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Original Research Article

Clinical usefulness of hysterolaparoscopy and chromopertubation in evaluation and management of female infertility in a tertiary care hospital

Sampada N. S., Madhuri Saha*, Rajini Uday

Department of Obstetrics and Gynecology, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India

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***Correspondence:**
Dr. Madhuri Saha,
E-mail: madhuri07saha@gmail.com

ABSTRACT

Background: Infertility is defined by the World Health Organization (WHO) as the inability to achieve pregnancy after 12 months of unprotected intercourse which affects 10–15% of couples globally. In India, prevalence ranges from 3.9% to 16.8%. Hysterolaparoscopy combined with chromopertubation (DHL + CPT) serves as a valuable diagnostic and therapeutic tool in case of female infertility. This study evaluates the effectiveness of DHL + CPT in managing primary and secondary infertility at a tertiary care hospital.
Methods: In this prospective study, 60 women with primary or secondary infertility underwent clinical evaluations, basic blood tests, and abdominopelvic ultrasonography during the study period. Participants underwent DHL + CPT during their preovulatory phase following a negative urine pregnancy test. Tubal patency was assessed using methylene blue dye, and therapeutic interventions like cystectomy, adhesiolysis, ovarian drilling, septal resection were performed as necessary. Reproductive outcomes were monitored through follow-up visits or telephone correspondence.
Results: Among the participants, 75% had primary infertility, and 25% had secondary infertility. Of the 32 primary infertility patients followed up, 24 (75%) conceived within six months. In the secondary infertility group, 10 out of 18 patients (55.5%) achieved pregnancy within six months. Therapeutic interventions were performed in 53% of cases, yielding promising reproductive outcomes.
Conclusions: DHL + CPT is an effective, cost-efficient, and accessible method for evaluating and managing reversible causes of infertility. Patients undergoing interventions demonstrated significant improvements in fertility outcomes. However further research is warranted to explore newer, less invasive, and more cost-effective interventions.

Keywords: Infertility, Hysterolaparoscopy, Chromopertubation

INTRODUCTION

Infertility has become more prevalent in recent times, with various factors contributing to the rise in its rates. Modern lifestyle choices, such as stress, poor diet, environmental toxins, and delayed childbearing due to career or personal choices have contributed to its increased incidence. Additionally, health conditions like polycystic ovary syndrome (PCOS), endometriosis, and low sperm count have also increased. Advances in fertility treatments have improved options for couples facing infertility, but it remains an ongoing challenge for many. Several elements of urban lifestyle are contributing to the rise in infertility rates, which has made it a notable "new era" problem. According to World Health Organization (WHO), infertility is defined as "The failure to achieve a clinical pregnancy after 12 months of regular unprotected sexual intercourse".[1] About 10 to 15% of reproductive age group couples worldwide are facing infertility problems and it stands as a complex challenge in today's society with

significant societal ramifications.[2] The causes of infertility can be classified as female factors accounting for 40 to 55% which remain the most common reason for infertility, followed by male factors which accounts for 30 to 40%, combined factors (10%) and unexplained (10%). According to WHO, the prevalence of infertility in India is between 3.9% and 16.8%. Laparoscopy and Chromopertubation also popularly called "lap and dye test" is an easy, reliable and gold standard tool for evaluation of infertility with an added advantage of simultaneous therapeutic interventions wherever necessary.[3] It helps in the accurate assessment of the condition of the fallopian tubes and its patency, assessment of the ovaries, the uterus and other pelvic pathologies. It contributes towards procuring a valuable insight for both clinicians and patients aiding navigate the complexities of female infertility.[4] The advantage of performing laparoscopy early in the evaluation of women suspected of having endometriosis or pelvic adhesions is that surgical therapy can be initiated before starting ovulation induction drugs. Also, ovarian drilling can be performed in patients with failed medical management of PCOS.[5]

METHODS

This prospective cohort study was conducted in the Department of Obstetrics and Gynecology at Sapthagiri Institute of Medical Sciences and Research Centre from December 2022 to March 2024 with a sample size of 60 patients. The aim of this study was to study the role of hysterolaparoscopy and chromopertubation in the evaluation and management of female infertility in a tertiary care referral hospital and also to evaluate the outcomes of therapeutic hysterolaparoscopy procedures or surgeries in the better management of primary or secondary infertility. Clearance to conduct the study was taken from the Institutional Ethics Committee before the conduct of study. Patient confidentially was ensured by anonymizing data and securely storing all records. The inclusion criteria consisted of women in the age group of 20 to 40 years with primary or secondary infertility as per standard definition.

