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Mini-hysteroscopy for optimizing transcervical methods for treating intrauterine pathologies

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ABSTRACT

The uterine factor ranks third among the causes of infertility, accounting for 10–15% and increasing to 50% when combined with other factors. Currently, the introduction of new technologies into medical practice allows the doctor to choose various methods of surgical treatment of intrauterine pathology [endometrial polyp, uterine fibroids with a submucosal location of the G0–G1 node (International Federation of Gynecology and Obstetrics, FIGO), intrauterine adhesions, and congenital malformations of the uterus], including those without anesthetic support. Modern innovations in hysteroscopic surgery have radically changed the way intrauterine pathologies are treated, thanks to the emergence of the “see-and-treat” philosophy and the universal trend toward the miniaturization of office surgical tools and high-resolution optical systems without compromising their functional characteristics. However, many aspects of hysteroscopy in an outpatient setting, namely, its optimal range of applications, advantages and disadvantages in diagnostics and treatment of intrauterine pathologies, and economic components, are not sufficiently covered. This literature review discussed the most current data on the technique and possibilities of using a mini-hysteroscope in outpatient surgical hysteroscopy.

Keywords: mini-hysteroscopy; resectoscope; office hysteroscopy; intrauterine pathology; polyp; submucous uterine fibroids; septal resection; expansion of the cervical canal; miniaturization.

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Минигистерорезектоскопия как метод оптимизации трансцервикальных методов лечения внутриматочной патологии

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АННОТАЦИЯ

Маточный фактор в структуре бесплодия занимает третье место, составляя 10–15%, а в сочетании с другими факторами его значение возрастает до 50%. В настоящее время внедрение в медицинскую практику новых технологий позволяет врачу выбирать различные методы хирургического лечения внутриматочной патологии (полипа эндометрия, миомы матки с субмукозным расположением узла G0–G1 (FIGO), внутриматочных сращений и врождённых аномалий развития матки), в том числе и без использования анестезиологического пособия. Современные инновации в гистероскопической хирургии радикально изменили способ лечения внутриматочных патологий благодаря появлению философии «see-and-treat» и универсальной тенденции к миниатюризации офисных хирургических инструментов и оптических систем высокого разрешения без ущерба для их функциональных характеристик. Однако многие аспекты гистерорезектоскопии в амбулаторных условиях — её оптимальный спектр применения, преимущества и недостатки в диагностике и лечении внутриматочной патологии, а также экономическая составляющая — освещены недостаточно. В представленном обзоре литературы авторы рассматривают наиболее актуальные данные о технике и возможностях применения минигистерорезектоскопа в рамках амбулаторной оперативной гистероскопии в настоящее время.

Ключевые слова: минигистерорезектоскопия; резектоскоп; офисная гистероскопия; внутриматочная патология; полип; субмукозная миома матки; септальная резекция; расширение цервикального канала; миниатюризация.

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INTRODUCTION

In clinical practice, the prevalence of intrauterine disorders varies considerably, with estimates ranging from 8.5% to 62% [1–3]. Uterine disorders are the third most prevalent cause of infertility, accounting for 10% to 15% of cases. However, this is not a standalone etiological factor for infertility. In combination with other variables, it occurs in up to 50% of cases. Currently, 44.3% of patients with peritoneal factors of infertility present with a concomitant endometrial disorder, with endometrial polyps being the most prevalent (20.3%). Submucosal uterine leiomyomas affect 1.7% of infertile women [2, 4–7].

The integration of innovative technology into clinical practice has facilitated a diverse array of surgical options for the treatment of uterine disorders, including office hysteroscopic surgery (Bettocchi hysteroscopy), conventional hysteroscopy, hysteroscopy, and, more recently, mini-hysteroscopy [8].

Hysteroscopy, like any surgical intervention, carries the risk of complications related to anesthesia, cervical dilation, perfusion media, and the insertion of a hysteroscope into the uterus. Moreover, a considerable number of studies indicate that there may be potential iatrogenic risks associated with intrauterine surgical techniques during the early stages of gynecological training, which should be based on a “from simple to complex” premise [9–11].

The Royal College of Obstetricians and Gynecologists (RCOG) has established a complexity-based classification of intrauterine interventions, which serves to determine accreditation and training in hysteroscopic surgery (Table 1) [9, 12].

The advent of bipolar electrosurgery using small-diameter endoscopes with working channels and continuous-flow systems has made it possible to perform hysteroscopic surgeries in the office [13–15].

Recent innovations in hysteroscopic surgery have radically changed the way of treating intrauterine disorders owing to the “see-and-treat” approach, which has transferred the advantages of inpatient surgery into outpatient settings [16].

