European Association of Urology

GUIDELINES ON LAPAROSCOPY

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1. INTRODUCTION

A group of European urologists, each with a special interest in laparoscopy, has reviewed the published literature in order to provide guidelines for this subspeciality. In considering the role of a particular laparoscopic procedure as an alternative to its open counterpart, it must be stated that there is sometimes minimal evidence to support the use of, what historically has been understood to be, an established open procedure. This group has therefore established new standards of quality. Despite the lack of Level One evidence or Grade A recommendations, the Laparoscopy Working Group of the EAU feels that laparoscopy has a significant role to play in the practice of urology. Indeed, laparoscopy is a surgical field with a tremendous continuing development, both technological and methodological; it means that we are dealing with procedures worthy of particular consideration.

In these guidelines, the term 'laparoscopy' is used to describe every surgical technique carried out in a closed space, either enlarged or created, regardless of whether or not the technique is performed either inside or outside the peritoneum.

The Laparoscopy Working Group has browsed all the literature available on laparoscopy, published between 1990 and 2000, as well as some published in 2001. References are quoted according to the criteria described in Sections 1.1 and 1.2 (see below).

1.1 Methods of guideline development (1)

Woolf (1992) described three main methods of guideline development: informal, consensus, formal consensus, and evidence-linked guideline development (2).

In *informal consensus* development, this means that poorly defined often-implicit criteria for decision-making were available to guide the Laparoscopy Working Group. *Formal consensus development* methods, which are used by many consensus-development conferences and Delphi groups, provide 'greater structure to the analytical process' but still fail to provide 'an explicit linkage between recommendations and quality of evidence' (2). *Evidence-linked guideline development* requires the explicit linkage of recommendations to the quality of the supporting evidence (3).

This allows the user to make an informed choice about whether to comply with the individual recommendations within the guidelines by taking account of the level of supporting evidence. Clinicians therefore need a very good reason (which should be adequately documented) for choosing not to comply with a recommendation based upon a clinically relevant randomized trial or meta-analysis. However, the clinician has greater flexibility in using recommendations based upon lower levels of evidence.

1.2 Levels of evidence and grade of guideline recommendations

The levels of evidence are summarized in Table 1.1, and the grading of guideline recommendations is described in Table 1.2.

Table 1.1 Levels of evidence (3)

Level	Type of evidence
1a	Evidence obtained from meta-analysis of randomized trials
1b	Evidence obtained from at least one randomized trial
2a	Evidence obtained from one well-designed controlled study without randomization
2b	Evidence obtained from at least one other type of well-designed quasi-experimental study
3	Evidence obtained from well-designed non-experimental studies, such as comparative studies, correlation studies and case reports
4	Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities

Table 1.2 Grades of guideline recommendations (3)

Grade	Nature of recommendations
A	Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomized trial
B	Based on well-conducted clinical studies, but without randomized clinical trials
C	Made despite the absence of directly applicable clinical studies of good quality

1.3 References

1. **Grimshaw J, Eccles M, Russell I.**
   Developing clinically valid practice guidelines. J Eval Clin Prac 1995; 1: 37-48.
2. **Woolf SH.**
   Practice guidelines, a new reality in medicine. II. Methods of developing guidelines. (Review.)
   Arch Intern Med 1992; 152: 946-952.
3. **Agency for Health Care Policy and Research.**
   Clinical Practice Guidelines Development, Methodological Perspectives. US Department of Health and Human Services, Public Health Service, Washington DC,1992, pp. 115-127.

2. TECHNICAL ASPECTS

2.1 Introduction

Laparoscopy is a surgical technique that allows surgical procedures to be performed while minimizing trauma to the body. The following are indispensable for carrying out any laparoscopic procedure:

- Basic mandatory equipment
- Specific basic instruments
- Basic access techniques
- Complication management
- Specific training.

2.2 Equipment (1-3)

The view of the surgical field is provided by a video-camera, which represents the eye of the surgeon. It goes without saying that a proper video armamentarium is of paramount importance. The basic, indispensable equipment for videoing is as follows:

- At least one CCD (charge-coupled device), but preferaby three CCD video-cameras
- At least one, but preferably two, video-monitors
- Video-recorder cart.

In addition, equipment should also include:

- High-flow insufflator
- Xenon-light source
- High-frequency generator, both mono- and bipolar
- Suction and irrigation device. (Other devices for dissecting and for controlling bleeding may be useful, such as an ultrasonic dissector or a radio-frequency coagulator.)

2.3 Instruments (1-3)

As well as having instruments to enable access to, and development of, working room, the surgeon requires state-of-the-art instruments for optimal performance of laparoscopic procedures, including:

- Dissection
- Haemostasis
- Suturing
- Retrieval of specimens.

2.3.1 Access to, and development of, working room

Indispensable instruments for accessing and developing the working space include:

- Veress needle (for transperitoneal access only)
- Hasson trocar
- 10 mm trocar with safety sheath
- 10 mm trocars with ventile valve and reducer to 5 mm
- 0° and 30° 10 mm telescopes.

An optional instrument is a:

- Balloon dilator (for extraperitoneal access only).

Basically, there are no major differences between performing transperitoneal or extraperitoneal laparoscopic surgery. However, since the peritoneum is already an existing cavity, it is only necessary to inflate the peritoneum to create a working space. However, since the retroperitoneum and pelvis are not a cavity, it is first necessary to dissect the fat which fills the retroperitoneal space to create a working room.

Thus, in the case of a transperitoneal approach, the abdomen is insufflated by use of a Veress needle followed by puncture with a 10 mm trocar with a safety shield or using an open Hasson technique.

The retroperitoneoscopic approach is begun by making an open canal (15-20 mm wide in diameter) down to the retroperitoneal space, followed by finger dissection (with or without balloon dissection). A Veress needle is not required.

2.3.2 Dissection

The basic indispensable instruments for laparoscopic dissection are:

- Endoscopic curved scissors with rotatable blades

- Endoscopic curved dissector
- Suction-irrigation probe.

An optional but useful instrument is:
- An ultrasonic dissector.

Several dissection techniques may be applied:
- Blunt and sharp dissection with endoshears
- Blunt dissection with endo-peanuts
- Blunt dissection with right-angle dissector (5 mm, 10 mm).
- Blunt dissection with the tip of the suction-irrigation probe
- Sharp dissection with an ultrasonic scalpel.

2.3.3 Haemostasis
Haemostasis is one of the main issues of any surgical procedure. In laparoscopic surgery, there are several guidelines that can assure bloodless dissection. It is of major importance to dissect widely with optimal exposure of the organ rather than a deep dissection. To minimize blood loss, it is better to handle beforehand the vascular supply of an organ to be removed, rather than dissecting it all around and leaving dissection of the vessels as the last surgical step.

The basic indispensable instruments for laparoscopic haemostasis are:
- 5 mm monopolar coagulation forceps/dissector
- 5 mm bipolar forceps
- 10 mm endoclip-applicator
- Endo-GIA® stapler (for large veins only)
- Optional instruments
- Bipolar coagulation forceps/dissector
- Ultrasonic dissector
- Radio-frequency coagulating 5 mm probe.

2.3.4 Suture technique
Laparoscopic suture requires specific training, as it is rather different to open-surgery for both stitching and knotting. There are various methods. Basically, one (sometimes two) needle holder and short-threaded small needles are needed (i.e. thread 15–20 cm long and needles that pass easily through a 10 mm trocar). Specifically designed needles for laparoscopy are useful but not mandatory.