With absence of male factor infertility while the exclusion criteria included with women diagnosed with premature ovarian failure as per standard definition and patients having any contraindications for surgery or anesthesia. Patients satisfying the inclusion criteria were included in the study after a verbal consent.

The patients underwent physical examination and basic blood tests which include hemoglobin levels, blood grouping and Rh typing, and ultrasonography (USG) abdomino-pelvic scan which were found to be within acceptable limits. After pre anesthetic evaluation and clearance, patients underwent, DHL + CPT under general anesthesia in the preovulatory stage or in the follicular phase (day 6 to day 11 of the cycle) after a negative urine pregnancy test. Hysteroscopy was done to examine the uterine cavity, tubal ostia and its patency, condition of endometrium, presence of any pathological conditions such as intrauterine septum, uterine polyp, synechiae or fibrotic bands. Laparoscopy was then performed after creating pneumoperitoneum and uterus, ovaries, fallopian tubes, cul-de-sac and pelvic cavity were examined for any features contributing to the possible causation of infertility. Chromopertubation was performed to check for tubal patency by injecting diluted methylene blue dye into the uterine cavity and noting the spillage of the dye from the fimbrial ends.

Information collected included demographic data such as age, body mass index (BMI) and place of residence i.e. urban or rural; a detailed clinical history which included duration of infertility, history of previous treatment of infertility if any, smoking, exposure to toxic substances, pre diagnosed causes such as uterine polyp or fibroid, intrauterine septum, ovarian cysts, and pelvic inflammatory disease were enquired and data was tabulated. Data was initially organized using Microsoft excel and analyzed for percentage of incidence of each parameter. The clinical usefulness of this diagnostic and therapeutic tool was subsequently analyzed by means of its effectiveness and in the assessment and treatment of patients diagnosed with primary or secondary infertility.

RESULTS

Out of 60 infertile patients admitted, 64% had primary (n=38) and 36% (n=22) had secondary infertility respectively. Maximum number of patients was found to be in the age group of 26 to 30 years of age with distribution among primary and secondary infertility as shown in Table 1. The demographic data analysis revealed that a majority of patients (n=45) were residence of urban areas out of which 27 patients (60%) were diagnosed to have primary and 18(40%) had secondary infertility. 28(46%) subjects had normal BMI out of which 47% (18 patients) of women had primary infertility and 45% (10 patients) had secondary infertility as depicted in Table 1.

Most of the patients had normal hysteroscopy findings (61%). Abnormal hysteroscopy findings were seen in 65% patients with primary infertility (15 of 23 patients) and 34% patients with secondary infertility (8 of 23 patients). Endocervical polyp was noted in 2 subjects and polypectomy was done via avulsion per vaginally and sent for histopathological examination. Endometrial polyp was noted in 6 subjects. 2 small polyps measuring 1 cm was noted near posterior cornua and 4 patients had large polyps of 2 to 4 cm near the fundus and cornua and underwent polypectomy with specimens sent for HPE which was followed up and found to be normal. Abnormal endometrium was seen in 7 patients and among which 4 had bald endometrium and 3 had fluffy endometrium. Investigations deemed fit like endometrial biopsy and CB-NAAT was sent. Uterine anomaly was noted in 2 patients -one of them had subseptate uterus and trans cervical septal resection was done in the same sitting. Another patient was diagnosed with obstructed hemivagina, ipsilateral renal

agenesis (OHVIRA) syndrome with a right transverse hemi vaginal septum with a bulge and septal resection was done and menstrual blood was drained out. Cervical stenosis was noted in 6 patients and serial cervical dilatation was done using Hegar's dilators to visualize the uterine cavity as shown in Table 2.

Abnormal laparoscopic findings were seen in 66% (40) of patients with (57.5%)23 patients from primary infertility group and (42.5%)17 patients were from the secondary infertility group. Ovarian pathologies were noted in 22 subjects i.e. 40 % which was the most common detected abnormality on laparoscopy.

