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Original Research Article

Study of hysterosalpingography and fallopian tube recanalization in evaluation and treatment of infertile female in tertiary care center: prospective observational study

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ABSTRACT

Background: Infertility affects about 10-15% of couples, with tubal factors contributing to nearly one-third of female infertility cases. HSG remains the first-line imaging modality for evaluating uterine and tubal pathology, while FTR provides a minimally invasive treatment for proximal tubal block.
Methods: This prospective cross-sectional observational study was conducted in the department of obstetrics and gynecology, Government Medical College, Nagpur, over 18 months (January 2023-June 2024). Sixty infertile women meeting inclusion criteria were evaluated using HSG. Cases with proximal tubal block were selected for FTR. Data were analyzed using SPSS version 21, with $p<0.05$ considered statistically significant.
Results: The mean age of participants was 29.03±4.17 years, and the mean duration of infertility was 4.66±3.79 years. HSG showed normal findings in 58.3% and abnormal findings in 41.7% of patients, with bilateral cornual block being the most frequent abnormality. FTR was performed in 8 patients, with successful tubal patency achieved in 5 (62.5%) and conception in 3 (37.5%). There was no significant association between HSG findings and conception rate ($p>0.05$).
Conclusions: HSG is a simple, reliable, and cost-effective method for initial evaluation of tubal patency. FTR is a safe and effective therapeutic procedure for managing proximal tubal obstruction, improving fertility outcomes, and reducing the need for more invasive interventions.

Keywords: Infertility, Fallopian tube recanalization, Hysterosalpingography, Tubal block

INTRODUCTION

Procreation, or the desire to have offspring of one's own, is the greatest desire found in human beings.[1]

Infertility can be defined as the inability to conceive after 1-2 years of regular and unprotected sexual intercourse.[2] Universally around 10-15% of couples may experience some kind of problems in conception.[2] Unexplained infertility is a failure of a couple to attain pregnancy without the presence of any definite cause after 12 months of efforts to get conceived or after 6 months in the female of age ≥35 years.[3] The World Health Organization (WHO) has defined infertility on a clinical basis as 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.[4]

Infertility can be sex-wise divided into female infertility, male infertility, and a combination of female infertility. According to the other classification, infertility can be primary (inability to have any pregnancy) and secondary (inability to have a pregnancy after previously successful conception).[4] It is a global health problem affecting millions of people and their families in all aspects.[4] WHO also states that one in every six people experience

infertility in their lifespan.[4] The incidence of infertility in any community or population ranges between 5%-15%.[5] Female factors account for more than 40% of cases of infertility.[2,6] However, 10-25% of infertile females do not have a definite cause for their infertility and are diagnosed with 'unexplained infertility'.[3] The causes of female infertility can be broadly stated as follows:[5]

Dyspareunia and vaginal causes, congenital defects in the genital tract, infection in the lower genital tract, cervical causes, uterine causes, tubal causes, ovulatory dysfunction, peritoneal causes, chronic ill health, hormonal disorders, hyperthyroidism.

Out of all these factors and causes, 20-30% of all female infertility cases are caused by tubal factors, including bilateral proximal fallopian tube blockage, bilateral partial fallopian tube blockage, unilateral tube blockage, unilateral or bilateral hydrosalpinx, tubal scarring, or damage.[2,6-8] These tubal abnormalities are often secondary to pelvic inflammatory disease (PID), endometriosis, congenital malformations, or adhesions after pelvic surgery.[9-10]

Tubal factors of infertility are broadly classified as congenital factors and acquired factors.[8] A tubal obstruction can occur anywhere along the course of the fallopian tube.[2] It may be partial or complete depending on the extent involvement of tubal part.[2] Proximal tube blockage essentially prevents sperm to reach the fertilization area and distal tube pathology restricts the ovum movement.[11] Furthermore, a proximal tubal block may represent as either a pseudo-obstruction or true anatomical blockage.[8] Pseudo-obstructions are primarily due to spasms or mucus plugs obliterating the tubal lumen.[8] On the other hand, true anatomical tubal blocks are due to salpingitis isthmic nodosa (SIN), PID, cornual polyps or fibroids and intrauterine synechiae.[8] Sometimes true anatomical blocks arise post-abortion or after dysfunctional intrauterine contraceptive device.[8] Mid-tubal obstructions are commonly caused by PID, endometriosis or post-operative complications.[8] Distal tube blockages are due to fimbrial agglutination (mild block), fimbrial phimosis (moderate block) or complete obstruction (severe block).[8]

