Laparoscopic Subtotal Hysterectomy

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10.1 Introduction

Hysterectomy was mentioned in Greek manuscripts 2,000 years ago (Baskett 2005). Soranus of Ephesus described a vaginal hysterectomy for a prolapsed gangrenous uterus in the second century AD. The first abdominal hysterectomy was performed by Charles Clay in Manchester in 1844. During the eighteenth century the postoperative mortality of the procedure was over 70 % (Sutton 1997), mainly from haemorrhage and sepsis. The first abdominal total hysterectomy was performed by Dr E H Richardson in Baltimore in 1929. He also advocated the removal of the cervix for the prevention of cervical cancer of the cervical stump, which at the time had a reported incidence of 0.4 % (Johns 1997). However, subtotal abdominal hysterectomy remained the operation of choice for benign uterine disease until 1940 (Sutton 1995), when antibiotics were introduced, because not opening the vaginal vault reduced the risk of infection and thus death.

Following an intense debate after the introduction of antibiotics and transfusion in the 1950s, total abdominal hysterectomy prevailed as it offered protection against cervical cancer. The incidence of cervical cancer dropped to 0.14–0.16 % in the 1970s, with a further drop to 0.084 % attributed to the uptake of cervical screening (Quinn et al. 1999).

In 1989, the first total laparoscopic hysterectomy (TLH) was described by Harry Reich in

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Pennsylvania (Reich et al. 1989), and 2 years later the first laparoscopic subtotal hysterectomy was described by Kurt Semm (1991). This was performed via 'pelviscopy' (gynaecological laparoscopy); the word 'laparoscopy' was forbidden because it was associated with great intraoperative morbidity. The procedure carrying the unfortunate acronym CASH (classic abdominal serrated-edge macromorcellator hysterectomy) involved complete excision of the endocervix with the aid of a transcervical guide wire and removal of the uterine corpus. The procedure was long, expensive, had a relatively high morbidity, and required advanced laparoscopic surgical skills. Preservation of the ectocervix also contradicted the belief of gynaecologists, built over three decades, that the cervix is 'better removed'.

During recent years, the interest in subtotal hysterectomy through the laparoscopic approach has been revived. Indeed, the USA has seen a fourfold increase in the number of subtotal hysterectomies performed (Merrill 2008). However, grade A evidence is lacking. As different women have different pathology and are treated by surgeons with different skills, any attempt at randomisation is likely to be impossible. We will describe our own experience with laparoscopic subtotal hysterectomy with reference to the literature when available.

10.2 Preoperative Preparation

Laparoscopic subtotal hysterectomy includes morcellation of the myometrium and of the endometrium; therefore it is very important to exclude endometrial hyperplasia and malignancy. Preoperative endometrial assessment with transvaginal ultrasound scanning and, where appropriate, outpatient hysteroscopy and endometrial sampling is of paramount importance for all women undergoing the procedure.

Women are advised that there is a small chance of developing cyclical bleeding despite diathermy of the endocervix and it is impossible to predict which women will develop this symptom. This cyclical bleeding invariably lasts for 1 day only in a periodical pattern and will never evolve into a heavy period. We believe that women who are informed of the possibility of cyclical bleeding are much less likely to be disturbed by its occurrence and much less likely to request a trachelectomy following a laparoscopic subtotal hysterectomy. The importance of continued cervical screening is also reinforced.

Contraindications to laparoscopic subtotal hysterectomy include the following:

- uterus more than 20 weeks size
- stoma
- adhesions
- unfitness for anaesthesia
- poor compliance with cervical screening
- diskaryosis/cervical intraepithelial neoplasia
- suspected malignancy.

We consider it good practice to offer the results of our own continuous audit to the women attending the clinic.

10.3 Surgical Technique

This is a comprehensive account of our standardised technique. In other units, alternative forms of thermal energy, different types of morcellating devices and uterine manipulators are used with equally good results.

The procedure is performed under general anaesthesia by two surgeons, with the women in the Lloyd–Davies position. Preparation of the woman includes indwelling bladder catheterisation and placement of a Pelosi uterine manipulator (Apple Medical Corporation, Bolton, MA, USA Apple Medical Corporation, Marlboro, MA, USA) in the cervix. This is an articulated manipulator that allows extreme anteversion and retroversion as well as lateral manipulation of the uterus even in the absence of an assistant. The use of an indwelling catheter is essential as it will keep the bladder empty as the suprapubic port is placed later during the procedure and the collecting bag will immediately fill with carbon dioxide if the bladder is injured. If Palmer's point entry is indicated, a nasogastric tube is inserted to decompress the upper gastrointestinal tract after the introduction of anaesthesia.

