Hysterectomy for Benign Disease

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The number of hysterectomies performed is decreasing because of the availability of less-invasive alternatives and a general trend towards more conservative management. Historically, hysterectomy was performed through the vagina, which is the preferred approach. Nonetheless, a laparoscopic approach can be used to avoid open surgery when the vaginal route is not feasible. Total hysterectomy should be performed and intrafascial hysterectomy may have some advantage over extrafascial hysterectomy. The age of the patient, risk of ovarian carcinoma, and risk of reoperation should be considered prior to performing prophylactic salpingo-oophorectomy. Salpingectomy should be discussed with the patient who wishes to conserve her ovaries. There is now a trend towards shorter hospital stay and same-day discharge following hysterectomy. Criteria for audit on the operations are suggested.
Hong Kong J Gynaecol Obstet Midwifery 2017; 17(2):121-8

Introduction

Hysterectomy is one of the most common major gynaecological operations. In Hong Kong, 4000 to 6000 hysterectomies are performed each year (Table 1[1-3]). It appears that this number is now reducing, which is a trend that has also been observed elsewhere. Predisposing factors are multiple and include the availability of less-invasive alternatives and a general trend towards more conservative non-surgical management[4]. Despite this, hysterectomy remains one of the most common major operations and this review focuses on its application in benign disease.

History

The first authenticated case of partial vaginal hysterectomy was reported by Berengarius da Carpi in 1507. Schenck of Grabenberg reported 26 cases during the early 17th century. Baudelocque from France introduced the technique of artificially prolapsing and then cutting away the uterus and appendages. He performed 23 such procedures during the 16 years following 1800. The first attempt at abdominal hysterectomy was reported in 1843[5]. In the early 20th century, subtotal abdominal hysterectomy was the universal approach[6]. The first total abdominal hysterectomy was performed in 1929 by Edward Richardson and his technique remains the standard of care today[7]. Harry Reich performed the first laparoscopy-assisted hysterectomy in 1988. In search of a simpler approach, laparoscopic subtotal hysterectomy[8]—the classic intrafascial serrated edged macro morcellator hysterectomy (CISH)—was reported[9]. Of note, robot-assisted laparoscopic hysterectomy is another way to simplify a minimally invasive approach[10], and vaginal hysterectomy is increasingly performed in some countries[11,12].

Indications

Uterine leiomyoma and adenomyosis have been the two most common indications associated with abdominal and laparoscopic hysterectomy in Hong Kong. On the other hand, genital prolapse is probably the most common condition associated with vaginal hysterectomy[1].

Choice of Routes

The American College of Obstetricians and Gynecologists (ACOG) and the Society of Obstetricians and Gynaecologists of Canada have recommended vaginal hysterectomy as the optimum route for hysterectomy[13,14]. The ACOG recommendation is based on the Cochrane Review published in 2009 that showed vaginal hysterectomy to be associated with better outcomes and few complications[15]. The review was last assessed as up-to-date in August 2014 and the authors remained firm in their recommendation that vaginal hysterectomy was superior to laparoscopic and abdominal hysterectomy with a more rapid return to normal activity. If vaginal hysterectomy is not possible, laparoscopic hysterectomy should be performed. A comparison of different approaches to hysterectomy is shown in Table 2[16]. In a debate about the choice between laparoscopic versus vaginal hysterectomy, Bongers[17] suggested that most advantages of vaginal hysterectomy are related to skill and will change if surgeons have more exposure to total laparoscopic hysterectomy. Whilst this may be true in future, vaginal hysterectomy should remain

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Table 1. Number of abdominal hysterectomies performed in Hong Kong according to the Hong Kong College of Obstetricians and Gynaecologists Territory-wide Audits[1-3]

Year	Total abdominal hysterectomies for benign conditions	Laparoscopic hysterectomy	Vaginal hysterectomy	Total
1999[1]	4146	255	450	4851
2004[2]	5058	798	507	6363
2009[3]	4136	1091	460	5687

Table 2. Comparison of different approaches to hysterectomy[16]

Comparison	Details
Vaginal hysterectomy vs. abdominal hysterectomy	Faster return to normal activities More rapid recovery Fewer postoperative febrile episodes
Vaginal hysterectomy vs. laparoscopic hysterectomy	Shorter operating time Less urinary tract injuries than total laparoscopic hysterectomy
Laparoscopic hysterectomy vs. abdominal hysterectomy	Faster return to normal activities Fewer febrile episodes Fewer wound or abdominal wall infections Longer operating time

Table 3. Contraindications to vaginal hysterectomy[20]

- Uterus >12 weeks' size
- Uterine volume >300 cm^3
- Restricted uterine mobility
- Adnexal pathology
- Diminished vaginal space
- Cervix flush with vagina
- Inaccessible cervix
- Vesicovaginal fistula repair
- Invasive cancer of the cervix

the route of choice until we have evidence to the contrary. In fact, the same conclusion is reiterated by other more recent reports and meta-analysis[18,19].

