision. After placing the Veress needle into the peritoneal cavity, insufflation to 15 mmHg pneumoperitoneum is established. Certain safety steps are used to confirm entry into the peritoneal cavity, including absence of gas or blood at aspiration of a syringe through the Veress needle, injection of 5 cc saline that cannot be aspirated, low initial intraperitoneal pressure, and no rapid increase in intraperitoneal pressure at the commencement of insufflation. If any of these steps are not satisfactory, the Veress needle

is removed and reinserted. No more than three attempts are made with the Veress needle. If still unsuccessful, open trocar placement or a nonbladed visualizing trocar entry technique is used for direct vision into the peritoneal cavity. Radially expandable sheaths are the most commonly used trocars.[19,20]

Open Access

Using the Hasson Technique

The open procedure is carried out as follows: A 1.5-cm semicircular incision in the inferior border of the umbilicus is made and the subcutaneous tissue dissected. The fascia is then grasped with two Kocher clamps and lifted to separate these layers from the underlying viscera. The fascia and peritoneum are incised with scissors to gain access to the peritoneal cavity. The fascial defect is secured by passing two single stitches on both sides of the incision, aiming to avoid any gas leak. Afterward, the Hasson's blunt tip trocar is inserted and attached to both sutures. Subsequently, the insufflator is connected to the trocar and pneumoperitoneum is established.[21]

Using the Bailez Technique

A variation of the Hasson technique for laparoscopic access has been developed in children. Access to the peritoneal cavity is obtained using the following approach: a semicircumferential incision is made in the inferior part of the umbilicus and the umbilical skin lifted and dissection carried out underneath to expose the area of the umbilical scar where the peritoneum and the skin meet. On separating the skin from the peritoneum, the abdominal cavity is opened without an incision. The opening is sometimes enlarged with a hemostat to allow the introduction of a blunt nonarmed 5- or 10-mm trocar into the peritoneal cavity without forceful manipulation (Fig. 2.1). The rest of the procedure is accomplished as usual. At the end of the procedure, the opening is closed with a polydioxanone figure-of-8 stitch and the skin reapproximated with 5-0 polyglactin subcuticular sutures.[22]

The open technique using a peritoneal cut-down and trocar insertion under direct visualization is associated with fewer problems than blind insertion of the Veress needle and primary trocar. Nevertheless, the Hasson technique, believed to be safer than blind insertion of the Veress needle, also carries the risk of potential complications. Hasson's experience with open laparoscopic access demonstrates complications related to primary access in 0.5% of patients.[23] In an effort to decrease the complications associated with the introduction of the first trocar, many variations of the Hasson technique have been proposed. Suggested alternatives include modifications to the traditional open approach, as well as techniques using a blunt tip trocar, a visualizing trocar, and a finger to gain initial access to the peritoneal cavity.[8,24,25] Others have suggested using an alternative site of entry for laparoscopy in patients with previous abdominal surgery.[26] The incision made in the Hasson technique is done infraumbilically where a considerable amount of subcutaneous fat can

