Original Article

# Evaluation and Management of Mechanical Infertility Using Minimal Access Surgery

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## Abstract

**Introduction:** Tubal and peritoneal pathologies are one of the most common causes responsible for female infertility corresponding to 30%–40% of cases. The use of combined hysteroscopy and laparoscopy (HL) has now become a gold standard in the diagnosis and subsequent treatment of these pathologies. **Aim of the Study:** (1) Evaluation of infertile females for tubal and uterine pathologies using combined HL as a diagnostic aid. (2) To find out the feasibility of providing therapeutic management concurrently. **Materials and Methods:** This study was conducted from 2018 to 2019 on 100 married females in the age group of 20–45 years with primary or secondary infertility of > 1-year duration after ruling out male causes and hormonal causes of infertility. Laparoscopy and hysteroscopy were performed in a single session; methylene blue dye testing was done. Any relevant positive findings on hysterolaparoscopy were noted, and the incidence of different lesions was calculated. Surgical procedures wherever possible were carried out and tabulated accordingly. **Results:** Out of all patients subjected to combined HL, positive findings were noted in 76% of the cases. The most common hysteroscopic pathology in our patients was intrauterine adhesions (9.2%), followed by polyp (7.9%) and septum (6.6%). Similarly, on laparoscopy, the common findings were adhesions (23.7%), endometriosis (21.1%), myomas (17.1%), and hydrosalpinx (13.2%). Unilateral tubal block was seen in 15.8% and bilateral tubal block in 13.2% of the patients. Hysteroscopic procedures were done in 40.8% of the patients and laparoscopic procedures in 60.5% of the patients. **Conclusion:** From our study, we concluded that combined HL serves as an important diagnostic as well as a therapeutic modality in female infertility. Direct visualization of the uterine cavity and the ability to manipulate uterus and adnexa and perform any procedure required l(cannulation, septal resection, adhesiolysis etc.) all in a single session makes combined HL a far more superior tool for evaluation and treatment of infertility.

**Keywords:** Infertility, hysteroscopy, laparoscopy

## Introduction

Infertility, according to the WHO, is "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse."[1] Primary infertility denotes those patients who have never conceived. Secondary infertility denotes previous conception but failure to conceive subsequently. Infertility affects 10%–15% of couples, posing a unique issue, as a couple must be treated rather than an individual.[2] In female infertility, untreated infection, anovulation, and endometriosis are major causes. Tubal and peritoneal factors are responsible for 30%–40% of cases of female infertility. Clinically, the majority of pelvic pathologies have been difficult to determine based on routine pelvic examinations, and tests such as ultrasonography (USG), hysterosalpingography (HSG), and sonosalpingography are likely to miss many intra-abdominal and intrauterine pathologies. The ability to visualize uterine cavity properly through hysteroscope, perform tubal cannulation under direct vision, to manipulate uterus, pelvic organs, and look for lesions such as adhesions, endometriosis, and tubal disease, and perform chromotubation all in a single session has made combined hysterolaparoscopy (HL), a far more superior tool in evaluation of female infertility. In addition,

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laprohysteroscopic procedures such as septal resection, polypectomy, myomectomy, adhesiolysis, endometrial polypectomy, ovarian drilling, and ovarian cystectomy can be performed simultaneously.

### Aims and objectives

1. Evaluation of infertile females for tubal and uterine pathologies (nonhormonal causes) using combined hysteroscopy and laparoscopy (HL) as a diagnostic aid
2. To find out the feasibility of providing therapeutic management concurrently.

## Materials and Methods

We included 100 infertile females in the age group of 20–45 years with primary or secondary infertility, with normal semen analysis of husband and normal hormonal study of the patient. Patients with active pelvic infection or medical/surgical contraindication to the procedure were excluded from our study. Detailed medical, surgical, family, genetic history was taken. The information regarding the type of infertility, past obstetric history, gynecological history, and any pelvic surgeries was taken. The patients were questioned about their coital frequency, coital difficulty, type and duration of contraception usage, medications, smoking, and recreational drug usage. General and pelvic examinations were done. Pelvic ultrasounds were performed in all patients. Patients underwent routine blood investigations; hormonal assay included anti-Müllerian hormone, follicle-stimulating hormone, luteinizing hormone, prolactin, progesterone, and thyroid function test. Semen analysis of husband was done beforehand to rule out male infertility.