There is no universally accepted list of contraindications to vaginal hysterectomy but Sheth[20] has proposed a list as guidance (Table 3). The author remarked that many of these contraindications are relative and vary with the skill of the surgeon. He has the experience of operating on several patients with a cervix flush with the vagina as a result of a previous large loop excision of transformation zone or cone biopsy. Nonetheless this list is helpful at the initial learning phase.

Of note, robotic and single-port hysterectomy should not be considered a standard alternative until more evidence is available[16].

The Technique
Vaginal Hysterectomy

Vaginal hysterectomy is performed under general anaesthesia with prophylactic antibiotics given at induction. After making a circumferential incision at the vaginal forni, the bladder is dissected from the uterus and the anterior vesico-uterine space and the pouch of Douglas are entered. Uterosacral ligaments and transverse cervical ligaments are clamped, cut, and transfixed together with the uterine vessels. The uterus is bisected or morcellated as appropriate whenever difficulty is encountered due to uterine size. The upper uterine pedicles including the round ligaments, uterine tubes, and ovarian ligaments are then clamped, cut, and transfixed. After inspection of the adnexal organs (ovaries and fallopian tubes) and confirmation of haemostasis, the vaginal vault is closed[21].

For a large uterus, it is reasonable to pre-treat the patient with a 3-monthly dose of gonadotropin-releasing hormone agonist. Reducing the size of the uterus may make vaginal hysterectomy more feasible[22]. It may also reduce the operating time and consequent blood loss[23]. Bisection or morcellation are important techniques as the uterus is removed intact in only 16% of the patients. Coring is particularly useful for patients with endometrial hyperplasia as it avoids opening the uterine cavity in case

the patient had carcinoma of corpus. It is important to look for bleeders at 4 and 8 o'clock regions before closure of the vault. This can probably reduce the chance of vaginal haematoma. Currently, the author advises suturing of the uterosacral ligaments to the vault to reduce the chance of vault prolapse[24].

Perhaps the main obstacle to the adoption of vaginal hysterectomy is the acquisition of the necessary skill. In the author's experience, laparoscopy-assisted vaginal hysterectomy can serve as a stepping stone to the adoption of vaginal hysterectomy[23].

Laparoscopic Hysterectomy

There are many variations in the degree of laparoscopic involvement when performing laparoscopic hysterectomy, ranging from laparoscopy-directed preparation for vaginal hysterectomy to a complete laparoscopic procedure[25]. Equally variable is the exact technique in performing the procedure. A good discussion of the technique can be found in the review by King and Giles[26].

All those interested in performing laparoscopic hysterectomy must be aware of the eVALuate study by Garry et al[27]. The study concluded that laparoscopic hysterectomy was associated with a significantly higher rate of major complications than abdominal hysterectomy. The major complications included major haemorrhage, haematoma, bowel injury, ureteric injury, bladder injury, pulmonary embolus, major anaesthesia problem, unintended laparotomy, and wound dehiscence. Whether the same conclusion can be drawn today is questionable. The original author, Garry[28], suggests that changes in methods of haemostasis mean that the conclusions are no longer valid. This is a reasonable statement but has yet to be supported by more evidence.

Vaginal cuff dehiscence and evisceration are rare complications of hysterectomy although a higher rate was reported following laparoscopic hysterectomy (Table 4[29]). Specific factors related to laparoscopic hysterectomy explaining the increase may include the use of electrosurgery, shallow suture placement, and compromised knots.

Table 4. Estimated rates of vault dehiscence[29]

	Incidence (%)
Vaginal hysterectomy	0.15
Laparoscopy-assisted vaginal hysterectomy	0.20
Total laparoscopic hysterectomy	0.87
Total abdominal hysterectomy	0.28

Abdominal Hysterectomy

Most surgeons perform total abdominal hysterectomy following the technique of Richardson[30]. In his original description, he named the common problems associated with the existing methods of hysterectomy including haemorrhage, ureteric injuries, and postoperative *Streptococcus* infection. He then summarised the five features of his method (Table 5[31]). In a detailed description of his technique, he stated that the cervix is covered with a thin layer of fascia after the bladder has been pushed down. This fascia is to be cut a little below the level of the internal os so that the vascular plexus in the fascia layer will be freed from the cervix. Another transverse incision is made through the posterior peritoneal reflection 1 cm above the level of attachment of the two uterosacral ligaments and the dissection is continued for at least 2 cm. The uterosacral ligaments are clamped, divided, and ligated close to their cervical attachment before division of the basal segment of the broad ligament on both sides of the cervix[31]. It is therefore clear that the original technique described by Richardson is intrafascial hysterectomy.