2.3.5 Retrieval of specimens (4)
Finally, an organ bag is essential for removal of the specimen. The LapSac® is the best-tested bag and provides the safest material. This is very important when a tissue morcellation is needed; however, the bag is difficult to handle. Other bags with less resistant materials, but better opening mechanisms, can be used (e.g. Endobag® or Endocatch®).

2.4 Access techniques (1, 3, 5, 6)

2.4.1 Retroperitoneoscopy
The indications for retroperitoneoscopy include:
- Nephrectomy
- Radical nephrectomy
- Live-donor nephrectomy
- Heminephrectomy
- Nephron-sparing surgery
- Renal cyst resection
- Pyeloplasty
- Adrenalectomy
- Retroperitoneal lymph node dissection
- Ureterolithotomy
- Nephropexy.

Under general anaesthesia, the patient is placed in the typical kidney position. A 15-18 mm incision is made in the lumbar (Petit's) triangle between the 12th rib and the iliac crest, at the anterior edge of the sacrospinalis

muscle. A tunnel down to the retroperitoneal space is created by blunt dissection. This tunnel is dilated until an index finger can be introduced to shift the peritoneum forwards, thus creating a retroperitoneal space.

The dissection of the space between the lumbal aponeurosis and the renal fascia (Gerota's fascia) is now performed. This is done either exclusively with either the index finger (Figure 1) or by use of a dissection balloon. The initial wound (Port I) is closed around the port using a mattress suture to prevent gas leakage (Figure 2).

Figure 1. Retroperitoneoscopy. Finger dissection of the retroperitoneal space (2) between lumbodorsal aponeurosis (3) and Gerota's fascia (1).

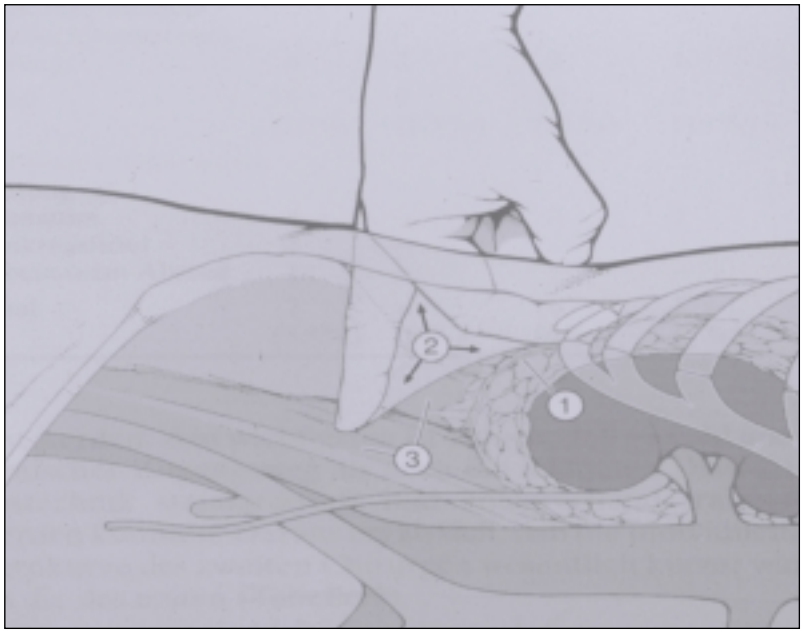
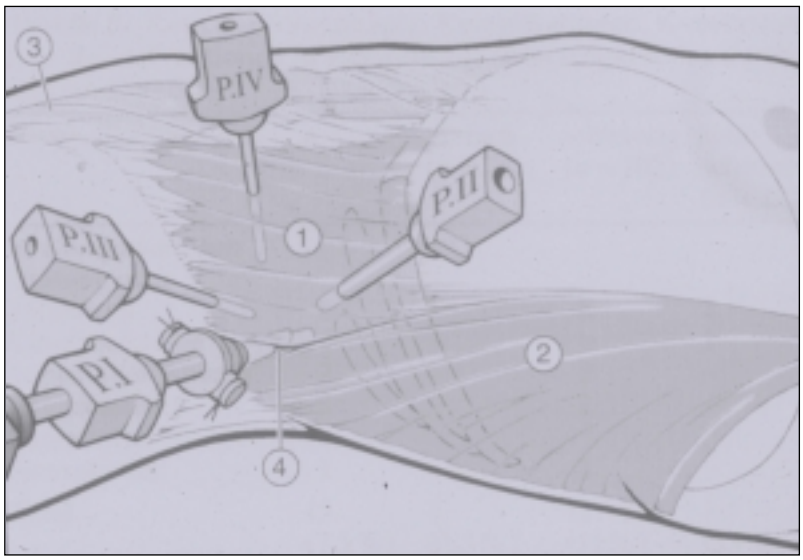


Figure 2. Retroperitoneoscopy. Arrangement of trocars on right side. 1 = obliquus externus muscle; 2 = latissimus dorsi muscle; 3 = rectus muscle; 4 = lumbar trigone.



The space is then inflated with carbon dioxide, up to a maximum pressure of 12 mm Hg, and inspected. Subsequently two secondary trocars (Port II and III) are inserted under endoscopic view. Residual adherences can be dissected and the renal fascia is opened longitudinally for exposure of the psoas muscle, which represents the landmark of retroperitoneoscopy.

If necessary, a further 5 mm trocar (Port IV) is inserted. This may be required, for example, to retract the kidney during dissection.

2.4.2 Transperitoneal laparoscopy of the upper tract

The indications for transperitoneal laparoscopy of the upper tract are:

- Nephrectomy
- Radical nephrectomy
- Live-donor nephrectomy
- Heminephrectomy
- Nephron-sparing surgery
- Renal cyst resection
- Pyeloplasty
- Adrenalectomy
- Retroperitoneal lymph node dissection.

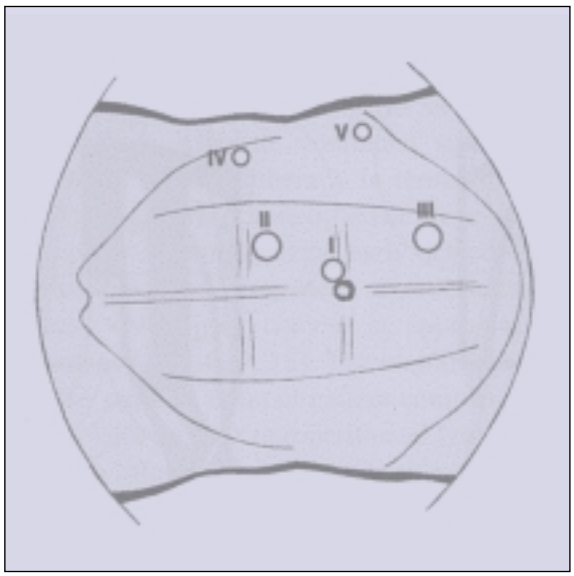
Before creating a pneumoperitoneum, a nasogastric tube is inserted with the patient placed in the typical flank position at an angle of 30° (Trendelenburg position). The surgeon and his assistant stand on the ventral side of the patient. A pneumoperitoneum is obtained using a Veress needle inserted in the peritoneal cavity, at the point where the anterior axillary line crosses the transverse line at the umbilicus level. Trocars are then inserted through the ventral abdominal wall as follows (Figure 3):

- Port I: 10 mm trocar, periumbilical (lateral edge of rectus abdominis muscle).
- Port II: 10 mm trocar for right side, 5 mm for left side, just below the costal margin (mammillary line).
- Port III: 5 mm trocar for the right, 10 mm for left side above iliac spine (mammillary line).