Laparoscopy and hysteroscopy were performed in a single session under general anesthesia. It was scheduled during the early proliferative phase of the cycle (8–12 days). Karl Storz hysteroscope (6-mm diameter) was used for diagnostic hysteroscopy with glycine as the distension medium. Hysteroscope was introduced into the uterine cavity through the endocervical canal under visual control. The tubal ostia were identified, and the endometrial surfaces were systematically inspected. Endometrial curettings for histopathological examination and occasionally acid-fast bacteria staining were taken in all patients. Therapeutic interventions in the form of septal resection, polypectomy, myomectomy, and synechiolysis (adhesiolysis) were done wherever required by operative scope (2.9-mm diameter) and with the help of specialized instruments (resectoscope, loop, scissors, and probes).

Karl Storz laparoscope (5-mm diameter) was used to inspect uterus, anterior and posterior cul-de-sacs, fallopian tubes, ovaries, and rest of the pelvic peritoneum. Chromopertubation was done in all of our cases using dilute methylene blue dye, and spill from fimbrial ends was noted. Therapeutic interventions such as adhesiolysis, operative procedure for endometriosis, myomectomy, cystectomy, cyst aspiration, ovarian drilling, adenomyomectomy, salpingectomy, tubal clipping, and fimbrial cystectomy were performed in the same sitting.

All relevant positive findings and interventions carried out on HL were properly charted, and the incidence of different lesions was calculated. The recorded data were compiled and entered in a spreadsheet (Microsoft Excel) and then exported to the data editor of SPSS version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as mean ± standard deviation, and categorical variables were summarized as frequencies and percentages.

## Results

The mean age of patients in our study was 31.1 years, with majority of these patients falling in the age group of 25–34 years, i.e., 68%. Most of the patients in our study had infertility of 2–5-year duration (71%). In our study, we had more cases of primary infertility (67%) as compared to secondary infertility (33%).

Almost all patients were ovulating with regular, normal cycles. Only 2% of the patients gave a history of oligomenorrhea. Most of the patients (77%) had no prior medical history. About 79% of the patients in our study had never undergone any surgical procedure in their life. About 8% of the patients reported infertility following lower-segment cesarean section (LSCS), 5% had undergone diagnostic laparoscopy once already but without hysteroscopy, 3% had a history of cystectomy, and 2% had a history of oophorectomy in past.

Out of all the patients subjected to combined HL, positive findings were noted in 76% of the cases. Hysteroscopy showed abnormal findings in 43.4% of the patients. The most common hysteroscopic pathology was intrauterine adhesions seen in 7 patients (9.2%), followed by polyp in 6 patients (7.9%) [Figure 1] and septum in 5 patients (6.6%). Among the patients subjected to hysteroscopy, five had a unilateral ostial block (6.6%) and six had a bilateral ostial block (7.9%). The findings are summarized in Table 1.

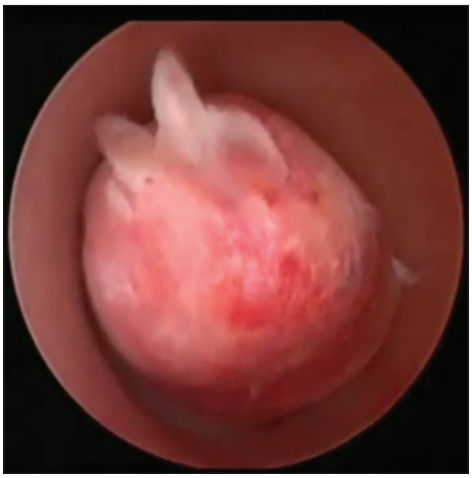

**Figure 1:** Endometrial polyp seen on hysteroscopy

The percentage of abnormal findings detected on laparoscopy was 52%. On laparoscopy, the most common finding was adhesions which were present in 18 patients [Figure 2], followed by endometriosis in 16 patients. Tubal distortion in the form of hydrosalpinx was seen in ten patients, and in two patients, tubes had a particular beaded appearance. Uterine anomaly in the form of bicornuate uterus was seen in one patient [Figure 3]. Dye testing at the end of the procedure revealed that 12 patients had a unilateral tubal block (15.8%) and 10 patients had a bilateral tubal block (13.2%). Many patients had more than one pathology on laparoscopy. The findings are summarized in Table 2.

