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Role of Diagnostic Hystero-Laparoscopy in treatment of Infertility

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ABSTRACT
Infertility affects approximately 10-15% of reproductive-aged couples worldwide, with female factors contributing significantly to its etiology. Despite advancements in diagnostic modalities, many underlying causes remain undiagnosed, necessitating a comprehensive approach. Diagnostic hystero-laparoscopy has emerged as a gold-standard, minimally invasive technique for evaluating and managing infertility by identifying uterine, tubal and pelvic abnormalities. The study aimed to evaluate the diagnostic and therapeutic efficacy of hystero-laparoscopy in identifying and managing the underlying causes of infertility in women. This prospective observational study included 110 women with infertility, categorized into primary (n = 85) and secondary infertility (n = 25). All participants underwent diagnostic hystero-laparoscopy during the early follicular phase. Hysteroscopy assessed intrauterine pathologies, while laparoscopy evaluated tubal patency, ovarian and pelvic pathologies. Therapeutic interventions, including polypectomy, adhesiolysis and chromopertubation, were performed as needed. Data were analyzed to determine the prevalence of abnormalities and their impact on subsequent fertility outcomes. Abnormal findings were observed in 62% of patients on laparoscopy and 31% on hysteroscopy. The most common laparoscopic findings were ovarian pathologies (21%) and endometriosis (18%), while hysteroscopy revealed endometrial polyps (11%) and uterine septa (6%) as the predominant abnormalities. Tubal blockages were identified in 14% of cases, with bilateral tubal patency seen in 74%. Combined abnormalities were present in 22% of patients. Secondary infertility showed a higher rate of hysteroscopic abnormalities (48%) compared to primary infertility (26%). Diagnostic hystero-laparoscopy is a safe and effective tool for the comprehensive evaluation and management of infertility. Its dual-modality approach allows for simultaneous diagnosis and therapeutic intervention, improving fertility outcomes in affected women.

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Key Words
Hystero-laparoscopy, infertility, primary infertility, secondary infertility, ovarian pathology, tubal block, uterine abnormalities, therapeutic interventions

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INTRODUCTION

Infertility, defined as the inability to conceive after 12 months of regular unprotected intercourse, affects approximately 8-12% of reproductive-aged couples worldwide. It represents a significant public health concern, with profound social and psychological implications for affected individuals and families[1]. Female infertility can arise from various etiologies, including uterine, tubal and pelvic pathologies, as well as systemic and hormonal disorders. Diagnostic hystero-laparoscopy, a minimally invasive technique, has emerged as a gold standard for the comprehensive evaluation of infertility by allowing direct visualization of intrauterine, tubal and pelvic structures[2].

Globally, an estimated 48 million couples experience infertility, with female factor infertility accounting for approximately 37% of cases. The prevalence of infertility in India is reported to be 10-15%, with a higher burden in urban areas due to delayed childbearing, lifestyle changes and environmental factors[3]. Primary infertility, where a woman has never conceived, is more common than secondary infertility, characterized by difficulty in conceiving after a previous pregnancy. Tubal pathology and pelvic adhesions are among the leading causes of female infertility, followed by endometriosis and uterine anomalies[4].

Several studies have highlighted the diagnostic and therapeutic utility of hystero-laparoscopy in infertility. A study by Gopchade[5] demonstrated that laparoscopy identified abnormalities in 62% of cases, with endometriosis and tubal blockages being the most common findings. Similarly, hysteroscopy has been shown to detect intrauterine abnormalities, such as polyps and adhesions, in approximately 30% of infertile women[6]. Combined hystero-laparoscopy not only increases diagnostic accuracy but also enables therapeutic interventions like adhesiolysis, polypectomy and chromopertubation in the same session, thus improving fertility outcomes.

While numerous diagnostic tools, including transvaginal ultrasound and hysterosalpingography, are available, they are limited by their inability to identify subtle pelvic and intrauterine pathologies. Hystero-laparoscopy provides a one-stop solution, combining diagnostic precision with therapeutic potential in a single minimally invasive procedure. Given the high prevalence of tubal and pelvic pathologies in Indian women and the limited data on the outcomes of hystero-laparoscopy in the region, this study aims to evaluate its role in identifying and managing underlying causes of infertility. The findings will contribute to optimizing infertility management and improving reproductive health outcomes in resource-limited settings.

Aims and objectives

Aim: To evaluate the diagnostic and therapeutic efficacy of hystero-laparoscopy in identifying and managing underlying causes of infertility in women.

Objectives:

- To assess the prevalence of uterine, tubal and pelvic pathologies in women undergoing diagnostic hystero-laparoscopy for infertility
- To determine the therapeutic interventions performed during hystero-laparoscopy and their impact on fertility outcomes

MATERIALS AND METHODS

Study design: This was a prospective observational study conducted on 110 women who presented with infertility at a tertiary care center. Patients were categorized into two groups: Primary infertility (n = 85) and secondary infertility (n = 25). The study period spanned 12 months, from January to December 2023.

