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RESEARCH ARTICLE

HYSTEROSCOPIC MYOMECTOMY: SURGICAL TECHNIQUES AND ITS ROLE - A REVIEW

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ABSTRACT

Introduction and background: Most common benign tumors of the female genital tract that we come across are uterine fibroids or leiomyoma and it occurs in about 70–80% of women over the age of 50 and in approximately 30% by the age of 35. In the recent years hysteroscopic myomectomy has emerged as most effective uterus preserving surgical treatment for submucous leiomyoma. Some of the determinants that play a vital role in selection of surgical technique are surgeons expertise, accessibility of operating instruments and myometrial invasion of the fibroid. **Methods:** A review of various articles on hysteroscopic myomectomy was undertaken using Google search and studies describing hysteroscopic myomectomy and its different techniques including efficacy and their role in clinical practice were included in the present study. **Results:** In thisstudy we have reviewed various published articles dealing with positive and negative aspects of hysteroscopic myomectomy techniquesand discussed in detail. **Conclusion:** The field of hysteroscopic myomectomy has immensely advanced out of all the hysteroscopic procedures that are done. It should result in complete resection of myoma without affecting the surrounding tissues. Ultimately, the choice should be individualized depending on fibroid classification, number, location, patient presenting symptoms and the surgeon's expertise and experience.

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INTRODUCTION

Most common benign tumors of the female genital tract that we come across are uterine fibroids or leiomyoma and it occurs in about 70–80% of women over the age of 50 and in approximately 30% by the age of 35[1]. The most frequent indication for hysterectomy in today's time is Uterine fibroids[2].They may be sub serous, intramural, or submucous depending on their location in the uterus. The frequency and severity of clinical symptoms are the factors determining the localization of the fibroid in relation to the uterus. Total 5.5% to 16.6% of all uterine myomas are submucous myomas[3]and this mostly leads to sub fertility, dysmenorrhea, heavy menstrual bleeding, and other symptoms[4,5].

In 1976 Neuwirth first described operative hysteroscopy, he used modified urological resectoscope for sub mucosal myoma resection.[6] Where as in recent years hysteroscopic procedure for submucous myomectomy has become more efficient and is safe with the refinement in instruments and development in techniques[7,8].In the recent years hysteroscopic myomectomy has emerged as most effective uterus preserving surgical treatment for submucous leiomyoma.[9,10]Currently with advent of new surgical techniques office hysteroscopy has brought a paradigm shift from operating room to outpatient clinics in order to treat submucosal and pedunculated intracavitary fibroids. Some of the determinants that play a vital role in selection of surgical technique are surgeons expertise, accessibility of operating instruments and myometrial invasion of the fibroid.

Here we are reviewing articles on various techniques and their efficacies in performing hysteroscopic myomectomy.

Aims and objectives:

- To review the literature available on hysteroscopic myomectomy and its techniques
- To assess the current place of office hysteroscopic myomectomy

MATERIAL AND METHODS

A review of literature on hysteroscopic myomectomy was undertaken using Google search and various studies describing hysteroscopic myomectomy and its various techniques including efficacy and their role in clinical practice were included in the present study. In this study we have reviewed various published article regarding hysteroscopic myomectomy technique that are used to treat submucous and intracavitatory leiomyoma (FIGO grade 0 to 2). These articles deal with positive and negative aspects of hysteroscopic myomectomy technique and have been reviewed and discussed in the present study.

Background: The prerequisite of hysteroscopic myometomy is to determine the size, location and intramural extension of submucous fibroids in order to provide appropriate treatment.

Classification of submucous fibroids: In 1993, Wamsteker classified submucous fibroid on the basis of myometrial extension of fibroid which was later adopted by the European Society for Gynaecological Endoscopy (ESGE) in order to predict difficulty in removing myoma via hysteroscopy. They classified, pedunculated myoma, completely inside the cavity and lacking extension into the myometrium as G0; Whereas thesessile fibroid with less than 50% extension into the myometrium as G1; and submucous fibroid having more than 50% extension into the myometrium as G2[11]. The extent of extension into the myometrium is assessed by the angle between the myoma and endometrium at its attachment and termed as type 1 and type 2 fibroid on the basis of the angle being less than 90 degrees and more than 90 degree respectively[11].