Recent studies have shown the infective aetiologies of tubal factor infertility.[1] Obstruction of the fallopian tube due to sexually transmitted diseases (STDs) such as *Chlamydia trachomatis* or *Neisseria gonorrhoeae* causing salpingitis is commonly observed.[1]

Evaluation of the fallopian tube function and patency is a prime component of the initial triad of diagnostic investigations for couples with infertility.[8] It is the third in line after semen evaluation and ovulation examination.[8] Tests for tubal patency include hysterosalpingography (HSG), dilation and insufflation test (DI), saline infusion sonography, hysterosalpingo-contrast-sonography (Hy Cosy), laparoscopy and chromopertubation, sono hysterosalpingography and falloscopy.[1]

HSG is a non-invasive and inexpensive procedure.[2] Therefore, it is commonly used as first-line screening technique for tubal patency and the presence of any tubal abnormality.[2,12] It is a radiographic examination which involves dye insertion via the cervix in to the uterus.[2] The dye works as a contrast and easily flows through and spills out into the peritoneum if tubes are patent.[2] However, patent tubes do not guarantee the normal function, as inner lining of the tubes can be damaged which will not be seen in HSG.[2] HSG provides 75-83% specificity and 65-84% sensitivity for confirmation of tubal patency.[1,2,13,14] Moreover, conventional HSG is considered safe in terms of radiation exposure, which 0.4-5.5 mGy, much below the safety threshold for teratogenicity.[8] If HSG findings are inconclusive or any abnormality is detected in the HSG, laparoscopy is used to confirm the diagnosis.[15] Additionally, HSGs have shown a false positive rate of 50% for diagnosis of tubal blockage of 50%.[2,13] Still HSG remains the procedure of choice before practising any advanced assisted reproductive techniques.[16]

When primary or baseline HSG shows either partial or complete tubal blocks, the procedure of choice in diagnosis and management of tubal blocks is selective salpingography and fallopian tube recanalization (FTR).[16] Recent developments show the efficiency of non-surgical approach in managing proximal tube pathologies under fluoroscopic guidance and increasing chance of spontaneous pregnancy.[2,17] Transcervical fallopian tube recanalization (T-FTR) is a standard procedure that provides enhanced diagnosis and effective treatment.[2,18] It is a low-risk procedure which is prominently used to release tubal blockage.[2] It is useful in managing proximal tubal obstruction and confirming tubal patency and helps in reducing the further need of invasive investigations.[18] The success rate for catheterization of the proximal tube by T-FTR is 85-95%.[2,9] It is usually performed at around day 10 of menstrual cycle which lies in the follicular phase.[2]

The present study aimed to assess the role of HSG and FTR in evaluation of female infertility in a tertiary care hospital.

METHODS

This prospective cross-sectional observational study was conducted at a Government Medical College, Nagpur, over 18 months (January 2023-June 2024) and included 60 participants. Infertile women with primary or secondary infertility, normal hormonal profiles, suspected tubal pathology, or ovulatory infertility unresponsive to three treatment cycles were included after written informed consent. Exclusion criteria comprised active pelvic infection, suspected genital tuberculosis, unexplained vaginal bleeding, and genital malignancy. Data were collected using a pre-tested, validated semi-structured

questionnaire, and all eligible participants were enrolled using complete enumeration sampling.

