



Surgical management of Abnormal uterine bleeding

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Introduction

- should have an informed decision about their treatment, which should be tailored taking their needs and preferences

Surgical options include

- first-generation (hysteroscopic) and second generation (non hysteroscopic) endometrial ablation,
 - myomectomy and hysterectomy.
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- endometrial ablation accounts for approximately 60% (Cromwell et al, 2009).

Endometrial ablation

- aim to permanently destroy the functionally active endometrial glands, in the endomyometrial junction and up to 5 mm of the myometrium.
- can be offered to women who have completed their family.

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- NICE recommends that in women who have a uterus no larger than 10 weeks of pregnancy, endometrial ablation should be the preferred surgical option to hysterectomy (NICE, 2007).

First-generation techniques

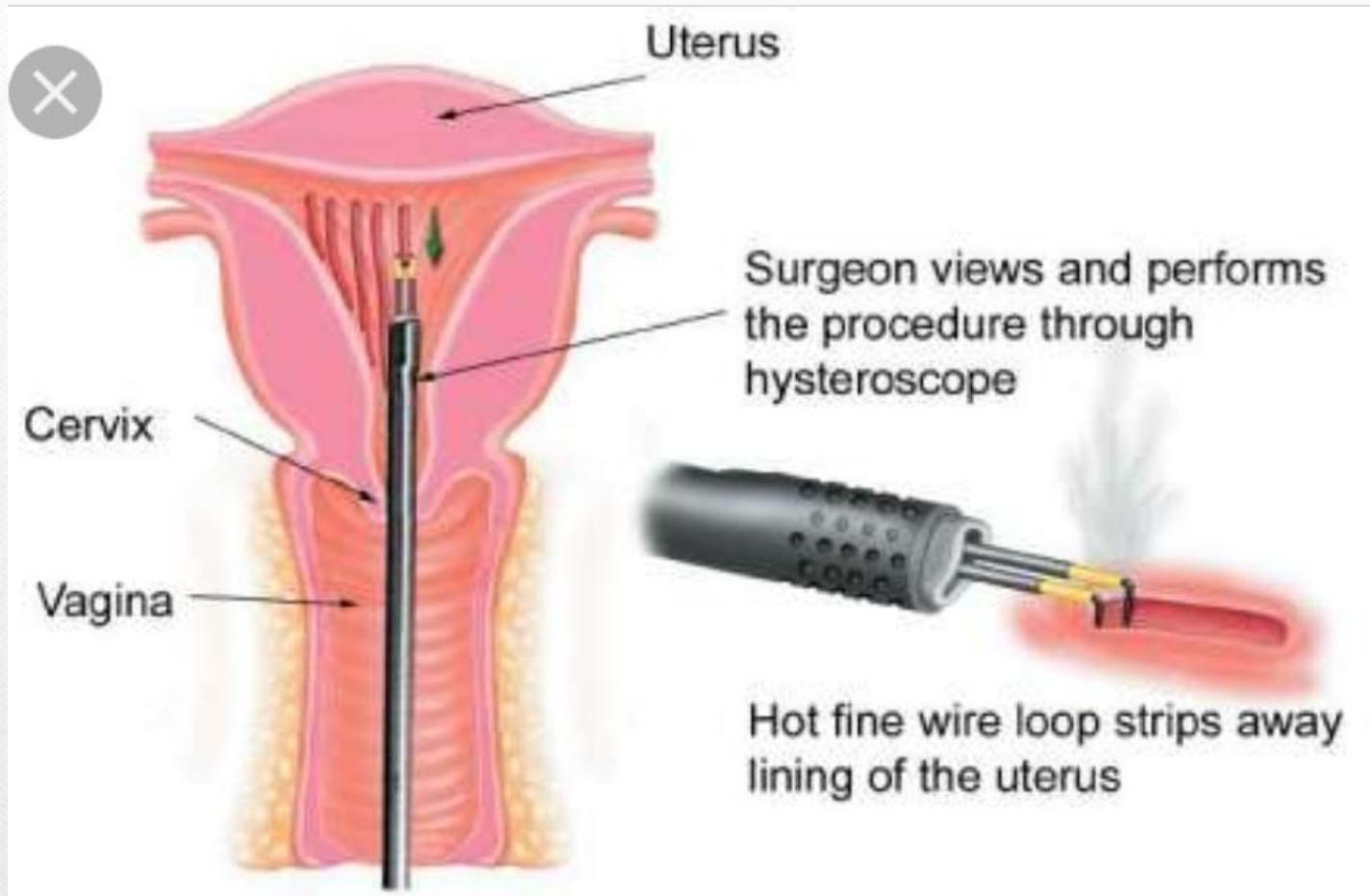
- refers to hysteroscopic procedures where destruction or removal of the endometrium and 5 mm of the superficial myometrium
- is performed under direct vision.
- require distension of the uterine cavity using an appropriate non-ionic fluid medium (usually glycine where monopolar diathermy is used) and use of a resectoscope.

Transcervical resection of endometrium (TCRE)

- involves resecting the endometrium using a 3 mm electrosurgical loop with an operative hysteroscope (resectoscope).
- Glycine is circulated in the uterine cavity through inflow/outflow channels to provide a clear view of the cavity.

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- A monopolar blend current at 80–100 W is used
 - More recently, bipolar energy source resectoscopes have become available which have the advantage that normal saline can be used as a distension medium minimizing the risk of glycine overload and transurethral resection syndrome.

