

Case Series

SPECTRUM OF HYSTEROSALPINGOGRAPHIC ABNORMALITIES IN WOMEN WITH PRIMARY INFERTILITY: A CASE SERIES OF 7 PATIENTS

Shruti Fakeerappa Savadatti¹, Divya Lakshmi Pakanati², Gutta varshitha³

¹Consultant Gynecologist, Prishi Polyclinic and fertility centre, Bengaluru, India.

²Consultant Gynecologist, Prabhavathi Multispeciality Hospital, Guntur, India.

³Consultant Gynecologist, Sai Sree nursing home, Guntur, India.

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Corresponding Author:

Dr. Shruti Fakeerappa Savadatti,
Consultant Gynecologist, Prishi
Polyclinic and fertility centre,
Bengaluru, India.
Email: shruti.fs@gmail.com

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ABSTRACT

Background: Tubal factor infertility is a leading cause of failure to conceive, particularly in women from low- and middle-income settings where sexually transmitted infections are prevalent. Hysterosalpingography is the recommended first-line imaging technique for evaluating uterine and fallopian tube anatomy in women presenting with infertility. This case series illustrates the spectrum of hysterosalpingographic findings encountered in women with primary infertility attending a tertiary care centre.

Case Presentations: Seven women aged 26–34 years with primary infertility of 2.5–6 years' duration underwent hysterosalpingography after clinical evaluation. Patient histories, examination findings, and hysterosalpingographic images are presented sequentially. All patients had a normal uterine cavity on imaging.

Results: Hysterosalpingographic findings demonstrated a spectrum of tubal abnormalities. Unilateral tubal occlusion was the most common finding, identified in five patients: right proximal tubal occlusion in four and left tubal occlusion in one. Bilateral tubal occlusion without tubal dilatation was found in one patient, and bilateral tubal blockage with bilateral hydrosalpinx in one patient. Two patients had a history of prior pelvic inflammatory disease. No uterine cavity abnormality was detected in any patient.

Conclusion: Hysterosalpingography reveals a varied range of tubal abnormalities in women with primary infertility, including unilateral and bilateral tubal occlusion and hydrosalpinx. Early hysterosalpingographic evaluation allows timely management decisions and appropriate referral for assisted reproductive techniques in affected women.

Keywords: Hysterosalpingography; primary infertility; tubal occlusion; hydrosalpinx; fallopian tube; infertility evaluation.

INTRODUCTION

Infertility is defined as the failure to achieve a clinical pregnancy after 12 or more months of regular, unprotected sexual intercourse in a woman younger than 35 years, or after six months in a woman aged 35 years or older. It is a global public health problem affecting an estimated 10–15% of couples of reproductive age. A systematic analysis of 277 national health surveys estimated that in 2010, approximately 48.5 million couples worldwide were affected by infertility, with the highest burden concentrated in sub-Saharan Africa, South Asia, and

Eastern Europe.^[1] Beyond the physical dimension, infertility carries substantial psychological, social, and economic consequences for affected individuals, their families, and health systems.

The aetiology of female infertility is multifactorial. A clinical review of infertility diagnosis and management standardize the principal causes as ovulatory dysfunction, tubal and peritoneal disease, uterine pathology, and unexplained infertility, with male factor contributing in a significant proportion of couples.^[2] Ovulatory disorders, including polycystic ovary syndrome, premature ovarian insufficiency, and hypothalamic amenorrhoea, account for

approximately 25–30% of female infertility. Tubal and peritoneal disease accounts for 25–35% of cases and represents the most amendable structural cause to radiological evaluation. Primary infertility — defined as infertility in a woman who has never achieved a clinical pregnancy — is particularly associated with ascending pelvic infection, Müllerian duct anomalies, and early-onset endometriosis. In low- and middle-income countries, sexually transmitted infections and their tubal sequelae are the dominant cause, making tubal factor infertility substantially more prevalent in these populations than in high-income settings.