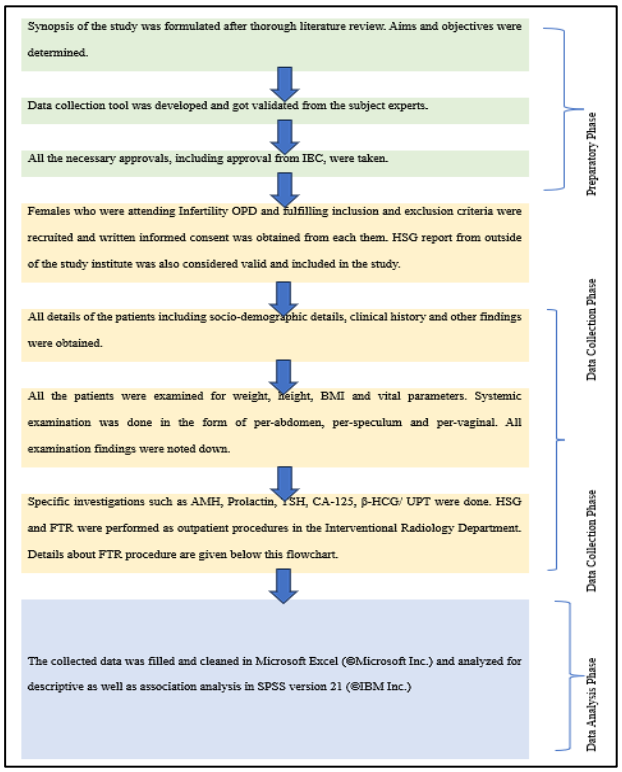

Figure 1: Methodology.

Procedure for FTR

FTR procedures were performed on an outpatient basis in the Interventional Radiology department under conscious sedation, with patients in the lithotomy position. After sterile preparation, a vaginal retractor was inserted to visualize the cervix, and an intrauterine balloon catheter was used to inject nonionic, water-soluble contrast. A routine HSG was first performed to assess uterine and tubal anatomy. If a fallopian tube was not visualized, selective salpingography was undertaken. In the absence of free peritoneal spill, a catheter and guidewire were advanced through the tubal ostium into the obstructed tube up to the peritoneal cavity. Repeat selective salpingography confirmed tubal patency. FTR was considered successful when free contrast flow with distal tubal visualization and intraperitoneal spillage was observed.

Data analysis phase

Data were entered and cleaned in Microsoft Excel 2021 and analyzed using SPSS version 21. Continuous variables were expressed as mean±SD, while categorical variables were summarized as median (IQR) or proportions, as appropriate. Descriptive statistics were performed and data were presented graphically. Normality was assessed using the Shapiro-Wilk test. Correlations were evaluated using Pearson's or Spearman's correlation tests based on data distribution. Associations between variables were analyzed using Pearson's chi-square test, with $p<0.05$ considered statistically significant. The strength of association was assessed using Cramer's V.

RESULTS

The present study conducted on 60 women who presented in infertility OPD yielded following results: descriptive analysis and comparative analysis.

Descriptive analysis

The mean±SD age of participants was 29.03±4.17 years, with a mean infertility duration of 4.66±3.79 years. Conception following FTR was achieved in 31 of 60 women (51.7%). Primary infertility was present in 44 women (73.3%), and 47 (78.3%) had regular menstrual cycles. A history of pelvic inflammatory disease was noted in 12 women (20.0%), while 8 (13.3%) had undergone prior pelvic surgery. Previous abortions were reported in 14 women (23.3%), and 44 women (73.3%) were nulligravida. Most participants (93.3%) had no history of contraceptive use. All male partners had normal semen analysis. Mean±SD hormonal parameters were AMH 3.46±2.15 ng/ml, prolactin 16.42±9.60 ng/ml, and TSH 3.14±2.26 mIU/l. Elevated CA-125 was observed in one participant.

Hysterosalpingography (HSG)

HSG was done in all 60 females. Out of these, 35 (58.3%) females had normal HSG findings. Whereas 25 (41.7%) showed some kind of abnormal findings on HSG.

Table 1: Frequency table of HSG Findings.

HSG findings	Frequency	Percentage
Abnormal	25	41.7
Normal	35	58.3
Total	60	100.0

HSG successfully showed tubal as well as cornual blockages. A total of 15 females had blockages in either fallopian tubes or cornua. Bilateral cornual block was the most common type (n=6) in these 15 cases. Bilateral fimbrial block was the next common blockage type with 3 cases. Bilateral tubal block, left cornual block, left cornuo-fundal block, right distal tubal block, right proximal tubal block and right mid-tubal block had one case of each.

Uterine abnormalities were observed in 6 females. Arcuate uterus (n=1), bicornuate uterus (n=2), partially septate uterus (n=1) and unicornuate uterus (n=2) were uterine anomalies found in HSG.

