

Original Article

Abnormal Hysteroscopy Findings among a Cross Section of Infertile Nigerian Women

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ABSTRACT

Background: Intrauterine lesions are important causes of infertility. This study aims to evaluate the abnormal findings at hysteroscopy among infertile women seen in 2 new Fertility/Gynaecological Endoscopy units in Nigeria. **Methods:** A prospective study of 159 infertile women who had diagnostic hysteroscopy in Nnamdi Azikiwe University Teaching hospital Nnewi and Holy Rosary Specialist Hospital, Onitsha to evaluate the intrauterine lesions seen. Data analysis was done with STATA software, version 12.0 SE (Stata Corporation, TX, USA). **Results:** Secondary infertility was the major type of infertility seen in 56.6% ($n = 91$) of cases and the mean duration of infertility was 4.3+/- 2.8 years. The indication for hysteroscopy was routine evaluation for infertility in 83.6% cases ($n = 133$). One hundred and twelve (70.4%) of the women had abnormal findings at hysteroscopy. The lesions detected were intrauterine adhesions (47.8%; $n = 76$), endometrial polyps (17.6%; $n = 28$), submucous fibroids (11.9%; $n = 19$) and mullerian duct abnormalities (10.7%; $n = 17$). Other findings were lost intrauterine copper devices (IUCD; 6.3%, $n = 10$), embedded fetal bone (2.5%; $n = 4$) and incarcerated omentum (1.9%; $n = 3$). Intrauterine adhesions were mainly moderate (40.8%; $n = 31$) and mild (34.2, $n = 26$) in severity while the submucous fibroids were mostly of type 0 (63.2%; $n = 12$). The commonest Mullerian abnormality seen was arcuate uterus (41.2%; $n = 7$). **Conclusion:** There was a high prevalence of abnormal findings on hysteroscopy among the studied women mostly intrauterine adhesions, endometrial polyps and submucous fibroids. These findings indicate a need to incorporate hysteroscopy in the routine evaluation of female infertility in the region.

KEYWORDS: Abnormal hysteroscopy, intrauterine adhesions, intrauterine pathologies, submucous fibroids

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INTRODUCTION

Infertility is a major common challenging gynaecological condition in Nigeria. It represents the commonest indication for gynaecological outpatient consultation in the country.^[1-4] This is on the basis of great importance attached to childbirth in the country.

In Southeast Nigeria, the prevalence rates of infertility among new gynaecological patients seen range from 15.4% reported in Abakiliki to 41.6% reported in our center.^[4,5] The aetiological factors in Infertility in Nigeria include tubal diseases, anovulation, uterine lesions and semen fluid abnormalities.^[1-4]

In Nigeria, evaluation of uterine lesions has been commonly done with hysterosalpingogram and pelvic scan.^[5-7] But these modalities have limited diagnostic accuracy when compared to hysteroscopy which is considered the gold standard in investigating intrauterine lesions in infertility^[8-10] Although Zinna *et al.* had shown that when pelvic scan is combined with uterine distension with fluid (sonohysterography), the diagnostic

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accuracy is similar to that of hysteroscopy. Yet hysteroscopy is superior as it offers the opportunity for the surgical correction of the identified pathology.^[11]

Hysteroscopy is the visualization of the uterine cavity under magnification by the use of small metal sheaths known as hysteroscopes. This is facilitated with the assistance of a distension media to distend the uterine cavity which is a potential space to aid visualization of the entire cavity. The procedure is done in the immediate post menstrual phase for a better vision of the cavity. If this is not feasible, then endometrial thinning becomes necessary.

The introduction of hysteroscopy into the routine evaluation of infertility has led to improved outcome of management by identifying and correcting intrauterine lesions hitherto unrecognized either by pelvic ultrasound or Hysterosalpingogram. These lesions include intrauterine adhesions, polyps, fibroids, foreign bodies, congenital anomalies of the uterus and proximal tubal cannulation. Hysteroscopy makes it feasible to remove and address these lesions in one procedure through hysteroscopic adhesiolysis, polypectomy, myomectomy, uterine septum resection and successful proximal tubal cannulation. In addition observation of the visualizable “flow” effect in the fallopian tube ostia in routine hysteroscopic evaluation has been found to be predictive of tubal patency.^[12]

The commonest intrauterine lesion found on hysteroscopy in Nigeria remains intrauterine adhesions and consequently, the operative hysteroscopic procedure most commonly carried out is hysteroscopic adhesiolysis.^[13-17] Ugboaja *et al.* reported a prevalence rate of intrauterine adhesion of 47.8% among infertile women managed in Nigeria and hysteroscopic adhesiolysis accounted for 46.9% of all the operative hysteroscopies carried out in their unit.^[17]

Operative hysteroscopy can also be performed for the diagnosis and management of a lost intrauterine contraceptive device (IUCD) or retained fetal bones, and for tubal cannulation in the treatment of proximal tubal occlusion.

