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A Study Evaluating the Incidence of Tubal Blockage in Infertility Patients and Comparison of Laparoscopic Chromopertubation with Hysterosalpingography and Sonosalpingography

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Abstract: In India the incidence of tubal block secondary to pelvic inflammatory disease is high. Numerous methods have been described for assessment of Fallopian tube (FT) patency. Since Laparoscopic Chromopertubation (CPT) is an invasive method and is associated with anesthesia complications, other less invasive and technically less cumbersome procedures are required. This prospective study included 50 cases of both primary and secondary infertility attending Gynecology outdoor. Group A included patients who had undergone hysterosalpingography (HSG) and Laparoscopic CPT and Group B in whom sonosalpingography (SSG) and Laparoscopic CPT was performed. In the current study amongst female related causes of infertility, incidence of tubal factor (tubal occlusion) was observed to be 42.0 %. In group A (HSG and laparoscopic CPT) there was an overall agreement in 88.0 % patients for both tubal patency (52.0 % cases) and for tubal occlusion (36.0 %) with false positive results in 12.0 % cases. Sensitivity and specificity of HSG was found to be 90.0 % and 84.2% respectively. In group B (SSG and laparoscopic CPT) there was an overall agreement in 92.0 % patients including 44.0 % for bilateral tubal patency and 48.0 % for tubal occlusion with false positivity of 8.0 %. The sensitivity and specificity of SSG technique was found to be 92.3% and 81.0 % respectively. Although, transvaginal SSG is not a substitute of Laparoscopic CPT it can be offered as a less expensive more convenient, noninvasive, simple outdoor screening procedure which can be performed in patients who have bronchial asthma or cardiac problems and are temporarily unfit for surgery.

Keywords: Hysterosalpingography, Sonosalpingography, Laparoscopic CPT, Infertility, Tubal blockage, Tubal patency

INTRODUCTION

Motherhood is one of the most pleasant experiences of woman in her life time. Unfortunately it is not very infrequent to see couples with infertility. Infertility is defined as failure to conceive after one year of regular unprotected intercourse and affects almost 10% to 15% of couples [1]. Main causes of infertility in women include anovulation, an associated tubal or peritoneal factor, uterine, cervical and idiopathic infertility [2]. Tubal factor as a cause of infertility is increasingly being recognized and currently it determines 30% to 35% of all infertility cases [3]. There are multiple tubal etiologic factors responsible for infertility and include tubal damage from pelvic inflammatory disease (PID), the use of intrauterine devices (IUD), a history of a perforated appendicitis, ectopic pregnancy and septic abortion [4]. In India the incidence of tubal block secondary to PID is high. Genital tuberculosis (TB) is still prevalent and is also an important etiologic factor of Fallopian Tube (FT) disease in India. The incidence of tubal factor causing infertility is rapidly increasing with increasing prevalence of salpingitis, sexually transmitted diseases (STD) etc [5].

Assessing the patency of the FT is therefore an important part of the workup of a sub-fertile couple. Numerous methods have been described for assessment of FT patency. Commonly used methods include HSG, SSG and laparoscopic CPT. HSG is the most widely

used non operative method of evaluating the uterus and FT. It is easier, safer and less expensive then surgical methods. However, HSG increases the chances of false positive patients of tubal obstruction resulting from tubal spasm induced by the procedure. HSG also has a high risk of exposure to ionizing radiation, exposure to iodinated contrast material and the study has a limitation in the fact that it only demonstrates the inner contour of the upper genital tract and gives no idea of the pelvic causes of tubal pathology [6].

Laparoscopic CPT is considered as one of the gold standard method to diagnose tubal pathology. Laparoscopy however is an invasive diagnostic method that requires general anesthesia and carries the risk of severe adverse effects including injury to pelvic blood vessels, intestinal loops and the urinary bladder. Moreover, laparoscopy alone does not provide an assessment of the uterine cavity. Because of the aforementioned reasons there is a need to develop a diagnostic tool having high sensitivity and specificity to distinguish an actual FT obstruction from a seeming one and which can decrease the need for laparoscopy.