Hysterosalpingography (HSG) is an outpatient fluoroscopic procedure in which water-soluble iodinated contrast medium is introduced into the uterine cavity through a cervical catheter. As contrast fills the cavity and traverses the fallopian tubes, real-time fluoroscopic images document the uterine contour, tubal lumen, and intraperitoneal spill. The procedure is performed without general anaesthesia, takes approximately 15–30 minutes, and provides simultaneous evaluation of both the uterine cavity and the fallopian tubes in a single examination session. HSG is the recommended first-line investigation for structural assessment of the female reproductive tract in the infertility workup.^[3] It is indicated in women with primary or secondary infertility, recurrent pregnancy loss, and suspected Müllerian anomalies, as well as for assessment of tubal integrity after reconstructive surgery. The range of detectable abnormalities includes unilateral and bilateral tubal occlusion, hydrosalpinx, intrauterine filling defects such as polyps and synechiae, and congenital anomalies of uterine shape and configuration.

The diagnostic accuracy of HSG for tubal pathology has been systematically evaluated against laparoscopy with chromopertubation, the accepted gold standard. A meta-analysis of 20 comparative studies encompassing 4,179 infertile patients reported a pooled sensitivity of 65% and specificity of 83% for HSG in detecting tubal occlusion.^[4] The negative predictive value of HSG is high, which makes the procedure reliable for excluding bilateral tubal disease. False-positive rates for proximal tubal occlusion are, however, substantial — reaching up to 39% in some series — primarily because of transient cornual spasm during the procedure which mimics true obstruction at the uterotubal junction. This limitation is clinically important because it can lead to misclassification and inappropriate referral. Differentiating cornual spasm from true organic occlusion requires delayed images and, where available, intravenous antispasmodics. A detailed review of proximal tubal pathology on HSG described the radiographic features of salpingitis isthmica nodosa, tubal endometriosis, post-inflammatory fibrosis, and congenital anomalies of the tubal isthmus, and outlined strategies to reduce false-positive diagnoses.^[5]

The spectrum of HSG findings in women with primary infertility reflects the diversity of underlying reproductive tract pathology. The most frequently encountered abnormalities are tubal occlusion — proximal or distal, unilateral or bilateral — and hydrosalpinx. Bilateral hydrosalpinx indicates severe prior pelvic inflammatory damage with extensive tubal scarring, and it carries a poor prognosis for spontaneous conception. Uterine cavity abnormalities, including submucosal fibroids, endometrial polyps, intrauterine adhesions, and Müllerian duct anomalies such as arcuate, subseptate, and bicornuate configurations, may also be identified. Establishing the pattern and prevalence of HSG findings in a defined clinical population provides data that guide the decision to proceed to more invasive investigation such as diagnostic laparoscopy, or to refer directly for assisted reproductive techniques. Such data also serve as an educational reference for clinicians and trainees involved in the evaluation and management of female infertility.

This case series presents hysterosalpingographic findings in seven women attending a tertiary care centre with primary infertility. Each patient underwent standardized clinical evaluation followed by HSG. The cases illustrate a range of tubal abnormalities — from unilateral proximal occlusion to bilateral hydrosalpinx — and are intended to provide a structured radiological and clinical educational reference for the assessment of primary infertility.

CASE SERIES

Case 1: A 27-year-old woman presented with primary infertility of three years' duration. Her menstrual cycles were regular with a 28–30 day interval. She had no prior pregnancies, no history of pelvic inflammatory disease, no pelvic surgery, and no known sexually transmitted infection. General and systemic examination was unremarkable.



Figure 1: Hysterosalpingogram showing a normal triangular uterine cavity. The left fallopian tube is opacified with free intraperitoneal spill of contrast, confirming left tubal patency. The right fallopian tube is not opacified and no right-sided contrast spill is seen, consistent with right proximal tubal occlusion.

Abdominal examination was normal with no tenderness or guarding. Bimanual examination revealed a normal-sized anteverted uterus with no adnexal masses or tenderness. Speculum examination was normal.

Investigations including complete blood count, thyroid function tests, and hormonal profile were within normal limits. Hysterosalpingography was performed and demonstrated a normal triangular uterine cavity with opacification of the left fallopian tube and free intraperitoneal spill of contrast, confirming left tubal patency. The right fallopian tube was not opacified and no right-sided contrast spill was seen, consistent with right proximal tubal occlusion [Figure 1].