Inclusion Criteria:

- Women aged 20-40 years with a history of primary or secondary infertility
- No contraindications for anesthesia or surgical procedures
- Willingness to undergo diagnostic hystero-laparoscopy and provide informed consent

Exclusion Criteria:

- Women with confirmed male factor infertility as the sole cause
- Known cases of pelvic malignancies
- Active pelvic infection or tuberculosis
- Patients unfit for surgery due to comorbidities

Procedure: After a detailed history and clinical examination, all participants underwent routine blood investigations, imaging studies (ultrasound) and hormonal profiling. Diagnostic hystero-laparoscopy was performed under general anesthesia during the early follicular phase of the menstrual cycle (Day 6-10).

Hysteroscopy: A 5 mm hysteroscope was used to visualize the uterine cavity. Findings such as polyps, septa, adhesions, or other abnormalities were recorded. Therapeutic procedures, such as polypectomy or adhesiolysis, were performed if indicated.

Laparoscopy: A 10 mm laparoscope was inserted through a sub-umbilical port. The uterus, ovaries, fallopian tubes and pelvic cavity were systematically examined for pathologies such as endometriosis, ovarian cysts, adhesions, or tubal blockages. Chromopertubation with methylene blue dye was performed to assess tubal patency.

Data collection: Findings from both procedures were documented, including intraoperative diagnosis and any therapeutic interventions performed. Patients were followed up for immediate postoperative recovery and further management based on the findings.

Statistical analysis: Data were analyzed using appropriate statistical tests. Categorical variables, such as the presence of abnormalities, were expressed as percentages. A $p<0.05$ was considered statistically significant.

Ethical considerations: The study was approved by the institutional ethics committee. Written informed consent was obtained from all participants after explaining the nature, risks and benefits of the procedure.

RESULTS AND DISCUSSION

Table 1 shows that abnormal findings were more frequent in laparoscopy than hysteroscopy, with 62% and 31% abnormalities, respectively. Primary infertility had more abnormalities detected via laparoscopy (65%) compared to hysteroscopy (26%). Secondary infertility showed a slightly lower prevalence of abnormalities in both procedures.

Ovarian pathology (21%) and endometriosis (18%) were the most common abnormalities across both groups. Tubal pathology and pelvic adhesions were noted in 13% and 14% of patients, respectively, with primary infertility showing higher rates than secondary infertility (Table 2).

Table 3 highlighting that 74% of patients had bilaterally patent tubes. Bilateral tubal blockages were seen in 14%, with a higher prevalence in secondary infertility (20%) compared to primary infertility (12%).

Table 4 details hysteroscopic findings, revealing that 31% of patients had abnormal results. Endometrial polyps were the most frequent abnormality (11%), followed by septum/subseptum (6%) and intrauterine adhesions (6%). Secondary infertility had a higher rate of hysteroscopic abnormalities (48%) compared to primary infertility (26%).

Table 5 compares abnormalities detected in both groups. Primary infertility had a higher prevalence of laparoscopic abnormalities (76%), while secondary infertility had a slightly higher rate of hysteroscopic abnormalities (48%). Combined abnormalities were identified in 22% of cases, with secondary infertility showing a slightly higher proportion (28%) than primary infertility (20%).

In this study, laparoscopic abnormalities were detected in 62% of women, with a higher prevalence in the primary infertility group (65%) compared to secondary infertility (52%). Hysteroscopic abnormalities were identified in 31% of women, consistent with previous studies. Hassa and Aydin[7] reported laparoscopic abnormalities in 68% of women with infertility, closely mirroring our findings. Hysteroscopy revealed abnormalities in 33% of cases, slightly higher than our rate of 31%. Varlas *et al*.[8] found a similar prevalence of laparoscopic findings, especially ovarian pathology and endometriosis, which were predominant in our study as well. The slight variation in rates may be attributed to differences in study populations, inclusion criteria, or diagnostic expertise.

Ovarian pathology (21%) and endometriosis (18%) were the most frequently identified abnormalities in this study, followed by tubal pathologies (13%) and pelvic adhesions (14%). A study by Panchal and Shah[9] found ovarian abnormalities in 24% and endometriosis in 20% of cases, nearly identical to our findings.