In 2005, Lasmar et al[12]. introduced a classification named STEPW to predict operative difficulties in submucous myomectomy. This classification took into account of the size of fibroid in cm, myometrial penetration in percentage, base extension with respect to the uterine wall, mapping in the uterus, and if the myoma is originating from uterine lateral walls. They gave score from 0 to 2 to each characteristics. The patients were assigned into three groups according to their scores obtained. The option of the operative technique for elimination of submucousmyoma hysteroscopically mainly hinge on its grading and position within uterine cavity. In addition, surgeon's expertise and instrument accessibility advocate a specific technique[13].

Following are the various techniques:

Resectoscopic Slicing: This is a classical method traditionally used to remove submucous myoma (type 0) by slicing technique. In this technique during hysteroscopy a loop cutting electrode is used cranio-caudally for the purpose of slicing via repeated and continuous application[14,15]. Generally with resectoscope monopolar energy source is used which is attached to a loop wire electrode. The monopolar energy is associated with various risks such as fluid overload, thermal injury,and hyponatremia due to the use of distention medias such as glycine and mannitol which are nonphysiologic and nonconducting in nature[16]. Newer resectoscopes are being developed that use bipolar energy with same efficacy as monopolar energy in polypectomy[17].Resectoscope using bipolar energy do not require the use of non-ionic distension media. The collected resected chips may obscure view which needs to be evacuated by removing the resectoscope. Recently Gallinat, Richard Wolf GmbH, Knittlingen,Germany has developed a resection master with automatic chip aspiration of resected fragments of the lesion. The size of the myoma is the main limiting factor during single step procedure for removal of pedunculated intracavitary submucous myoma. The surgeons with limited experience in resectioncan also perform this procedure[14,15].It is recommended to cut base of pedunculated fibroid by resectoscopic loop[18] or vaporizing electrode technique[19] or Nd: yAGlaser without touching lesion [20]. The cut piece is then removed with forceps. It has also been reported that remnant fibroid is expelled spontaneously during first menses following operation so resected fibroid remnants may be left in the uterine cavity[14]. This procedure may be associated with certain side effects such as continuous abdominal cramps and infection in the uterine cavity[21].

Nd:yAG laser: In 1987, Mergui first time used Nd:yAG laser to make multiple holes in the fibroids, tissue necrosis and reduction in size of myoma was the main principle behind this procedure[22].Nd:yAG laser can be used to ablate fibroid for 2 cm or less in diameter. Its use is significantly reduced over time due to its high cost and it requires eye protection and special training. The other limitations of this procedure is that it is more time consuming and lacks tissue specimen for histopathology[19].

Vaporization of Myoma: Spherical or cylindrical shaped electrodes can be used for vaporization of myoma. The extent of vaporization is determined by many factors like wattage of generator, impedance of tissue and duration of contact. Fibroid vaporization is a faster technique as compared to traditional resectoscopic methods. Uterine perforation may be seen with this procedure due to high current exhibit pressure for a longer duration at one point [18]. The main limitation of this technique is the unavailability of tissue specimen for histopathological examination and also numerous gas bubbles produced due to use of high power. Sarcoma may be missed due to the fact that it is not homogeneous. Therefore, it is required not to vaporize fibroid completely before specimen tissue recovered for histopathological examination[14,20].

Morcellation by Intrauterine morcellator (IUM): The morcellation by IUM is a recent technique which saves the specimen so that it can be sent for histopathological examination. Wamsteker and Emanuel in the year 2005, have compared this technique with conventional resectoscopy. This technique is efficient and quick for removal of G0 and G1 type fibroid and has shorter learning curve and lesser fluid related side effects. The limitation is that it can't be used in type G2 fibroid (with more than 50% intramural extension).

Office hysteroscopic myomectomy: The evolution of miniature hysteroscope (diameter <5mm)with continuous flow system and working channelshas made it possible to operate in outpatient settings for smaller intracavitary type G0 fibroids without the need for cervical dilatation and anesthesia. The use of bipolar electrosurgical technology with saline miniature electrode of 5 fr has augmented the number of pathologies removed by office operative hysteroscopy [23].