The laparoscope is passed through Port I and used to check the trocar insertion for Ports II and III. The ports are secured to the skin. After complete inspection of the intra-abdominal site, the descending colon has to be mobilized to allow access to the retroperitoneum on the left side. On the right side, the ascending colon has to be mobilized. Since the lateral abdominal wall is free, one further port can be inserted through the newly exposed retroperitoneum:

- Port IV: 5 mm along the posterior axillary line between Port II and III.

Figure 3. Transperitoneal laparoscopy in the upper retroperitoneum. Arrangement of trocars on right side.



2.4.3 Transperitoneal access to the pelvis

The indications for transperitoneal access to the pelvis are:

- Cryptorchidism
- Colposuspension
- Pelvic lymph node dissection
- Radical prostatectomy
- Varicocelectomy
- Hernioplasty.

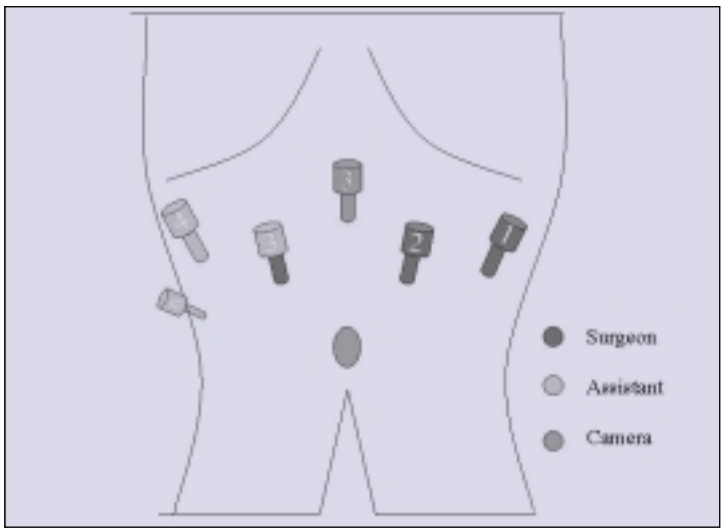
The patient lies in a deflected supine position with a 30° Trendelenburg decline. Before trocar placement, a 14F Foley catheter is inserted to drain the bladder. There are two techniques for placement of the first trocar at the umbilical level:

- Creating a pneumoperitoneum with the Veress needle
- Open mini-incision closed with a blunt trocar (Hasson technique).

The Veress needle is inserted at a 45° angle into the empty peritoneum at the umbilical level. The position should be checked by aspiration, infusion of 5 ml of saline, and the intra-abdominal pressure carefully observed to be below 12 mm Hg during insufflation (initially below 5 mm Hg). The disposable Veress needles with a safety shield is safer than the reusable ones. Alternatively, particularly for children, a small needle with a sheath for insertion of a miniature telescope can be used.

Previous major abdominal surgery is a relative contraindication to blind-needle insertion and a Hasson cutdown technique should be used for the first port. The arrangement of the working ports depends on the procedure, as, for example, in Figure 4. All the secondary trocars have to be placed under endoscopic control. Except in case of cryptorchidism, the first operative step represents the exposure of the Retzius space. This can be accomplished via an incision lateral to the lateral umbilical ligament, e.g. as in pelvic lymph node dissection, or after high transection of the urachus and both lateral umbilical ligaments, e.g. as in radical prostatectomy or colposuspension.

Figure 4. Laparoscopic radical prostatectomy: arrangement of trocars.



2.4.4 Extraperitoneal access to the pelvis

The indications for extraperitoneal access to the pelvis are:

- Colposuspension
- Pelvic lymph node dissection
- Radical prostatectomy
- Varicocelectomy
- Hernioplasty.

There are two techniques:

Balloon dissection - After a 15 mm subumbilical skin incision, the transverse fascia is explored by a blunt mid-line dissection. The index finger or the telescope can be used for preliminary dissection of the extraperitoneal space. Then, a balloon-trocar system is introduced and the dissecting balloon is filled with 1000–1200 ml of saline, according to the patient's size. The balloon dissection can be monitored endoscopically with the laparoscope inserted in the balloon-trocar sheath. The balloon is kept inflated for 5 minutes to provide adequate haemostasis. After desufflation and retrieval of the balloon catheter, a 12 mm trocar (Hasson trocar) is inserted and fixed with an airtight mattress suture and connected to the insufflator (maximum pressure 15 mm Hg). It is then possible to insert the working trocars in a similar manner to the transperitoneal approach.

Finger dissection - The index finger is introduced via the suprapubic incision. The digital dissection allows adequate exposure of the Retzius space. The trocars are then placed only under palpatory control (e.g.10 mm subumbilical, 5 mm pararectal).

The extraperitoneal approach to the pelvis allows direct access to the pelvic organs, but it has the disadvantage of a smaller working space.

2.5 Management of complications (7-14)

2.5.1 Introduction (Tables 2.1- 2.5)

The complication rate depends on both the complexity of the procedure and the operator training, and ranges from 0.8% to 13.6%. It should be underlined that, in comparative studies, the complication rate of laparoscopic procedures did not differ from the corresponding open procedures. In any case, complications should be prevented by a careful planning of the procedure.

2.5.2 Placement of the trocars

To avoid complications caused by trocar insertion, it is important to standardize the access techniques used, whether transperitoneal or retroperitoneal. Whereas retroperitoneoscopy is very rarely associated with complications during trocar insertion, the transperitoneal approach entails some specific risks. A preoperative ultrasound examination of the upper abdomen can give information on the size of the liver and spleen, and can also give an indication of possible adhesions between the intestines and abdominal wall. If adhesions between the intestines and the abdominal wall are suspected (e.g. following surgery or due to suppurative processes in the abdomen), the access should be made above, and lateral, to the umbilicus.

Following insertion of the Veress needle into the abdomen, the tip of the needle should be able to move freely. An injury should be suspected if the following are noted:

- Aspiration of intestinal or gastric fluid or blood
- The intra-abdominal pressure with a low gas flow exceeds 15 mm Hg.

In both these situations, the position of the Veress needle needs to be corrected; if a perforation continues to be suspected, a laparotomy should be performed. Alternatively, following the creation of the pneumoperitoneum and the insertion of the optic trocar, a suspected perforation must be ruled out by thoroughly inspecting the trocar insertion site.

If a perforation of the large blood vessels is diagnosed, an immediate laparotomy becomes necessary. It is much harder to detect an injury to the intestine or the stomach. Insertion of the first trocar is usually performed blind through the incision of the Veress needle in the umbilical region. For this purpose, a shielded trocar is recommended to minimize the risk of injury. Additional working trocars are inserted through the abdominal wall under laparoscopic vision with the help of transillumination.

Trocars equipped with a safety-shield mechanism are designed to prevent injury to blood vessels and abdominal organs. However, they do not provide a total safety guarantee. Existing adhesions between the abdominal organs and the anterior abdominal wall increase the risk of injury caused by the first trocar. In this situation, either an open-access technique (e.g. Hasson trocar) or a 2 mm needlescope should be used.

At the end of the procedure, all instruments should be carefully checked to make sure they are complete and not damaged.

