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Original Research Article

Hysterosalpingographic findings in infertile women diagnosed with genital tuberculosis

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ABSTRACT

Background: Objectives of the study were to describe the hysterosalpingographic (HSG) findings among infertile women with genital tuberculosis (GTB).

Methods: This is a retrospective analytical study conducted at Sri Muthu Kumaran Medical College Hospital and Research Institute, Chennai, from January 2016 to January 2020. Study population included 51 infertile women with genital tuberculosis. GTB was diagnosed by either culture/histopathological examination (HPE) or polymerase chain reaction (PCR) studies. In these proved cases of tuberculosis, HSG findings were analysed. Permission from the institutional review board was obtained for the retrospective analysis of the hospital data.

Results: Among 113 women who underwent hysterosalpingography, 51 were diagnosed with GTB. In these 51 women, the HSG finding were normal in 23.5% and were abnormal in 76.5% of cases. The abnormal HSG findings noted in association with GTB were calcification (3.9%), distorted uterine cavity (3.9%), beaded tubes, intravasation with blocked tubes (5.9%), fimbrial block with hydrosalpinx (15.6%), cornual block (35.3%) and mid tubal block.

Conclusions: Though imaging findings may be highly suggestive of tuberculosis, some of the features such as tubal block and hydrosalpinx are not specific for tuberculosis and may be seen in other infective causes of tubal damage also. Therefore, specific investigations for tuberculosis are still required to make a definite diagnosis. The presence of HSG features indicate that considerable tubal damage has occurred.

Keywords: Infertility, Hysterosalpingography, Genital tuberculosis, Tubal block

INTRODUCTION

Tubal and peritoneal pathology are major causes of infertility and accounts for 30-40% of all cases. Acute and chronic pelvic inflammatory disease caused by gonorrhoea, chlamydia, polymicrobial organisms from the vaginal flora, mycoplasma and *Mycobacterium tuberculosis* (MTB) are important infective causes of tubal damage leading to infertility.¹ Genital tuberculosis (GTB) is responsible for a significant proportion of females presenting with infertility.² GTB as a cause of infertility is 10-15 times more common in developing countries. In United States of America (USA), Australia and West

European countries the incidence of GTB among infertile women is less than 1%, but the incidence in some African countries and India is 15–19%.^{3,4} India is one of the countries with the highest incidences of TB in the world.

Female GTB is nearly always secondary to tuberculosis focus elsewhere in the body. The fallopian tubes are believed to be the initial and most frequently affected genital organ in mycobacterial tuberculosis infection (MTB). The cause of the predilection of MTB for the fallopian tube is unknown. From the fallopian tubes, secondary spread can occur to the peritoneum in 45% or to the ovaries in 10 to 30% of cases and the endometrium is

involved in 50 to 80% cases. Tubal disease spreads to the endometrium by discharging tubercle bacilli through the ostia into the uterine cavity.

Diagnosis of GTB is difficult because majority of cases are asymptomatic and the diagnosis is often made during evaluation of infertility or other gynaecological problems. It is estimated that at least 11% of patients are asymptomatic and hence the disease is discovered incidentally.⁵ The diagnosis can be missed even with extensive investigations. Therefore, the diagnosis of GTB is often challenging. Besides causing tubal damage, GTB also leads to intrauterine and pelvic adhesions. As a part of infertility work up, hysterosalpingogram (HSG) is a frequently performed investigation to ascertain tubal patency especially in low resource countries. Most often, it is the HSG finding which alerts the clinician as to the possibility of GTB, encouraging for further evaluation.

Aim of the study

The aim of this study is to describe the HSG findings in infertile women diagnosed with GTB.

METHODS

This is a retrospective analytical study conducted at a Tertiary Care Medical College Hospital and Research Institute, from January 2016 to January 2020. Study population included 51 infertile women with confirmed GTB. 153 infertile women with suspected or confirmed tubal disease were evaluated for GTB by carrying out histopathological examination (HPE), culture by BACTEC method and polymerase chain reaction (PCR) studies using IS 6110 probes on the endometrial tissue. Infertile women with ovulatory dysfunction, presence of male factor abnormalities, sexual dysfunction and others were excluded from the study. Tubal evaluation and patency were assessed by laparoscopy in all 153 women. HSG was available in 113 women and abnormal findings on HSG, such as cornual blocks, distal blocks and beaded tubes; retort shaped hydrosalpinges, localized spill, intravasation, calcification and filling defect in the uterine cavity were looked for. Among these 113 women who had HSG, 51 were positive for MTB by either culture/HPE or PCR studies. In these proved cases of GTB, HSG findings were analysed. Permission was obtained from the institutional review board for the retrospective analysis of the hospital data.