Sonosalpingography is one of the latest methods which can be considered simple, safe and well-tolerated technique used for investigation of the uterine cavity and FT with very few adverse effects and a low occurrence of complications. SSG involves instillation of sterile saline through a Foley's catheter inserted through the cervix with simultaneous TVS. This method surprisingly has also shown to increase spontaneous pregnancy rates [7, 8]. The risks of adverse effects during the procedure itself are minimal [9] and it has an added advantage of being performed as an outpatient procedure [10].

The current study was therefore planned to evaluate SSG combined with laparoscopic CPT and compare it with HSG combined with laparoscopic CPT in the diagnosis of FT pathology.

MATERIAL AND METHODS

The study involved fifty women of primary or secondary infertility. In all these patients detailed history to include nature and duration of infertility, history suggestive of PID, Tuberculosis and previous operations was taken. Menstrual history, past obstetric history in case of secondary infertility and significant personal and past medical history was also recorded. History regarding male factors of infertility was also taken. All the patients were subjected to a general, abdominal and bimanual pelvic examination to detect any obvious pathology. Routine investigations, husband's semen analysis and other relevant investigations were done in all these cases.

Group A - Included 25 patients initially subjected to HSG on day 8^{th}–10^{th} of menstrual cycle followed by laparoscopic CPT in next month. The FT and uterus were assessed for patency, unilateral or bilateral and proximal or distal occlusion, peritubal adhesions, hydrosalpinx and tuboovarian mass. Presence of arcuate uterus, congenital anomalies of uterus, endometriosis, pelvic adhesions or any other findings were also evaluated.

Group B - Included 25 patients in whom Transvaginal SSG was performed on 8^{th}–10^{th} day of menstrual cycle followed by laparoscopic CPT in next month. FT and uterus were assessed for the same parameters as above.

RESULTS

In group A out of twenty five patients, twenty had primary infertility with tubal blockage present in six cases (30.0%) and five patients had secondary infertility with tubal blockage present in three cases (60.0%). In group B out of twenty five patients 16 had primary infertility with tubal blockage in five patients (31.2%) and nine patients had secondary infertility with tubal blockage in seven cases (77.7%). In both the groups studied patients with secondary infertility had more chances of tubal blockage as cause of infertility.

In group A, amongst 25 patients of infertility laparoscopic CPT detected 16 patients (64%) having bilateral patency and 9 (36%) patients having tubal occlusion, while in only 13 (52%) patients HSG could demonstrate a normal patent FT with false positive results in 12% cases. In 3 (12%) cases laparoscopic CPT detected proximal occlusion. In contrast, 6 (24%) cases were demonstrated by HSG to have a proximal blockage. In 3(12%) cases HSG detected proximal occlusion that was normal on laparoscopic examination and occurred possibly due to sudden spasm at cornual end during dye instillation. Both CPT and HSG detected distal tubal occlusion in 6 cases (24%). Detection of tuboovarian mass, peritubal adhesions, uterine anomaly, endometriosis and pelvic adhesions were high in laparoscopic procedure while HSG could not detect any of these abnormalities except uterine anamoly (Table - 2).