Following the completion of the laparoscopic procedure, all working trocars should be removed under direct vision. The surgical wounds can then be closed under laparoscopic vision by suturing the fascia and subsequent closure of the skin. If closure of the fascia at the access points of the trocars are omitted, hernias can result in 10 mm wounds.

2.5.3 Insufflation of carbon dioxide

The insufflation of carbon dioxide (CO_2) required for the maintenance of the pneumoperitoneum results in partial absorption of the applied gas by the patient during surgery. This leads to an increase in the arterial partial pressure and end-expiratory partial pressure of carbon dioxide. There is also a decrease in blood pH. The anaesthetist can influence the situation by increasing the ventilation, while the surgeon can use the carbon dioxide sparingly. A lower intra-abdominal pressure (e.g. 10–12 mm Hg) will result in a lower carbon dioxide absorption rate. The duration of surgery is also important, since the rate of carbon dioxide absorption increases with the operating time.

Especially in obese patients, considerable emphysema of the skin due to the insufflated carbon dioxide can occur, depending on the duration of surgery. This emphysema is quickly resorbed within a few hours following surgery. However, carbon dioxide absorption can cause further impairment of cardiac and pulmonary function in patients suffering from severe cardiac insufficiency or disorders of pulmonary function. In these patients, the laparoscopic approach should be evaluated in relation to the benefit and risks for the patient.

2.5.4 Vascular injuries

Vascular injuries are the most common injuries occurring during urological laparoscopic surgery. Unforeseen haemorrhage can occur at any point in time during laparoscopic surgery, as in open surgery. But, in laparoscopy, it is much more difficult to control the bleeding source. Thus, the prevention of bleeding through careful preparation is the number one priority in laparoscopic surgery.

Bleeding from blood vessels in the abdominal wall, resulting either from insertion of the Veress needle or the optic trocar, can usually be controlled by coagulating the port through a second trocar, or by using a circular suture to enclose the bleeding vessel and the port with the trocar.

During the process of inserting the working trocars, both indispensable transillumination and the laparoscopically controlled technique should prevent injury to larger blood vessels. Damage of the epigastric vessels in the lower abdomen can be prevented by avoiding the area in which they are found.

It is always better to control an injured blood vessel using clips or sutures than by using extensive endocoagulation.

Injuries of the large abdominal vessels lead to extensive haemorrhage. Thus, in most cases, an immediate laparotomy should be performed.

2.5.5 Injuries to organs

Injury to organs during laparoscopic surgeries can generally affect all intra-abdominal and retroperitoneal organs. Besides the complications due to haemorrhage, injuries to organs comprise the most severe potential for complications in laparoscopic procedures. The frequency of organ perforation ranges from 0.3% to 1.5%. Visceral lesions are more often observed when a transperitoneal access has been used compared to retroperitoneoscopy.

There are several different ways of causing organ damage, with the main causes being direct injury through instruments and the effects of endocoagulation used for haemostasis. All instruments used during surgery have to be checked for an intact insulation prior to their use. It is recommended that bipolar coagulation is used when feasible, either ultrasonic or radio-frequency coagulation, in preference to monopolar coagulation.

If a lesion to an organ, that has occurred during surgery, is detected, the surgeon must decide whether laparoscopic or open surgery is the better choice for suture-repair of the lesion. The incurred damage can usually be limited with immediate proper treatment. Lesions that have not been detected during surgery are usually more severe and show their effects following a latent period of 2 to 3 days.

Table 2.1 Frequency of complications of different laparoscopic procedures using combined statistical data from four laparoscopic centres (7)

Procedure	No. of complications/no. of procedures	Frequency (%)
Varicocelectomy	10/766	1.3
Cryptorchidism	1/259	0.4
Pelvic lymphadenectomy	18/481	3.7
Nephrectomy/heminephrectomy	29/351	8.3
Renal cyst resection	5/139	3.6
Ureteric procedures	4/58	6.9
Adrenalectomy	6/44	13.6
Nephropexy	1/41	2.4
Lymphocele fenestration	2/41	4.9
Retroperitoneal lymphadenectomy	5/40	12.5
Others	26/187	13.9
Total	107/2407	4.4

Table 2.2 Incidence of complications in relationship to complexity of the 10 most common laparoscopic operations as listed in table 2.1 (7)

Classification	Number of procedures	Percentage of complications*	Percentage of re-intervention
Easy	1025	1.0 (0.8–1.3)	0.0
Difficult	761	3.9 (2.4–6.8)	1.1
Very difficult	435	9.2 (8.2–13.6)	2.7
Total	2221	3.6 (0.8–13.6)	0.8

*All differences are highly significant.

Table 2.3 Complications of 2407 laparoscopic procedures performed at four laparoscopic centres in Germany (7)

Complication	No.	Percentage of total (%)
Vascular injury	40	1.7
Bleeding/haematomas	40	1.7
Visceral and nerve injury	26	1.1
Intestinal lesions	6	0.2
Ureteric lesions	7	0.3
Pancreatic lesions	4	0.2
Perforated urinary bladder	3	0.1
Nerve lesions	7	0.3
Infection/healing	19	0.8
Wound infections	5	0.2
Fever	4	0.2
Epididymitis	2	0.1
Hernia related to trocar	5	0.2
Lymphocele	4	0.2
Associated trauma	14	0.6
Local emphysema	6	0.2
Pulmonary embolism	2	0.1
Miscellaneous	12	0.5
Total	107	4.4

Table 2.4 Frequency of complications related to the different steps of laparoscopic surgery, as occurred in 2407 procedures (7)

Complication	No.	Percentage (%)
Trocar insertion	6	0.2
Dissection	67	2.9
Associated trauma	7	0.3
Wound healing	19	0.8
Others	7	0.3
Total	107	4.4

Table 2.5 Most frequent complications of urological laparoscopy and methods for prevention

Complication	Method of prevention
Vascular injury by trocar	
Bleeding from arteria epigastrica	Transillumination prior to trocar insertion
Bleeding from aorta/vena cava	Appropriate skin incision, use of trocars with safety device, use of small calibre ports (2 or 5 mm) with telescopes (e.g. children), use of Hasson trocar (open access) preferably though retroperitoneoscopy
Vascular injury during dissection	
Bleeding from branches of major vessels	Right-angle clamp for dissection, use of bipolar coagulation forceps, use of curved endoclips, use of harmonic scalpel (Ultracision®)
Bleeding from renal hilum	Put traction on hilum by elevating the kidney, use suction device also for blunt dissection. Use sponge introduced into the abdomen to tamponade the bleeding site
Visceral injury by trocar (intestinal lesions)	Use ultrasound prior to laparoscopy, use of small calibre ports (2 or 5 mm) with telescopes (e.g. in case of adhesions), use Hasson trocar, preferably through retroperitoneoscopy
Visceral injury during dissection	
Intestinal lesions	Careful use of monopolar coagulation. Check the course of your instruments. Prefer bipolar coagulation close to the intestines. Do not hesitate to convert to open surgery
Ureteric lesions	Be aware of the anatomical course of the ureters; try to identify them early during dissection. Pre-stent the ureter in difficult cases. Do not hesitate to convert to open surgery
Pancreatic lesions	Be aware of the anatomical situation (e.g. during left adrenalectomy or nephrectomy). Reduce the application of monopolar electrocautery near the pancreas. Long-lasting secretion (for more than 7 days) on the left side may indicate a pancreatic fistula
Perforated urinary bladder	Check the hole in the bladder and try to suture it laparoscopically if possible. If this is not possible, move to open surgery
Nerve lesions	Be aware of the anatomical course of relevant nerves (e.g. obturator nerve, femoral nerve). Do not hesitate to convert to open surgery in case of transection
Associated trauma	
Local emphysema	Reduce the carbon dioxide pressure after placement of trocars (e.g. to 10-12 mm Hg)
Healing	
Hernia related to trocar	Close the fascia of all ports > 5 mm, preferably by retroperitoneoscopy

2.6 Specific training

Published evidence exists to support the concept that 50 laparoscopic procedures are required before a plateau in the incidence of complications occurs. It is therefore suggested that until this time an individual surgeon should not regard himself to be an expert in laparoscopy. Patients should also be informed about the number of specific procedures already undertaken by the proposed surgeon, in addition to the small but calculated risk of conversion to open procedure (less than 5%), and the rare but life-threatening complications of serious vascular damage (0.2%), bowel injury (0.2%) and carbon dioxide embolus (0.1%), which may require emergency surgery.