Hydrosalpinx was found in 5 cases, out of which 2 cases had bilateral, 2 cases had left sided hydrosalpinx and a single case had right sided hydrosalpinx.

Table 2: Frequency table of HSG findings details.

HSG Findings			Frequency
Abnormal	Blockage	Bilateral cornual	6
		Bilateral fimbrial	3
		Bilateral tubal	1
		Left	2
		Right	3
	Hydrosalpinx	Bilateral	2
		Left	2
		Right	1
	Uterine anomaly	Arcuate uterus	1
		Bicornuate uterus	2
		Septate uterus	1
		Unicornuate uterus	2
Normal			35
Total			60

Table 3: Association of HSG findings and conception.

HSG Findings		Conception based on β HCG/ UPT		Total
		No	Yes	
Normal	Frequency	17	18	35
	Percentage	48.6	51.4	100
Abnormal	Frequency	12	13	25
	Percentage	48.0	52.0	100
Total	Frequency	29	31	60
	Percentage	48.3	51.7	100

Pearson χ^2=0.002, df=1, p=1.000, Crammer's V =0.006.

Table 4: Association of HSG blockage findings and conception.

HSG blockage findings		Conception based on β HCG/ UPT		Total
		No	Yes	
No block	Frequency	21	24	45
	Percentage	46.7	53.3	100
Block	Frequency	8	7	15
	Percentage	53.3	46.7	100
Total	Frequency	29	31	60
	Percentage	48.3	51.7	100

Pearson χ^2=0.200, df=1, p=0.769, Crammer's V=0.058.

These findings hereby fulfil the first objective of 'assessment of role of HSG in evaluation of infertile females. HSG showed potential infertility causes in 41.7% cases and diagnosed tubal block in 25.2% females.

A total of 13 (52.0%) cases who had abnormal findings in HSG, conceived after treatment. However similar proportion of cases (n=18, 51.4%) who had normal HSG findings conceived in due course. Therefore, there was no statistically significant association between HSG abnormal findings and conception (Table 3).

A total of 7 (46.7%) cases who had finding of blockage in HSG, conceived after treatment. However slightly higher proportion of cases (n=24, 53.3%) who had no findings of blockage on HSG conceived in due course. Therefore, there was no statistically significant association between HSG blockages findings and conception. Here, second objective was fulfilled (Table 4).

Fallopian tube recanalization (FTR)

FTR was performed in 8 of 60 women (13.3%), all of whom had cornual or proximal tubal block. Tubal patency was successfully achieved in 5 cases (62.5%), while the procedure failed in 3 cases (37.5%). Of the 5 women with successful recanalization, 3 conceived subsequently, yielding a post-FTR conception rate of 37.5% (3/8).

Notably, all three women in whom FTR failed also conceived during follow-up; however, these cases were excluded from the calculation of FTR success.

Table 5: Frequency table of FTR procedures.

HSG findings	Frequency	Percentage
Not done	52	86.7
Done	8	13.3
Total	60	100.0

By these results first and third objectives were fulfilled.

Comparison of different variables based on type of infertility

According to independent t test, mean age of females was statistically significantly higher in secondary infertility than that of primary infertility (t=-2.046, df=58, p=0.045). Similarly, according to Mann-Whitney U Test, number of females with abortions were statistically significantly higher in secondary infertility than that of primary infertility (Z=-5.707, p<0.001). All other variables could not yield any statistically significant difference (Table 6).

Table 6: Frequency table of FTR procedures.

Variables	Primary infertility	Secondary infertility	Test used	P value
Mean age (years)	28.39	30.81	Independent t test	0.045
Mean infertility duration (years)	5.14	4.14	Mann-Whiteny U test	0.165
Abortions	2	16	Mann-Whiteny U test	<0.001
Mean AMH (ng/ml)	3.37	3.70	Mann-Whiteny U test	0.245
Mean prolactin (ng/ml)	16.46	16.32	Mann-Whiteny U test	0.848
Mean TSH (mIU/l)	3.39	2.45	Mann-Whiteny U test	0.398

Table 7: Association table between different variables and type of infertility.