Case 2: A 31-year-old woman was evaluated for primary infertility of four and a half years' duration. Her menstrual cycles were regular with a 28-day interval. She reported a prior episode of pelvic inflammatory disease two years earlier, for which she had received a course of oral antibiotics in an outpatient setting. She had no prior pregnancies or pelvic surgery.

Abdominal examination revealed mild lower abdominal tenderness on deep palpation. Bimanual examination showed a normal-sized uterus with no adnexal masses. Mild bilateral parametrial tenderness was elicited. Speculum examination was normal.

Hormonal investigations were within normal limits. Hysterosalpingography showed a normal triangular uterine cavity with no opacification of either fallopian tube and no intraperitoneal contrast spill from either side, consistent with bilateral tubal occlusion [Figure 2].



Figure 2: Hysterosalpingogram showing a normal triangular uterine cavity with absent opacification of both fallopian tubes and no intraperitoneal contrast spill bilaterally, consistent with bilateral tubal occlusion.

Case 3: A 29-year-old woman presented with primary infertility of three years' duration. Her cycles were slightly irregular with intervals ranging from 28 to 35 days, and she reported occasional mild dysmenorrhea. She had a history of vaginal discharge treated with antibiotics 18 months previously but had

no formal diagnosis of pelvic inflammatory disease. There was no prior pelvic surgery or pregnancy.

Abdominal examination was unremarkable. Bimanual examination revealed a normal-sized uterus with no adnexal tenderness or masses. Speculum examination showed no cervical abnormality.

Hormonal profile and pelvic ultrasound were within normal limits. Hysterosalpingography demonstrated a normal uterine cavity. The right fallopian tube was opacified with peritoneal spill, confirming right tubal patency. The left fallopian tube was not visualised and no left-sided contrast spill was seen, consistent with left tubal occlusion [Figure 3].



Figure 3: Hysterosalpingogram showing a normal uterine cavity. The right fallopian tube is opacified with peritoneal spill confirming right tubal patency. The left fallopian tube is not visualised and no left-sided contrast spill is seen, consistent with left tubal occlusion.



Figure 4: Hysterosalpingogram showing a normal uterine cavity. The left fallopian tube is opacified with contrast spill in the left adnexa, confirming left tubal patency. The right fallopian tube is not opacified with absent right-sided contrast spill, consistent with right tubal occlusion.

Case 4: A 32-year-old woman was referred for primary infertility of five years' duration. Her menstrual cycles were regular with a 28-day interval and she reported mild dysmenorrhea. She had no history of pelvic inflammatory disease, pelvic surgery, or prior pregnancy.

General and abdominal examination were unremarkable. Bimanual examination demonstrated

a normal-sized uterus with no adnexal masses or tenderness. Speculum examination was normal. Laboratory investigations and pelvic ultrasound were normal. Hysterosalpingography showed a normal uterine cavity. The left fallopian tube was opacified with contrast spill visible in the left adnexa, confirming left tubal patency. The right fallopian tube was not opacified and no right-sided contrast spill was seen, consistent with right tubal block [Figure 4].

Case 5: A 34-year-old woman presented with primary infertility of six years' duration. Her menstrual cycles were regular, but she reported recurrent lower abdominal pain and an abnormal vaginal discharge over the preceding two years. She gave a history of a documented episode of pelvic inflammatory disease three years earlier, for which she had been hospitalised and received intravenous antibiotics. She had no prior pregnancies or pelvic surgery.

Abdominal examination revealed mild bilateral lower abdominal tenderness. Bimanual examination showed a normal-sized uterus with bilateral adnexal tenderness; no discrete adnexal masses were palpable. Speculum examination showed a mucopurulent cervical discharge.

Pelvic ultrasound demonstrated bilateral adnexal cystic structures with a tubular configuration, raising suspicion of hydrosalpinx. Hysterosalpingography confirmed bilateral tubal blockage with bilateral hydrosalpinx: both fallopian tubes were grossly dilated and tortuous with retained contrast, and no intraperitoneal spill was seen bilaterally, consistent with bilateral distal tubal occlusion and hydrosalpinx formation [Figure 5].