Training is required for those at all levels of expertise and it is recommended that all urologists should follow a progressive series of dedicated courses. It is hoped that all endourologists will consider attendance at Course A (Table 2.6). More complex procedures, especially those involving reconstruction are difficult and require attendance of theoretical and practical courses and some degree of innate perception.

Table 2.6 Standardized training courses in laparoscopy and retroperitoneoscopy in urology

Course	Structure	Content
Course A	Theory	Laparoscopic instruments, physiology, access techniques, operative techniques, indications, contraindications, results and complications
	Practice	
	• Pelvitrainer	Bimanual co-ordination and dissection (chicken bone), organ entrapment (porcine kidney)
	• Live video demonstration	Laparoscopy for cryptochordism, pelvic lymphadenectomy, nephrectomy, retroperitoneoscopy
Course B	Theory	Summary of courses in theory and special operative techniques, including laparoscopic suturing
	Practice	
	• Pelvitrainer	Knotting and suturing techniques (chicken bone, porcine bowel, bladder)
	• Animal (pig)	Ligation of epigastric vessels, pelvic lymphadenectomy, nephrectomy
Course C	Theory	Special operative techniques, indications, complications, suturing
	Practice	
	• Pelvitrainer	Knotting and suturing techniques (chicken bone, porcine bowel, bladder)
	• Department (assistance)	Laparoscopy for cryptorchidism, pelvic lymphadenectomy, nephrectomy, retroperitoneoscopy
Course D	Theory	Reconstructive techniques, management of complications, suturing
	Practice	
	• Pelvitrainer	Knotting and suturing (advanced course)
	• Animal (pig)	Adhesiolysis, bleeding complications, hernioplasty, pyeloplasty, colposuspension, antirefluxplasty, ileal conduit

2.7 The difficulty scoring system of laparoscopic procedures (15)

Scores, everywhere, have always been a subject of controversy and discussion and this one is unlikely to be the exception to the rule. However, if it can serve as a basis for discussion, this proposal will not have been in vain.

It is important to stress that the proposed score is only a means of classifying the learning curve. It aims to provide the beginner in laparoscopic surgery with a scale of improvement, a perspective of progression. It is not designed to 'classify' surgeons. Fortunately, surgery is not confined to a technical procedure, but the surgical procedure is nevertheless an integral part of surgery.

2.7.1 Criteria

Technical difficulty: The first criterion is obviously technical difficulty, as what could be more different than spermatic vein ligation for varicocele compared with pyeloplasty with a resection suture according to Küss, in which the surgeon must be skilled in laparoscopic suture, running suture and interrupted sutures, and must be able to perform a functional operation whose end result will be assessed in the long term.

Technical difficulty is evaluated on a scale of 1 to 7. Score 1 corresponds to the technical difficulty of diagnostic laparoscopy for impalpable testis, while score 7 corresponds to maximum technical difficulty (e.g. radical prostatectomy).

Operative risk (7, 13): The second assessment criterion concerns operative risk, related to the particular degree of danger of the operation. A slightly 'engaged' operation is an operation associated with a minimum risk of mortality, in which a salvage conversion can be easily performed, with no risk for the patient and without jeopardizing the end result of the operation. Consequently, pyeloplasty is a slightly 'engaged', 'low risk' operation, because, in the event of technical difficulty, conversion to a conventional, open approach allows the objective to be achieved (e.g. repair of the ureteropelvic junction). There is therefore a 'way out' for the surgeon, without jeopardizing the end result of the operation.

In contrast, an operation is 'engaged' and 'high risk', when a poorly executed procedure or a particular anatomical or pathological situation can cause the death of the patient. Thus, surgery involving vessels (simple or radical nephrectomy, lumboaortic lymphadenectomy, etc.) constitutes 'high risk' surgery because damage to large vessels (iliac vessels, vena cava or aorta) can cause extremely severe morbidity, or even the patient's death, even when surgical conversion is decided rapidly. This degree of 'engagement' is also further scored

from 1 to 7. Score 1 corresponds to minimal engagement (e.g. repair of varicocele), while score 7 corresponds to lumboaortic lymphadenectomy for residual masses after chemotherapy of a non-seminomatous germ-cell tumour.

Sustained nature: The third (and most subjective) criterion evaluates the sustained nature of the operation (i.e. the degree of attention and concentration required by the operation). Some operations, such as radical prostatectomy, require permanent attention due to the existence of technical difficulties and/or operative risk at each step of the procedure, while other operations, such as adrenalectomy, remain 'difficult' only for a relatively limited period of time, until the renal pedicle has been identified and the adrenal vein has been clipped. The sustained nature is also scored from 1 to 7.

2.7.2 Scoring system

Each urological procedure is given an overall score, which is the sum of the individual scores given to the different criteria - technical difficulty, operative risk and sustained attention - with each criterion being scored from 1 to 7 (Table 2.7). The overall score of the three criteria is then used to classify each operation according to one of six increasing levels of global difficulty (Table 2.8). Only procedures currently performed and accepted in the urological community have been described, according to the personal experiences of the EAU Laparoscopic Working Group and on the basis of the international literature.

Table 2.7 Classification and difficulty of laparoscopic procedure

Level of difficulty	Definition	Overall score of criteria
E	Easy	Between 3 and 5
SD	Slightly difficult	Between 6 and 8
FD	Fairly difficult	Between 9 and 11
D	Difficult	Between 12 and 14
VD	Very difficult	Between 15 and 17
ED	Extremely difficult	Greater than 18

Table 2.8 Scoring of the most frequent laparoscopic operations according to their technical difficulty, operative risk and degree of attention (each criterion is scored from 1 to 7). The sum of the three criteria is used to classify each operation according to an increasing level of difficulty:

E (Easy), SD (Slightly Difficult), FD (Fairly Difficult), D (Difficult), VD (Very difficult), ED (Extremely Difficult).