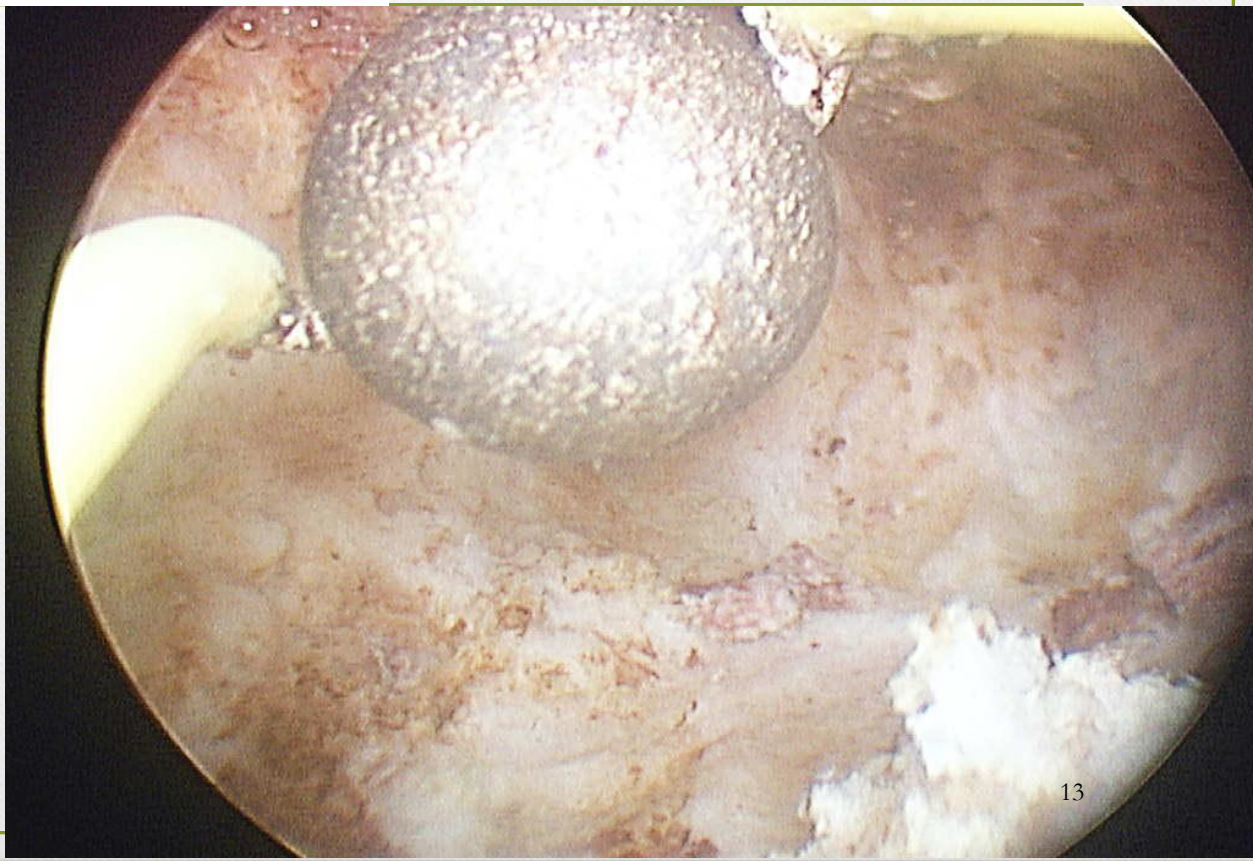
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- The disadvantage is that blood is miscible in normal saline which can compromise the surgical field.
 - Other uterine pathologies such as polyps and fibroids can be treated simultaneously.
 - has the longest learning curve, and the highest risk of complications (Overton et al, 1997).



