

MINIMALLY ACCESS TECHNIQUES FOR MENORRHAGIA

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Abstract : Menorrhagia is a common complaint in gynaecological practice and has significant bearing on quality of life issues. Correct diagnoses of cause of menorrhagia is important and management should be directed to the specific cause. The treatment should be planned considering patient wishes, expected outcome, complications and cost effectiveness. The treatment options for women with menorrhagia with no demonstrable cause, that is, in women with dysfunctional uterine bleeding or DUB, are medical treatment, LNG IUS, endometrial ablation and hysterectomy. Most commonly medical management is followed by D&C and ultimately in hysterectomy in many cases. There is much interest globally in decreasing hysterectomy rates in women with DUB as they have anatomically normal uterus. Endometrial ablation techniques have been evolving since 1980's in response to need for safe and effective alternative to hysterectomy. Hysteroscopic ablation was the first to evolve among minimally access techniques for the treatment of DUB. Though there is no doubt about its efficacy, it is technically difficult, requires considerable skill and training and the learning curve is long. In 1990's many nonhysteroscopic techniques were developed. These methods are much simpler to perform with less risk than electrosurgical or laser endometrial ablation. Further, interventional radiological procedures like Uterine Artery Embolization have proven role in treating menorrhagia due to fibroid, adenomyosis and AV malformations, studies are needed before it can be used for treating menorrhagia due to DUB. Levonorgestrel intra uterine system has proved to be an effective alternative to not only the ablative techniques but also to hysterectomy. It is easy to introduce, safe and has minimal complications

INTRODUCTION

Menorrhagia affects 20-30% of women in the reproductive age group causing not only medical problems like anemia and fatigue but also restriction of physical activity, absence from work and discomfort. Traditionally medical therapy is used initially for these cases but it reduces blood loss by 30-50%. It is also associated with side effects, non compliance and return of symptoms on stopping the treatment. Despite these shortcomings medical therapy is the mainstay of treatment in young patients with menorrhagia. In elderly women with family completed, hysterectomy has been considered the definitive surgical management following medical therapy failure. Though it has high satisfaction rates it is a major surgical procedure with physical, social and emotional consequences besides the risk of minor and major operative complications. In a woman with no pathology in the uterus, hysterectomy for menorrhagia appears to be too radical a treatment.

Minimal access techniques, hysteroscopic and non-hysteroscopic, which target endometrium are therefore valid options. Levonorgestrel Intra uterine system (LNG IUS), originally designed for contraception, has emerged as an effective treatment for menorrhagia. Uterine artery embolization is another minimally invasive technique for treating menorrhagia associated with fibroid uterus.

DILATATION AND CURETTAGE

Dilatation and curettage as a diagnostic procedure, has largely been replaced by the other simpler techniques of endometrial sampling and in doubtful cases by hysteroscopy and directed biopsy. However when performed as a diagnostic procedure for menorrhagia in elderly women, it is sometimes curative in women approaching menopause. It is also effective in stopping an acute episode of bleeding as it removes the hyperplastic proliferative endometrium of that cycle while providing the endometrial specimen for histopathology. Except in these situations D&C has a limited role as a therapeutic procedure as the endometrium regenerates from the basal layer in the next cycle. Newer techniques of endometrial ablation, on the other hand, destroy the basal layer of endometrium and superficial layer of myometrium so that endometrium does not regenerate.

ENDOMETRIAL ABLATION

The concept of ablating the endometrium for treatment of menorrhagia

is not new. However, it came into actual clinical practice in 1981 when Goldrath presented his studies on hysteroscopic ablation of endometrium using Nd:YAG laser. For 15 years, hysteroscopic endometrial ablation was the principal method for destruction of endometrium. Although effective, it required considerable skill and training and there was a long learning curve, Number of complications, many of them very serious, were reported. In late 1990's a number of non-hysteroscopic techniques began to appear and soon became popular.