The advantages of intrafascial hysterectomy may include minimisation of urinary tract and bowel injury, reduction of postoperative infection, and preservation of the anatomic relationship between the endopelvic fascia and the vagina[32]. It may also be helpful when dealing with difficult anatomy from adhesive disease such as endometriosis and large myomas that increase the risk of injury to the surrounding structures[33]. Unfortunately, the theoretical advantages of intrafascial hysterectomy have not been proven by direct comparison with extrafascial hysterectomy. Conceptually speaking, this can be considered the third way in the dichotomy between subtotal and total abdominal hysterectomy[34]. In the United Kingdom, the extrafascial technique of hysterectomy is more commonly used. The clamps are placed directly onto the uterine vessels and the cardinal and uterine ligaments without entering the vesico-uterine or recto-uterine space[35]. The author suspects that this is also the case in Hong Kong. This change can be observed in standard textbooks. For example, in the 8th edition of *Te Linde's operative gynecology*[36], the existence of the pubovesicocervical fascia was mentioned categorically whilst from the 9th edition on, this fascia is no longer named[37]. It was also remarked that dissection of the posterior peritoneum off the cul-de-sac was considered unnecessary[37]. In addition, if one learns hysterectomy from an oncologist, it is likely to be extrafascial. Intrafascial hysterectomy should only be performed for benign disease. Oncologists are more likely to use the extrafascial technique for both benign and malignant diseases.

Table 5. The five features of Richardson's method of hysterectomy[31]

Feature	Principle	Effect
1. Complete separation of the cervix posteriorly, as well as anteriorly by means of blunt dissection confined to its relatively avascular mid-section	Segregation of the loosely attached, fan-shaped plexus of veins on each side to a narrow zone adjacent to the basal portion of the broad ligament so that these veins can be included in a single clamp (in addition to separation of the bladder and rectum)	Avoid bleeding encountered in the lower lateral cervical region
2. Detachment of the divided and ligated uterine vessels from the lateral margins of the cervix down to the basal portions of the broad ligaments	Drop the ureters considerably further away	Ureters are safe from injury
3. Preliminary surgical toilet of the vagina and cervix; cervix not squeezed by the application of forceps, not drawn into pelvic cavity; finger or hook not introduced into vagina; only knife enters the vagina and this is discarded after vaginal detachment	-	Reduction of postoperative *Streptococcus* peritonitis
4. Reattachment of basal segments of the broad ligaments, uterosacral ligaments, and round ligament to the lateral angle of the vaginal vault	-	Guarantee adequate vault support
5. Complete absence of haemorrhage	-	Simplifies the technique and permits perfect exposure

More information on intrafascial hysterectomy can be found in the article written by Aldridge and Meredith[38]. In summary, the peritoneum and fascial cuff are opened at the level of the ligated uterine vessels just above the attachment of the uterosacral ligaments. The fascial cuff is detached from the posterior surface of the cervix. This can reduce the risk of bowel injury in case of adhesion at the pouch of Douglas. A similar incision is made at the pubovesicocervical ligament anteriorly at the same level and similarly, the ligament is detached from the cervix. The transverse cervical ligaments are clamped in stages inside the fascial cuff until the cervix can be cut from the vaginal vault. The vault and fascial cuff are then closed. One advantage of this technique is that the uterosacral ligaments are kept intact rather than cut and then reattached to the vault. This can avoid any dissection in the pouch of Douglas. Very clear diagrams can be found in the article illustrating the technique[38].

Subtotal Hysterectomy

From the 1960s onwards, removal of the uterine cervix has been performed to prevent carcinoma of cervix[39]. In a review, the incidence of carcinoma of the cervical stump was reported as 0.32% to 1.9%[40]. Although some authors suggested that the risk may be similar to the rate of vaginal cancer after total abdominal hysterectomy, the validity of this claim has not been proven[7]. It is difficult to understand why the incidence is much lower after removal of the uterine corpus alone. The efficacy of additional procedures, e.g. CISH[9] or electrocoagulation of endocervical mucosa to remove the transformation zone[41], to reduce the risk remains to be confirmed.