Cold loop myomectomy: This technique, developed by Mazzon (1995)[24], was based on the principle to create a safe and efficient procedure, while keeping surrounding endometrial and myometrial integrity unaffected[24].It is based on sequence of three operating steps:

- Intracavitary component of the fibroid excision with an electric loop having monopolar current in cutting mode.
- Using acold blade without energy for enucleation of the intramural component of the fibroid.
- Finally, excision of the intramural component with the help of an angled cutting loop.

Following cold loop resectoscopic myomectomy chances of intrauterine adhesions are less as compared to electrosurgical resection hence it is important in patients who want to preserve their future fertility[25].

Enucleation in toto: This can be done by two techniques. The techniques are:

- **Litta's technique:** It is a hysteroresectoscopic technique in which a 90 degree Collins electrode is used and an elliptic incision is given on the endometrial mucosa that covers the myoma and the cleavage zone of the myoma is reached. Followed by resection of connecting bridges between myoma and surrounding muscle fibers. This allows nearly complete protrusion of the myoma into the uterine cavity and facilitates complete myomectomy by slicing. Litta et al. in the year 2003 performed a study on 44 women having G2 submucous fibroid out of which 41 (93.1%) were successfully treated[26].

- **Lasmar's technique**: In this technique the Collins electrode is used in shape of a 'L', to dissect the endometrium around the fibroid by mobilizing myoma in all directions, bleeding vessels are only coagulated. With the help of grasping forceps (small fibroids) or by slicing it in several pieces the fibroid is removed from the uterine cavity. Total 98 cases have been successfully reported (50 out of 98: direct mobilization plus grasping; 46 out of 98: direct mobilization plus slicing)[27].

RESULTS AND DISCUSSION

In our study we reviewed different articles available on hysteroscopic myomectomy techniques and their role and outcome. Efficacy of different techniques of hysteroscopic myomectomy in hospital settings and outpatient clinics were analyzed in improving presenting symptoms like

Table 1. Various studies onhysteroscopic myomectomy and their effectiveness in improving abnormal uterine bleeding

Author	Cases (n)	Main indication (%)	Technique for removal of Myoma (n)	Follow up (years)	Improvement in uterine Bleeding (%)
Munoz et al.2003 [28]	96	84 AUB 12 Infertility	Resectoscopic slicing	2.8(1-7)	88.5
Loeffer et al. 2005 [29]	177	91AUB 9 AUB + Infertility	Resectoscopic slicing (104) Resectoscopic slicing with endometrial ablation (73)	(1-15)	80.8 95.9
Campo et al.2005 [30]	80	79 AUB 17 Infertility	Resectoscopic slicing	(0.5-2)	69.5
Marziani et al.2005 [31]	107	78 AUB 23 Infertility	Resectoscopic slicing	(2-5)	80.9
Polena et al.2007 [32]	235	84.7 AUB 6.8 Infertility	Resectoscopic slicing (with endometrial ablation in 37 %of pts)	3.3 (1.5 -5.5)	94.4
K Yendru et al.2019 [33]		83 AUB 25 Infertility			90.4 %
Wenying Zhang et al. 2021 [34]	55	AUB 45.45 Anemia 52.72	Modified Resectoscopicslicing 34.54 % Classical Resectoscopic slicing 65.45 %	3 months	100 %

Table 2. Effects of Hysteroscopic Myomectomy on Fertility Issues

Author	Cases	Type of Myoma	Conception rate (%) According to type of myoma	Infertility	Post hysteroscopic Myomectomy Conception Rate (%)	Reproductive outcome
Bernard et al.2000 [36]	31	NR	NR	NR	33.5 %	Term Pregnancies 9 (29%)
Fernandez et al. 2001[37]	59	NR	NR	NR	27 %	
Munoz et al. 2003 [28]	14	NR	NR	NR	5 (35.7 %)	Term Pregnancies 3(21.4 %)
Shokeir TA et al. 2005[38]	29	G0 25 G1 4	NR	Primary: 14 Secondary: 15	21 /29 (72.4 %)	Rate of deliveries increased from 3.8% to 63.2% Rate of abortion decreased from 61.6 % to 26.3 %
K K Roy et al. 2010 [3]	200	NR	NR	Primary: 62 Secondary: 20	62/200 31 % 20/200 10% Conception rate 58/82 70.7%	Baby rate increased from 16.2 % to 74 %
Littaet al.2014 [39]	104	NR	NR	NR	85.8 %	NR
Jayakrishnan K et al. 2013 [40]	37	G0: 27 G1: 8 G2: 2	G0: 33.3 % G1: 25 % G2: 0	Primary: 23 Secondary:14	29.7 % 8/23 34.7 % 3/14 21.42 %	NR
Yendru KSet al. 2019[33]	25	G0:19 G1: 5 G2: 1	G0:6 (31.5 %) G1: 2 (40 %) G2:0	NR	32 %	NR