Roller ball endometrial ablation

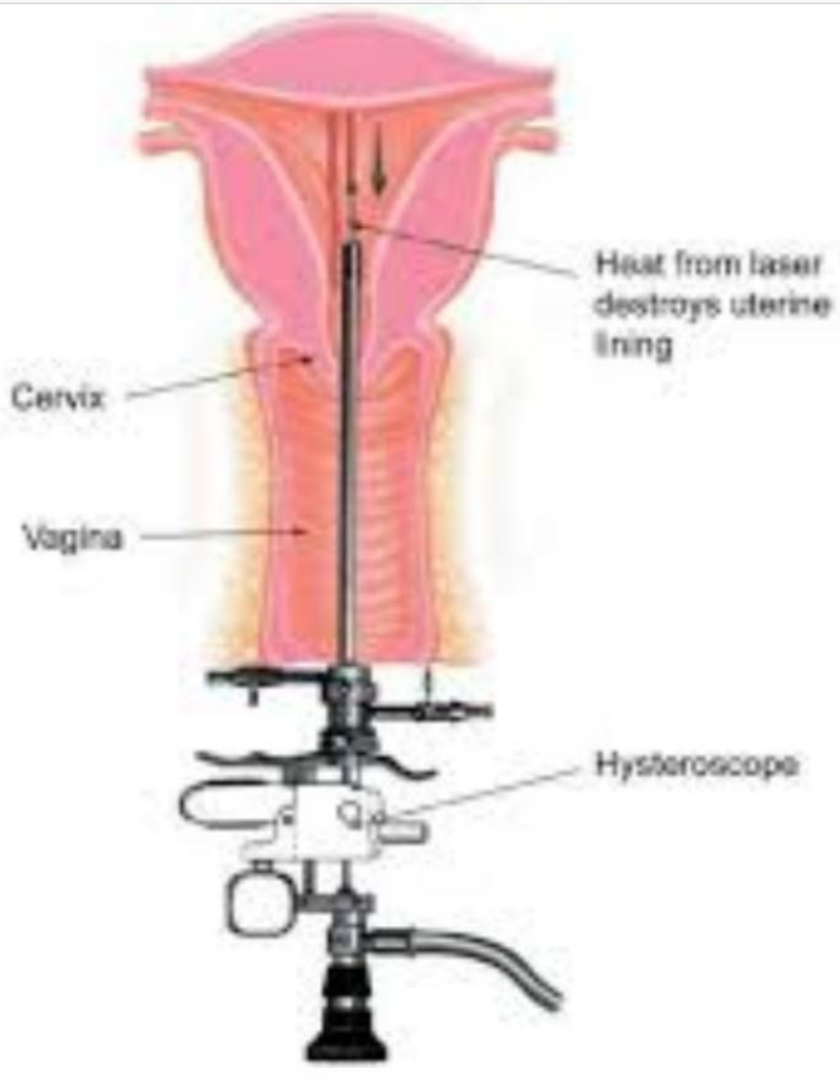
- uses a roller ball electrode instead of a loop through the resectoscope.
- endomyometrial destruction up to 5 mm depth but without removal of tissue.

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- It is safer over areas where myometrium is relatively thin such as at the cornual region or in the vicinity of a caesarean section scar.
 - Results of rollerball ablation are similar to TCRE, but the risk of complications is significantly lower (Overton et al, 1997).

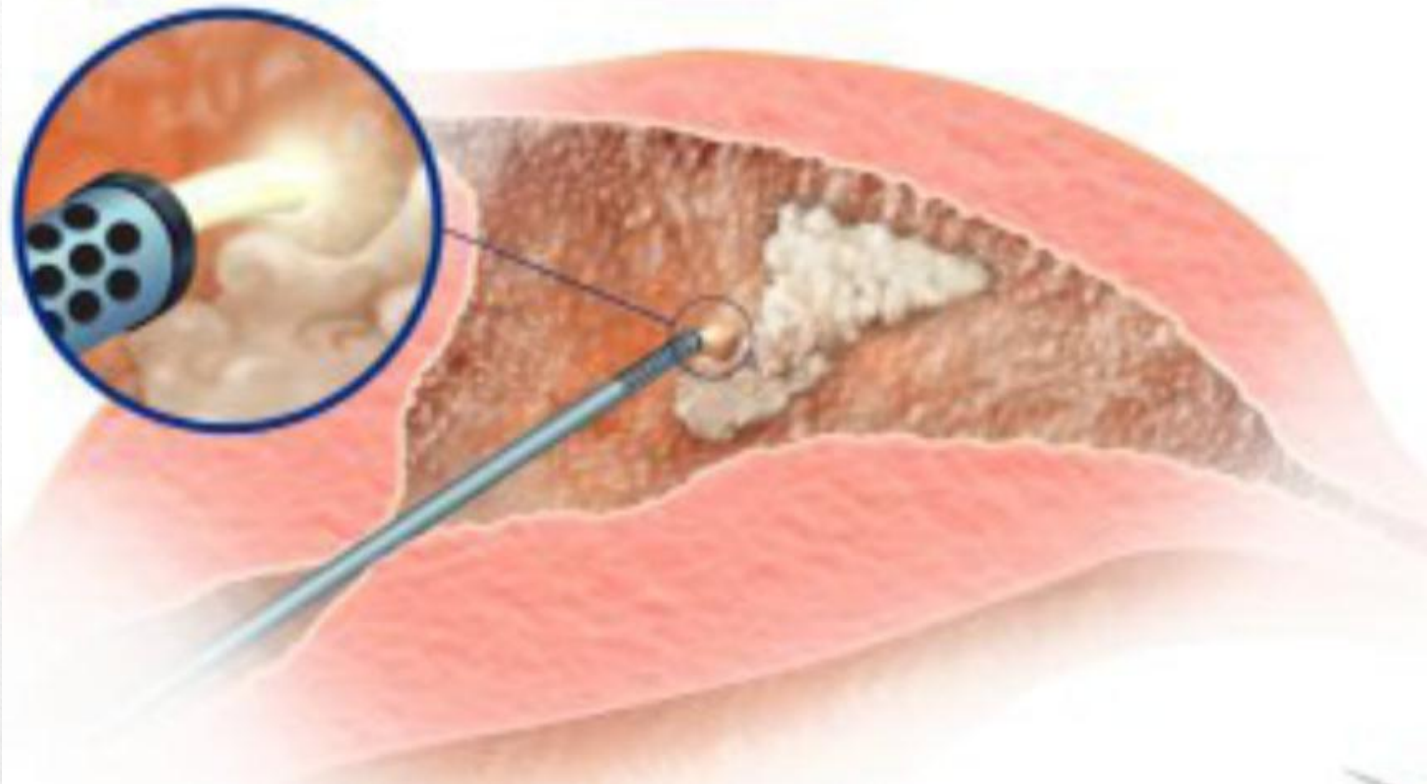


Endometrial laser ablation

- The uterine cavity is distended with normal saline.
- A 600-micrometre flexible quartz fibre is inserted down the operating channel of the hysteroscope that transmits Nd:YAG laser energy to the endometrium.
- is rarely used now in view of costs, prolonged operating times and safety aspects in theatres.