Serous cyst adenoma was found in 5 cases whereas mucinous cystadenoma was detected in 4 cases - cystectomy was done in 7 cases and oophorectomy was done in the other 2. Polycystic ovarian features were noted in 7 patients i.e. 71% among which 4 had primary and 3 had secondary infertility- ovarian drilling was performed in 4 subjects. Chocolate cyst of ovary was noted in 2 patients for which cystectomy was done.

Other laparoscopic findings included uterine leiomyomas in 6 cases, features of pelvic inflammatory disease in 2 cases and tubal pathology was noted in 7 cases. Uterine pathology was noted in 11 cases. Out of them, 3 patients had uterine anomalies. One of them was diagnosed with OHVIRA syndrome and had uterine didelphys, while the other patient had unicornuate uterus with a non-communicating rudimentary horn and one patient had bicornuate uterus. 2 patients had intramural fibroids and underwent myomectomy. Adhesions between the uterine walls and omentum and bowel were noted in 2 patients and adhesiolysis was performed using sharp and blunt dissection in the same sitting. Out of 7 patients, 2 cases had features of PID - while the rest had features like tubal kinking, peri tubal adhesions, para tubal cysts, hemato/pyosalpinx and fimbrial cysts which were dealt with accordingly as shown in Table 3.

Chromopertubation done in all 60 cases which showed bilateral spill in 40 patients (66%) of which 27 cases (65%) belonged to primary infertility group and 13 patients (66%) in secondary infertility group. Absence of bilateral spillage was noted in only 10% i.e. 6 cases of which 4 patients had primary infertility and 2 had secondary infertility whereas unilateral spill was present in 14 cases of which 10 patients had right tubal patency and remaining 4 cases had left sided tubal patency as shown in Table 4.

Out of 60 patients, 10 were lost to follow up (6 patients with primary infertility and 4 with secondary infertility). Out of the remaining 50 patients – analysis of the reproductive outcomes revealed that 32 patients diagnosed with primary infertility who had been followed up, 24 of them had conceived approximately at the end of 10 months and out of 18 patients with secondary infertility, 10 patients had conceived at the end of 6 months as depicted in Table 5.

Table 1: Distribution of cases by age group and Body mass index.

Category	Total cases (%)	Primary infertility (%)	Secondary infertility (%)
Age (years)			
20-25	18 (30)	11 (21)	7 (31)
26-30	22 (36)	14 (36)	8 (36)
31-40	20 (33)	13 (34)	7 (31)
Body mass index (kg/m$^{2)}$			
Underweight (<18.5)	9 (15)	6 (15)	3 (13)
Normal (18.5 to 24.9)	28 (46)	18 (47)	10 (45)
Overweight (24.9 to 29.9)	18 (30)	10 (26)	8 (36)
Obese (>30)	5 (8)	4 (10)	1 (4)
Place of residence			
Urban area	45 (75)	27 (60)	18 (40)
Rural area	15 (25)	10 (66.6)	5 (33.3)

Table 2: Hysteroscopy findings.

Hysteroscopy findings	Number of cases (%)	Primary infertility (%)	Secondary infertility (%)	Interventions performed
Normal	37 (61)	21 (58)	16 (66)	
Endocervical polyp	2 (3)	1 (2)	1 (14)	Polypectomy done and sent for HPE
Endometrial polyp	6 (10)	4 (11)	2 (8)	Polypectomy done and sent for HPE
Uterine anomaly	2 (3)	1 (2) (OHVIRA)	1 (4)	1 case subseptate uterus noted – transcervical septal resection done

Continued.

Hysteroscopy findings	Number of cases (%)	Primary infertility (%)	Secondary infertility (%)	Interventions performed
Abnormal endometrium	7 (11)	5 (13)	2 (8)	3 cases had fluffy endometrium-endometrial biopsy done and sent for CB-NAAT
Cervical stenosis	6 (10)	4 (11)	2 (8)	Cervical dilatation done
Total	60	36	24	

Table 3: Laparoscopic tubal pathology.