Variables		Primary infertility	Secondary infertility	Test used	P value
D and C	No	42	11	Chi-square test	0.012
	Yes	2	5		
Previous surgery	No	38	14	Chi-square test	1.00
	Yes	6	2		
PID	No	33	15	Chi-square test	0.153
	Yes	11	1		
Contraceptive use	No	42	14	Chi-square test	0.565
	Yes	2	2		
Menstrual history	Regular	34	13	Chi-square test	1.000
	Irregular	10	3		

According to Chi-square test, D and C procedure has statistically significant association with secondary infertility. Rest all variables could not yield any statistically significant association with type of infertility (Table 7).

DISCUSSION

The study included women with a mean±SD age of 29.03±4.17 years and a mean±SD infertility duration of 4.66±3.79 years. All participants were evaluated by hysterosalpingography and underwent fallopian tube recanalization for tubal factor infertility. Heis et al conducted a similar study in which 281 infertile women underwent hysterosalpingography before selective laparoscopy with no post-procedural complications.[19] The average age in this study was 31.5 years (SD 5.91), and the average duration of infertility was 4 years (SD 3.44).[19]

In the present study, out of 60 females, 46 (76.7%) did not have any abortions and 10 (16.7%) females had single abortions, whereas two females each had abortions twice and thrice. Out of the total of 60 females, 7 (11.7%) had undergone D and C. Remaining 53 (88.3%) did not undergo D and C. Eight (13.3%) out of the total had a previous history of surgery. Of these 8 females, 4 had undergone diagnostic laparoscopy, 2 had hysteron-laparoscopy, 1 had laparoscopy cystectomy, and 1 had FTR for left FT. Findings by Shen et al indicate that factors such as being 35 years or older, having secondary infertility, having a duration of infertility lasting five years or more, and a history of ectopic pregnancy, abdominal surgery, or curettage following an abortion can influence the success rate of FTR and these factors may also serve as predictors of surgical success in treating tubal obstructive infertility.[20]

Participants in had mean±SD AMH of 3.46±2.15 ng/ml; and mean±SD TSH of 3.14±2.26 mIU/l. During the follicular phase, elevated prolactin levels can interfere with normal follicular development, leading to the atresia of the dominant follicle and preventing ovulation in contrast to the mean±SD prolactin of 16.42±9.60 ng/ml in the present study which was lower than 30 ng/ml (normal value).[21] Conversely, the role of prolactin in the luteal phase remains ambiguous, as it is thought to both stimulate corpus luteum function by promoting LH receptor formation and inhibit it by suppressing corpus luteal steroidogenesis.[21]

HSG was done in all 60 females. Out of these, 35 (58.3%) females had normal HSG findings. Whereas 25 (41.7%) showed some kind of abnormal findings on HSG. Hysterosalpingogram (HSG) has been advocated as a first-line investigation historically. However, Lim et al states that HSG is out of date and has no place in a modern infertility evaluation.[22] While, Kumari et al conducted a study highlighting the significant role of HSG in investigating tubal pathology in women facing both primary and secondary infertility.[23] Their findings suggested a higher occurrence of primary infertility and emphasised the importance of HSG as a more advanced diagnostic tool compared to ultrasound in reducing the risk of female infertility within the Indian population.[23]

HSG successfully showed tubal as well as cornual blockages in the present study. Tubal obstruction is currently one of the most important causes of female infertility. [2] In the current study, a total of 15 females had blockages in either fallopian tubes or cornua. Bilateral cornual block was the most common type (n =6) in these 15 cases. Bilateral fimbrial block was the next common blockage type, with 3 cases. Bilateral tubal block, left cornual block, left corner-fundal block, right distal tubal block, right proximal tubal block and right mid-tubal block had one case of each. Tubal factor infertility is attributable to untreated sexually transmitted diseases that ascend along the reproductive tract and are capable of causing tubal inflammation, damage, and scarring. Improved clinical screening and prevention of ascending infection may provide a solution to the infective causes of infertility.[24]