Operations	Technique	Risk	Attention	Overall score	Level of difficulty
Cryptorchidism (diagnostic) (16)	1	1	1	3	E
Cryptorchidism (therapeutic) (17, 18)	2	2	2	4	E
Varicocele (19)	2	1	1	4	E
Resection of cortical renal cyst (20)	2	2	1	5	E
Resection of parapelvic renal cyst	2	3	2	7	SD
Ureterolithotomy (21)	4	2	1/3	7/9	SD/FD
Partial nephrectomy (benign) (2, 22)	3	3	2/3	8	SD
Nephropexy	3	2	3	8	SD
Adrenalectomy (< 6 cm) (23-26)	3	3	3	9	FD
Pelvic lymph node dissection	2	3/4	3	8/9	FD
Colposuspension	4	2/3	3	10	FD
Sacral colpopexy	3/4	4/3	3	10	FD
Nephrectomy (benign disease) (2, 22)	4	4	3	11	FD
Nephro-ureterectomy (transitional cell carcinoma) (27)	4	4	4	12	D
Adrenalectomy (> 6 cm) (28)	4	4	4	12	D
Pyeloplasty (resection suture) (29, 30)	6	3	4	13	D
Partial nephrectomy (tumour) (31)	5	4	5	15	VD
Radical nephrectomy (T1) (32-34)	4/5	4/5	4/5	12/15	VD
Retroperitoneal lymph node dissection (RPLND) (staging) (35-37)	5	6	6	17	VD
Nephrectomy (living donor) (38, 39)	4	7	7	18	ED
RPLND (post-chemotherapy) (35-37)	5	7	7	19	ED
Radical prostatectomy (40-42)	7	5	6/7	18/19	ED

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3. LAPAROSCOPIC PROCEDURES

3.1 Adrenalectomy

From the very beginning of laparoscopy, laparoscopic adrenalectomy provided a truly beneficial approach to avoiding a large incision and extensive organ manipulation to remove small glands (1-8). Both the transperitoneal and retroperitoneoscopic approaches have proven efficacious. In fact, after only a few years of clinical experience (9-14), laparoscopy is considered to be a definitively minor invasive approach compared to open surgery, with the same efficacy and safety for removing the adrenal glands (15-19). Following the comparative experience of multicentre studies (20-21), it has been shown that laparoscopic adrenalectomy is feasible and safe with a low cost-to-benefit ratio, regardless of the pathology. Only large tumours (> 6 cm) are still under investigation (14).

Because of the different anatomy of the left adrenal gland compared to the right adrenal gland, the retroperitoneal approach has been assessed as the approach of choice for the left adrenal gland. The approach for removal of the right gland is optional and depends on the surgeon's preference and familiarity with the technique being used (17). Partial adrenalectomy is feasible, provided the pathology of the lesion has been previously assessed.

A summary of the current guideline recommendations for adrenalectomy is given in Table 3.1.

Table 3.1 Adrenalectomy: guideline recommendations

Total number of patients	More than 1000
Expert opinion	Superior
Level of evidence	1b
Grade of recommendation	A
Current indications	Adrenal tumours < 6 cm diameter

3.2 Colposuspension

In the two randomized trials comparing laparoscopic versus open colposuspension, results were inconsistent. In the study by Fatthy et al. (2001), the success rate at 18 months was 88% in the laparoscopy group and 85% in the open group (22). Blood loss, post-operative stay and time to return to work were significantly smaller in the laparoscopy group. In the study by Su et al. (1997), the success rate at 3 months was 80% in the laparoscopy group and 96% in the open group (23). The superiority of the laparoscopic procedure cannot therefore be established. Moreover, the number of patients enrolled in these series was too small for an equivalence study.

On the other hand, there have been four non-randomized comparative studies in which reported results are comparable between arms (24-27). Less post-operative pain, shorter hospital stay and shorter convalescence are reported with the laparoscopic approach, but the design of the studies do not allow any scientific conclusion to be made.

In the reports of series (28-47), both the transperitoneal and the extraperitoneal approaches have been assessed. Persson demonstrated that two stitches on every side produce a better result than one stitch (32). In these papers, the number of patients treated was highly variable, ranging from less than 25 patients in 11 papers to more than 50 patients in seven papers. Efficacy parameters reported by review papers (48-58) are given in Table 3.2.

Table 3.2 Colposuspension: efficacy parameters (48-58)

Operative time	32-112 min
Complication rate	0-16%
Success rate at 12 months	58-91%
Success rate at 24 months	68-89%
Success rate at 24 months	37-82%

Unfortunately, on the basis of scientific criteria, the effectiveness of open surgery for stress incontinence is itself questionable, though there is a tendency to consider the Burch procedure as the benchmark. In addition, there is also competition between the use of laparoscopic surgery and other minimally invasive procedures, e.g. tension-free vaginal tape (TVT), with the latter being probably much easier to learn. It is therefore very likely

to be difficult to carry out prospective, comparative trials in the future.

A summary of the current guideline recommendations for colposuspension is given in Table 3.3.

Table 3.3 Colposuspension: guideline recommendations

Total number of patients	More than 1000
Expert opinion	Under evaluation
Level of evidence	2a
Grade of recommendation	C
Current indications	Incontinence associated with genital prolapse to be treated by laparoscopic approach

3.3 Cryptorchidism treatment

Following the early laparoscopic diagnosis of non-palpable testes (59), the laparoscopic orchidopexy of undescended testes has gained in popularity. According to the position of the undescended testis, either a primary laparoscopic orchidopexy or a two-stage Fowler–Stephens technique is performed (60). The staged technique can be carried out either totally by laparoscopy, or the first stage by laparoscopy and the second by open surgery (61). The recommended minimal interval between the two stages is six months. Due to the extent of mobilization which can be performed by laparoscopy, a primary orchidopexy can be performed for undescended testes as high as 3.5 cm above the internal inguinal ring (62). The success rate (scrotal location of the testicle and absence of atrophy) of laparoscopic orchidopexy is reported as being up to 100% in several series of between 3 and 13 patients, with a follow up ranging from three to 18 months (61, 63-65).

Laparoscopy is currently recommended for the treatment of undescended testes (66-71). However, long-term studies are needed to assess the testicular growth after the various procedures (60).

The current guidelines for the laparoscopic treatment of cryptorchidism are summarized in Table 3.4.

Table 3.4 Treatment of crytorchidism: guideline recommendations

Total number of patients	More than 100
Expert opinion	Established
Level of evidence	2b
Grade of recommendation	B
Current indications	Undescended non-palpable testes

3.4 Hernia repair

The success of open hernioplasty (Lichtenstein) is indicated by the almost total lack of recurrences (72-76). Similar results are demonstrated by the laparoscopic procedure which is based on the same principle (77-86). However, the latter results are still influenced by the learning curve. In all Phase III trials, the laparoscopic approach was found to have no disadvantages; it was associated with less pain and a shorter convalescence time compared with open hernioplasty (87-93). Laparoscopy is superior to open hernioplasty for recurrent or bilateral hernia management. The good socio-economic aspects of laparoscopically managed hernia repair are another advantage (94).

The current guideline recommendations for hernia repair are given in Table 3.5.

Table 3.5 Hernia repair: guideline recommendations

Total number of patients	More than 13,000
Expert opinion	Established
Level of evidence	1a
Grade of recommendation	A
Current indications	Primary inguinal hernia Recurrent inguinal hernia Bilateral inguinal hernia

3.5 Nephrectomy

Among the early attempts to perform urological procedures by laparoscopy, transperitoneal nephrectomy has been a milestone (95). Following this pioneer success, retroperitoneal routes were developed to remove kidneys by laparoscopy (6, 96). Based on those early experiences, the research work continued rapidly to expand, allowing urologists trained in laparoscopy to extend safely the indications for kidney removal by laparoscopy, either by the trans- or retroperitoneal route.