In the group B out of 25 cases laparoscopic CPT demonstrated bilaterally patent tubes in 13 cases (52%) while SSG revealed tubal patency only in 11 cases (44%) with a false positive result in 8% cases. Tubal occlusion was demonstrated by laparoscopic CPT in 12 cases (48%) and by SSG in 14 cases (56%). Laparoscopic CPT demonstrated proximal tubal blockage in 6 cases (24%) while SSG demonstrated proximal tubal blockage in 7 (28%) cases. General anesthesia while performing laparoscopy may have corrected transient spasm of the tubes, thereby reducing the number of cases to 6 as compared to 7 of bilateral

tubal blockage. Distal tubal occlusion was detected in 6 (24%) cases by CPT while in 7 cases (28%) by SSG. One (4%) false negative case (demonstrated to have patent tubes on SSG and unilateral tubal blockage on laparoscopic CPT) on SSG may have been due to false interpretation of turbulence of passage of reflux of urine. SSG detected bilateral distal tubal blockage in six cases (false positive results for two cases), while laparoscopic CPT revealed bilateral blockage in four cases only. These false positive cases could have been due to improper resolution or inadequate technique or placement of Foleys catheter bulb high in uterine cavity thus occluding the complete passage of the fluid instilled in the cavity, thereby saline not reaching up to distal end of tubes.

Laparoscopic CPT detected 4 cases (16%) of TO mass while 3 cases (12%) of TO mass were detected by SSG. Both the techniques detected uterine anomaly in 1 case (4%) as bicornuate uterus. SSG could not detect endometriotic patches/spots in pelvis but detected 1 case (4%) of endometriosis in the form of endometrioma ovary. Laparoscopic CPT on the other hand revealed 3 cases (12%) of endometriosis including 1 case of endometrioma. Pelvic adhesions in 3 cases (12%) were demonstrated only by laparoscopic CPT. SSG as well as laparoscopic CPT equally showed fibroid in 2 cases. Two (8%) cases during SSG found to have comparatively restricted fimbrial floatation movement. These were suspected as peritubal adhesions which were confirmed on laparoscopic CPT, while laparoscopy demonstrated 6 (24%) cases of peritubal adhesions because of direct visualization. (Table -3)

Table–1: **Interpretation of tubal findings by laparoscopic CPT in all cases of infertility**

Type of Infertility	Group A (Total Cases – 25)			Group B (Total Cases – 25)		
	Total No. of Cases	Tubal Blockage	%	Total No. of Cases	Tubal Blockage	%
Primary	20	6	30.0	16	5	31.2
Secondary	5	3	60.0	9	7	77.7

Table–2: **Comparison of findings at laparoscopic CPT and HSG**

Findings	**Laparoscopic CPT**		**HSG**	
	No. of cases	**%**	**No. of Cases**	**%**
(A) Tubal Patency	16	64	13	52
(B) Tubal Occlusion	09	36	12	48
Proximal	03	12	06	24
Unilateral	01	04	01	04
Bilateral	02	08	05	20
Distal	06	24	06	24
Unilateral	01	04	02	08
Bilateral	05	20	04	16
(C) Peritubal Adhesions	03	12	–	–
(D) Tuboovarian Mass	01	04	–	–
(E) Uterine Anomaly	01 (Hypoplastic)	04	01 (Hypoplastic)	04
(F) Endometriosis	01	04	–	–
(G) Pelvic Adhesions	05	20	–	–
(H) Tubercli	01	04	–	–

Table–3: **Comparison of findings at laparoscopic CPT and SSG**

Findings	**Laparoscopic CPT**		**SSG**	
	No. of cases	**%**	**No. of Cases**	**%**
(A) Tubal Patency	13	52	11	44
(B) Tubal Occlusion	12	48	14	56
Proximal	06	24	07	28
Unilateral	02	08	02	08
Bilateral	04	16	05	20
Distal	06	24	07	28
Unilateral	02	08	01	04
Bilateral	04	16	06	24
(C) Peritubal Adhesions	06	24	02	08
(D) Tuboovarian Mass	04	16	03	12
(E) Uterine Anomaly	01	04	01	04
(F) Endometriosis	03	12	01	04
(G) Pelvic Adhesions	03	12	–	–
(H) Fibroid (Uterus)	03	12	03	12
(I) Tubercli	01	04	–	–

DISCUSSION

Work up of an infertile couple has always been a challenge for the clinician. Tubal pathology remains one of the most important etiologies for infertility. Despite continuing technical advances in this field, a robust method which is also minimally invasive and having least side effects is yet to be developed. The current study has attempted to evaluate the usefulness of SSG combined with laparoscopic CPT and compare it with HSG combined with laparoscopic CPT in the diagnosis of FT pathology. Among the female related etiology of infertility, tubal factor remains the most important cause of infertility. In the present study tubal factor (Tubal occlusion) in patients with infertility was observed in 42% patients. Desai and Hazare reported tubal factor in patients with infertility in 39.5% of their patients [11].