Operative hysteroscopy was carried out in 31 patients (40.8%). The most frequently performed procedure was tubal cannulation, which was attempted in 11 patients and was successful in relieving the blockage in 8 of those patients. The rest of the procedures were as follows: polypectomy in 6 patients (7.9%), septum resection in 5 patients (6.6%), adhesiolysis in 5 patients (6.6%), submucosal myomectomy in 2 patients (2.6%) [Figures 4 and 5], and cervical dilatation in 2 patients (1.35%), as shown in Table 3.

**Table 1: Incidence of abnormal hysteroscopic findings**

| Uterine factors | Frequency (%) |
|---|---|
| Fibroid | 2 (2.6) |
| Polyp | 6 (7.9) |
| Adhesions | 7 (9.2) |
| Septum | 5 (6.6) |
| Unilateral ostial block | 5 (6.6) |
| Bilateral ostial block | 6 (7.9) |
| Cervical stenosis | 2 (2.6) |

**Table 2: Incidence of abnormal laparoscopic findings in study patients**

| Findings | Frequency (%) |
|---|---|
| Adhesions | 18 (23.7) |
| Endometriosis | 16 (21.1) |
| Fibroid | 13 (17.1) |
| Uterine anomaly | 1 (1.3) |
| Hydrosalpinx | 10 (13.2) |
| TB | 2 (2.6) |
| Fimbrial cyst | 1 (1.3) |

TB: Beaded tubes

**Table 3: Hysteroscopic interventions in patients**

| Intervention | Frequency (%) |
|---|---|
| Myomectomy | 2 (2.6) |
| Adhesiolysis | 5 (6.6) |
| Polypectomy | 6 (7.9) |
| Septum resection | 5 (6.6) |
| Cannulation | 11 (14.5) |
| Cervical dilatation | 2 (2.6) |

Operative laparoscopy was carried out in 60.5% of the patients. Various laparoscopic procedures were as follows: adhesiolysis in 15 patients (19.7%), followed by myomectomy in 10 patients (13.2%), surgery for endometriosis in 10 patients (13.2%), hydrosalpinx drainage in 4 patients (5.3%), salpingectomy in 3 patients (3.9%), tubal clipping in

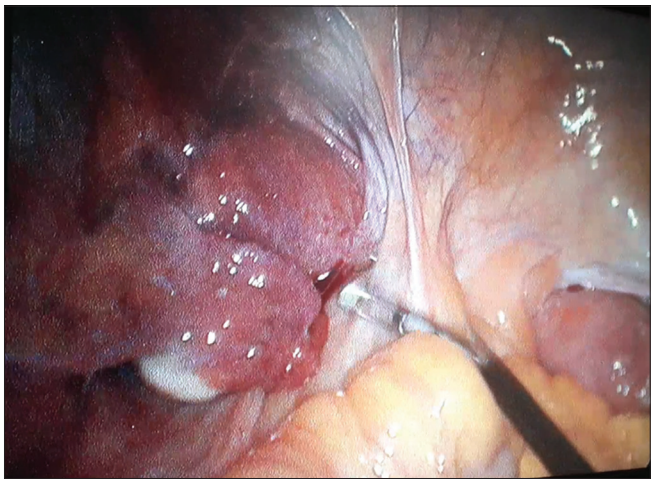

**Figure 2:** Adhesions seen on laparoscopy

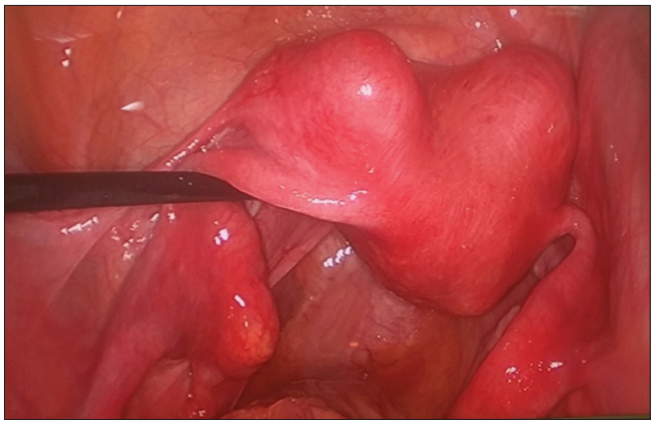

**Figure 3:** Bicornuate uterus

**Figure 4:** Uterine septum resection using hysteroscopic scissors

2 patients (2.6%), and omental biopsy in 2 patients (2.6%), as illustrated in Table 4.