3.5.1 Simple nephrectomy (for benign disease) (Table 3.6)

Laparoscopic nephrectomy is a safe alternative to open nephrectomy for the removal of non-functioning kidneys in benign diseases, and results in less morbidity and a shorter hospital stay (71, 97, 98). Moreover, laparoscopic nephrectomy produces a better cosmetic result; it is also cost-effective and offers advantages with respect to hospital stay and the time taken to resume normal activity. It is safe in children (99, 100). The complication rate depends upon the pathology affecting the kidney to be removed: post-inflammatory conditions have a higher complication and conversion rate (101, 102). Bilateral contemporary nephrectomy in preparation for a kidney transplant is suitable for a laparoscopic approach (103).

The trans- or retroperitoneal route is governed by operator preference. Although a definitive answer regarding the advantages and disadvantages of either route awaits the results of randomized trials, retroperitoneal laparoscopy appears to be associated with less operative time, less conversion rates, and a shorter hospital stay (104-106).

Table 3.6 Simple nephrectomy: guideline recommendations

Total number of patients	Approximately 1200
Expert opinion	Established
Level of evidence	2a
Grade of recommendation	A
Current indications	Non-functioning kidneys in benign disease

3.5.2 Radical nephrectomy (Table 3.7)

Laparoscopic radical nephrectomy is still performed in a few centres worldwide: this surgery is made difficult by the need to remove the intact specimen and the extent of the exeresis. However, in low-stage tumours only (T1-T2), technical results are comparable to open radical nephrectomy with the advantages of minimal invasivity, i.e. low morbidity and great surgical efficiency (107-112). In large, reported series, the advantages of laparoscopic radical nephrectomy have been confirmed (111-113). It can be performed by both trans- and retroperitoneal routes, with or without hand assistance. No clear advantages have been demonstrated for either route, apart from less operative time and hospital stay (107) for the retroperitoneal approach, which can give the possibility of an early ligation of the vascular kidney supply (111). One-port metastasis has been reported (109) in a series where the kidney was morcellated before the removal. However, the follow up is still too short to confirm the validity of laparoscopic radical nephrectomy as an effective treatment for renal cancer (114, 115); nevertheless, the actuarial intermediate-term disease-free survival rate is comparable with open surgery (113) for T1 and T2 tumours.

Table 3.7 Radical nephrectomy: guideline recommendations

Total number of patients	More than 300
Expert opinion	Feasible
Level of evidence	2b
Grade of recommendation	C
Current indications	T1–T2 tumors

3.5.3 Partial nephrectomy (Table 3.8)

This is an established procedure for benign disease, but it is technically difficult. When performed for removing small renal tumours (< 3 cm), the procedure is technically very demanding, and is still experimental and not yet standardized. Only small series have been reported without long-term follow up (111, 112, 116–119). It is not therefore recommended for use in clinical practice and should only be performed in controlled prospective trials.

Table 3.8 Partial nephrectomy: guideline recommendations

Total number of patients	Less than 100
Expert opinion	Established (benign disease), Under evaluation (cancer)
Level of evidence	3 (benign disease) 4 (cancer)
Grade of recommendation	B (benign disease) C (cancer)
Current indications	Hydrocalicectasy, Tumours < 3 cm

3.5.4 Nephro-ureterectomy (Table 3.9)

As with simple nephrectomy, laparoscopic nephro-ureterectomy is an established method for benign disease, i.e. removing a non-functioning kidney and ureter for ureterohydronephrosis.

On the other hand, laparoscopic nephro-ureterectomy for transitional cell cancer (TCC) of the upper urinary tract is technically demanding, though feasible, but with a mandatory technical point - the collecting system should not be opened during the procedure (120). For this purpose, the transperitoneal approach allows the descending removal en bloc of the kidney and the ureter, together with the bladder cuff. Extrafascial nephrectomy with adrenal sparing is advised (121, 122). The laparoscopic approach has some advantages with respect to the open procedure (lower morbidity, shorter hospitalization, better cosmetic results) (123). However it remains controversial from an oncological point of view. TCC has an high frequence of seeding; in addition, port metastases have been reported during nephro-ureterectomy for upper urinary tract TCC (124-135). Because of the low number of cases, results are not conclusive. Good long-term results have been reported only for low-stage tumours and are similar to those obtained with open surgery.

Table 3.9 Nephro-ureterectomy: guideline recommendations

Total number of patients	Less than 100
Expert opinion	Established (benign disease) Under evaluation (cancer)
Level of evidence	2b (benign disease) 3 (cancer)
Grade of recommendation	B (benign disease) C (cancer)
Current indications	Ureterohydronephrotic non-functioning kidneys Low-stage transitional cell carcinomas

3.5.5 Live-donor nephrectomy (Table 3.10)

Laparoscopic live-donor nephrectomy is feasible and represents an alternative to open surgery when performed in transplant centres by a skilled and very trained laparoscopist (136-140). In fact more than 500 cases have been done in only two centres (141, 142).

All comparative studies, as well as a retrospective analysis of the literature (N = 738 laparoscopic versus 3502 open living-donor nephrectomies) did not show any disadvantage with respect to the laparoscopic approach, whereas the laparoscopic nephrectomy was superior with respect to post-operative morbidity and convalescence of the donor (143-156). Some authors postulate that the longer warm ischaemia time (1.5 versus 2.5 minutes) may lead to a shorter lifetime of the graft (157, 158). Others, however, have shown that there is no influence (159). Nevertheless, there are no long-term results. Moreover, the procedure is technically very demanding and should always be performed by a very experienced surgeon well trained in laparoscopy.

Table 3.10 Live-donor nephrectomy: guideline recommendations

Total number of patients	About 800
Expert opinion	Feasible
Level of evidence	2a
Grade of recommendation	B
Current indications	Live-donor nephrectomy

3.6 Nephropexy (Table 3.11)

Laparoscopic nephropexy is a feasible procedure for the treatment of symptomatic nephroptosis. It is a minimally invasive alternative to open nephropexy. However, nephropexy is seldom indicated. Only patients with an objective deterioration of renal function and a clear obstruction of renal outflow (as demonstrated in the standing position) will benefit from nephropexy. In doubtful cases (i.e. when it is not definite that a patient's symptoms would be relieved by nephropexy), a minimally invasive approach,such as laparoscopic nephropexy, can provide a reasonable way of allowing for the uncertainty of the results (160-169).

Table 3.11 Nephropexy: guideline recommendations

Total number of patients	Less than 100
Expert opinion	Feasible
Level of evidence	3
Grade of recommendation	C
Current indications	Nephroptosis

3.7 Pyeloplasty (Table 3.12)

In review papers, the laparoscopic pyeloplasty has been reported with results that are comparable between arms (170-173). Less post-operative pain, shorter hospital stay and shorter convalescence have been reported with the laparoscopic approach, but the design of the studies do not allow any scientific conclusions to be made. Most of the papers (173-190) have reported series including less than 25 patients. The operative time ranges between 89 and 300 minutes, and the complication rate between 10% and 25%, with a success rate of between 75% and 100%. Both dismembered and non-dismembered procedures have been described (172, 187), while transperitoneal and extraperitoneal approaches are possible (182). The procedure is feasible in children (176, 179). However, laparoscopic pyeloplasty is a technically difficult procedure, requiring very good training, especially for suturing.

Expert opinion indicates that this technique can be offered when a pyeloplasty is indicated, provided that the surgical team has mastered the technique. However, there is competition between the use of laparoscopic surgery and other minimally invasive procedures, e.g. endopyelotomy, with the later being probably much easier to learn. The long-term results are unknown.