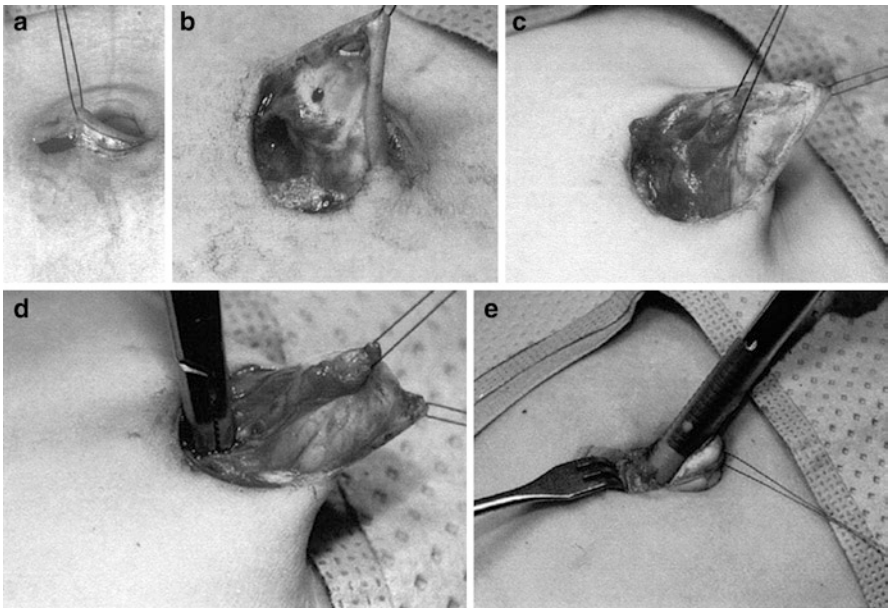

Fig. 2.1 (**a**) A semicircumferential incision is made in the inferior part of the umbilicus. (**b**) Umbilical skin lifted and dissection carried out underneath to expose the area of the umbilical scar. (**c**) Figure illustrating where the peritoneum and the skin meet. (**d**) The opening is sometimes enlarged with a hemostat. (**e**) The introduction of a blunt nonarmed 5 mm trocar

be encountered, while the technique described herein takes advantage of the fact that at the umbilicus the skin and peritoneum are in contact with each other without interposed fat. Therefore, this approach is believed to be advantageous for obese patients.[22]

Optical Access

Optical access trocars have been developed as an alternative method of peritoneal entry. The theoretical advantage of these trocars is that each layer can be identified prior to transection. Two visual entry systems are available: one system retains the conventional trocar and cannula push-through design, where the visual trocar transects abdominal myofascial layers by applying axial PF generated by the surgeon's dominant upper body muscles, while the second visual cannula system applies radial PF generated by the surgeon's much weaker dominant wrist muscles to part the abdominal myofascial layers.

The First Disposable Visual Entry System

This system retains a push-through trocar and cannula design where the spike principle recruits considerable PF thrust, denting tissues towards viscera. After pneumoperitoneum

is established with the Veress needle, the pressure is increased to 20 mm Hg. A Visiport™ (Covidien, Mansfield, MA), a disposable device consists of an optical obturator with a blunt, clear window at its distal tip and a recessed knife blade. Following the skin incision and blunt dissection into the fascia, the trocar connected to a 0° laparoscope is inserted. Under constant visualization, it is moved into the abdomen by activating the retracted blade at the instrument tip. The subcutaneous fatty tissue, anterior fascia of the rectus muscles, rectus muscles, posterior fascia of the rectus muscles, transversalis fascia, and peritoneum are traversed with slight rotating movements and moderate pressure. The trigger is activated when passing through fascia and peritoneum. The trocar advances by dilating the tissue planes and the correct position in the abdomen of the instrument can be recognized easily. After the peritoneal cavity is entered and pneumoperitoneum is started, the handpiece of the optical access trocar is removed and the 0° laparoscope is replaced with a 30° endoscope. All secondary trocars are placed under direct vision.[27]

The Second Reusable Visual Entry System

The Endoscopic Threaded Imaging Port (EndoTIP™) (Karl Storz, Tuttlingen, Germany), is a reusable visual entry cannula that may be used as a primary and ancillary port and may be used to perform intra- or retroperitoneal operations. It consists of a stainless steel proximal valve and distal hollow cannula section. A single thread winds diagonally on the cannula's outer surface, which ends distally in a blunt notched tip. EndoTIP™ is available in different lengths and diameters for different surgical applications. The reusable retaining ring, or Telescope Stopper (TS), keeps the mounted telescope from sliding out of focus during insertion. This system has no trocar and is a hollow threaded cannula with a blunt distal tip to engage abdominal tissue layers. It uses the Archimedes spin principle to tent tissue away from viscera, while relaying clear real-time monitor images of the port site. In addition, the outer thread avoids overshoot and renders port insertion and removal incremental and less forceful.[28] Despite visualization of tissue layers, these ports cannot prevent serious injuries as outlined by the review of the Food and Drug Administration's database by Sharp et al.[29]

The Retroperitoneal Approach

The retroperitoneoscopic approach to the kidney and adrenal has been described in detail previously.[30,31] Briefly, patients are given gentle bowel preparation and are positioned on the operative table in the full 90° flank position with the table flexed and the kidney rest elevated. The technique used is a three-port approach. A 1.5-cm incision is made at the tip of the 12th rib and the retroperitoneum is entered. A trocar-mounted 800-cc balloon is used to create a working space outside and posterior to Gerota's fascia. A 10-mm 30° laparoscope is used to visualize proper dilation through the balloon. Following balloon deflation, a 10-mm blunt port is inserted and CO_2 pneumoretroperitoneum is established under high flow at a patient pressure of 15 mm Hg.[17]