Nd-YAG laser



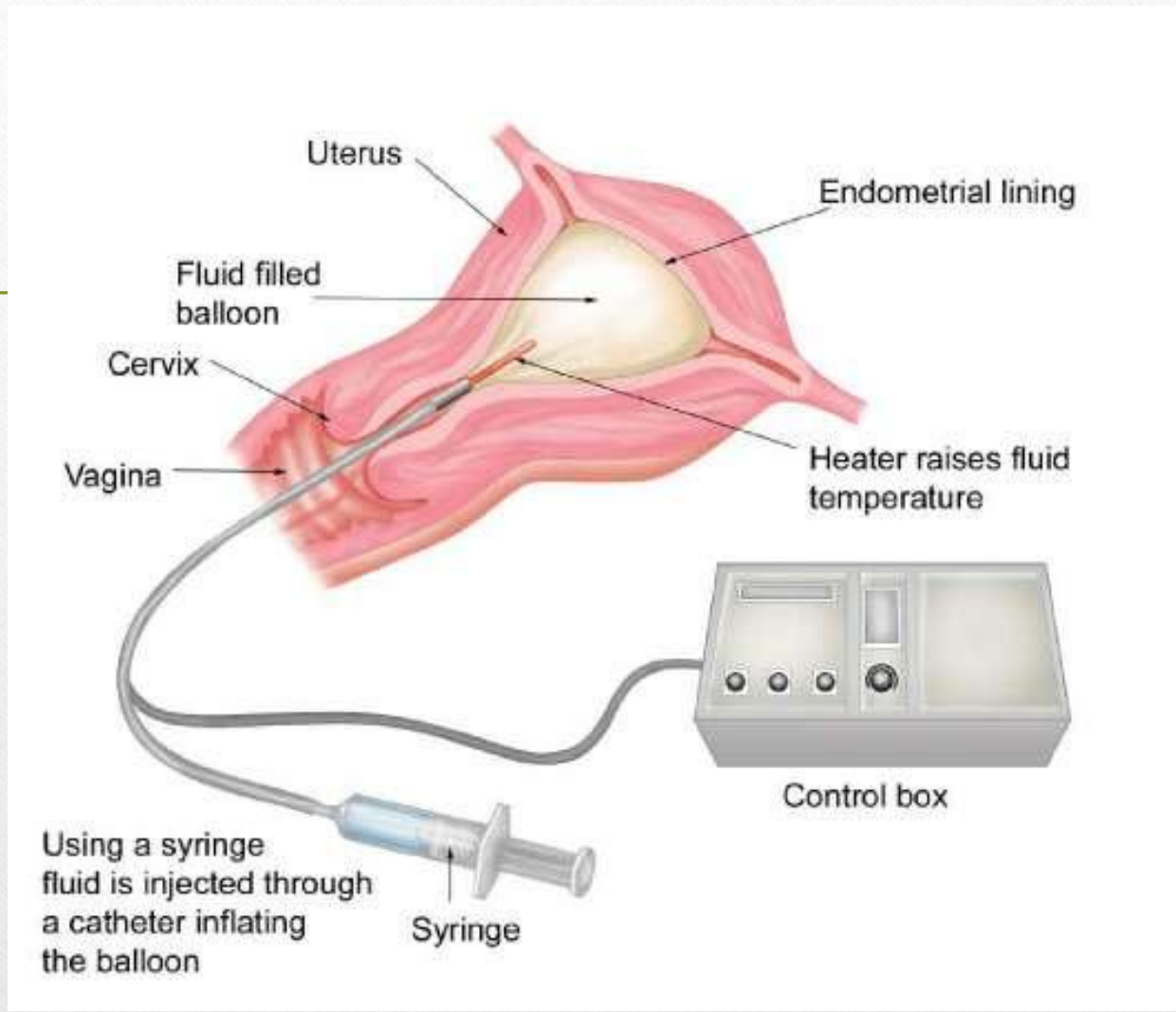
Second-generation techniques

- are not performed under direct vision, with the exception of hydrothermal ablation.
- less dependent on the surgeon's skills, quicker to learn and safer to use.
- Suitable if the uterus is not excessively enlarged (no larger than between 10 and 12 weeks of pregnancy) or have submucous fibroids no larger than 3 cm.

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- The Medicines and Healthcare products Regulatory Agency (MHRA) recommends preoperative hysteroscopy prior to endometrial ablation to exclude false passage or uterine perforation(MHRA 2010).

Thermal balloon ablation

- consists of a catheter and a silicone balloon filled with circulating hot liquid at high pressures to ablate the endometrial cavity.



The four different thermal balloon systems available are

- the GYNECARE THERMACHOICE III Uterine Balloon Therapy System (Ethicon Inc., Johnson and Johnson, New Brunswick, NJ, USA),
- the Cavaterm™ (Veldana Medical, Morges, Switzerland),
- the Thermablate Endometrial Ablation System™ (EASTM) (Idoman Limited, Tourmakeady, County Mayo, Ireland) and
- the Menotreat balloon (Atos, Medical AB, Horby, Sweden).