Table 3.12 Pyeloplasty: guideline recommendations

Total number of patients	More than 200
Expert opinion	Feasible
Level of evidence	3
Grade of recommendation	C
Current indications	Pyeloplasty

3.8 Pelvic lymph node dissection (Table 3.13)

Laparoscopic pelvic lymph node dissection has a lower morbidity and a lower complication rate than open surgery (191, 192), with the same completeness of dissection as in open surgery (193-196). Large series have demonstrated the efficacy and safety of the procedure (197-200), indicating that the procedure is a valid alternative to open surgery for the staging of prostate cancer, prior to prostatic surgery or radiotherapy (201-214). Clinical results have been confirmed by an experimental randomized study in pigs (215).

Table 3.13 Pelvic lymph node dissection: guideline recommendations

Total number of patients	More than 1500
Expert opinion	Established
Level of evidence	2b
Grade of recommendation	B
Current indications	Prostate cancer staging

3.9 Radical prostatectomy (Table 3.14)

Laparoscopic radical prostatectomy presented a real challenge for the evolution of laparoscopy. The feasibility and safety of the procedure has been demonstrated by several studies (216-222), and has been performed using different techniques (transperitoneal, extraperitoneal, descending, ascending) with similar technical results. After a few years of clinical experience (223-225), it still remains a very demanding procedure which

requires significant laparoscopic expertize with an ongoing learning curve. The only comparative study (226) has shown that the oncological control of laparoscopic radical prostatectomy is similar to open surgery. The largest series showed good functional results (227). However, no long-term data are available and no Phase III studies have been performed to date. Because of the steeper learning curve, good results are achieved only after a long period of specific laparoscopic practice.

Table 3.14 Radical prostatectomy: guideline recommendations

Total number of patients	More than 500
Expert opinion	Feasible
Level of evidence	2b
Grade of recommendation	B
Current indications	Low prostate-specific antigen (PSA) intraprostatic cancer

3.10 Retroperitoneal lymph node dissection (for testicular cancer) (Table 3.15)

After the initial experience in pigs and humans demonstrating the feasibility of the technique (228-231), laparoscopic retroperitoneal lymph node dissection for stage I testicular cancer represents nowadays an alternative to surveillance and risk-adapted chemotherapy (232-233). It is superior to open surgery with respect to morbidity, has a lower complication rate than open surgery, and shows a similar completeness of dissection with long-term results equal to open surgery (232-244). A clinical comparative study (236) confirmed the data of experimental comparative studies in pigs (242-243). However, it is a difficult operation which requires a long learning curve and a good skill in laparoscopy.

The excision of residual tumour after chemotherapy in stage II testicular tumour is an experimental indication (245).

Table 3.15 Retroperitoneal lymph node dissection (for testicular cancer): guideline recommendations

Total number of patients	More than 300
Expert opinion	Feasible (Stage I)
	Under evaluation (Stage II)
Level of evidence	3 (Stage I)
	4 (Stage II)
Grade of recommendation	C
Current indications	Clinical stage I non-seminomatous testicular tumour

3.11 Renal cyst treatment (Table 3.16)

The laparoscopic treatment of renal cysts represents a minimal invasive procedure which is easy to perform compared to the alternative of percutaneous sclerotherapy. Only one comparative study exists (246), in which laparoscopic deroofing of renal cysts demonstrated a 5% recurrence rate compared with an 82% recurrence rate for sclerotherapy. In three papers (247-249), the various experiences of laparoscopic treatment of renal cysts are reviewed, mainly with a few patients. Both cortical and peripyelic cysts have been treated. The indications for treatment were pain and infection. The operative time ranged from between 50 and 390 minutes, and the success rate ranged between 50% and 100%, with a follow up of between 6 and 40 months. The main complications reported were bleeding and haematomas. It is recommended that the surgeon performs a biopsy of the base of complex cysts and fills the unroofed cavity with perirenal fat.

Table 3.16 Renal cyst treatment: guideline recommendations

Total number of patients	Less than 300
Expert opinion	Established
Level of evidence	3
Grade of recommendation	B
Current indications	Bosniak category II
	Recurrence after pecutaneous aspiration

3.12 Ureterolithotomy (Table 3.17)

Laparoscopic ureterolithotomy is seldom indicated in the era of shockwave lithotrypsy (SWL) and endo-urology. The few reported cases in the literature are very small series, without randomized, controlled or comparative studies. Only one review paper (247) considers the possible indications: failure of SWL or endo-urological

methods; large stone requiring multiple SWL or endo-urological interventions; longstanding impacted stone; multiple ureteric calculi. Because of the risk of urinary leakage, a post-procedure ureteral stent is recommended. The success rate is between 90% and 100%, whereas the conversion rate is up to 15%.

Table 3.17 Ureterolithotomy: guideline recommendations

Total number of patients	Less than 100
Expert opinion	Feasible
Level of evidence	4
Grade of recommendation	C
Current indications	Ureteral stones not treatable with SWL or endo-urology

3.13 Varicocelectomy (Table 3.18)

Laparoscopic spermatic vein ligation is reported in the early series of urological laparoscopy (250-260). It is a procedure that is easy to perform and has a low rate of complications (2-12%). In controlled studies, similar results were obtained with laparoscopic spermatic vein ligation compared with open surgery (261-265), including a pregnancy rate of 26-47%, an improvement in sperm density of 27-80%, and a recurrence rate of 1-20%. The mean operative time is longer than for open surgery (10-170 minutes). Although it provides an alternative to the Palomo technique, it carries costs and is more invasive, and is therefore considered appropriate only for bilateral varicocele.

Table 3.18 Varicocelectomy: guideline recommendations

Total number of patients	More than 1000
Expert opinion	Feasible
Level of evidence	2b
Grade of recommendation	C
Current indications	Bilateral varicocele

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4. GUIDELINES FOR LAPAROSCOPY IN UROLOGY: RECOMMENDATIONS AT A GLANCE

Laparoscopic procedure	Expert opinion	Level of evidence	Grade of recommendation	Technical difficulty
Adrenalectomy	S	1b	A	+++
Colposuspension	U	2a	C	++
Cryptorchidism treatment	E	2b	B	+
Hernia repair	E	1b	A	+
Nephrectomy for benign disease	E	2a	B	++
Radical nephrectomy (T1–T2)	F	2b	C	+++
Partial nephrectomy (cancer)	U	4	C	+++
Partial nephrectomy (benign desease)	E	3	B	+++
Nephro-ureterectomy (cancer)	U	3	C	+++
Nephro-ureterectomy (benign disease)	E	2b	B	++
Live-donor nephrectomy	F	2a	B	+++
Nephropexy	F	3	C	+
Pyeloplasty	F	3	C	+++
Pelvic lymph node dissection	E	2b	B	+
Radical prostatectomy	U	2b	B	++++
Retroperitoneal lymph node dissection (stage I)	F	3	C	+++
Renal cyst treatment	E	3	B	+
Ureterolithotomy	U	4	C	++
Varicocelectomy	F	3	C	+

Key to scoring system (See also Section 1.2)

Expert opinion	Definition	Technical difficulty	Definition
S	Superior	+	Basic
E	Established	++	Intermediate
F	Feasible or alternative	+++	Complex
U	Under evaluation	++++	Very complex

ABBREVIATIONS

CCD	charge-coupled device
CO2	carbon dioxide
RPLND	retroperitoneal lymph node dissection
PSA	prostate-specific antigen
SWL	shockwave lithotrypsy
TCC	transitional cell carcinoma
TVT	tension–free vaginal tape