Apart from prevention of carcinoma, there are other disadvantages to keep the cervix. These include cyclical or acyclical vaginal bleeding, pelvic pain, vaginal discharge, deep dyspareunia and reduced libido, post-coital bleeding, and abnormal cytology[42].

Is there any advantage to conserving the cervix? A Cochrane review on the subject found no evidence to support the claims of improved outcomes for sexual, urinary, or bowel function following subtotal hysterectomy[43]. The rekindled interest is probably more a response to the search for a simpler approach to laparoscopic hysterectomy[7], thus retracing the development of the open procedure. The claims to improve outcomes are excuses that try to justify this backward step.

Concomitant Procedures

Prophylactic Bilateral Salpingo-oophorectomy

Removal or conservation of the adnexa at the same time with the uterus was already a common question during ward rounds when the author started his training. A significant change in practice has been observed. Mikhail et al[44] reported that from 1998 to 2001, there was a 2.2% increase in the rate of bilateral salpingo-oophorectomy per year. From 2001 onwards, however, there was a 3.6% annual decline from 49.7% to 33.4% in 2011.

One of the main indications for bilateral salpingo-oophorectomy is to reduce the risk of carcinoma of ovary. The lifetime risk of developing ovarian cancer in the general population is one in 70 or 1.4%[45]. It is also well known that hysterectomy can reduce the risk of carcinoma of the ovary by 26% to 30%[39]. Various mechanisms including screening effect, protection from carcinogens, decreased blood supply to the ovary, and triggering of an immune response to the surface glycoprotein MUC1 have been proposed to explain this observation. The exact degree of protection can therefore only be estimated from comparative studies. According to a recent systematic review, the prevalence of ovarian cancer in women who underwent hysterectomy with ovarian conservation was 0.14% to 0.7% compared with 0.02% to 0.04% in those who underwent hysterectomy with bilateral salpingo-oophorectomy[46]. The benefit would be much higher in patients at a higher risk of carcinoma of ovary, e.g. those with hereditary cancer syndrome.

Another advantage of bilateral salpingo-oophorectomy is avoidance of the need for reoperation because of adnexal pathology, the 'residual ovary syndrome'. The risk has been estimated to be 2% to 3%[47] although the ACOG quoted a risk of 7.6% when one ovary was conserved and 3.6% when both were conserved[45]. The risk is higher in patients with endometriosis, pelvic inflammatory disease, and chronic pelvic pain[45]. For example, the risk of reoperation was found to be 47% in a small series of patients with endometriosis[48]. One has to distinguish this from the 'ovarian remnant syndrome' that develops following previous bilateral salpingo-oophorectomy.

Hysterectomy alone can affect ovarian function. Siddle et al[49] reported that the mean age of ovarian failure reduced from 49.5 years to 45.4 years after hysterectomy. The finding was confirmed in a more recent prospective study, in that the risk of ovarian failure after 4 years of follow-up was doubled after hysterectomy[50]. Underlying reasons include the effect of hysterectomy on blood supply to the ovaries and also on secretion of follicle-stimulating hormone, and the condition that led to the hysterectomy. Whatever the mechanism, this should be kept in mind when advising patients whether or not to have their ovaries removed.

Another factor to consider is the effect of adnexae removal on overall mortality. The review mentioned above identified three observational studies that examined all-cause mortality[46]. Two studies favoured hysterectomy alone in women younger than 45 or 50 years in terms of all-cause mortality. No difference was found in the third study but this may be due to shorter follow-up, long interval between the oophorectomy and recruitment into the study, and exclusion of outcomes present at the time of recruitment[51,52]. Similar results have been reported in a recent study[53]. Currently, the author usually advises removal of adnexae in postmenopausal women although there is evidence to suggest that postmenopausal ovaries are still metabolically active[54,55].

Vaginal bilateral salpingo-oophorectomy can be performed at the same time as vaginal hysterectomy. In the author's experience, 15% of patients had planned vaginal removal of adnexae and in all cases the concomitant procedure was performed successfully. There was no conversion because of this additional procedure[23]. These findings echo the ACOG conclusion that the choice of whether to perform prophylactic oophorectomy at the time of hysterectomy is based on the patient's age, risk factors and informed wishes, but not on the route of hysterectomy[13].

Prophylactic Bilateral Salpingectomy

Prophylactic bilateral salpingectomy is a more recently introduced concomitant procedure. There has been a rapidly increasing body of evidence that the fallopian tube is the site of origin of non-uterine pelvic high-grade serous carcinomas[56]. The annual increase in concomitant salpingectomy was approximately 8% from 1998 to 2008, to 24% from 2009 to 2011[44].