Selection Criteria for Endometrial Ablation:

Endometrial ablation (EA) is done only in women who have completed their family and do not desire future fertility. A thorough preoperative evaluation of endometrial cavity, myometrium, adnexa and the cervix is required before undertaking this procedure. Malignancy (focal/premalignancy) needs to be ruled out, thus endometrial sampling is mandatory preoperatively. Uterine size > 12cm is a contradiction. Uterovaginal prolapse, endometriosis and active PID preclude endometrial ablation.

The thickness of endometrium and access to entire endometrial surface is crucial to the successful outcome. Preoperative D&C, preoperative thinning of endometrium with Danazol or GnRH analogues can increase the success rate.

However, EA does not guarantee amenorrhoea and hence the importance of counseling. Endometrial ablation offers surgical alternative to hysterectomy to women with menorrhagia in terms of shorter hospital stay, absence of surgical incisions and rapid return to activity.

HYSTEROSCOPIC ENDOMETRIAL ABLATION (FIRST GENERATION ENDOMETRIAL ABLATION):

Endometrial ablation in these procedures is performed under direct vision using hysteroscope. Endometrium can be resected using a cutting loop (TCRE) or coagulated using a roller ball. A randomized study conducted at Lady Hardinge Medical College comparing TCRE and roller ball coagulation of endometrium showed both techniques to be safe with comparable success rates¹.

Transcervical Resection of Endometrium (TCRE):

This technique requires resectoscope / operating hysteroscope which consists of a telescope and a continuous flow sheath system (inner and

outer sheath) allowing for simultaneous in-and outflow of the distension liquid. Non electrolyte medium, usually 1.5% glycine solution is used to distend the uterine cavity using a continuous flow irrigation pump, thus maintaining a clear view. The resectoscope allows for two different techniques – resection and coagulation. Endometrial slices of 3-5 mm thickness can be resected with a U-shaped loop connected to a unipolar electrosurgical generator (50-100W) under direct endoscopic control. The main advantage is that it enables histopathological analysis of the material removed. Submucous myomas upto 3cm in size also can be resected. However, the technique requires skill and training to avoid penetrating too deep into the myometrium and causing perforation. A strict watch on fluid deficit has to be kept to avoid the serious complication of fluid overload.

Roller Ball coagulation:

It is performed with an endoscopic resectoscope but in this case the terminal loop is replaced with a roller ball. The roller ball electrode consists of a metal ball or bar connected to a unipolar electrosurgical generator and is used for systematic coagulation of the entire endometrium. Technically, this method is easier than TCRC since the endometrium is simply coagulated. However, the disadvantage is that it does not provide any specimen for histopathological examination.

Since myometrium is thinner and resection is a little difficult at the uterine cornua, coagulation is often performed at the cornua, followed by resection in the rest of the cavity. Any bleeding points at the end of the procedure can be coagulated with roller ball or bar.

Bipolar Coaxial System (Versapoint);

In this system bipolar cautery is used instead of unipolar and hence normal saline is the distension medium. Complications associated with glycine, that is hyponatremia, water intoxication etc, are therefore avoided

Nd:YAG Laser coagulation:

This technique is similar to electrosurgical coagulation but performed with a laser. The initial studies demonstrated high success rate of 94% and amenorrhoea rates of 60-80%.^{2,3} However the use of laser for endometrial ablation is not popular because it is expensive and requires special training.

Success Rates

75-80% success rates are achieved with these procedures in terms of patient satisfaction and avoidance of hysterectomy.

Various factors affect the outcome of these procedures. A lot depend on the skill and expertise of the operating surgeon. The presence of adenomyosis is associated with increased failure rate and is found in 75% of post hysterectomy specimens.⁴ Also the failure rate is high in large uteri with large endometrial cavities.

Complications:

Complications with these techniques depend upon skill and training of the operating surgeon and include cervical and uterine perforation, hemorrhage and complications related to distension media.

NON RESECTOSCOPIC / NON HYSTEROSCOPIC ENDOMETRIAL ABLATION (NREA) OR SECOND GENERATION ABLATION TECHNIQUES

NREA refers to number of techniques where the destruction of endometrium is done with devices placed within the endometrial cavity without the use of uterine resectoscope or hysteroscope.