To limit complications encountered during operative hysteroscopies, adequate and meticulous patient evaluation through history-taking, physical examination, and relevant investigations is necessary. In addition, timing the procedure in the immediate postmenstrual phase and the use of progestogens and other hormones for endometrial thinning helps to improve visibility and therefore enhances the outcome of the procedures.

It is a good practice point to define the size and orientation of the uterus through pelvic examination

before the commencement of the procedure which should commence with a systematic evaluation of the cervical canal, cervical os, uterine cavity, and tubal ostia.

Administering 100 µg misoprostol orally or vaginally in the evening before the procedure reduces the difficulty with cervical os dilation especially in women with cervical stenosis.

Operative hysteroscopy can be associated with complications which include cervical lacerations, uterine perforations and fluid and electrolyte imbalance. The rate of complications depends on the skill of the surgeon as well as the severity of the conditions being managed. In Nigeria, a complication rate of 6.8% was reported by Ugboaja *et al.* and comprised mainly of haemorrhage.^[17]

In Nigeria as other developing countries, reports of the use of hysteroscopy in the management of infertility in public hospitals are scarce.^[17] The available reports are largely from a few Assisted Reproductive Technology centers in the country.^[13-16]

This study therefore, is aimed at bridging this gap by presenting the findings at diagnostic hysteroscopy among infertile women seen in a public hospital and missionary hospital in Southeastern Nigeria. In our units, we routinely do diagnostic hysteroscopy for all the patients presenting to the unit for management as a day case. The procedure is done in the immediate postmenstrual phase. Intrauterine pathologies identified prior to, or during the diagnostic procedure amenable to endoscopy treatment are also addressed during the procedures. These include intrauterine synaechia, polyps, submucous fibroids, congenital abnormalities of the uterus, retained foreign bodies or proximal tubal occlusions.

Aim

The aim of the study is to evaluate the prevalence and pattern of abnormal hysteroscopy findings among infertile women managed in our units over eighteen month's period.

METHODS

Study setting

The fertility and Gynaecological endoscopy unit of Nnamdi Azikiwe University Teaching Hospital Nnewi Anambra State, Nigeria and Holy Rosary Specialist Hospital, Onitsha Anambra State, Nigeria.

Study design

A prospective study of 159 infertile women who presented to the Fertility and Gynaecological endoscopy units of Nnamdi Azikiwe University Teaching Hospital Nnewi Anambra State, Nigeria and Holy Rosary

Specialist Hospital, Onitsha Anambra State, Nigeria for management between November 1st and April 30th 2017.

Study population

Consecutive infertile women who presented at the Fertility and gynaecology endoscopy unit of Nnamdi Azikiwe University Teaching Hospital and Holy Rosary Specialist Hospital, Onitsha Anambra State, Nigeria for management within the study period who gave consent for the study were recruited. Those who withheld consent were excluded from the study.

Procedure

A case report form as developed and used to collect data on all the infertile women who presented for management. The information obtained includes the biosocial data, the presenting complaint, menstrual pattern and reproductive performance.

Following clinical evaluation including transvaginal scan and in some cases, hysterosalpingogram, the patients are scheduled for diagnostic hysteroscopy. This is done under general anaesthesia, because we also do laparoscopy and dye test at the same setting and in the immediate post menstrual phase.

Misoprostol (50 ug) is normally inserted into the posterior fornix a night before the procedure in the nulliparous women to aid cervical os dilatation. The procedure is done with the Stryker (USA) Camera, Monitor and Light Source while the Hysteroscopes used were techno (Germany). We usually start with administration of anaesthesia, patient positioning in lithotomy position, bladder drainage, and pelvic examination. This is followed by exposition of the cervix with Sims speculum, grasping the anterior lip with volsellum, estimation of the uterine depth and cervical os dilatation.

Dilatation is usually up to 5.5 mm for the diagnostic procedure and may increase in cases where operative procedures are done.

Our choice of distension media was normal saline delivered via a manual pressure bag pump with a gauge suspended on a drip stand. Following the introduction of the diagnostic hysteroscope under fluid distension, a systematic survey of the cervical canal, cervical os and the uterine cavity including the fundus, the anterior and posterior walls and the lateral walls were done. The tubal ostia were then examined for normalcy, fibrosis or occlusion. Distension pressure was maintained at 100mmHg to 150 mmHg. The designed case report form was then completed with the findings from hysteroscopy which included the nature of cervical canal, the cervical os, the uterine walls, the fundus and the tubal ostia. The operative details including the duration of the procedure,

the nature and volume of distension media and the challenges and complications encountered were also documented.