Figure 5: Hysterosalpingogram demonstrating bilateral tubal blockage with bilateral hydrosalpinx. Both fallopian tubes are grossly dilated and tortuous with retained contrast and no intraperitoneal spill bilaterally, consistent with bilateral distal tubal occlusion secondary to hydrosalpinx formation.

Case 6: A 26-year-old woman was evaluated for primary infertility of two and a half years' duration. Her menstrual cycles were regular with a 28–30 day interval and she had no dysmenorrhea. She had no prior pregnancies, pelvic surgery, or history of pelvic infection or sexually transmitted disease.

Abdominal and bimanual examination were entirely normal. Uterine size was normal and no adnexal masses or tenderness were detected. Speculum examination was normal.

Routine investigations and hormonal profile were within normal limits. Hysterosalpingography showed right tubal occlusion with no right-sided contrast spill and a patent left fallopian tube with free intraperitoneal spill of contrast [Figure 6].



Figure 6: Hysterosalpingogram showing right tubal occlusion with absent right-sided contrast spill. The left fallopian tube is patent with free intraperitoneal spill of contrast.

Case 7: A 30-year-old woman presented with primary infertility of four years' duration. Her menstrual cycles were irregular with intervals ranging from 28 to 40 days, and she reported mild dysmenorrhea. She had a history of vaginal discharge treated conservatively two years previously, but no formal diagnosis of pelvic inflammatory disease had been made at that time. She had no prior pregnancy or pelvic surgery.

Abdominal examination was normal. Bimanual examination revealed a normal-sized uterus with no adnexal tenderness or masses. Speculum examination was unremarkable.

Hormonal investigations including FSH, LH, AMH, and prolactin were within normal limits. Hysterosalpingography showed right tubal occlusion with absent right-sided contrast spill. The left fallopian tube was patent with free peritoneal spill of contrast [Figure 7].

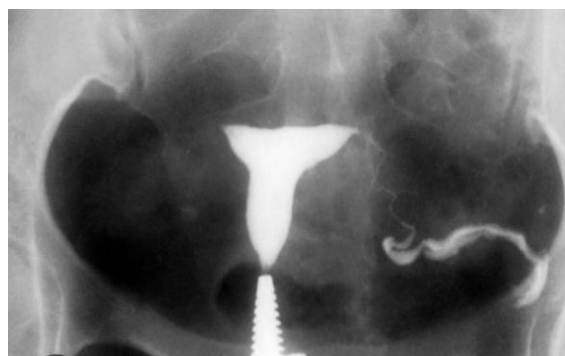


Figure 7: Hysterosalpingogram showing right tubal occlusion with absent right-sided contrast spill. The left fallopian tube is patent with free peritoneal spill of contrast.

DISCUSSION

This case series documents the hysterosalpingographic findings in seven women presenting with primary infertility. The predominant abnormality was unilateral tubal occlusion, identified in five patients: right-sided in four cases (Cases 1, 4, 6, and 7) and left-sided in one (Case 3). One patient had bilateral tubal occlusion without tubal dilatation (Case 2), and one demonstrated bilateral tubal blockage with bilateral hydrosalpinx (Case 5). The uterine cavity was normal in all seven patients. The spectrum of findings is consistent with the pattern reported in the published literature on HSG in primary infertility.

Waheed et al,^[6] reported HSG findings in 303 women with primary and secondary infertility at a Saudi tertiary referral centre and observed that congenital malformations were more frequently associated with primary infertility, while post-surgical and post-infectious tubal changes were more common in secondary infertility. Their data support the concept that primary infertility has a distinct aetiological profile, in which tubal damage from prior subclinical or undertreated infection contributes substantially to tubal damage even when a formal history of pelvic inflammatory disease is absent. This is reflected in the present series, where only two of the seven patients (Cases 2 and 5) reported a documented prior episode of pelvic inflammatory disease, yet tubal abnormalities were identified in all cases.

Aziz et al,^[7] reviewed 4,108 hysterosalpingograms performed over two years, documenting bilateral tubal patency in 60% of patients, unilateral tubal block in 15%, and bilateral block in 10%. The proportion of patients with some degree of tubal abnormality in their cohort was therefore approximately 25–30%. The higher frequency of tubal abnormalities in the present series most likely reflects referral bias, as all patients were investigated specifically for infertility, and those with a suspicion of tubal disease may have been preferentially referred for HSG.