Advantages over Resectoscopic technique :

(1) Rapid to perform; (2) Require less skill and training; (3) No risk of systemic fluid absorption; (4) Results are comparable to resectoscopic techniques; (5) Potential for office use.

Patient selection:

Most of NREA devices require a relatively normal uterine cavity of length

<12 cm. Free fluid ablation (Hydrotherm Ablater) and MEA can be performed when the uterine cavity is irregular.

Anaesthesia :

All manufacturers state that their devices can be used in the outpatient setting without the need for general anaesthesia, however the evidence in the literature is variable. Various techniques have been reported under conscious sedation, local anaesthesia and no anaesthesia.

Techniques

Thermal Balloon Ablation

In this system, the endometrium is destroyed using thermal energy from the heated fluid in the balloon placed within the endometrial cavity. Different systems using this technique are described below:

Thermachoice :

In this system, a single use balloon catheter of outer diameter of 5.5 cm is inserted in the uterine cavity and balloon is filled with dextrose solution and heated to 87°C for 8 min at 160-180mmHg. The balloon catheter has a heating element which is connected through a cable to an electronic controlled device.

All published series except one have used this in uterine cavities of less than 10 cm and without polyps or submucous myomas.

A large multicentric study showed that thermachoice led to significant reduction in severity and duration of menstrual flow and dysmenorrhoea. 15% women were amenorrhoeic and 8% reverted to eumenorrhoea by 12 months.⁵

Another study showed comparable results of thermachoice with rollerball and TCRC as regards reduction in menstrual flow.⁶⁻⁸

Cavaterm

This system uses an oscillating pump in the central unit that vigorously circulate the fluid (glycine) in the balloon which is in intimate contact with the endometrial surface. Two versions of this device are available. The original device consist of a single use catheter having outer diameter of 8.5mm with a silicone balloon which can be adjusted according to the length of the endometrial cavity.

In this system the fluid in balloon is heated to 75°C for 15 min at a pressure of 200-220 mmHg.

Cavaterm Plus is the modified version of the original device wherein the fluid is heated to 78°C at pressure of 230-240mmHg, thereby decreasing the treatment time to 10 minutes.

This system can be used in cavities measuring 4-10 cm in length. Cervical canal length > 6 cm contraindicates its use. Various studies show no difference in amenorrhoea rate between Cavaterm and TCRC.⁹⁻¹² Two RCT's have been published wherein no difference in amenorrhoea rate between cavaterm and TCRC is found. They found a significantly shorter operating time and at 2 years a higher satisfaction and reoperation rates with cavaterm.¹³⁻¹⁴

Menotreat

This device has disposable catheters of 2 different sizes and the balloon is heated to 85°C at 200 mmHg for 11 min. In this device the fluid is heated within the controller, not the balloon catheter.

This device has limited availability. Only one published series has shown its effectiveness wherein 84.3% patients had 50% reduction in bleeding at 6 months following the procedure.¹⁵

Thermablate

This system comprises of a cartridge consisting of balloon, catheter and a reservoir attached to the control unit. The fluid is heated in the reservoir to 73°C before the treatment starts. When the fluid first enters the uterus, the temperature is 155°C and it decreases to 115°C by end of procedure ie in 128 sec at pressure of 180-200 mmHg. To achieve uniform temperature distribution, the pressure is pulsed periodically to mix the fluid in the balloon.

Many studies are not available on this device. Two studies show amenorrhoea rates of 25% and 90% satisfaction rate at 6 months and

no serious complications.¹⁶⁻¹⁷

Radiofrequency Electrosurgical Ablation:

Novasure

Novasure is currently in widespread use and this system consists of a controller unit and a 7.2 mm probe containing a bipolar radiofrequency electrode. After transcervical insertion of the probe, the surgeon measures the intercornual distance with the probe. This combined with the sounded uterine length allows the controller unit to calculate the amount of power required for the specific uterus. The sheath is pulled back after which the gold mesh electrode expands and conforms to the shape of uterine cavity. The radiofrequency energy then ablates the endometrial surface for around 90 seconds.