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- Both Themachoice III and Cavaterm™ use 5% dextrose at temperatures of 87°C (pressure 160–180 mmHg) and 78°C (pressure 230–240 mmHg) respectively.
 - The Menotreat balloon is a relatively newer device that employs circulating heated saline at 85°C and a pressure of 200 mmHg.

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- The Thermablate EASTM is another thermal balloon device which uses glycerine at 173°C with pressure maintained at 220 mmHg.
 - The treatment cycle for all these devices varies between 2 and 10 minutes, with the Thermablate EASTM having the shortest treatment cycle.

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- The combination of high temperature and high pressure causes endovascular coagulation in the endometrial lining and subsequent fibrosis
 - contraindicated in the presence of a classical caesarean section or a history of transmural myomectomy.
 - Endometrial preparation is not required because the endometrium is compressed by the balloon pressure.

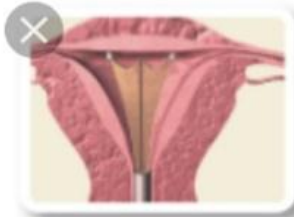
Bipolar radiofrequency endometrial ablation

- is the most widely used second-generation device in the UK.
- Novasure (Hologic Inc, Bedford, MA, USA) delivers radiofrequency energy to the endometrium until tissue impedance reaches 50 ohms.

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- comprises an electrode array that conforms to the contours of the uterine cavity.
 - An inbuilt cavity integrity test uses a small amount of carbon dioxide (CO₂) to check for any leak or perforation.

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- The average treatment time is 90 seconds, with a maximum treatment time of 120 seconds.
 - The endometrium is desiccated to the level of the superficial myometrium.
 - Endometrial preparation is not necessary although cervical dilatation to 8 mm is required to introduce the device.

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- Pre-insertion hysteroscopy should be mandatory in view of the need to dilate the cervix prior to device placement.
 - Results from a variety of randomised trials have demonstrated its efficacy and its use in an outpatient setting has been reported(Penninx et al, 2016).



Your doctor slightly opens your cervix (the opening to the uterus), inserts a slender wand, and extends a triangular mesh device into the uterus



The mesh gently expands, fitting to the size and shape of your uterus



Precisely measured radio frequency energy is delivered through the mesh for about 90 seconds



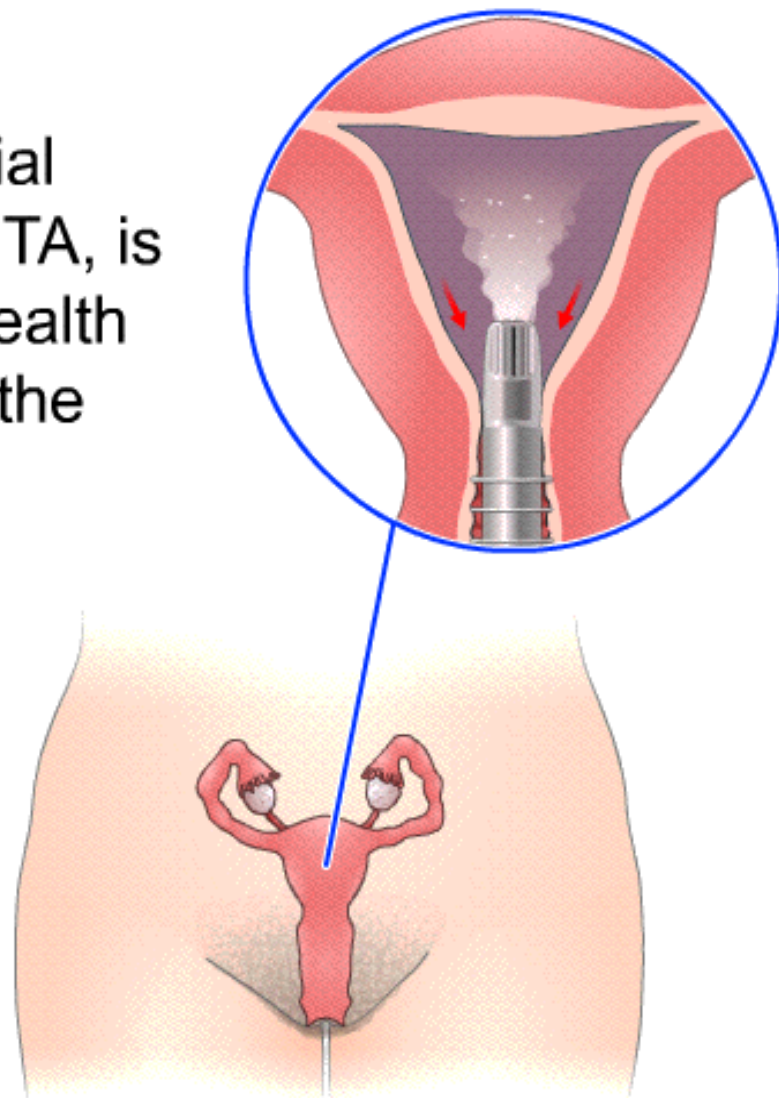
The mesh device is pulled back into the wand, and both are removed from the uterus.

Hydrothermal ablation

- performed under direct hysteroscopic vision.
- Endometrial destruction is achieved by circulating heated saline at 90 C in the endometrial cavity.