## Discussion

Infertile women with normal ovulation, normal ultrasound finding, normal hormonal profile, and normal husband semen analysis have a higher possibility of having tuboperitoneal and uterine pathologies, and these can be best picked up by the magnified and direct vision of hysteroscope and laparoscope. They can also be treated in the same session, thereby avoiding the potential risks associated with a second surgery and anesthesia.

The mean age of patients in our study was 31.1 years, with majority of these patients falling in the age group of 25–34 years, i.e., 68%. The spectrum of age distribution was similar to a study carried out by Sajida and Majidah, in which the mean age of infertility was 28.4 years.[3] The duration of infertility in majority (71%) of the patients was 2–5 years with 4.7 years as the mean duration. This observation is justified by the fact that couples rarely opt for invasive procedures for the diagnosis and treatment of infertility during the first few years. In our study, we had more cases of primary infertility (67%) as compared to secondary infertility (33%). Similar observations were made in studies conducted by Ramesh and Kurkuri[4] and Shetty *et al*.[5]

HL were safely carried out in all 100% of the patients. Hysteroscopy was difficult in two patients of cervical stenosis but was successfully carried out after serial cervical dilatation. No significant surgical or anesthetic complication was reported in any patient apart from minor bleeding, postoperative pain, and fever. Monitored by laparoscopy, the complication rate of hysteroscopy declined significantly.

**Table 4: Laparoscopic interventions in patients**

| Intervention | Frequency (%) |
|---|---|
| Myomectomy | 10 (13.2) |
| Adhesiolysis | 15 (19.7) |
| Endometriosis surgery/endometrioma excision | 10 (13.2) |
| Hydrosalpinx drainage | 4 (5.3) |
| Omental biopsy | 2 (2.6) |
| Salpingectomy | 3 (3.9) |
| Tubal clipping | 2 (2.6) |

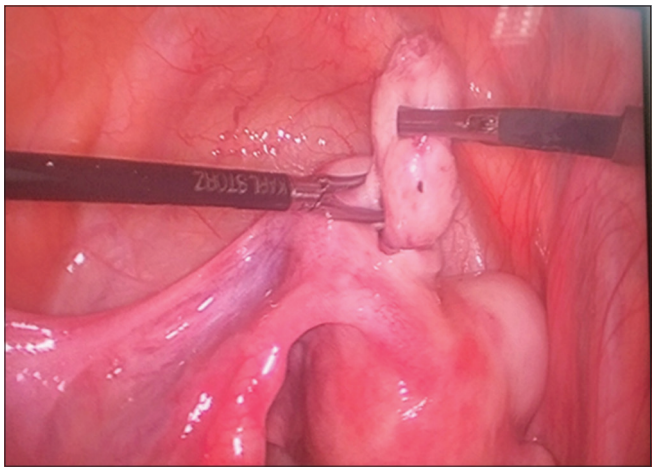

**Figure 5:** Laparoscopic myomectomy

The most common hysteroscopic pathology was intrauterine adhesions which were seen in 7 patients (9.2%). These adhesions were mostly flimsy; however, in one patient, these were particularly dense, obliterating almost half of the uterine cavity. Hysteroscope could not be maneuvered properly into the cavity; endometrial biopsy was taken which later revealed tuberculosis. Adhesions were seen mostly in patients with secondary infertility following repeated curettage or manual removal of placenta. The gold standard for determining the presence, extent, and nature of intrauterine synechiae is diagnostic hysteroscopy. The surgical treatment consists of adhesiolysis under hysteroscopic vision. A study carried out by Jain *et al*.[6] also discovered intrauterine synechiae to be most prevalent among their subjects. This finding also correlated to the findings of Shokeir *et al*.,[7] El Huseiny, and Soliman.[8]

Other frequently seen pathology on hysteroscopy in our study was uterine polyp, which was present in 6 patients (7.9%). One of the polyps was located near the internal os and the other near one of the tubal ostia where they could be directly implicated in causing infertility. Uterine septum was present in 5 patients (6.6%) and submucosal fibroids in 2 patients (2.6%). These conditions distort the uterine cavity and result in implantation failure which can manifest as either infertility or as recurrent pregnancy loss. A septate uterus (which is the most common uterine malformation) is associated with the poorest reproductive outcome, with pregnancy losses of more than 60% and fetal survival rates reported to be as low as 6%–28%.[9]