The procedure is performed through a 4-port operative laparoscopy: a 10 mm infraumbilical port for the laparoscope, two 5 mm lateral ports and a suprapubic 12 mm port for morcellation. The lateral ports are placed high in the abdomen, at the same level as the umbilicus. This allows more space for handling pedicles in large uteruses and also facilitates the angle of coagulation as the line of the instrument is parallel to the lateral margin of the uterus and away from the pelvic sidewall.

Laparoscopic subtotal hysterectomy is a two-surgeon procedure, with both surgeons predominantly operating with their right hand. The surgeon on the left uses the right hand to handle instruments through the left port and the left hand to manipulate the Pelosi uterine manipulator and maximise exposure of the operating field. The surgeon on the right of the woman under surgery uses the right hand to handle instruments through the right port and the left hand to handle the laparoscope.

The laparoscopic steps include coagulation and transection of the infundibulopelvic ligament in the case of bilateral salpingo-oophorectomy or the ovarian ligament in the case of conservation of the ovaries. The round ligament is coagulated and transected. The broad ligament is incised and the uterovesical fold is deflected to allow more space for the Lap Loop (Roberts Surgical Healthcare, Kidderminster, UK) monopolar diathermy device at the level of the cervical isthmus. The broad ligament is incised lateral to the uterus so that the uterine plexus is not inadvertently injured.

Transection of the uterine vessels is performed at the same time as the detachment of the uterine corpus using the Lap Loop monopolar wire after removal of the uterine manipulator. The Lap Loop device is inserted through the suprapubic port to the left of the uterus and the wire is grasped by the surgeon on the right, advanced behind the cervix and attached to the Lap Loop applicator. The pouch of Douglas is checked with the wire under tension to avoid bowel entrapment inside the monopolar wire. The diathermy is set at 100 W coagulation and the surgeon on the left keeps the uterus retroflexed. With this technique, the angle of cutting is vertical and the Lap Loop device provides a conisation effect removing a wedge off the endocervix.

When the uterine vessels are cut with the wire, they remain attached on the sides of the cervical stump instead of retracting to the pelvic sidewall. All pedicles are cross-coagulated, i.e. coagulated from the left and the right side trocars at right angles, by the surgeon and the assistant. Any complementary coagulation to the uterine vessels is easy, does not require any additional dissection and most importantly does not jeopardise the integrity of the ureters and the major vessels of the pelvic sidewall.

The uterus is then morcellated by drawing the specimen into the morcellator using a single-tooth or a gallbladder forceps while the uterus is lifted and stabilised by the surgeon on the right. The tip of the rotating electromechanical morcellator is always kept within 2 cm of the lower abdominal wall (Erian et al. 2007), and the single-tooth forceps is only advanced 3–4 cm beyond the edge of the trocar to avoid inadvertent grasping of bowel or omentum during the morcellation. We routinely use the suprapubic port for the morcellator as we feel this provides more space inferiorly and laterally from the blade of the morcellator to the abdominal viscera and the pelvic sidewall, therefore minimising the risk of accidental damage to vital structures.

After morcellation is completed, the peritoneal cavity is cleared of any collected blood and fragments of myometrium by collection and irrigation with normal saline solution followed by suction. The bowel is not displaced before all the visible fragments are removed to minimise missing uterine corpus fragments in between bowel loops. The clearance of the pelvis, paracolic gutters and upper abdomen (as the woman is in deep head-down position) is of paramount importance as there have been reports of pelvic seeding of morcellated uterine tissue and subsequent development of adenomyotic masses (morcelloma) (Donnez et al. 2007; Hilger and Magrina 2006) in the peritoneal cavity or the cervical stump. Meticulous clearance of the peritoneal cavity has been advocated (Sutton 1995; Johns 1997) because several complications may be attributed

to incomplete collection of uterine fragments. The endocervix is cauterised with bipolar diathermy.

Haemostasis is checked after decompressing the peritoneal cavity. Then the abdominal cavity is re-inflated and a 16 gauge drain is passed through the lateral port to the pouch of Douglas. The drain is connected with a decompressed collection container as suction drainage may draw small or large bowel into the drain and cause ischaemia and subsequent perforation (Reed et al. 1992). Finally, the laparoscopic instruments and trocars are removed under direct vision and the port sites are closed with a J-shaped needle and number 1 Vicryl® (polyglactin 910; Ethicon Endo-Surgery, Cincinnati, OH, USA) under laparoscopic control before decompression of the pneumoperitoneum.

10.4 Learning Curve

As with all new procedures, mentoring and preceptorship are essential to minimise the risk of complications (Cutner and Erian 1995). Once introduced as routine practice, the complication rate of minimal access hysterectomy seems to fall by 11–13 % per year reaching a plateau after about 5–7 years of practice (Brummer et al. 2008; Wattiez et al. 2002). The fall in complication rates may be associated with the early identification of potential visceral injury and laparoscopic repair of the injured viscera.