A hydrothermal endometrial ablation, also known as HTA, is a procedure that allows health care providers to destroy the inner lining of the uterus.

It is one way to treat women who experience too much menstrual bleeding or if menstrual bleeding is irregular.



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- A tight seal at the cervix is essential to prevent leakage of hot saline and avoid vaginal burns.
 - has not been established with cavity length less than 6 cm or more than 10.5 cm, with intramural fibroids larger than 4 cm or with intracavity fibroids.

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- have the advantage of being performed under direct vision and irregular cavities or those with fibroids can therefore be treated.
 - need to induce endometrial thinning with gonadotrophin-releasing hormone (GnRH) analogues prior to treatment.

Role of endometrial preparation, preoperative hysteroscopy and endometrial biopsy

- Pretreatment -to obtain a clearer view and to improve efficacy by allowing treatment of endometrial glands in the superficial myometrium.

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- When using first-generation techniques, endometrial preparation with GnRH analogues reduces operating times and fluid absorption but increases cervical resistance.
 - Pretreatment did not offer any advantage with second generation techniques and was associated with a higher incidence of adverse effects(Tan and Lethaby, 2013).
 - Endometrial atypia should be excluded prior to ablation.

Contraception after endometrial ablation

- there is still a need to use effective contraception postoperatively.
- Pregnancy following ablation is reported to occur in 0.7% of women.

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- All endometrial ablation techniques can be undertaken with Essure system sterilisation
 - Endometrial ablation should only be performed after the correct location of Essure micro-inserts has been confirmed by hysterosalpingogram, usually performed three months after Essure insertion.
 - There is a small risk of stretching or removal of Essure micro-inserts during ablation

Safety, efficacy and acceptability of various endometrial ablation techniques

- The Cochrane review did not find any significant difference in amenorrhoea rates, quality of life and satisfaction rates following the three first-generation endometrial ablation techniques(Letheby, 2013).

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- Roller ball ablation and TCRE were reported to be quite similar in terms of future hysterectomy or repeat surgical intervention in up to 10-year follow-up.
 - Roller ball ablation was quicker to perform than TCRE and achieves equivalent results, although TCRE has the added benefit of providing tissue for histological examination.

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- Daniels et al. performed a network meta-analysis to compare the clinical effectiveness of six second-generation techniques.
 - The satisfaction rates, improvement in quality of life and a need for future surgical intervention were similar.
 - Overall, when counselling patients, satisfaction rates of around 80% can be reported, with expected amenorrhoea rates of up to 50%.

First-generation versus second-generation endometrial ablation

- Lethaby et al. reported no significant differences in amenorrhoea rates or patient satisfaction rates at one year and the patient acceptability .
- had a significantly shorter operative time (mean duration 15 minutes shorter) and a significantly larger proportion of second-generation procedures could be performed under local anaesthetic.

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- While perioperative and postoperative complications, as well as the need for repeat surgery at 5 years, were lower with second-generation techniques, the differences were not statistically significant.

Perioperative complications

- The MISTLETOE national audit reported an overall complication rate of 4.4% with the first-generation techniques(Overton, 1997).

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- While certain complications such as fluid overload leading to transurethral resection syndrome are specific to first-generation devices, other perioperative complications such as haemorrhage, uterine perforation and cervical lacerations may occur with any technique, although their incidence is much lower with the second generation techniques.

Long-term post-ablation complications

- Infection, pregnancy-related complications such as miscarriage, ectopic pregnancy, preterm birth, intrauterine growth restriction, abnormal placentation (placenta accreta), uterine rupture, caesarean section and postpartum haemorrhage.

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- Post-ablation syndrome is characterised by either new-onset or significant worsening of pain during menstruation.
 - It is thought to result from obstruction of menstruation following uterine scarring and synechiae formation subsequent to endometrial destruction.

Table 3. Perioperative complications with first- and second-generation ablation techniques²³

Complications	First-generation endometrial ablation*	Second-generation endometrial ablation	Risk ratio (95% CI)
Haemorrhage	3%	1.2%	0.74 (0.29–1.91)
Perforation	1.3%	0.3%	0.32 (0.10–1.01)
Cervical lacerations	0.2%	1.1%	0.22 (0.08–0.61)
Endometritis	1.4%	2%	1.25 (0.45–3.49)
Haematometra	2.4%	0.7%	0.32 (0.12–0.85)

*Reference category. CI = confidence interval

Limitations

- The impact of endometrial ablation has not been studied in women who are at a significant risk of developing endometrial hyperplasia or cancer.

Myomectomy

- remains the only surgical option if fertility needs to be retained and there is good evidence to support removal of submucous fibroids to increase pregnancy rates (Bosteels et al, 2015).

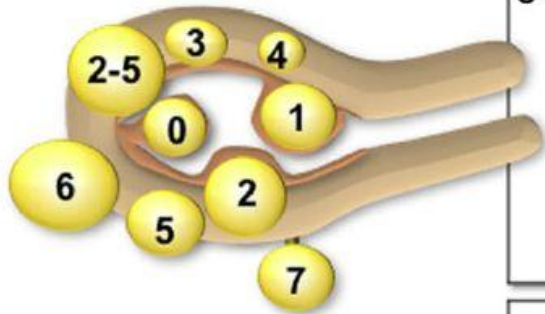
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- Intracavity or submucous fibroids were originally graded under the Wamstaker classification (type 0 = totally intracavity, type 1 >50% intracavity and type 2 <50% intracavity) which was adopted by the European Society for Gynaecological Endoscopy.
 - The International Federation of Gynecology and Obstetrics (FIGO) fibroid classification has superceded this (Figure 1), (Munro et al, 2011).