Hysteroscopic interventions were carried out in 31 patients (40.8%). Tubal cannulation was most frequently performed after the dye test showed delayed or failed spill from either or both ends. They were successful in relieving the obstruction in 72.7% of the patients. Polypectomy was the most frequent operation performed (7.9%). It was done using polypectomy snares, scissors, and loop resectoscopes. Adhesiolysis was done in five out of seven patients using sharp dissecting scissors, followed by insertion of Foley's balloon in the uterine cavity and treatment with oral estrogens for 4 weeks. Septum resection was done in all the five patients using an electrical resectoscope and scissors. Myomectomy was done in two patients with FIGO Grade 0 and Grade 1 fibroids.

In our study, the most common findings on laparoscopy were tuboperitoneal adhesions which were seen in 23.7% of the patients. These adhesions involved fallopian tubes in some patients, uterus and ovaries in some patients, and all three in others. These were mostly seen in patients with a history of previous pelvic surgery (LSCS/myomectomy) and with endometriosis of varying grades. In one patient, adhesions were quite extensive, and uterus, tubes, ovaries,

POD, and omentum were all adherent, and uterus was fixed and immobile (frozen pelvis). Omental biopsy was taken in this patient. Our findings are similar to that of Cumming and Taylor who found out that 23.7% of their patients suffered from peritubal adhesions of sufficient degree.[10] Others such as Jayakrishnan *et al*.,[11] Ramesh and Kurkuri,[4] and Khan *et al*.[12] also reported similar findings. Endometriosis of varying degrees was the next most common finding seen in 21.1% of the patients. It was in the form of endometriotic patches, blebs, scarring, endometriomas, and adhesion formation. Laparoscopic cautery ablation, endometrioma drainage and excision, and adhesiolysis were carried out in the same sitting. Next in order of occurrence were fibroids (subserosal and intramural) seen in 13 patients (17.1%), hydrosalpinx in 10 patients (13.2%), beaded tubes (TB) in 2 patients (2.6%), bicornuate uterus in 1 patient (1.3%), and fimbrial cyst in 1 patient (1.3%).

Operative laparoscopy was carried out in 60.5% of the patients. It was achieved using specialized instruments such as bowel graspers, Maryland bipolar forceps, harmonic scalpel, morcellator, scissors, manipulating probes, and suction irrigation systems. In cases where myomectomy was performed, layered closure of myoma bed was achieved using V-Loc barbed sutures. Various laparoscopic procedures were as follows: adhesiolysis in 15 patients (19.7%) followed by myomectomy in 10 patients (13.2%) and surgery for endometriosis in 10 patients (13.2%). Out of the ten patients that presented with hydrosalpinx, drainage was done in four patients of small hydrosalpinx, salpingectomy in three patients who had large hydrosalpinx, and tubal clipping in two patients.

Dye testing revealed unilateral block in 15.8% of the patients and bilateral tubal block in 13.2% of the patients. Similar percentages were also reported by Ramesh and Kurkuri[4] in their research.

Of note is the fact that laparoscopy alone would have detected abnormal findings only in 52% of cases, while hysteroscopy in isolation would have detected abnormal findings in only 43.4% of cases, both of which are significantly less than the overall percentage of abnormal findings in our cases, i.e., 76%. The use of combined HL thus gives a better diagnostic yield. Either investigation alone would have proven inadequate and missed significant findings.

## Conclusion

From our study, we concluded that combined HL is the gold standard investigation in the evaluation of female infertility, especially where anatomical causes are suspected. The most common finding in our study was adhesions, both intrauterine and extrauterine, and these are readily missed by conventional investigations (USG/HSG). Furthermore, many patients have abnormalities both in the uterine cavity and tubal, peritoneal, and ovarian pathologies, so using a combined approach of HL is much more beneficial in such patients. The added benefit of getting surgically treated in the same session provides a means of judiciously utilizing both the doctor's and patient's time and the rest of the hospital resources, thereby making hysterolaparoscopy the most effective tool for evaluation and management of infertility.

### Ethical standard

Ethical approval was obtained.

### Informed consent

Informed consent was taken from all patients undergoing the procedure.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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