The probe has many features. In addition to the radiofrequency electrode, it contains channel for CO₂ that tests uterine integrity after probe placement. It also has provision of suction which gets activated during the process of endometrial vaporization and desiccation thus maintaining effective surface contact of the electrode with the endometrial surface.

The sounded uterine cavity length should be under 10 cm and the cavity must be symmetrical. No endometrial preparation is necessary.

A number of studies have compared this device with REA and other NREA techniques and the results are promising.¹⁸⁻²⁰

Cryotherapy

This technique uses cold temperature to freeze and destroy the endometrium. Liquid Nitrogen or compressed gases are used to achieve temperature around -90°C. In this technique 5.5mm cryoprobe is inserted transcervically and the tip of the probe is placed in one cornu of the uterus then moved to other cornu and the remainder of the uterine cavity. Ultrasound is used to monitor the depth of tissue freezing. Usually 2-3 freeze thaw cycles are required to ablate the entire endometrial cavity taking around 10-20 min.

Advantages of Cryotherapy are it is easy to use, is safe as it is done under ultrasound to monitor ablation depth can be outpatient setting and requires less anaesthetic due to analgesic effect of cold temperatures.

In the immediate post operative period minor side effects include pain and persistent discharge in some cases.

Late side effects are abdominal and vaginal pains, prolonged tiredness and perimenopausal symptoms.

Free Fluid Endometrial Ablation

In this method endometrial ablation is done using hot water directly into the endometrial cavity, thus overcoming the possibility of missing some areas which are not in contact with the balloon. Two systems using this technique are available- the HydroThermablator and the Enabl system.

Hydro thermablator

This system is based on circulating hot saline at 90°C into the uterine cavity under direct hysteroscopic guidance for 10 min to ablate the endometrium. The device consist of disposable sheath that fits over 3mm hysteroscope which is connected to a controller unit. After transcervical insertion of device into the endometrial cavity, diagnostic hysteroscopy can first be performed and then the unit is started. The process takes approximately 3 min to heat the saline to 90°C, 10 min to ablate the endometrium and 1 min to cool down after which the device is withdrawn. For safety concerns, the unit is electronically monitored closed system which automatically alarms and shuts down when the fluid escapes via cervix or fallopian tubes thereby reducing the intracavitary pressure. This technique has the potential to be used in patients with abnormal endometrial cavities including intracavitary polyps and myomas.

Two retrospective studies have proven the efficacy of this procedure in patients with abnormal endometrial cavities, however more studies are needed to confirm this.²¹⁻²²

Enabl System

This system does not require the use of hysteroscope. Here a flexible probe which is attached to a controller unit maintains a tight seal at the internal os and circulates fluid in the uterine cavity at 85°C for 15 min. More studies are needed to prove its efficacy for future use.

Microwave EA

In this method, microwave energy is used to ablate the endometrial cavity. The device consists of multiuse 8 mm probe which is connected to a microwave generator. The generator generates microwaves of 9.2GHz which heats the local tissue to 90°C upto depth of 6 mm. After insertion of probe into the uterus the intracavitary position of the device is confirmed and the machine is activated. Sweeping movements are used from fundus downwards to ablate the entire endometrium. The procedure takes about 2-4 minutes.

Diode Laser (ELITT - Endometrial Laser Intrauterine Thermotherapy)

In this technique diode laser is used to destroy the endometrium. The units are used at 30 W for 5 min creating a zone of tissue necrosis of 6 mm. Preliminary clinical studies are promising however large RCT's are needed.^{23,24}

Photodynamic Therapy

This therapy is used upon destroyed endometrium by causing local cytotoxic effect. The endometrium is pretreated by agents which get activated by monochromatic light. They react with tissue oxygen producing singlet oxygen that is cytotoxic and causes tissue necrosis. Larger studies are needed to prove its efficacy in clinical practice.