Polyp
Adenomyosis
Leiomyoma
Malignancy & hyperplasia

Submucosal
Other

Coagulopathy
Ovulatory dysfunction
Endometrial
Iatrogenic
Not yet classified

Leiomyoma Subclassification System



SM- Submucosal	0	Pedunculated Intracavitary	
	1	<50% Intramural	
	2	≥50% Intramural	
	O - Other	3	Contacts endometrium; 100% Intramural
		4	Intramural
		5	Subserosal ≥50% Intramural
		6	Subserosal <50% Intramural
		7	Subserosal Pedunculated
8	Other (specify e.g. cervical, parasitic)		
Hybrid Leiomyomas (impact both endometrium and serosa)	Two numbers are listed separated by a hyphen. By convention, the first refers to the relationship with the endometrium while the second refers to the relationship to the serosa. One example is below		
	2-5	Submucosal and subserosal, each with less than half the diameter in the endometrial and peritoneal cavities, respectively.	

Figure 1. Classification system including leiomyoma subclassification system. Reprinted from Int J Gynaecol Obstet, 113(1), Munro MG, Critchley HO, Broder MS, Fraser IS; FIGO Working Group on Menstrual Disorders. FIGO classification system (PALM-COEIN) for causes of abnormal uterine bleeding in nongravid women of reproductive age. Pages 3–13, Copyright 2011, with permission from Elsevier.

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- Neither of these classifications aims to grade the difficulty of hysteroscopic treatment and for this reason the STEPW (size, topography, extension, penetration, wall) classification described by Lasmar et al. may be more helpful when planning treatment (Table 1).

Table 1. Lasmar / STEPW fibroid classification

	Size (cm)	Topography	Extension of the base	Penetration	Lateral wall	Total
0	<2	Low	<1/3	0	+1	
1	>2 to 5	Middle	1/3 – 2/3	<50%		
2	>5	Upper	>2/3	>50%		
Score	+	+	+	+	+	=

Score	Group	Complexity and therapeutic options
0 to 4	I	Low-complexity hysteroscopic myomectomy
5 to 6	II	High-complexity hysteroscopic myomectomy. Consider GnRH use. Consider two-step procedure
7 to 9	III	Consider alternatives to hysteroscopic techniques

GnRH = gonadotrophin-releasing hormone; STEPW = size, topography, extension, penetration, wall.

Hysteroscopic myomectomy

- Many are amenable to hysteroscopic treatment with either full or partial removal.
- The most common technique is to use a surgical resectoscope and resect chips from the fibroid.
- For type 0 lesions there is little or no need for resection into the uterine wall.

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- For type 1 and 2 fibroids, as the fibroid is resected there is a tendency for the fibroid to extrude into the uterine cavity.
 - Continuous resection can result in inadvertent perforation of the uterus.
 - Intraoperative ultrasound can be useful to determine wall thickness and accurate preoperative imaging to determine the depth of extension into the myometrium or whether it extends to the serosal surface.

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- If the fibroid encroaches the serosal surface, resection under laparoscopic control may be necessary.
 - Occasionally a two-stage procedure 4 to 6 weeks apart may be required for safe and complete treatment of Lasmar group II or III lesions.
 - Gonadotrophinreleasing hormone (GnRH) analogues can be used to reduce fibroid size and possible fluid absorption but there is inconclusive evidence on reduction of operating time.

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- Resection of submucous fibroids of greater than 5 cm in diameter after preparation with GnRH analogues should only be undertaken by experienced hysteroscopic surgeons.
 - Some hysteroscopic surgeons use a cold loop technique to enucleate the fibroid (Mazzon et al, 2015)

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- can be a difficult procedure with risk of bleeding that may require an intracavity balloon to tamponade the vessels.
 - There is possibly less synechia formation with cold resection because of less diathermy energy

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- Newer ways of dealing with smaller intracavity fibroids, generally up to 2 cm, have evolved with the development of miniature morcellators, which can be deployed down a hysteroscope side port.
 - This allows lesions to be removed in an outpatient setting without the need to retrieve the specimen separately following detachment

Abdominal myomectomy

- reduce uterine volume for pressure symptoms and afford menstrual relief for women wishing to retain their fertility.
- Adhesions to the myomectomy wound are especially common, as is intraoperative haemorrhage.

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- Adhesions can be reduced by careful attention to haemostasis, tissue handling and possible use of anti-adhesion products.
 - Blood loss can be reduced through downregulation with GnRH analogues(Lethaby et al, 2001), the use of intraoperative tourniquets and vasopressin.

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- Both laparoscopic and robotic, can significantly reduce tissue handling and speed postoperative recovery
 - There are limitations, however, including size, number and position of the fibroids, which will determine whether it is feasible to be undertaken laparoscopically.

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- Shrinking the lesions with GnRH analogues or ulipristal acetate may improve the chances of a successful minimal access surgical procedure, although there can be loss of the usually obvious tissue planes delineating the myomata.
 - Advances in minimal access surgical equipment technology, including the development of effective laparoscopic morcellators, allow the removal of large amounts of tissue through a 12 mm port.