The operating time seems to be longer in the first operations but stabilises after the first 30 procedures (Ghomi et al. 2007). The effect of surgical volume was seen in a double-parallel randomised trial in the UK (Garry et al. 2004), where laparoscopic hysterectomy was performed in a limited number of centres, with participating surgeons performing on average only 13 procedures over 4 years. In this study, the complication rate (including preoperative conversion to laparotomy) for the laparoscopic hysterectomy group remained as high as 11 % (Ghomi et al. 2007). Similarly, cyclical bleeding after the procedure has been demonstrated to be more common with the most inexperienced surgeons (Lieng et al. 2008). This may be related to the correct level of detachment of the uterine corpus or smoothness of the incision line in the cervical stump. In our experience, the Lap Loop system offers a fairly standard level of a smooth uterine incision even in the hands of less experienced surgeons, which may offer an advantage over the monopolar hook or spatula, ultrasonic hook or Plasma Kinetic (Gyrus Olympus Medical Systems Hamburg Germany) hook technique. However, this advantage has not been assessed by comparative studies.

In our series, the major complication rate was 1.2 % (Erian et al. 2008a), which is in agreement with results found by Wattiez et al. at Clermond Ferrand (Wattiez et al. 2002). All complications associated with haemostasis (haematoma, pelvic collection and transfusion) occurred during the first 81 operations (Erian et al. 2008a) and this reflects the duration of the learning curve. However, visceral injuries occurred later, after the first 100 operations (Erian et al. 2005) or 2 years of practice, probably reflecting the confidence to undertake more difficult procedures in women with a complex previous surgical history. These findings are in accordance with those from previous studies (Wattiez et al. 2002). It is notable that none of the visceral injuries that occurred in our series were related to thermal energy or morcellation.

In our technique, reflection of the bladder is essential prior to the placement of the Lap Loop wire, but we understand that in other units this step is not considered to be essential, with equally good but unpublished results. We have changed the technique of bladder dissection and now each surgeon dissects their side of the bladder. Following this change, we have not had any bladder damage. All bladder injuries in our series (0.75 %) occurred in women with three or four previous caesarean sections (Erian et al. 2008a).

10.5 Laparoscopic Subtotal Hysterectomy as Same-Day Surgery

The Foley indwelling catheter and the drain are removed 4 h after the procedure. Women are reviewed by the medical team 6 h postoperatively

and discharged. They are advised to call the 24-h helpline service if they are experiencing any symptoms. If there has been bladder damage during surgery, the home care team will allocate a nurse who will remove the catheter at the appropriate time (5 days postoperatively) and ensure there is an acceptable postvoiding residual of urine. In our series of over 400 women, we have not had to intervene surgically or transfuse any women intra- or postoperatively. The readmission rates seem very low (Erian et al. 2008b) and the duration of surgery is short, even with large uteruses approaching 1 kg in weight. The postoperative management protocol is simple but requires a team effort and multiprofessional education to organise a setting where LSH can be performed safely as a 6-h discharge procedure.

10.6 Urinary Tract Injuries: Diagnosis, Surgical and Postoperative Management

In our series, there was no ureteric injury (0 %) in the first 500 women. This was probably the case because there is no need to dissect the paracervical tissues. The distance between the cervix and the ureter is less than 5 mm in over 10 % of women (Simon et al. 1999); the lateral thermal spread of coagulating devices varies from 2 to 4 mm (Carbonell et al. 2003) and they are usually 2–5 mm wide. It is easy to understand how ureteric thermal injury occurs in these conditions. The possibility of avoiding this area altogether gives laparoscopic subtotal hysterectomy a distinct advantage over total laparoscopic hysterectomy.

In a recent series (Jung and Huh 2008), the incidence of ureteric injury was 0.34 %. It is noteworthy, however, that all ureteric injuries in this series occurred when a colpotomy was used to remove the uterus from the peritoneal cavity. When colpotomy was replaced by morcellation, there was no ureteric injury for over 10 years. We can safely say that ureteric injury during LSH is very rare when morcellation is used to remove the uterine corpus.