Laparoscopy findings	Number of cases (%)	Primary infertility (%)	Secondary infertility (%)	Interventions performed
Normal	20 (33)	13 (21)	7 (11)	
Uterine pathology				
Anomaly	3 (27)	2 (33)	1 (20)	
Adhesions	6 (54)	4 (66)	2 (40)	2 patients underwent adhesiolysis
Fibroid	2 (18)	0	2 (40)	2 patients had intramural fibroids and underwent myomectomy
Tubal pathology				
PID	2 (28)	2 (40)	0	Conservatively managed
Others (tubal kinking, peritubal adhesions, hemato/pyosalpinx, paratubal cysts)	5 (71)	3 (42)	2 (100)	Tubal resection, cystectomy, release of tubal adhesions.
Ovarian pathology				
PCO features	7 (31)	4 (33)	3 (30)	Ovarian drilling done in 4 cases
Cysts	9 (40)	6 (50)	3 (30)	Serous cyst adenoma was found in 5 cases. Mucinous was found in 4 and cystectomy done in 7 cases and oophorectomy done in the other 2 cases
Endometriosis	3 (13)	1 (8)	2 (20)	Chocolate cyst was found in 2 cases and cystectomy done
Tubo-ovarian pathology	3 (13)	1 (8)	2 (20)	Tubo-ovarian mass was found in 1 case and salphingoophorectomy done. Conservative management was done in the other 2 cases.

Table 4: Prevalence of tubal block (chromopertubation test).

Chromopertubation	Number of cases (%)	Primary infertility (%)	Secondary infertility (%)
Bilateral spill present	40 (66)	27 (65)	13 (66)
Bilateral spill absent	6 (10)	4 (10)	2 (11)
Unilateral spill present	14 (23)	10 (25)	4 (22)

Table 5: Reproductive outcome.

Number of cases	Primary infertility (n=32) (%)	Secondary infertility (n=18) (%)
Number of patients conceived	24 (75)	10 (55)
Number of patients not conceived	8 (25)	8 (44)

DISCUSSION

This study included 60 infertile patients (primary or secondary) aged between 20 and 40 years who fulfilled the inclusion criteria. In this study the incidence of primary infertility was 64% i.e. in 38 patients and secondary infertility was diagnosed in 36%i.e. 22 patients. This is in conjunction with a study done by Al-Turki et al where the prevalence of infertility was 18.93% with primary infertility more common than secondary infertility.[6] All the patients were compared for demographic characteristics like age, BMI, place of residence and the results were

analyzed. Maximum number of patients were found to be in the age group of 26 to 30 years with no significant variation among primary and secondary infertility cases. This is in conjunction with other studies done by Parul Sharma et al[7] where the most common age group was between 26 and 30 years.

Abnormal hysteroscopy findings were seen in 65% patients with primary infertility i.e. 15 out of 23 patients and 34% patients with secondary infertility i.e. 8 out of 23 patients. Most common abnormality encountered in this study was endometrial abnormalities accounting to about 11 %. Other abnormalities included endometrial polyps (10%), cervical stenosis (10%) and uterine anomalies (3%) such subseptate uterus and OHVIRA syndrome. Godinjak et al found uterine anomalies in 5.27% of cases which included septate, bicornuate, and arcuate uterus which is in conjuncture with the index study.[8] Shrivastava et al reported uterine septum in 6.29% of primary infertility cases which is slightly higher than our results.[9] Gad et al found uterine septum as the most common hysteroscopic finding, which is similar to our study.[10] Pabuçcu et al found that metroplasty in septate uterus cases led to a conception rate of 41%, showing the effectiveness of surgical interventions.[11] Pritts et al concluded that sub mucosal fibroids which cause distortion of endometrial cavity resulted in decreased pregnancy rates and was treated with myomectomy/resection of submucous fibroid polyp and the results are at par with our study.[12]