Sarkar et al. studied the comparison of HSG and laparoscopy for diagnosis of infertility and observed that among the 82 women experiencing infertility, HSG identified pathological findings in 45.1% of cases, while 54.9% showed no abnormalities. However, laparoscopic evaluation revealed pathological findings in 65.85% of cases, with 34.15% showing no abnormalities. Notably, in their study, laparoscopy detected pathology in 44.4% (20 out of 45) of the women who showed no abnormalities on HSG and found no abnormalities in 8.1% (3 out of 37) of those who had pathological findings on HSG. Additionally, laparoscopy showed no abnormalities in 6 of the 35 women who had tubal pathology detected by HSG.[25] The sensitivity of HSG was determined to be 63%, with a specificity of 89.3%, a positive predictive value of 92%, a predictive value of 55%, and an overall accuracy rate of 72%.[25]

Uterine abnormalities were observed in 6 females. Arcuate uterus (n=1), bicornuate uterus (n=2), partially septate uterus (n=1) and unicornuate uterus (n=2) were uterine anomalies found in HSG.

Primary infertility was reported by 119 women (42.3%) and secondary infertility by 162 women (57.6%). The mean age of females was statistically significantly higher in secondary infertility than that of primary infertility (t=-2.046, df=58, p=0.045). The number of females with abortions was statistically significantly higher in secondary infertility than in primary infertility (Z=-5.707, p<0.001). D and C procedures have a statistically significant association with secondary infertility.

281 patients and 562 fallopian tubes were examined, with 402 tubes found to be patent and 160 occluded. Peri tubal adhesions were diagnosed in one woman. Due to tubal occlusion detected by hysterosalpingography, 46 women (16.4%) were referred for laparoscopy. Among them, 8 (17.3%) underwent unilateral salpingectomy, 28 (60.8%) underwent bilateral salpingectomy, 7 (15.2%) had salpingolysis, and 3 (6.7%) had untreatable adhesions. Five cases of hydrosalpinx were found, two of which were bilateral, two of which were left-sided, and a single case of right-sided hydrosalpinx.

HSG showed potential infertility causes in 41.7% of cases and diagnosed tubal block in 25.2% of females, as reported by Heis et al. They also found that the concordance rate was 71.7%, with hysterosalpingography showing a sensitivity of 80%, specificity of 50%, negative predictive value of 61%, and positive predictive value of 71%. Within 1 to 11 months after the procedure, 30 women (10.7%) conceived, while Tvarijonaviciene et al found the sensitivity of hysterosalpingography in evaluating general tubal pathology was found to be 81.4%, with a specificity of 47.8%. The likelihood ratio for a positive test result was 1.6, while for a negative test result, it was 0.4.[36] In an assessment of 385 fallopian tubes by Gao et al using transvaginal four-dimensional hysterosalpingo-contrast sonography (TVS 4D-HyCoSy), 38.2% (147 tubes) were found to be patent, 46.2% (178 tubes) showed partial obstruction, and 15.6% (60 tubes) exhibited complete obstruction, and they also found out of 195 patients, 72 with 144 fallopian tubes underwent laparoscopy, resulting in a 90.97% overall agreement rate when compared to TVS 4D-HyCoSy.[14] The sensitivity, specificity, positive predictive value, negative predictive value, and Youden index for 4D-HyCoSy, as compared to laparoscopy, were 97.7%, 86.7%, 98.4%, 81.3%, and 0.84, respectively.[14] Jitchanwichai et al concluded that premedication with hyoscine butyl bromide before HSG can lower the incidence of diagnosing proximal tubal obstruction and reduce the chances of false occlusions.[10] Cases of infertility may also show high uterine artery blood flow

impedance. In such cases with unknown causes of infertility, uterine artery Doppler could be used for investigation.[3]

Selective salpingography and tubal cannulation can also have a unique role in the management of tubal infertility and should be offered to selected candidates prior to IVF. Tubal cannulation can be used effectively to restore patency in a proportion of cases of proximal tubal obstruction, thus avoiding the need for expensive assisted reproductive techniques.[13]

FTR was done in only 8 (13%) females. Out of these 8 females, in 5 cases, FT was made patent after FTR. In 3 patients, FTR was a failure. In the remaining 52 patients, FTR was not performed. The technical success rate of fluoroscopy-guided fallopian tube cannulation was assessed by Wang et al was achieved in 94% of cases (319 out of 341 tubes). Success rates they reported varied with different interventions: high-pressure contrast injection alone had a success rate of 98% (184 out of 341), selective catheterisation achieved 90%, and microcatheter/ microwire interventions resulted in a 73% success rate.[26] FTR, performed via interventional radiology in patients with fallopian tube blockage diagnosed through HSG, was reported by Mohan et al as cost-effective, minimally invasive, and with a low complication rate. It demonstrates excellent technical success and enhances conception rates.[16] But if a hysterosalpingo-contrast-ultrasonography (HyCoSy) is available, it should be utilized instead, as suggested by Ambildukhe et al.[1]