Present study correlates well with the study of Taori and Findvi revealing overall agreement of results of sonography and chormolaparoscopy in 92% including agreement of 64% for bilateral patency and 28% for tubal occlusion. Apart from detecting tubal patency/non patency laparoscopic CPT revealed peritubal adhesions in 24%, uterine anomaly in 4%, Endometriosis, pelvic adhesions & fibroid each in 12% cases and tubercles in 4%, whereas transvaginal SSG reported peritubal adhesions in 8%, T.O. mass in 12%, uterine anomaly, endometriosis each in 4% and fibroid in 12% cases[12]. In a similar study tubal patency was determined using SSG and was compared with laparoscopic CPT, sensitively for tubal patency with SSG compared to Laparoscopic chromopertubation was 93.30% with the 95% CI between 84.77 and 96.85. Among the 100 tubes evaluated there was 93.68% agreement with regard to tubal patency when compared with laparoscopic CPT [13].

SUMMARY AND CONCLUSION

Among the female related causes of infertility in the present study incidence of tubal factor (Tubal occlusion) is 42%. There is higher incidence of tubal block in patients suffering from secondary infertility (i.e. 60% in group A and 78% in group B) in comparison to primary infertility (30% in group A & 31% in group B) reflecting the unhygienic practices following abortions and deliveries in the community.

Although findings of HSG and SSG are comparable regarding tubal patency or non-patency but HSG present a number of potential problems in evaluating the upper genital tract. Exposure to ionizing radiation raises, concerns of possible oncogenesis or teratogenesis. Iodinated contrast could produce an anaphylactic reaction as well as HSG could not detect pelvic pathology in most cases. Moreover the information obtained is limited to internal mullerian duct anatomy detecting the exact site of tubal occlusion.

SSG has the advantage of detecting other associated pelvic pathology like T.O. mass, uterine anomaly, Endometrioma, Fibroid, intramural fibroid, sub mucous fibroid and to some extent peritubal adhesions. Moreover the use of physiological saline solution as negative contrast is less expensive, convenient and no hazards of radiation make this procedure superior to HSG. Further no need of indoor admission as well as anesthesia and noninvasiveness of the procedure along with less time consuming and cost effectiveness makes it an alternative to laparoscopic CPT as a routine screening, but it can be criticized on the facts that findings are subjective, there is need of experienced sonologist and it is difficult to detect exact site of tubal block. Intra tubal pathology, peritubal adhesions and mobility of tube cannot be properly assessed, and there are chances of false positive results due to improper resolution of sonography machine.

Laparoscopic CPT bears a significant advantage for evaluating tubal patency as all the findings are observed under vision along with other pelvic pathology in the same sitting. Particularly pelvic adhesions, endometriotic patches, T.O. mass, endometriosis and peritubal adhesions were detected with better accuracy than transvaginal SSG because of better interpretation under direct vision. Thus in evaluating the FT patency the laparoscopic CPT maintains the status of gold standard.

Transvaginal SSG is not a substitute, but it can be offered as a screening test which is less expensive more convenient, noninvasive, simple outdoor procedure in the initial work up of infertile women and laparoscopic CPT or HSG can be deferred for about 6 months in patients in whom SSG showed patents tubes, thus allowing us to concentrate on other factors of infertility. In patients with negative or suspicious finding established method can be done to confirm the diagnosis.

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