Mayrhofer et al,^[8] examined the incidence and aetiology of tubal occlusion in a retrospective cohort of 373 infertile women and found that 25.5% had at least one occluded tube, with unilateral occlusion more common than bilateral (63.2% vs 36.8%). Proximal occlusion predominated, accounting for 86.2% of all identified blocks, and prior pelvic infection was the leading identifiable cause. In the present series, the pattern is broadly similar — unilateral occlusion was the most common finding, and prior infection was the probable aetiology in the majority of patients based on clinical history.

Toufig et al,^[9] and Ibekwe et al. 10 both identified tubal blockage as the dominant HSG finding in infertile women from settings with a high background burden of pelvic infection. Ibekwe et al,^[10] reported abnormal HSG in 80% of patients in south-eastern Nigeria, with bilateral tubal block and fimbrial

adhesions as the principal findings. Makwe et al,^[11] found tubal pathology in 54.9% of 266 women attending a Lagos fertility clinic, with bilateral occlusion being more common than unilateral in their cohort. These data from sub-Saharan African populations demonstrate a higher prevalence of severe tubal disease than is typically seen in high-income settings, likely reflecting the greater burden of untreated sexually transmitted infections. The pattern in the present series falls between these extremes, with all patients showing some tubal abnormality but bilateral severe disease present in only one patient.

Bilateral hydrosalpinx, as identified in Case 5, represents the most severe form of tubal damage encountered on HSG and has management implications beyond tubal assessment alone. Strandell et al,^[12] demonstrated in a prospective randomised multicentre trial that salpingectomy before in-vitro fertilisation in women with hydrosalpinx resulted in significantly higher rates of clinical pregnancy, implantation, and live birth compared with no surgical intervention. The hypothesis is that hydrosalpinx fluid has a direct adverse effect on the endometrial environment and embryo development. Women found to have bilateral hydrosalpinx on HSG should therefore be counselled about the potential benefit of bilateral salpingectomy before embarking on in-vitro fertilisation cycles.

The comparative accuracy of HSG versus laparoscopy was examined by Tan et al,^[13] who reported very good agreement between the two modalities for tubal patency assessment (kappa value 0.898) in a large single-centre study. HSG also performed well for hydrosalpinx diagnosis (kappa 0.838). These data support the role of HSG as the primary investigation for tubal assessment, with laparoscopy reserved for cases in which HSG findings are inconclusive, peritoneal pathology is clinically suspected, or apparent proximal occlusion needs to be distinguished from cornual spasm.

The role of *Chlamydia trachomatis* infection as a cause of tubal infertility is well established. Tang et al,^[14] conducted a global systematic review and meta-analysis demonstrating a strong association between *Chlamydia trachomatis* seropositivity and tubal factor infertility, with a pooled odds ratio of 5.14 (95% CI 4.00–6.59) for positive CT IgG. Systematic *Chlamydia* screening in women of reproductive age, prompt treatment of positive cases, and contact tracing are therefore key preventive measures against tubal damage and subsequent infertility.

An additional benefit of HSG beyond diagnosis was highlighted by Dreyer et al,^[15] who reported in a landmark randomised trial that oil-based contrast media used during HSG resulted in a significantly higher rate of ongoing pregnancy than water-based contrast (39.7% vs 29.1%; relative risk 1.37). While most centres in resource-limited settings use water-based contrast for safety and availability reasons, this therapeutic effect of the procedure itself provides

further justification for early HSG in the infertility evaluation pathway.

This series has several limitations: The number of cases is small and represents a selected referred cohort rather than a consecutive population sample. Laparoscopic confirmation of HSG-diagnosed tubal occlusion was not available for all patients, and the possibility of false-positive proximal occlusion due to cornual spasm — a recognised limitation of HSG — cannot be excluded.

CONCLUSION

Hysterosalpingography reveals a varied spectrum of tubal abnormalities in women with primary infertility, ranging from unilateral proximal tubal occlusion to bilateral tubal blockage with hydrosalpinx. Unilateral occlusion is the most common finding, and prior pelvic infection may contribute to tubal pathology in affected women. All patients in this series had a normal uterine cavity. Early HSG evaluation guides appropriate management decisions, including referral for assisted reproductive techniques or appropriate surgical intervention such as salpingectomy in women with bilateral hydrosalpinx.