Clinical evidence of the efficacy of bilateral salpingectomy in reducing ovarian cancer risk is accumulating. In a population-based cohort study, Falconer et al[57] reported that the risk of ovarian cancer among women with previous salpingectomy was lower (hazard ratio=0.65). Bilateral salpingectomy was associated with a 50% decrease in the risk of ovarian cancer compared with the unilateral procedure. A meta-analysis also showed that the odds ratio of developing ovarian cancer was 0.51 after bilateral salpingectomy[58]. Although the evidence cannot be considered conclusive, prophylactic bilateral salpingectomy

Table 6. Mean duration of hospital stay after hysterectomy in Hong Kong[1-3,60] *

Year	Duration of hospital stay (days)		
	Abdominal hysterectomy	**Laparoscopic hysterectomy**	**Vaginal hysterectomy without pelvic floor repair**
1994[60]	8.1 ± 4.6	-	7.8 ± 5.5
1999[1]	7.4 ± 4.0	6.5 ± 3.8	6.3 ± 3.9
2004[2]	6.3 ± 3.7	4.0 ± 2.5	4.4 ± 2.2
2009[3]	5.7 ± 3.3	3.5 ± 2.5	4.4 ± 2.9

* Data are shown as mean ± standard deviation

should be considered when planning hysterectomy.

The author has also performed bilateral salpingectomy during vaginal hysterectomy. In the author's experience, the procedure is more technically challenging than bilateral salpingo-oophorectomy because of the risk of tearing the mesosalpinx. In a large retrospective cohort study of 425 patients who underwent vaginal hysterectomy[59], the overall success rate of salpingectomy was 88% and pelvic adhesion significantly predicted failure. The postoperative complication rate attributed to salpingectomy was 3.8%, including pelvic bleeding, pelvic abscess/infection, fever, drainage of pelvic haematoma, reoperation, and ileus.

Enhanced Recovery

The duration of hospital stay after hysterectomy is decreasing in Hong Kong (Table 6[1-3,60]). In many overseas centres, same-day discharge is practised. In a systematic review, same-day discharge appeared feasible for patients who underwent a minimally invasive hysterectomy, although only articles studying robot-assisted surgery and laparoscopic surgery were included[61]. Same-day discharge has been reported as feasible in 31.8% of patients in retrospective studies[61]. Among some prospective studies, 78.4% of patients were discharged on the same day[61]. Preoperative inclusion criteria included support from a social network, American Society of Anesthesiologists score of 1 or 2, age younger than 60 years, and adequate motivation and understanding to consent and participate. Similar results have been reported for vaginal hysterectomy[62,63]. Apart from selection of suitable patients, a perioperative multimodal evidence-based recovery protocol to optimise same-day discharge is an indispensable element for early discharge or same-day discharge. These protocols have been named differently as enhanced recovery pathway, enhanced recovery after surgery, and fast-track surgery. More information on the principles and practices of such protocols can be found in the review article by Kalogera

and Dowdy[64].

Audit on Hysterectomy

An audit on hysterectomy can be performed on the indication, route, procedure and complications, concomitant procedures, and hospital stay. Alternative less-invasive treatments should be tried or at least discussed with the patient before hysterectomy[65]. Reasonable audit criteria can be derived from local publications[21,66]. These criteria include: 10% as a reasonable target for using the vaginal approach in patients without genital prolapse; a minimal access approach should be used for a uterus smaller than 12 weeks' gestation; total hysterectomy should be the target for most hysterectomies; healthy ovaries should not be routinely removed at the time of hysterectomy; the option of prophylactic salpingectomy should be discussed; prophylactic antibiotics should be given before incision; and the incidence of peri-operative complications should be around 10%.

Conclusion

Hysterectomy is one of the most common major gynaecological operations. Development has gone full circle, from a vaginal to an abdominal approach and now a rekindling of interest in vaginal hysterectomy. The indication tends to be more stringent with the adoption and development of less-invasive alternatives. Prophylactic bilateral salpingo-oophorectomy has also undergone a similar pattern of change. Total versus subtotal hysterectomy has a different pattern and currently, the application of subtotal hysterectomy should be very limited. Nonetheless prophylactic bilateral salpingectomy should be considered in all patients who wish to conserve their ovaries. In general, the duration of hospital stay after hysterectomy is also reducing.

Declaration

The author has disclosed no conflicts of interest.

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