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- The rate-limiting steps are access and the requisite minimal access surgical skills and training.
 - In an effort to allow the continued use of morcellation devices without dispersal of fragmented tissue, intraperitoneal isolation bags have been developed.
 - thus preventing unwanted seeding of the specimen within the abdominal cavity or port sites.

Hysterectomy

- A Cochrane review did not find any significant difference in the prevalence of stress urinary incontinence, voiding dysfunction, constipation, faecal incontinence, sexual function or dyspareunia within 2 years of having either total or subtotal hysterectomy(Lethaby, 2012).

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- Subtotal hysterectomy was, however, associated with shorter operative time, lower intraoperative blood loss, and lower incidence of postoperative pyrexia or urinary retention.

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- Around 5% of women have continuing cyclical light bleeding following subtotal hysterectomy and a smaller proportion require future cervical stump removal for pain, or very rarely, malignancy.
 - The choice of surgical approach is dictated by the presence of pelvic or extrapelvic pathology, previous surgeries, body habitus, other associated comorbidities and surgical expertise available.

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- A Cochrane systematic review declared that vaginal hysterectomy should be undertaken in place of abdominal hysterectomy where possible
 - and that laparoscopic hysterectomy may avoid the need for abdominal hysterectomy(Nieboer, 2009).

Abdominal hysterectomy

- It is a useful approach when there is coexistent pelvic pathology such as adhesions, endometriosis, ovarian masses or large fibroids.
- The NHS - laparoscopic hysterectomy

Laparoscopic hysterectomy

Laparoscopic-assisted vaginal hysterectomy

- involves dividing the round ligaments and/or infundibulopelvic ligaments laparoscopically, while the rest of the procedure is carried out vaginally.

Laparoscopic hysterectomy

- uterine vessels are ligated laparoscopically and the remainder of the operation is performed vaginally.

Total laparoscopic hysterectomy

- involves removal of the uterus and cervix laparoscopically.
- The uterus is withdrawn into the vagina to maintain a pneumoperitoneum and the vault sutured laparoscopically.
- with the development of colpotomy cups which present the vaginal fornix for division and displace the ureters laterally.
- also allows maintenance of the uterosacral ligament complex in most cases, which should reduce the risk of vault prolapse.

Laparoscopic-assisted supracervical hysterectomy

- The vagina is not usually opened, therefore reducing the risk of infection, and there is no disruption of the uterosacral complex.
- Bladder deflection is not required as the cervix is transected above this level.

Vaginal hysterectomy

- The limitations of vaginal hysterectomy are uteri larger than at 14 weeks of pregnancy, the presence of concomitant ovarian pathology and most pertinent, surgical training.

Robot-assisted hysterectomy

- has been promoted as having the advantage of 3D vision, intuitive learning with a full range of instrument movement compared with laparoscopic hysterectomy, with less risk of surgeon fatigue and spinal and shoulder problems.
- Major disadvantages are, however, the absence of haptic feedback and excessive cost.

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- The National Institute for Health and Care Excellence issued guidance in November 2015 with regard to the use of robot-assisted surgery for hysterectomy based on the findings of a Cochrane review.
 - It states that robotic hysterectomy should be limited to clinical research settings at present as it is unclear whether it is safer and more effective than conventional laparoscopic surgery.

Risks and complications of hysterectomy

- an overall complication rate of 4% and significant need for convalescence.
- The most common complications of hysterectomy can be categorised as infectious, venous thromboembolic, genitourinary tract and gastrointestinal tract injury, bleeding, nerve injury and vaginal cuff dehiscence.

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- Injury to the genitourinary tract is estimated to occur at a rate of 1–2% for all major gynaecological surgeries, with 75% of these injuries occurring during hysterectomy.

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- Bladder and ureteric injury are more common at laparoscopic hysterectomy and seem to be related to dissection around the cervix and securing the uterine arteries.
 - Injury to the gastrointestinal tract after hysterectomy is less common, with a range of 0.1–1%.

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- Bleeding complications and the need for transfusion after hysterectomy are also rare, with vaginal hysterectomy having the lowest rate and abdominal hysterectomy the highest.
 - Neuropathy after hysterectomy is a rate of 0.2–2% Vaginal cuff dehiscence is estimated at a rate of 0.39%.

Efficacy, cost-effectiveness and satisfaction rates of surgical treatments

- A systematic review of five randomised controlled trials demonstrated that satisfaction rates were higher with hysterectomy (over 90%), but the difference was not statistically significant(Fergusson et al, 2011).

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- Hysterectomy is, longer convalescence and delay in return to work.
 - With the exception of fluid overload, other short-term complications like sepsis, blood transfusion, postoperative pyrexia, or vault or wound haematoma were more frequent after hysterectomy than ablation.

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- No differences were reported in haemorrhage rates (compared with resection), thromboembolic events, or cardiorespiratory and anaesthetic complications.
 - Women undergoing ablation were 3.6 times more likely to require future gynaecological surgery.

Conclusion

- exerts a significant burden on society.
- It is important that women are offered the most effective treatments and involved in the decision making process.

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- There is good evidence to support the use of both endometrial ablation and hysterectomy for women with AUB as both achieve high satisfaction rates and significantly improve quality of life.
 - There is poor evidence to support myomectomy to normalise menstrual loss, unless intracavity, and further research is needed here.

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THANK YOU