Postoperatively, the patients were given antibiotics and discharged home the same day and followed up at the clinic in a week's time.

Data analysis

Data was analyzed with Stata version 12.1. The mean, median and modes were calculated for the continuous variables while percentages were calculated for the composite variables. The Pearsons test was used to explore relationship between variables and *p*-value of less than 0.05 at a confidence interval of 95% was taken as significant. The data is presented in tables.

Ethical approval

Ethical approval was obtained from the Institutions ethical board and the ethical principles of non-maleficence, beneficence, confidentiality and respect of persons were applied throughout the duration of the study. The patients were well counseled on the purpose of the study and they all gave consent. Those who withheld consent were excluded from the study.

RESULTS

Biosocial characteristics of the women

As shown in Table 1, most of the women were public servants (42.8%; *n* = 68) and had acquired tertiary education (76.8%; *n* = 122). The age range of the women was 21-46 years with a mean 36.6+/-6.2 yrs and the modal parity group was 0-1 (88.1%; *n* = 0.140). The mean parity was 0.5+/-1.1. All the women were Christians and majority belong to the catholic denomination (34.7%; *n* = 87).

Clinical and Reproductive characteristics of the women

The mean age of menarche was 13.9+/-1.8 yrs and 49.1% of the women had normal menstrual pattern with a mean cycle length of 27.7+/-2.0 days. Secondary infertility constitute 56.6% (*n* = 91/159) of cases while primary infertility accounted for 43.4% (*n* = 69/159) of cases. The mean duration of infertility was 4.3+/- 2.8 years. Seventy eight (49.1%) of the women had done a pelvic surgery in the past, mainly appendectomy (38.4%; *n* = 28). The main previous treatment received was ovulation induction with clomiphene citrate (35.2%; *n* = 56/159) [Table 2].

Abnormal findings at hysteroscopy among the women

As shown in Table 3, 70.4% (*n* = 112/159) of the women had abnormal findings at hysteroscopy. The lesions

Table 1: Distribution by sociodemographic characteristics of the women

Sociodemographic profile	Frequency (%)
Education	
Secondary	37 (23.2)
Tertiary	122 (76.8)
Age	
20–29	35 (22.0)
30–39	75 (47.2)
40 and above	49 (30.8)
Parity	
0–1	140 (88.1)
2–4	18 (11.3)
5 and above	1 (0.6)
Occupation	
Public servant	68 (42.8)
Housewife	27 (17.0)
Trader	24 (15.1)
Healthcare worker	23 (14.5)
Student	13 (8.2)
Artisan	4 (2.5)
Religion	
Catholic	87 (54.7)
Anglican	42 (26.4)
Pentecostal	30 (18.9)

Table 2: Distribution by the reproductive and clinical characteristics of the women

Characteristics	Frequency (%)
Type of infertility (<i>n</i> =159)	
Primary	69 (43.4)
Secondary	90 (56.6)
Duration of infertility/159	
<5 years	94 (59.1)
5 years and above	65 (40.9)
Menstrual abnormality/159	
Yes	78 (49.1)
No	81 (50.9)
Previous pelvic surgeries/159	
Yes	78 (49.1)
No	81 (50.9)
Type of pelvic surgeries/78	
Appendectomy	28 (35.9)
Myomectomy	18 (23.1)
Caesarean section	16 (20.5)
Exploratory laparotomy	4 (5.1)
Cystectomy	7 (9.0)
Others	1 (1.3)
Previous treatment/159**	
Clomiphene citrate	56 (35.2)
Myomectomy	12 (7.5)
Herbal medicine	18 (11.32)
Combination	36 (22.6)
Artificial insemination	4 (2.5)
IVF and embryo transfer	3 (1.9)

**There were cases of multiple treatments. IVF=*In vitro* fertilization

Table 3: Distribution by abnormal findings at hysteroscopy among the women

Abnormalities	Frequency
Abnormal findings, frequency (%)	112 (70.4)
Intrauterine adhesions, frequency (%)	76 (47.8)
Mild, <i>n</i> (%)	26 (34.2)
Moderate, <i>n</i> (%)	31 (40.8)
Severe, <i>n</i> (%)	19 (25.0)
Endometrial polyps, frequency (%)	28 (17.6)
Solitary, <i>n</i> (%)	19 (67.9)
Multiple, <i>n</i> (%)	9 (32.1)
Submucous fibroids, frequency (%)	19 (11.9)
Type 0, <i>n</i> (%)	12 (63.2)
Type 1, <i>n</i> (%)	5 (26.3)
Type 2, <i>n</i> (%)	2 (10.5)
Mullerian abnormalities, frequency (%)	17 (10.7)
Arcuate uterus, <i>n</i> (%)	9 (52.9)
Incomplete septum, <i>n</i> (%)	7 (41.2)
Uterus didelphys, <i>n</i> (%)	1 (5.8)
Lost IUCD, frequency (%)	10 (6.3)
Retained fetal bone, frequency (%)	4 (2.5)
Uterine perforation with entrapment of omentum, frequency (%)	3 (1.9)