in controlling bleeding, conception rate, reduction size of myoma and post-operative complication noted. Most studies have shown that hysteroscopic myomectomy is safe and effective in the control of menstrual disorders with a success rate ranging from 69.5 to 100 %[28-34]. Usually the success rate declines as the follow-up period increases; this could be to due to a number of factors including the incomplete removal of fibroid (which could in time become larger and cause bleeding) as well as the occurrence of other dysfunctional factors as a cause of menorrhagia[35]. Studies were reviewed and results were analyzed as shown in Table 1. Studies conducted by Munoz et al[28],Loeffer et al[29],Campo et al[30], showed improvement in AUB symptoms88.5 % ,80.8 %, 69.5 % respectively. Another study conducted by Marziani et al[31]reported control in bleeding up to 80.9 %. Polena et al[32]and Loeffer et al[29] suggested the use of concomitant transcervical endometrial ablation (TCEA) along with resectoscopic slicing and reported higher success upto 94.4 % and 95.9 % respectively. K Yendrue[33]showed success rate in 90.4 % women whereas Wenying Zhang et al[34]showed 100% relief in AUB symptoms after a follow up of 3 months. Several studies have shown the effects of hysteroscopic myomectomy on the reproductive outcome in infertile women. Bernard et al[36]conducted study in 31 women and reported a pregnancy rate of 33.5 %. Another study conducted by Fernandez et al.[37]in 59 women and showed a pregnancy rate of 27 % All these studies thus conclusively prove that submucous fibroids are associated with infertility and their removal considerably improves fertility. Munoz et al.[28] showed a conception rate of 35.7 % in 14 women. T Shokeir et al.[38]reported an overall pregnancy rate of 72.4 % in 21 women after hysteroscopicmyomectomy in their study. K. K. Roy et al.[3]reported a pregnancy rate of 70.7 % in 82 infertile patients after hysteroscopic myomectomy. Litta et al.[39] conducted a study on 104 infertile women and reported a pregnancy rate of 85.8 %. The live birth rate was increased from 16.2 to 74%.

Jayakrishnan K et al.[40]in their study analyzed fertility issues further according to the type of fibroids. They reported conception rate of 33.3 % in type 0 fibroidsand 25 % in type 1 fibroidswith increasing intramural extension. Another study conducted byYendru KS et al.[33] reported a pregnancy rate of 31.5 % in Type 0 and 40 % in type 1. No pregnancy reported in type 2 fibroids[33]. Hysteroscopic myomectomy although is minor surgery in hands of a skilled surgeon, it is associated with few minor and major though rare complications, hence one must use this method cautiously.They can be perioperative complications like, uterine perforation, cervical laceration, creation of false passage, electrolyte imbalance, fluid overload, intraoperative haemorrhage and electrosurgical complications. Although air embolism is rare but can occur with fluid distension media in outpatient as well as inpatients setting. Long-term complications like intrauterine adhesion formation may occur postoperatively.

Conclusion

The field of hysteroscopic myomectomy has greatly advanced out of all the hysteroscopic procedures that are done. It should result in complete resection of myoma without affecting the surrounding tissues. It is advantageous as it is less invasive, less expensive, uterus preserving and fertility enhancing with minimum risk to patients. The morcellation by IUM is a recent technique which conserves the specimen for histopathological examination and thus leads to less operating time by avoiding two step myomectomy. Ultimately, the choice should be individualized depending on fibroid classification, number, location, patient presenting symptoms and the surgeon's expertise and experience.

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