Unfortunately, a number of aspects of office-based hysteroscopy, including its advantages and disadvantages

in the diagnosis and treatment of intrauterine disorders, are not adequately addressed in the literature. In this regard, this article offers an overview of the applicability and scope of application of bipolar mini-hysteroscopy in gynecological surgery, based on recent research data.

APPLICABILITY OF MINI-HYSTERORESECTOSCOPY

The current stage of medical care for various intrauterine disorders implies a general tendency to miniaturize high-resolution office surgical instruments without compromising their optical characteristics. A Karl Storz (Tuttlingen, Germany) prototype with an external diameter of 15 Fr (5.3 mm) based on a pediatric resectoscope enabled the expansion of office-based surgical hysteroscopy (Fig. 1, a, b) [8, 16–19]. Mini-resectoscopic surgery involves a serial resection of the intrauterine lesion, starting with its free end and advancing the “slicing” toward its base, bed coagulation, and extraction of the obtained histological specimen from the uterine cavity (Fig. 2, 3) [20].

One notable benefit of mini-hysteroscopy is the potential to complete the procedure in a one-day hospital setting. This approach does not require cervical fixation and dilation, thus eliminating the need for anesthesia and providing minimal discomfort during operation, while also reducing the risk of intraoperative complications such as cervical ruptures, false passages, uterine perforations, and bleeding. As reported by Chupin, the incidence of electrical injuries of the genital tract, including the cervix, vagina, and vulva, is reduced when using a mini-resectoscope compared to conventional hysteroscopic procedures [6].

For mini-resectoscopy, saline solution is used as a distension medium at a lower pressure within the uterine cavity, which is less dangerous compared to hypotonic fluids used for other hysteroscopic procedures.

Furthermore, this surgical technique, performed in a one-day hospital setting, is more cost-effective, which will significantly reduce the cost of treating women with intrauterine disorders compared to inpatient treatment [6].

Table 1. RCOG-classification of difficulty levels of operative hysteroscopy/hysteroscopy

Level 1	Diagnostic hysteroscopy with targeted biopsy Removal of small polyps Removal of intrauterine contraceptive devices
Level 2	Proximal fallopian tube cannulation Mild Ascherman's syndrome Removal of pedunculated fibroid (type 0) or large polyp
Level 3	Dissection/resection of an intrauterine septum Severe Ascherman's syndrome Endometrial resection or ablation Resection of submucosal fibroid (type 1 or 2) Repeat endometrial ablation or resection

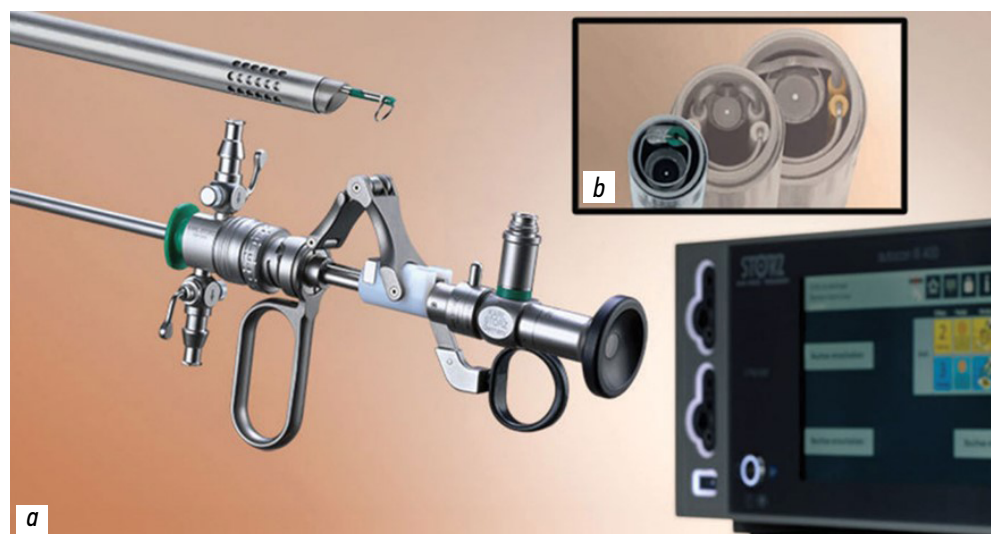


Fig. 1. Mini-resectoscope 15 Fr (Karl Storz SE&Co, KG, Tuttlingen, Germany) (a) and the differences in optics are 15 Fr and 26 Fr (b).



Fig. 2. Resection of the endometrial polyp using a hysteroscopescope 15 Fr.