RESULTS

A total of 153 subjects were evaluated for GTB by culture, HPE and PCR techniques and the diagnosis of GTB was confirmed in 51 (34%) women. The mean age of women with confirmed GTB was 26.40 years \pm 3.73 years. Forty eight (94.1%) women sought medical advice for primary infertility and three women (5.88%) were investigated for secondary infertility. 24 women (47.05%) women did not have any gynaecological symptoms other than infertility

and 13 (25.5%) women presented with menstrual disturbances. Tubal evaluation by HSG was carried out in 113 women. The findings were reported normal in 63 (55.7%) patients and were abnormal in 50 (44.3%) patients. The abnormal findings noted were cornual block in 22.1%, fimbrial block with hydrosalpinx in 10.6%, mid tubal block in 1.77%, beaded tubes in 3.54%, intravasation of dye into the lymphatics and veins in 2.65%, calcification 1.77%, intrauterine synechiae and distorted uterine cavity in 2 (1.77%) patients (Figures 1-6 and Table 1).



Figure 1: HSG of bilateral cornual block.

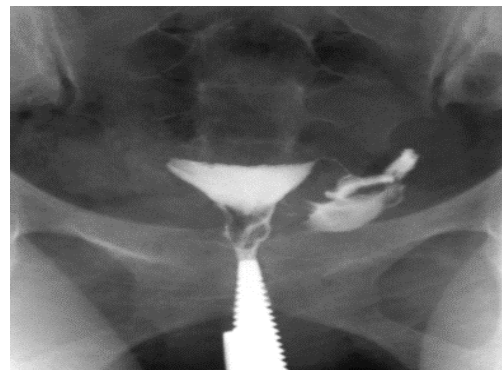


Figure 2: HSG of right cornual block.



Figure 3: HSG of beaded appearance of fallopian tubes on either side with distal blocks.

Microbiological studies for MTB were carried out in 153 women and among them, 51 (34%) were positive for MTB by either culture/HPE or PCR studies. PCR was positive in 42 patients, culture and PCR in 5 patients, culture alone in 2 patients, culture and HPE in another 2 patients (Table

2). HSG findings were available in all the 51 patients who were diagnosed with GTB.



Figure 4: HSG of intravasation of dye into the parametrial vessels and greater veins.

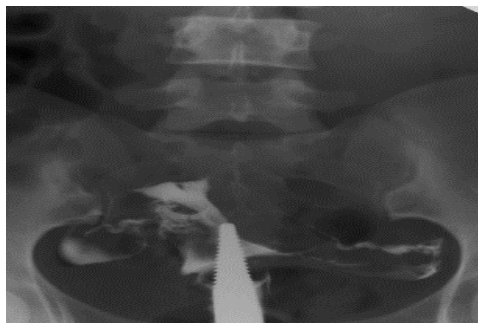


Figure 5: HSG of fundal synechiae.



Figure 6: HSG of distorted uterine cavity with “T shaped uterus”.

Table 1: HSG findings in 113 patients.

HSG findings	Number	%
Cornual block	25	22.1
Mid tubal block	2	1.77
Fimbrial block with hydrosalpinx	12	10.6
Intravasation with tubal block	3	2.65
Beaded tubes	4	3.54
Calcification	2	1.77
Distorted uterine cavity	2	1.77
Normal findings	63	55.76

Table 2: Positive MTB results by various tests.

Test	Range
PCR	42
PCR + culture	5
Culture	2
Culture +HPE	2

Among the 51 patients with proved GTB, in 39 of them (76.5%) abnormal HSG findings were present (Table 3). In 12 (23.5%) patients, the HSG findings were normal. In these women with normal HSG findings, laparoscopy showed tubercles on the serosa of the fallopian tube in one patient, and flimsy peritubal adhesions in 3 cases and in 9 patients both HSG and laparoscopy were normal. The abnormal HSG findings noted in association with GTB are calcification, distorted uterine cavity, beaded tubes, intravasation with blocked tubes, fimbrial block with hydrosalpinx, cornual block and mid tubal block (Table 3).