REFERENCES

1. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. *PLoS Med.* 2012;9(12):e1001356. doi:10.1371/journal.pmed.1001356
2. Carson SA, Kallen AN. Diagnosis and management of infertility: a review. *JAMA.* 2021;326(1):65-76. doi:10.1001/jama.2021.4788
3. Schankath AC, Fasching N, Urech-Ruh C, Hohl MK, Kubik-Huch RA. Hysterosalpingography in the workup of female infertility: indications, technique and diagnostic findings. *Insights Imaging.* 2012;3(4):301-308. doi:10.1007/s13244-012-0182-5
4. Swart P, Mol BW, van der Veen F, van Beurden M, Redekop WK, Bossuyt PM. The accuracy of hysterosalpingography in the diagnosis of tubal pathology: a meta-analysis. *Fertil Steril.* 1995;64(3):486-491. doi:10.1016/s0015-0282(16)57781-4
5. Zafarani F, Ghaffari F, Ahmadi F, Soleimani Mehranjani M, Shahrzad G. Hysterosalpingography in the assessment of proximal tubal pathology: a review of congenital and acquired abnormalities. *Br J Radiol.* 2021;94(1122):20201386. doi:10.1259/bjr.20201386
6. Waheed KB, Albassam MA, AlShamrani AG, et al. Hysterosalpingographic findings in primary and secondary infertility patients. *Saudi Med J.* 2019;40(10):1067-1071. PMID: 31588489.
7. Aziz MU, Anwar S, Mahmood S. Hysterosalpingographic evaluation of primary and secondary infertility. *Pak J Med Sci.* 2015;31(5):1188-1191. doi:10.12669/pjms.315.7545
8. Mayrhofer D, Holzer I, Aschauer J, et al. Incidence and causes of tubal occlusion in infertility: a retrospective cohort study. *J Clin Med.* 2024;13(13):3961. doi:10.3390/jcm13133961
9. Toufig H, Benameur T, Twfieg ME, Omer H, El-Musharaf T. Evaluation of hysterosalpingographic findings among patients presenting with infertility. *Saudi J Biol Sci.* 2020;27(11):2876-2882. doi:10.1016/j.sjbs.2020.08.041
10. Ibekwe PC, Udensi AM, Imo AO. Hysterosalpingographic findings in patients with infertility in south eastern Nigeria. *Niger J Med.* 2010;19(2):165-167. PMID: 20642082
11. Makwe CC, Ugwu AO, Sunmonu OH, Yusuf-Awesu SA, Ani-Ugwu NK, Olumakinwa OE. Hysterosalpingography findings of female partners of infertile couple attending fertility clinic at Lagos University Teaching Hospital. *Pan Afr Med J.* 2021;40:223. doi:10.11604/pamj.2021.40.223.29890
12. Strandell A, Lindhard A, Waldenström U, Thorburn J, Nilsson L, Hamberger L. Hydrosalpinx and IVF outcome: a prospective, randomized multicentre trial in Scandinavia on salpingectomy prior to IVF. *Hum Reprod.* 1999;14(11):2762-2769. doi:10.1093/humreprod/14.11.2762
13. Tan J, Deng M, Xia M, Lai M, Pan W, Li Y. Comparison of hysterosalpingography with laparoscopy in the diagnosis of tubal factor of female infertility. *Front Med (Lausanne).* 2021;8:720401. doi:10.3389/fmed.2021.720401
14. Tang W, Mao J, Li KT, et al. Pregnancy and fertility-related adverse outcomes associated with Chlamydia trachomatis infection: a global systematic review and meta-analysis. *Sex Transm Infect.* 2020;96(5):322-329. doi:10.1136/sextrans-2019-053999
15. Dreyer K, van Rijswijk J, Mijatovic V, et al. Oil-based or water-based contrast for hysterosalpingography in infertile women. *N Engl J Med.* 2017;376(21):2043-2052. doi:10.1056/NEJMoa1612337.