Two ancillary ports are then placed, of which the size depends on the indications; they may be 5 or 12 mm. One port is placed at the junction of the paraspinal muscles and the 12th rib, while the other is placed in the midaxillary line 2 cm above the anterior superior

iliac crest. The psoas muscle is identified, the intermediate stratum of the transversalis fascia is divided, and the kidney and adrenal are retracted anteromedial. Mobilization remains completely posterior to the kidney and/or adrenal until vascular control is complete. Further steps involving ablative techniques, radical or partial nephrectomy, ureterectomy, or adrenalectomy have been previously described.[17,32]

Laparoscopic Access Difficulties

Factors that cause difficulties in laparoscopic entry to the peritoneal cavity or the retroperitoneal space are mainly related to patient factors and to some extent to surgeon factors.

Patient Factors

Obesity

Obesity is an ever-increasing problem. A thick layer of adipose subcutaneous tissue limits access, especially in the insertion of the initial camera port. The angle of insertion is more critical as this adipose layer limits free rotational movement of working ports. Patients who are grossly obese are at a significantly greater risk of complications when undergoing laparoscopic surgery. It is generally recommended that an open (Hasson) technique should be performed for primary entry in patients who are morbidly obese, although even this technique may be difficult. If a Veress needle approach is used in the patient who is morbidly obese, it is important to make the vertical incision as deep as possible in the base of the umbilicus, since this is the area where skin, deep fascia, and parietal peritoneum of the anterior abdominal wall will meet. In this area, there is little opportunity for the parietal peritoneum to tent away from the Veress needle and allow preperitoneal insufflation and surgical emphysema. If the needle is inserted vertically, the mean distance from the lower margin of the umbilicus to the peritoneum is 6 cm (±3 cm). This allows placement of a standard length needle even in extremely obese women. Insertion at 45°, even from within the umbilicus, means that the needle has to traverse distances of 11–16 cm, which is too long for a standard Veress needle.[33,34]

Ports need to be placed closer to the operation site, or longer ports and instruments must be used. The potential risk of misplacement of ports with associated injury is also higher for those choosing initial Verres needle insufflation. Open Hasson access requires a larger skin incision to see in the obese patient, and the overall operation time is generally prolonged. If the surgeon realizes intraoperatively that he or she is far away or aiming with difficult angle to the target organ, then new ports should be inserted, which will make the procedure more efficient and close the previous ports.

Very thin patients are also potentially at risk of trocar-related injury, mainly with the primary port, as adjacent organs and major vessels are much closer to the abdominal wall. Great care, therefore, must be taken when performing first entry and a Hasson approach or insertion at Palmer's point is preferable in this situation.[11,35] Care and caution are essential when doing laparoscopy in children where open access may be advised and even

continuous monitoring of all the laparoscopic instruments is essential to avoid inadvertent injury during the surgery.

Previous Surgery in the Area of Interest

Previous surgery can influence laparoscopy in many ways. It may cause difficulty in placing a Verres needle because of abdominal wall adhesions and limitations in proper insufflation. In retroperitoneal laparoscopy, a previous significant breach of the retroperitoneum increases the potential for significant adhesions and limitations in creating a sufficient working space.[36]

The rate of adhesion formation at the umbilicus may be up to 50% following midline laparotomy and 23% following low transverse incision.[37] The umbilicus may not, therefore, be the most appropriate site for primary trocar insertion following previous abdominal surgery. The most usual alternative site is in the left upper quadrant, where adhesions rarely form, although even this may be inappropriate if there has been previous surgery in this area or splenomegaly. The preferred point of entry is 3 cm below the left costal margin in the mid-clavicular line (Palmer's point). A small incision is made and a sharp Veress needle inserted vertically. A check for correct placement using the pressure/flow test is performed. CO_2 is then insufflated to 20 mmHg pressure and a 2–5 mm endoscope is used to inspect the undersurface of the anterior abdominal wall in the area beneath the umbilicus. If this is free of adhesions, the trocar and cannula can be inserted under direct laparoscopic vision. If there are many adhesions present, it is possible to dissect these free via secondary ports in the lower left abdomen or an alternative entry site can be selected visually.[35]