Bladder injury is not so uncommon. If a suprapubic trocar is used, catheterisation is absolutely essential. In our experience, bladder injury only occurred in the presence of multiple (more than 2) previous caesarean sections and this is a counselling point that needs to be stressed. The results by Donnez et al. (2009) are in agreement with this point as all their bladder injuries happened in women with previous caesarean sections as well. The incidence reported was 0.25 %, which is lower than that in our series (0.75 %). Bladder injuries are easy to detect intraoperatively as the catheter bag is inflated with carbon dioxide that escapes through the bladder incision. Bladder injury is repaired by laparoscopic suturing using a single-layer closure (Thakar et al. 2002). Antibiotic prophylaxis is administered and the bladder is catheterised for 5 days on free flow (the catheter is draining freely in a urine collector and no tap is used ensuring continuous decompression of the bladder) on an outpatient basis. The catheter is then removed at home and the postvoiding residual urine is measured.

10.7 Satisfaction with the Procedure

In our series, 98 % of the women were satisfied with the operation and the same number would recommend the procedure to a friend. In previous studies (Ghomi et al. 2007), there was clear evidence that the laparoscopic approach resulted in a shorter convalescence time, less postoperative pain and rapid improvement in quality-of-life indicators (Simon et al. 1999). This percentage is higher than that in a recent report (Lieng et al. 2008), which presented a satisfaction rate of 90 %. However, in that study about half the women did not expect to have any bleeding postoperatively. In our opinion, the procedure is offered to treat menorrhagia and not to induce complete amenorrhea. When this is clearly conveyed to the women preoperatively, they are less likely to be disappointed because of cyclical bleeding. The incidence of cyclical bleeding in our series was 2 % and some surgeons would argue that this is the reason why our satisfaction

rate is 98 % (Erian et al. 2008a). This is incorrect as there are women who are dissatisfied because of other problems such as residual pain, postoperative infection, communication with medical and nursing staff and waiting time.

10.8 Laparoscopic Subtotal Hysterectomy and Cervical Cancer

One of the main arguments of those supporting total hysterectomy is the potential for the cervical stump to develop cervical intraepithelial neoplasia (CIN) or cancer. We do not offer a laparoscopic subtotal hysterectomy to women with smear abnormalities. A study of 1.87 million has shown that the risk of cervical cancer after a normal smear history is 1:5546 (0.018 %) (Morrell et al. 2005). The incidence of cervical cancer in women who have undergone subtotal hysterectomy is 0.1–0.2 % (Brummer et al. 2008). To put this into context, the risk of cervical cancer in women who undergo laparoscopic subtotal hysterectomy is smaller than the risk of uterine rupture in labour in women with a previous caesarean section (0.3 %)—and vaginal birth after a caesarean section is considered routine practice.

In the rare case when cervical cancer does occur in the cervical stump, the prognosis is no different to that in women who have not had a hysterectomy (Hellström et al. 2001). However, the treatment of CIN with large loop excision of the transformation zone (LLETZ) is more hazardous as the uncontrolled spread of thermal energy toward the bladder in the absence of a uterine corpus may result in fistulae. In these circumstances, laparoscopic dissection of the anterior peritoneum with a relatively full bladder, acting as a heat sink, should be considered.

10.9 Cervical Stump Symptoms

The rate of persistent vaginal bleeding in other series can be as high as 24 % (Lieng et al. 2006; Lieng et al. 2008), but 90 % of the women are satisfied with the procedure and this reinforces the need for appropriate preoperative counselling regarding this potential symptom. In our series, 2 % of the women complained of chronic vaginal bleeding and this low rate may be attributed to the low amputation of the cervical stump with the Lap Loop device and the meticulous destruction of the cervical canal with high-frequency pulsatile bipolar diathermy.

Disturbing symptoms, namely pain and bleeding from the cervical stump, have been reported to be more common in women who have endometriosis (Okaro et al. 2001). However, later studies have contradicted this notion (Ghomi et al. 2005). The degree of treatment of peritoneal disease, the presence of ovaries and the pre- and postoperative medical treatment of the disease would affect these results. There has not been a study assessing the resolution of symptoms, which is thought to result from the retained cervix after a trachelectomy.

In a large retrospective Scandinavian study (Brandsborg et al. 2007), at least a third of the women undergoing hysterectomy had chronic pain 1 year later and the main risk factors appeared to be pelvic pain, pain in another part of their body and of course endometriosis. In women who have persistent pain, therefore, other causes of pain must also be considered, in addition to the retained cervical stump (Garry 2008).

Conclusion

Laparoscopic subtotal hysterectomy is an effective procedure that can be performed safely in a day care setting. It is not proven to be superior or inferior to total laparoscopic hysterectomy, but it seems to carry less febrile morbidity and a lower risk of hospital admission, making it more suitable for same-day surgery. The procedure offers an early return to normal activities and an early resumption of sexual function.

Advances in coagulation and morcellation technology have reduced the operating time and have dramatically changed the safety profile of the procedure compared with the 1990s. The long-term risks are small and mostly theoretical, whereas the benefits in the immediate and late postoperative period are documented and substantial.

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