Those 8 females who underwent FTR had either cornual or tubal blocks. Out of these, 5 FTR procedures were successful, and the tube was made patent. Out of these 5 cases, 3 females conceived in due course. Therefore, FTR has a success rate of 37.5%. However, it was worth noting that those 3 patients who had failed FTR were conceived in due course. As FTR failed in these patients, they were not considered for calculating the success rate of FTR. All women who underwent successful recanalization achieved an immediate post-procedural tubal patency rate of 100%, as reported by Al-Omari et al.[17] During a follow-up period of up to one year after FTR, they observed 41% of the women had conceived, with all pregnancies occurring intrauterine.[17] Ikechebelu et al concluded that the successful recanalization rate was 90.2% per tube and 88.9% per patient, with a conception rate of 33.3%.[18] Women with only cornual obstruction should be considered first for laparoscopy-assisted hysteroscopic cannulation before assisted reproduction was suggested by Ikechebelu et al.[18] The study by Marlow et al demonstrated that successful fallopian tube recanalization (FTR) resulted in pregnancy for over a third of the patients, with most delivering healthy babies. Due to its effectiveness and low complication rate, FTR is a viable treatment option for women with tubal infertility.[27] The study by Fataftah et al demonstrated that transcervical fallopian tube recanalization for proximal tubal obstruction, with a patent contralateral tube, significantly increased the spontaneous pregnancy rate in cases of tubal factor infertility.[2] Due to its low risk profile, transcervical fallopian tube recanalization was recommended as a first-line treatment for women with unilateral proximal fallopian tube obstruction and a patent contralateral tube.[2]

Of 13 patients with abnormal HSG findings in the present study, 52% conceived after treatment, while 51.4% of patients with normal HSG findings also conceived eventually. Similarly, 46.7% of patients with HSG blockage conceived after treatment, compared to 53.3% of those without blockage. No statistically significant association was found between HSG findings or blockage and conception rates. This association was not explored by many studies. The present study observed that out of 60 females, 31 (51.7%) conceived based on β-HCG or UPT results, whereas 29 (48.3%) did not conceive based on β-HCG or UPT results.[19] The overall conception rate was 35% (17 out of 48) reported by Wang et al.[26]

Thurmond recommended that establishing strong relationships with gynaecologists and fertility specialists is essential for interventional radiologists to secure referrals, especially for complex cases.[28] Offering services like imaging-guided breast biopsies and uterine artery embolization can help build trust. While newer fertility specialists may favour IVF for its higher success rates, it's important to remind them of the benefits of catheter recanalization as a less invasive and cost-effective option for treating proximal tubal occlusion.[29] Although fluoroscopic tubal occlusion for sterilisation is not commonly performed, interventional radiologists can assist with challenging cases to demonstrate their value was recommended by Thurmond.[28]

De Silva et al suggested that fallopian tube catheterisation might be a viable alternative to IVF for patients with proximal tubal obstruction.[12] Future studies should compare catheterisation methods with IVF and evaluate cumulative reproductive outcomes over extended follow-up periods. These results suggest that fallopian tube catheterisation might be a viable alternative to IVF for patients with proximal tubal obstruction.

CONCLUSION

The present study highlighted that fallopian tube recanalization (FTR) as an effective, minimally invasive, and cost-efficient option for the management of tubal factor infertility, with high procedural success and favorable spontaneous pregnancy rates. While hysterosalpingography (HSG) remains a useful diagnostic tool for detecting tubal obstruction, its ability to predict conception outcomes was not superior to other methods. Factors such as age, duration of infertility, and prior pelvic surgery were found to influence FTR success, consistent with existing literature. Notably, no statistically significant difference in conception rates was observed between patients with normal and abnormal HSG findings,

suggesting that FTR outcomes are influenced by multiple patient-specific factors beyond HSG results alone.

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