If the initial intraperitoneal pressure is high (>10 mm Hg) and there is no rapid increase in intraperitoneal pressure at the commencement of insufflation, the Veress needle is removed and reinserted. No more than three attempts are made with the Veress needle. If still unsuccessful, open trocar placement or a nonbladed visualizing trocar entry technique is used for direct vision into the peritoneal cavity.[20]

Anatomical Variations

Patients with a large degree of hydronephrosis or giant hydronephrosis that crosses the midline and causes significant anatomic distortion are at risk of injury to the intra-abdominal organs. Open (Hasson) access into the peritoneum is performed to avoid injury to the already displaced abdominal contents.[38] Prelaparoscopic deflation of the hydronephrotic kidney with intraoperative or preoperative nephrostomy tube insertion may also be performed. Variation in the course and size of parietal vessels attributable to inferior vena caval obstruction or portal hypertension are also susceptible to provoking unexpected injuries to parietal vessels.[39]

Surgeon Factors

It is well established that both the retroperitoneal and transperitoneal approaches have distinct advantages and disadvantages with regard to urological laparoscopic surgery. In

practical terms, the selection of one approach over the other depends on an individual surgeon's experience and training.[40] Surgeon experience is paramount in getting a safe, versatile access and in reducing the rate of port-site and other complications. With experience comes skill at accurate port placement, preventing inadvertent injury as well as maximizing surgical ergonomics, and, therefore, reducing fatigue.[31]

Conclusion

Gaining safe and accurate access is the first and most important step in achieving a safe and efficient laparoscopic surgery. Detailed knowledge of the organ anatomy and prior surgical history with availability of all the important surgical tools is an important requirement to do safe laparoscopy.

Caution is vital in laparoscopic access and especially in children and thin or obese patients, and also in patients with previous surgeries. Open access is always an alternative for safe laparoscopy in difficult case scenarios.

References

1. Cuschieri A. Minimal access surgery and the future of interventional laparoscopy. *Am J Surg*. 1991;161:404-407.
2. Fitzgibbons RJ, Salerno GM, Filipi CJ. Open laparoscopy. In: Zucker KA, ed. *Surgical Laparoscopy*. St. Louis, MO: Quality Medical Publishing; 1991:87-97.
3. Mayol J, Garcia-Agular J, Ortiz-Oshiro E, De-Diego Carmona JA, Fernandez-Represa JA. Risks of the minimal access approach for laparoscopic surgery: multivariate analysis of morbidity related to umbilical trocar insertion. *World J Surg*. 1997;21:529-533.
4. Pemberton JR, Tolley DA, Van Velthoven RF. Prevention and management of complications in urological laparoscopic port site placement. *Eur Urol*. 2006;50:958-968.
5. Chandler JG, Corson SL, Way LW. Three spectra of laparoscopic entry access injuries. *J Am Coll Surg*. 2001;192:478-490.
6. Bhoyrul S, Vierra MA, Nezhat CR, Krummel TM, Way LW. Trocar injuries in laparoscopic surgery. *J Am Coll Surg*. 2001;192:677-683.
7. Schäfer M, Lauper M, Krähenbühl L. Trocar and Veress needle injuries during laparoscopy. *Surg Endosc*. 2001;15:275-280.
8. Catarci M, Carlini M, Gentileschi P, Santoro E. Major and minor injuries during the creation of pneumoperitoneum. A multicenter study in 12,919 cases. *Surg Endosc*. 2001;15:566-569.
9. Antevil JL, Bhoyrul S, Brunson ME, Vierra MA, Swadia ND. Safe and rapid laparoscopic access – a new approach. *World J Surg*. 2005;29:800-803.
10. Godfrey C, Wahle GR, Schilder JM, Rothenberg JM, Hurd WW. Occult bladder injury during laparoscopy: report of two cases. *J Laparoendosc Adv Surg Tech A*. 1999;9:341-345.
11. Hurd WW, Bude RO, DeLancey JO, Gauvin JM, Aisen AM. Abdominal wall characterization with magnetic resonance imaging and computed tomography. The effect of obesity on the laparoscopic approach. *J Reprod Med*. 1991;36:473-476.
12. Hurd WW, Amesse LS, Gruber JS, Horowitz GM, Cha GM, Hurteau JA. Visualization of the bladder and epigastric vessels prior to trocar placement in diagnostic and operative laparoscopy. *Fertil Steril*. 2003;80:209-212.