Table 3: HSG findings in 51 patients diagnosed with GTB.

Parameters	Range	Percentage
Calcification	2	3.9
Distorted uterine cavity	2	3.9
Beaded tubes	4	7.8
Intravasation with blocked tubes	3	5.9
Fimbrial block with hydrosalpinx	8	15.6
Mid tubal block	2	3.9
Cornual block	18	35.3
Normal findings	12	23.5

DISCUSSION

When TB affects the genital organs, infertility results as a result tubal obstruction and dysfunction, destruction of the endometrium resulting in intra-uterine adhesions and in advanced stages, by causing ovulatory failure. When the tubercle bacilli reach the tube, infection begins in the mucosa and then spreads through the tubal wall to the peritoneal surface. In a small number of cases secondary to an abdominal lesion, the tubes, ovaries and the uterine serosa are involved initially and then spread towards the mucosa takes place.⁶

As a part of infertility work up, HSG is the initial investigation frequently is performed to evaluate tubal patency in those women who do not have morbidities such as pelvic inflammatory disease (PID), previous ectopic pregnancy, previous surgical procedures and endometriosis. In developing countries, HSG continues to be the preliminary investigation to detect the abnormalities of the uterus and fallopian tubes and their patency. It is a reliable test for ruling out tubal occlusion, and it is less invasive and less expensive. HSG is considered the gold standard for the evaluation of tubal lumen.⁷

Tubal lesions in TB have various appearances in HSG ranging from non-specific findings such as hydrosalpinx and tubal occlusion to specific patterns such as "beaded tube", "golf club tube", "pipe stem tube", "cobble stone tube" and the "leopard skin tube" have been described.⁸ In our study, tubal occlusion was the commonest finding seen in 78% of cases with GTB. This is a non-specific finding, as blocks at various segments of the tube can also be seen in infections caused by chlamydia and gonococcus.

Tuberculous salpingitis in its acute form, due to the granuloma and caseous ulceration in the mucosa, form diverticular outpouchings which is described as salpingitis isthmica nodosa (SIN) appearance on HSG giving a "tufted" like appearance. There is associated thickening and tubal dilatation which manifests on HSG as hydrosalpinx and is a common feature in TB. However, this finding is also not specific for TB as it can develop following PID caused by other organisms, adhesions or obstruction of any cause.⁸ Occlusion of the isthmus or fimbrial end of the tube filled with serous or clear fluid produce a retort-shaped dilatation of the tube which gives a "golf club like appearance" to the ampulla.⁸ There is one characteristic feature which may point to the possibility of tuberculosis. In chronic gonococcal salpingitis, the fimbrial end of the tube is closed and bulbous with inversion and obliteration of the fimbriae. Whereas in the TB, there is a tendency for the tube to remain everted, with patency of the orifice even when the tube is enlarged and distended, thus producing the characteristic "tobacco pouch" appearance which can be well appreciated at the time of laparoscopy. When this finding is noted, the probability of TB should be suspected. In these cases, as the tubal orifice remain open; there is periodic expulsion of exudates into the peritoneal cavity resulting in frequent exacerbation of symptoms.

In the chronic stage, there is healing with fibrosis and scarring. This results in alternate areas of constriction and dilatation which gives beaded appearance (rosary bead) on HSG. The intraluminal scarring due to adhesions can give rise to a cobblestone pattern in hydrosalpinges. When there is scarring in the mucosa of the entire tube, it gives an appearance of "rigid pipe" to the tube. Inflammatory fibrosis can eventually lead to complete obstruction of the fallopian tubes, which can be seen with or without tubal dilatation. Tubal occlusion in TB is considered the most common finding seen on HSG and occurs most commonly at the junction between the isthmus and ampulla. Tubal occlusion was the most common HSG finding reported in 81% of cases of GTB in Chavhan et al study.⁷ In our study tubal occlusion was seen in 78% of cases. Studies have shown that cornual occlusion is not very common in TB.⁹ However, in our analysis, cornual occlusion was the commonest finding seen in 18/39 (46.1%) of cases diagnosed with GTB. Among all cases diagnosed with cornual occlusion on HSG, MTB was positive in 18/25 (72%) of cases. The other conditions which can cause cornual occlusion are gonococcal and Chlamydia infections, interventions like uterine curettage and previous abortions. In this study, distal blocks with

hydrosalpinx was seen in 15.6% of cases diagnosed with GTB. Chavhan et al reported tubal dilatation in 46% of GTB. Though not specific for GTB, presence of tubal dilatation is highly suggestive of TB.⁷

