Role of Hysteroscopy in Infertility and Assisted Reproduction

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INTRODUCTION

The uterus plays a major role in sperm migration, embryo implantation, and fetal development. Congenital uterine anomalies and acquired uterine lesions may affect such uterine functions precluding successful pregnancy. Despite advances in the field of assisted reproductive techniques (ART), only one-third of cycles started end in a pregnancy and one-fourth result in a live birth [1]. Intrauterine pathologies are found to be present in 25% of infertile patients [2]. Structural abnormalities of the uterine endometrial cavity may affect the reproductive outcome adversely, by interfering with implantation or causing spontaneous abortion. Therefore, exclusion of any intrauterine pathology becomes an important step in infertility work-up. Intrauterine abnormalities may be visualized using variety of techniques, including hysterosalpingography (HSG), transvaginal sonography (TVS), sonohysterography (SHG), and hysteroscopy [3-5]. Hysterosalpingography, although very sensitive (98%), has low specificity (34.9%) [6]. Transvaginal sonography is more specific (96.3%) and sensitive (100%) than HSG [7].

Although hysteroscopy is considered the “gold standard,” controversies still exist between TVS and hysteroscopy in the diagnosis of intrauterine abnormalities. With the invention of miniature hysteroscope, it is possible to perform hysteroscopy in an office (outpatient) setting, without anesthesia, for diagnostic indications and certain therapeutic interventions [8]. Observational studies suggested higher pregnancy rates after hysteroscopic removal of endometrial polyps, submucous fibroids, uterine septum or intrauterine adhesions [9].

ENDOMETRIAL POLYPS

The visual appraisal of uterine cavity provided by the hysteroscope offers an excellent method for the removal of polyps, particularly pedunculated polyps, which can be transected and removed in their totality. The resectoscope is particularly useful for removing sessile polyps as the base can easily be resected to avoid recurrence [10].

A RCT with high level of evidence suggested that hysteroscopic removal of endometrial polyps in women undergoing intra-uterine insemination (IUI) for unexplained, male, or female factor infertility increases the odds of clinical pregnancy compared to diagnostic hysteroscopy and biopsy only [11]. However, other non-RCTs did not show the effectiveness of hysteroscopic polypectomy in enhancing fertility [12-14].

SUBMUCOUS MYOMAS

When a myoma is pedunculated, transection of the pedicle can be accomplished with mechanical hysteroscopic scissors. Sessile submucousmyomas benefits most from resectoscopic shaving of the myoma, which causes the uterus to contract so that the myoma that is intramural becomes intraluminal, allowing its complete removal.

Submucosal and intramural fibroids interfere with fertility based on the results of a large systematic literature review with a meta-analysis of observational studies [15, 16]. Women treated by hysteroscopic myomectomy for submucosal fibroids might have similar reproductive outcomes as infertile women with normal uterine cavities [17].
Surgical removal of large intramural fibroids prior to IVF treatment might increase the likelihood of a successful reproductive outcome [18]. Hysteroscopic removal of fibroids in infertile women has claimed statistically significant differences in the clinical pregnancy rates between both comparison groups [19]. However, there is still evidence of uncertainty on the effectiveness of removing fibroids in infertile women [20, 21]. Additional RCTs studying the effectiveness of hysteroscopic myomectomy in infertile women are needed.

**INTRAUTERINE ADHESIONS**

To outline the precise distortion of the uterine cavity and permit direct treatment, intrauterine visualization is required. An operative hysteroscope with mechanical hysteroscopic scissors are used to divide these adhesions. In many of these patients, the endometrium has been traumatized; therefore, additional trauma or damage due to electrosurgery and laser should be avoided. A negative correlation between the extent of uterine adhesions and subsequent pregnancy outcome following treatment has been observed in a large study that classified intrauterine adhesions [22].

**UTERINE SEPTA**

Traditionally, abdominal metroplasty (Jones or Tompkins) has been performed for uterine septa. Currently, hysteroscopy is used to divide the septum transcervically under direct vision. In general, hysteroscopic scissors are sufficient to divide thin septa. For broad septa, the resectoscope fitted with a thin cutting electrode is useful.

Several non-RCTs have compared the reproductive outcome before and after hysteroscopic metroplasty for septate uterus in women with recurrent miscarriage, and all have shown significant improvement in pregnancy outcome [23]; 29% of women with otherwise unexplained infertility had a term birth after hysteroscopic metroplasty[24].

**TUBAL OSTIA**

The first 2-3 mm into the tubal ostia can be evaluated by hysteroscopy. Hysteroscopic evaluation of the intramural Fallopian tubes provides an opportunity to diagnose and treat polyps and adhesions obstructing or distorting the tubal ostia.

Direct ostial cannulation allows the selective assessment of tubal patency. Hysteroscopic tubal occlusion may be also an option for the management of hydrosalpinx before IVF when salpingectomy or laparoscopy is contraindicated [25].

**CERVICAL CANAL**

Hysteroscopy is of value in exploring the cervical canal in patients who have had repeated abortions. Visual appraisal of the cervical canal during hysteroscopic examination reveals that, in many of these patients, there is a loss of the sphincter-like action of the internal cervical os. Uterine anomalies can also be detected [10].

**ADENOMYOSIS**

Adenomyosis is difficult to diagnose consistently with hysteroscopy and is only occasionally suspected if small sinuses are observed, particularly in the fundal region. The condition is also difficult to diagnose by biopsy taken through the hysteroscope, or even with the resectoscope, as only superficial myometrial tissue can thus be obtained [10].

**FALLOPOSCOPY**

Endoscopy of the ampulla and distal end of the tube is best performed with rigid 3mm endoscopes introduced from the abdominal side. Falloposcopy has been attempted using the hysteroscope as the conduit for miniendoscopes. New falloscopes are now developing to improve the field of view and resolution, and also offer the capability of washing and introducing fluids while maintaining a diameter of less than 1mm [10].

**EMBRYOSCOPY**

Rigid miniendoscopes can be introduced transabdominal and transuterine to observe the embryo in situ. As the technology advances, the possibility of a practical transcervical method for embryoscopy remains on the horizon.
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Hysteroscopy may be of value when laparoscopy fails to demonstrate an ectopic pregnancy, particularly if TVS is not conclusive and pregnancy test is persistently positive. Hysteroscopy can also guide selective suction aspiration for termination of the missed pregnancy [10].

HYSTEROSCOPY AND IVF

Hysteroscopy is considered the “gold standard” investigation for assessment of the uterine cavity, with the ability to treat uterine pathology in infertile patients, especially with repeated IVF failures [26-35]. Office hysteroscopy should be part of the infertility workup before IVF even in patients with normal HSG and/or TVS [36].

The effect of local endometrial injury by office hysteroscopy on the outcome of the subsequent IVF cycle is currently under investigation. As miniendoscopes become accepted for intrauterine visualization, the transfer of gametes or embryos under visual control may become a reality.

CONCLUSION

Hysteroscopy is a powerful tool for the diagnosis and treatment of intrauterine pathologies. In patients with failed IVF, hysteroscopy is mandatory to improve the reproductive outcome. Further RCTs are needed to provide international guidelines on hysteroscopic surgery in subfertile women. Although the indications of hysteroscopy are well established, other potential applications remain under investigation.

REFERENCES


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