13. Shafer DM, Khajanchee Y, Wong J, Swanström LL. Comparison of five different abdominal access trocar systems: analysis of insertion force, removal force and defect size. *Surg Innov*. 2006;13(3):183-189.
14. Leibl BJ, Schmedt CG, Schwarz J, Kraft K, Bittner R. Laparoscopic surgery complications associated with trocar tip design: review of literature and own results. *J Laparoendosc Adv Surg Tech A*. 1999;9:135-140.
15. Corson SL, Chandler JG, Way LW. Survey of laparoscopic entry injuries provoking litigation. *J Am Assoc Gynecol Laparosc*. 2001;8:341-347.
16. Ternamian AM. A trocarless, reusable, visual-access cannula for safer laparoscopy; an update. *J Am Assoc Gynecol Laparosc*. 1998;5(2):197-201.
17. Viterbo R, Greenberg RE, Al-Saleem T, Uzzo RG. Prior abdominal surgery and radiation do not complicate the retroperitoneoscopic approach to the kidney or adrenal gland. *J Urol*. 2005;174:446-450.
18. Aron M, Desai MM, Rubenstein M, Gill I. Laparoscopic instrumentation. In: de la Rosette J, Gill I, eds. *Laparoscopic Urologic Surgery in Malignancies*. Berlin, Germany: Springer; 2005:271-285.
19. Marcovich R, Del Terzo MA, Wolf JS Jr. Comparison of transperitoneal laparoscopic access techniques: Optiview visualizing trocar and Veress needle. *J Endourol*. 2000;14:175-179.
20. Seifman BD, Dunn RL, Wolf JR. Transperitoneal laparoscopy into the previously operated abdomen: effect on operative time, length of stay and complications. *J Urol*. 2003;169: 36-40.
21. Fitzgibbons RJ, Salerno GM, Filipi CJ. Open laparoscopy. In: Zucker KA, ed. *Surgical Laparoscopy*. St. Louis, MO: Quality Medical Publishing; 1991:87-97.
22. Franc-Guimond J, Kryger J, González R. Experience with the Bailez technique for laparoscopic access in children. *J Urol*. 2003;170:936-938.
23. Hasson HM, Rotman C, Rana N, Kumari NA. Open laparoscopy: 29-year experience. *Obstet Gynecol*. 2000;96:763-766.
24. String A, Berber E, Foroutani A, Macho JR, Pearl JM, Siperstein AE. Use of the optical access trocar for safe and rapid entry in various laparoscopic procedures. *Surg Endosc*. 2001;15: 570-573.
25. Grundsell H, Larsson G. A modified laparoscopic entry technique using a finger. *Obstet Gynecol*. 1982;59:509-510.
26. Gersin KS, Heniford BT, Arca MJ, Ponsky JL. Alternative site entry for laparoscopy in patients with previous abdominal surgery. *J Laparoendosc Adv Surg Tech A*. 1998;8:125-130.
27. Thomas MA, Rha KH, Ong AM, et al. Optical access trocar injuries in urological laparoscopic surgery. *J Urol*. 2003;170:61-63.
28. Ternamian AM. Laparoscopy without trocars. *Surg Endosc*. 1997;11:815-818.
29. Sharp HT, Dodson MK, Draper ML, Watts DA, Doucette RC, Hurd WW. Complications associated with optical-access laparoscopic trocars. *Obstet Gynecol*. 2002;99:553-555.
30. Gill IS. Laparoscopic radical nephrectomy for cancer. *Urol Clin North Am*. 2000;27: 707-719.
31. Fahlenkamp D, Rassweiler J, Fornara P, Frede T, Loening SA. Complications of laparoscopic procedures in urology: experience with 2, 407 procedures at 4 German centers. *J Urol*. 1999;162:765-771.
32. Sung GT, Gill IS. Anatomic landmarks and time management during retroperitoneoscopic radical nephrectomy. *J Endourol*. 2002;16:165-169.
33. Holtz G. Insufflation of the obese patient. In: Diamond MP, Corfman RS, DeCherney AH, eds. *Complication of Laparoscopy and Hysteroscopy*. 2nd ed. Oxford, United Kingdom: Blackwell Science; 1997:22-25.
34. Hurd WH, Bude RO, DeLancey JO, Gauvin JM, Aisen AM. Abdominal wall characteristics with magnetic resonance imaging and computed tomography. The effect of obesity on the laparoscopic approach. *J Reprod Med*. 1991;36:473-476.