The tuberculous granulomas can also get calcified in the tubes, endometrial cavities and in the ovaries. The presence calcified lymph nodes or calcified areas in the course of fallopian tubes suggest the diagnosis of the TB.⁹ Tubal calcification are usually seen in the form of small linear streaks or tiny nodules in the course of the tubes. Plain films of the pelvis may show such calcifications which must be differentiated from other causes of calcifications such as calcified pelvic nodes, calcified uterine myomas, urinary calculi, pelvic phleboliths and calcification in an ovarian dermoid. Presence of calcification is highly suggestive of MTB and was noted in 3.9% of our cases, involving the ovaries and the uterine cavity. Other studies have also shown calcification in 5.1 and 7.1% of cases.^{7,10} The ovaries can get calcified following an abscess or tubo-ovarian mass. In our study, in one patient the ovary was completely calcified on one side, there were areas of calcification in both the tubes and the pelvic and para-aortic nodes were also calcified.

In the uterus, TB presents as acute or chronic endometritis. During the phase of acute endometritis, on HSG there is irregularity of the contour of the endometrial cavity and there can be intravasation of contrast into the vascular and lymphatic system. Chronic endometritis is characterized by fibrosis, scarring, and calcification. This can be detected on HSG as irregular filling defects due to intra uterine synechiae, and deformed uterine cavity. Intrauterine scarring may lead to obliterated uterine cavity, giving an appearance of "pseudo-unicornuate" uterus, 'T' shaped uteri or asymmetrical small uterus. Calcification can also be noted in the endometrial cavity. Venous and lymphatic intravasations are good indicators suggesting endometrial TB which was seen in 5.9% of cases in this study. In Farrokh et al study, HSG demonstrated venous and lymphatic intravasation of contrast media in the pelvic vessels in 4 (20%) of patients.¹¹ Sharma et al study also showed high prevalence of contrast intravasation, noted in 17.1% of cases.¹⁰ Venous and lymphatic intravasation may also be seen if there obstruction to flow such as intra-uterine adhesions and tubal obstruction of any aetiology. Other uterine changes noted in association with MTB infection are irregular uterine cavity, shrunken cavity, filling defects and synechiae.¹⁰ In our analysis distorted uterine cavity was seen in 5.1% of cases.

In our study abnormal HSG findings were seen in 44.3% of cases of women with proved or suspected tubal disease. Following microbiological studies (51 patients) 34% were positive for MTB by either culture/HPE or PCR studies. In Chavhan et al study, GTB was found in 7.5% of all patients who were investigated for infertility.⁷ This high prevalence of MTB in our study was due to the chosen study population who had either proved or suspected tubal disease. A study from India showed that the incidence of

GTB was 3% among all infertility cases and 41% of tubal factor infertility.¹²

In this study, in 12 (23.5%) patients, the HSG findings were normal in spite of the confirmed GTB. In these women with normal HSG findings, laparoscopy showed tubercles on the serosa of the fallopian tube in one patient, and flimsy peri tubal adhesions in 2 cases and in 9 patients both HSG and laparoscopy were normal. Probably in those women with normal HSG and normal laparoscopic findings, the GTB was either early or latent, however was picked up by the PCR studies. As the disease has not yet caused structural abnormalities in the tubes and the uterus in these patients, the prognosis would be good and anti-tuberculous treatment at this stage may improve the prospects of pregnancy.

CONCLUSION

HSG is a useful tool for evaluating the internal architecture of the uterus and the fallopian tubes. It may also suggest the diagnosis of GTB in patients investigated for infertility. Very often, it is the HSG finding that alerts the clinician as to the presence of GTB. Though imaging findings may be highly suggestive of TB, some of the features such as tubal block and hydrosalpinx are not specific for TB and may be seen in other infective causes of tubal damage also. Therefore, specific investigations for MTB are still required to make a definite diagnosis. The presence of HSG features indicate that considerable tubal damage has occurred and there may be a need for assisted reproductive techniques (ART). In the presence of HSG changes, prior to attempting ART, GTB should be investigated and treated.

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