Fig. 3. Myomectomy of the G0 node (FIGO) using a hysteroscopescope of 15 Fr.

The scope of application of mini-hysteroscopes may include endometrial and cervical polyps, submucosal leiomyomas, and uterine synechiae and malformation [20].

POLYPECTOMY AS PART OF MINI-RESECTOSCOPY

A multicenter prospective study conducted in Italy demonstrated that office-based “see-and-treat” endometrial polypectomy using a mini-resectoscope is an acceptable, safe, and effective alternative to inpatient resectoscopic polypectomy. The procedure with the mean operating time of 10.39 ± 4.69 minutes was performed without anesthesia and was well-tolerated by patients. The mean polyp size was 16.66 ± 9.51 mm. One-stage polypectomy was successfully performed in 175 patients (96.15%), with only 1 patient (0.54%) requiring a second office-based stage to complete the surgery [13, 14].

The study by Papalampros in 2004–2007 involved surgical treatment of endometrial polyps by inserting a small-diameter resectoscope into the uterine cavity in 24 patients divided into two groups. The “no touch” insertion technique was found to be less traumatic than the conventional approach involving various vaginal and cervical instruments. The uterine cavity was clearly visualized regardless of the menstrual cycle phase. The maximum operating time was 15 minutes. All surgical procedures were conducted without general anesthesia, with the exception of intracervical anesthesia when necessary (4.4 mL of lidocaine 2% with adrenaline 1:80,000). The extracted polyps ranged in size from 1 to 5 cm. The preliminary experience with a 15 Fr mini-resectoscope has demonstrated its efficacy in resecting endometrial polyps and submucosal fibroids in a one-day hospital setting. This device combines the ergonomic advantages of a conventional resectoscope with downsized optical components [8].

MINI-RESECTOSCOPE FOR FIBROID RESECTION

Uterine leiomyoma is a fundamentally different intrauterine disorder.

Hysteroscopic myomectomy is now considered the “gold standard” for the treatment of G0–G1 (FIGO) small submucosal leiomyomas. It is an effective and safe option for abnormal uterine bleeding and infertility associated with this intrauterine disorder.

Mini-hysteroscopes with a working channel and continuous-flow systems have facilitated myomectomy procedures in the office. Hysteroscopy can be performed using a bipolar resectoscope, without the need for cervical dilation and the use of bullet forceps. However, this technique is currently limited to G0 fibroids with a diameter of 1.5–2 cm [21]. To date, there is no objective evidence regarding the treatment of G1/G2 submucosal fibroids in the outpatient setting using a mini-resectoscope. This highlights the need for further research aimed at optimizing the treatment of intrauterine disorders.

MINI-RESECTOSCOPE FOR OTHER INTRAUTERINE DISORDERS

Recently, hysteroscopic septal resection has become an essential technique for the treatment of women with a uterine septum and habitual miscarriage. Between 2017 and 2019, a prospective, randomized, controlled trial compared surgical and postoperative outcomes using a conventional hysteroresectoscope and a 15 Fr mini-resectoscope for septal resection. Forty patients who met the inclusion criteria were randomized into two groups by the type of resectoscope used. Various parameters were reported, including time of cervical dilation, operating time, intraoperative complications, postoperative pain, length of hospital stay, and reproductive outcomes after surgery in both groups. The study findings demonstrated that hysteroscopic septoplasty using mini-resectoscope loops is as effective as conventional techniques in terms of good visualization and septal resectability. Moreover, it has additional advantages such as shorter time for uterine access, easy insertion of the resectoscope without cervical dilation, shorter operating time, and a significant reduction in postoperative complications [22, 23].

However, the published scientific evidence on the use of mini-resectoscopes for surgical interventions for both congenital malformations and uterine adhesions is limited. Consequently, further large-scale randomized studies will be necessary to provide a more comprehensive understanding.

CONCLUSION

Currently, office-based surgical hysteroscopy represents one of the most compelling examples of contemporary trends in the treatment of intrauterine disorders and surgical options for significant challenges such as female infertility. The efficacy of bipolar mini-resectoscopy in intrauterine interventions without the use of general anesthesia is being increasingly demonstrated, making one-day admissions a standard practice. The use of a 15 Fr mini-resectoscope may prove to be a valuable alternative to conventional hysteroresectoscopy, with the potential to improve long-term treatment outcomes. The limited number of reliable scientific publications on this topic will require more comprehensive and precise studies to investigate the use of mini-resectoscopes and optimize transcervical treatments of intrauterine disorders in women.

ADDITIONAL INFO

Authors' contribution. All authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Финансирование. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

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