All hysteroscopy and laparoscopic abnormal findings detected were noted intraoperatively, documented in detail and analyzed subsequently. A higher incidence of abnormalities was detected in laparoscopy i.e. 66% than with hysteroscopy which accounted for 26% of the abnormal findings with maximum incidence being in the primary infertility group wherein 15 cases out of 23 were diagnosed on hysteroscopy and 23 out of 40 cases were diagnosed on laparoscopy. In agreement with our results, a study done by Mohamed et al reported a higher rate of diagnosis of abnormalities on laparoscopy than hysteroscopic with 63%and 50% of patients from primary infertility group in hysteroscopy and laparoscopy respectively.[10] Our study also supports findings of a study done by Puri et al which highlighted laparoscopy as an effective diagnostic and therapeutic tool in the evaluation and management of infertility.[13] Ovarian pathologies which accounted for 55% of the cases of infertility which included serous, mucinous cystadenoma, chocolate cyst of ovary and polycystic features were the most common abnormalities detected on laparoscopy in our study. This is in conjuncture with a study done by Puri et al who found that PCOS which was noted in 33.3% in primary infertility group and 11.5% in secondary infertility group, endometriosis (18%), and tubal blockages (18%) were the most common laparoscopic abnormalities.[13] Varlas et al reported endometriosis and tubal pathology in 35% of cases, which is consistent with the findings of our study.[14] Polycystic ovarian features which were observed in 7 patients in our study and ovarian drilling was performed for 4 cases who belonged to the primary infertility group. This is in correspondence with the study done by Sharma et al wherein ovarian drilling for PCOS was the most common laparoscopic intervention (22.66%) done.[7] Shrivastava et al found PID (16.8%), fibroids (8.29%), and endometriosis (7.8%) were the most common laparoscopic findings which closely matching our results.[9]

In our study, on the performance of chromopertubation, bilateral spill was noted in 40 cases with 27patients who were diagnosed with primary infertility and 30 patients with secondary infertility. Bilateral spill was absent in only 6 cases and unilateral spill was present in 14 cases with 10 patients with right side patent tube and remaining 4 cases had left side patent tube. The bilateral tubal patency rate (66%) is comparable to Sairem et al (17.9% unilateral block, 37.7% bilateral block).[15] Varlas et al found bilateral tubal occlusion in 20% of patients, which is comparable to our study.[14]

All these studies done with respect to chromopertubation depicts its usefulness with regards to assessment of tubal patency as in our study.

On the analysis of the reproductive outcomes of the patients who had undergone diagnostic or therapeutic interventions, it was found that in the primary infertility group 24 out of 32 patients conceived within 10 months (75%) and 10 out of 18 patients in the secondary infertility group conceived within 6 months (55%). Higher pregnancy rates i.e. 75% in primary and 55% in secondary infertility align with other studies done in this arena supporting early laparoscopic and hysteroscopic intervention. Pritts et al concluded that hysteroscopic removal of fibroids significantly improves fertility outcomes which is consistent with our study.[12] Reproductive outcomes in our study (75% in primary infertility, 55% in secondary) are in line with other research studies depicting the efficacy of diagnostic hysterolaparoscopy with chromopertubation as an effective tool.

Limitations

The study was conducted with a limited sample size with a limited subgroup analysis and reduced statistical analysis. Our study did not compare DHL+ CPT with hysterosalpingography which is a commonly done outpatient procedure for assessment of tubal patency thus limiting the ability to evaluate its relative diagnostic accuracy. There is also a small possibility although rare of developing anaphylactic reactions to methylene blue dye during chromopertubation.[16] Larger, multi-centric studies with large sample size and long-term follow up would strengthen the evidence for their role in infertility management. Also, DHL+ CPT is unavailable in low resource setting and also requires expertise in laparoscopy and hysteroscopy making it of less popular in rural setting.

CONCLUSION

With the above-mentioned findings, there is considerable evidence that performance of diagnostic and therapeutic hysterolaparoscopy and chromopertubation in patients with primary or secondary infertility is of immense value in the evaluation and treatment of cases with female factor infertility. This study is in concurrence with other studies done in the same arena which proves the importance of these diagnostic and therapeutic techniques. This study demonstrated with substantial evidence that hysterolaparoscopy and chromopertubation procedure is a cost effective, easily available tool in most tertiary care centers, requiring minimal expertise in performance, yet having immense diagnostic and therapeutic potential in the management of female primary and secondary infertility. The ability of these procedures to simultaneously diagnose and also treat multiple fertility related conditions in a single sitting enhances patient compliance and usefulness making it a valuable tool in the improvement of reproductive interventions. Hystero-laparoscopy can also be called as the 'third eye' of gynaecologists in the evaluation and treatment of female infertility.[17] When used strategically, at the right instance they can significantly improve the chances of conception especially in women facing complex fertility challenges and societal pressure of embracing motherhood. Hence this study recommends that hysterolaparoscopy and chromopertubation technique may be made an integral part in the comprehensive evaluation and management of female infertility.

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