Chemoablation of the Endometrium

In this technique chemical agents are used to ablate the endometrium. Only one study has so far been published using this technique. They used 95% trichloroacetic acid which was instilled in the uterine cavity via a 3 Fr catheter. Pretreatment with GnRH agonist was done in half the patients.²⁵ The results of the technique are comparable to other NREA techniques but more studies are needed to confirm its efficacy.

Complications of NREA techniques:

Minor immediate complications include nausea, vomiting, pelvic pains, endometritis, urinary tract infection, haematometric and pelvic infection.

Reported serious complications include sepsis, adnexae/ uterine necrosis, lower genital tract, thermal injury.

UTERINE ARTERY EMBOLIZATION (UAE):

Uterine artery embolization has proven efficacy in abnormal uterine bleeding due to fibroids (success rate of 80-95%) and adenomyosis (success rate of 56-92%)^{26,27} Bleeding due to AV malfunction has also been treated using UAE. A small 5 Fr catheter is threaded through a femoral artery under angiographic imaging and guided into the uterine arteries Polyvinyl alcohol particles or triocetyl gelation microspheres are released to block the blood vessels that feed the fibroid or adenomyosis causing them to shrink.

The main advantages of this technique are it is less invasive requires less recovery time and can be performed under local anaesthesia or intra venous sedation However, side effects include bleeding, hematomas at puncture site, allergic reactions to contrast dye, miss embolization of non-target organs and severe post-procedural pain.

LEVONORGESTREL RELEASING INTRAUTERINE SYSTEM (MIRENA)

Levonorgestrel containing intrauterine device was initially designed for contraceptive purposes. Subsequently, its effect on decreasing the

menstrual blood flow was noted and it became a highly effective tool in treating menorrhagia.

This device consists of a T-shaped frame (32 mm by 32 mm) made of polyethylene surrounded by elastomer sleeve in vertical part which contains 52 mg of Levonorgestrel. It releases 20 microgram of Levonorgestrel daily at constant rate over 5 years.

Mechanism of action: LNG causes decidualization of the endometrial stroma, atrophy of the endometrial glands and strong inflammatory infiltrate. Estrogen receptors are downregulated in the glands and stroma thereby inhibiting stimulation by estrogens and causing endometrial atrophy. These changes appear as early as one month after LNG-IUS insertion and are independent of phase of menstrual cycle.

LNG-IUS has been shown to decrease menstrual blood loss by 74-97% and increase hemoglobin levels thereby treating anemia.²⁸⁻³⁵

Currently, LNG-IUS is considered the most effective first line medical therapy for reduction of menstrual blood loss and the overall management of dysfunctional uterine bleeding (DUB). It also serves as a contraceptive method in addition to treating heavy menstrual bleeding.

It is an effective modality of treatment in women with menorrhagia who want future child bearing. Fertility returns rapidly after removal of LNG-IUS and the course of future pregnancies is unaffected.

Various studies³⁵⁻³⁹ comparing LNG-IUS with endometrial ablation techniques have found comparable results as regard reduction in menstrual flow and patient satisfaction. LNG-IUS insertion requires minimal skill and can be used effectively to treat DUB in low resource settings and at lower cost.

Studies comparing LNG with hysterectomy regarding patient preference of treatment and cost analysis indicated that maximum number of patients (68%) preferred LNG-IUS as treatment modality and it was more cost effective than hysterectomy.^{40,41}

Cervical dilatation is required before its insertion into the uterine cavity in nulliparous women. Adequate analgesic can be achieved by administration of NSAID given 1 hour prior to insertion or by use of paracervical block with 1% lignocaine.

Complications are rare with LNG-IUS and include perforation, embolism, expulsion and infection.

Benefits of LNG-IUS far outweigh its risks and its effectiveness in treating DUB and menorrhagia associated with fibroid, endometriosis and endometrial hyperplasia can make it the treatment of choice especially in women desiring contraception as well.

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