Table 1: Findings in laparoscopy and hysteroscopy

Procedure	Primary infertility (n = 85)	Secondary infertility (n = 25)	Total (n = 110)
Laparoscopy			
Normal (%)	30 (35%)	12 (48%)	42 (38%)
Abnormal (%)	55 (65%)	13 (52%)	68 (62%)
Hysteroscopy			
Normal (%)	63 (74%)	13 (52%)	76 (69%)
Abnormal (%)	22 (26%)	12 (48%)	34 (31%)

Table 2: Laparoscopic Findings in Primary and Secondary Infertility

Finding	Primary infertility (n = 85)	Secondary infertility (n = 25)	Total (n = 110)
Normal (%)	30 (35%)	12 (48%)	42 (38%)
Ovarian Pathology (%)	20 (24%)	3 (12%)	23 (21%)
Endometriosis (%)	16 (19%)	4 (16%)	20 (18%)
Tubal Pathology (%)	12 (14%)	2 (8%)	14 (13%)
Adhesions (%)	12 (14%)	3 (12%)	15 (14%)
Myomas (%)	11 (13%)	1 (4%)	12 (11%)
Uterine Anomalies (%)	2 (2%)	-	2 (2%)
Abdominal TB (%)	1 (1%)	-	1 (1%)

Table 3: Chromopertubation findings

Findings	Primary Infertility (n = 85)	Secondary Infertility (n = 25)	Total (n = 110)
Bilateral patency (%)	65 (77%)	16 (64%)	81 (74%)
Right block (%)	6 (7%)	1 (4%)	7 (6%)
Left block (%)	4 (5%)	3 (12%)	7 (6%)
Bilateral block (%)	10 (12%)	5 (20%)	15 (14%)

Table 4: Hysteroscopic findings

Findings	Primary infertility (n = 85)	Secondary infertility (n = 25)	Total (n = 110)
Normal (%)	63 (74%)	13 (52%)	76 (69%)
Endometrial polyp (%)	7 (8%)	5 (20%)	12 (11%)
Intrauterine adhesions (%)	4 (5%)	3 (12%)	7 (6%)
Septum/subseptum (%)	5 (6%)	2 (8%)	7 (6%)
Obliterated ostium (%)	1 (1%)	1 (4%)	2 (2%)
Unicornuate uterus (%)	1 (1%)	-	1 (1%)
Hypoplastic uterus (%)	1 (1%)	-	1 (1%)

Table 5: Comparison of Abnormalities Detected in Primary vs Secondary Infertility

Type of abnormality	Primary Infertility (%)	Secondary Infertility (%)	Total (%)
Laparoscopic abnormalities	65 (76%)	13 (52%)	78 (71%)
Hysteroscopic abnormalities	22 (26%)	12 (48%)	34 (31%)
Combined abnormalities	17 (20%)	7 (28%)	24 (22%)

Tubal blockages were reported in 15% of cases in Hovav *et al*.[10], aligning closely with our detection rate of 14%.

Hysteroscopy revealed endometrial polyps (11%) and intrauterine adhesions (6%) as the most common findings. Secondary infertility showed a higher prevalence of hysteroscopic abnormalities (48%) compared to primary infertility (26%). Jain[11] reported endometrial polyps in 12% and adhesions in 7% of cases, closely matching our findings. Higher rates of hysteroscopic abnormalities in secondary infertility were similarly noted in Khatuja *et al*.[12], which suggested that uterine trauma during previous pregnancies could contribute to higher rates of abnormalities.

The dual-modality approach in this study allowed for immediate therapeutic interventions such as polypectomy, adhesiolysis and chromopertubation. These interventions are associated with improved fertility outcomes, as demonstrated by several studies. Namita *et al*.[13] highlighted the efficacy of combined diagnostic and therapeutic hystero-laparoscopy in achieving pregnancy rates of 35-40% within one year of the procedure. In our study, post-procedure follow-up is ongoing to evaluate pregnancy outcomes but preliminary data suggest a positive trend similar to previous findings.

The findings underscore the diagnostic and therapeutic utility of hystero-laparoscopy, especially in settings where access to advanced imaging modalities is limited. Immediate therapeutic interventions performed during the procedure can optimize patient management and reduce the time to conception.

STRENGTHS AND LIMITATIONS

The strengths of this study include its prospective design, standardized procedural protocols and a comprehensive assessment of both primary and secondary infertility cases. However, limitations include the single-center nature of the study and the relatively short follow-up period for fertility outcomes.

CONCLUSION

Diagnostic hystero-laparoscopy is an invaluable tool in the comprehensive evaluation and management of infertility. In this study, a significant proportion of women with both primary (65%) and secondary (52%) infertility had abnormalities detected via laparoscopy, with hysteroscopy adding diagnostic value in 31% of cases. The most common laparoscopic findings included ovarian pathology, endometriosis and tubal blockages, while hysteroscopy frequently identified endometrial polyps and uterine septa. This dual-modality approach not only facilitated accurate diagnosis but also allowed for immediate therapeutic interventions, such as polypectomy, adhesiolysis and chromopertubation, in a single setting. These findings underscore the importance of hystero-laparoscopy as a minimally invasive, safe and effective method for evaluating and treating female infertility, offering hope for improved fertility outcomes in affected women.

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