IUCD=Intrauterine copper devices

detected were intrauterine adhesions (IUAs) (47.8%; *n* = 76/159), endometrial polyps (17.6%; *n* = 28/159), submucous fibroids (11.9%; *n* = 19/159) and mullerian duct abnormalities (10.7%; *n* = 17/159). Other findings were lost Intrauterine contraceptive device (IUCD) (6.3% *n* = 10/159), embedded fetal bone (2.5%; *n* = 4/159) and incarcerated omentum (1.9%; *n* = 3/159). Severe Intrauterine adhesions was seen in 25% (*n* = 19/76) of cases of IUA while moderate IUA was encountered in 40.8% of cases (*n* = 31/76). Submucous fibroids were mostly of type 0 (63.2%; *n* = 12/19). The commonest Mullerian abnormality seen was arcuate uterus (41.2%; *n* = 7/17).

DISCUSSION

This study of abnormal findings at hysteroscopy among infertile women found a prevalence rate of 70.4% of intrauterine abnormalities among the studied women. This rate is high but quite similar to the earlier findings of Ajayi *et al.*,^[14] who found a rate of 61.1% among women in Lagos, Okohue *et al.*,^[13] in Portharcourt who reported a prevalence rate of 77.0% and Ajayi *et al.*^[15] who also found 76.0% among women in Asaba, South-south Nigeria. All these were found among patients been worked up for *in vitro* fertilization. This very high prevalence of intrauterine pathologies as found in this study strongly indicates the need to incorporate hysteroscopy in the routine evaluation and management of infertility cases. There is no doubt that some of these

lesions detected under magnification may not have been found by the routine pelvic ultrasonography.

The commonest intrauterine lesion detected in our study was intrauterine adhesions (IUAs). This is similar to previous reports in Nigeria,^[13-15,17] and India.^[18] These intrauterine adhesions are caused by post traumatic or post infectious trauma to the basal layer of the endometrium resulting in scarring of the endometrium leading to the obliteration of the cavity. The common precipitating events include dilatation and curettage for pregnancy related events, myomectomy, caesarean section as well as hysteroscopic surgeries. The reproductive consequences of intrauterine adhesions include recurrent miscarriages, infertility, increased risk of ectopic pregnancy, abnormal placentation and preterm labour.^[19,20]

The second most common pathology detected by our study was endometrial polyps. This is also similar to previous reports in the country.^[13,14,17] Endometrial polyps are localized overgrowth of the endometrium which may be single or multiple. The true incidence of endometrial polyps in the general population is unknown because many of them are asymptomatic and discovered during routine evaluation of infertile women.

The mechanism through which polyps cause infertility is largely unknown but some postulated mechanisms include distortion of the endometrial cavity, inflammatory endometrial response, irregular endometrial bleeding, obstruction to sperm transport and function as well as interference with endometrial receptivity.^[21,22] On the basis of available evidence that shows improved reproductive outcomes in patients following polypectomy.^[23-25]

It is logical to recommend polypectomy in all infertile women with endometrial polyps as part of the management. We did polypectomy for all our patients.

The other significant intra cavity lesion seen among our patients was submucous fibroids which were observed in 11.9% of women ($n = 19$). Uterine fibroids are benign tumours of the myometrium seen among women of reproductive age. Its locations can be submucous, intramyometrial or subserosal.

Fibroids are classified as type 0, located entirely within the cavity; type 1 when more than 50% of the mass lies within the cavity and type 2 when less than 50% of the mass is found within the uterine cavity. The aetiological mechanisms of fibroids in infertility have not been clearly understood. The postulated mechanisms include distortion of the endometrium, dysfunctional uterine contractility, chronic endometrial

inflammation, abnormal uterine vascularization as well as impaired endometrial receptivity.^[26-28] Hysteroscopic myomectomy has been shown to improve pregnancy rates among women with infertility. All our patients with types 0 and 1 had hysteroscopic myomectomy with the Resectoscope utilizing monopolar current with glycine as the distension media.

We also found a prevalence rate of Mullerian duct abnormalities (MDAs) of 10.7% ($n = 17$) among the women. Mullerian ducts are primitive ducts that differentiate in the females to form the fallopian tubes, the uterus, cervix and upper part of the uterus. The tubes usually fuse in the midline in the course of development to form a median septum which subsequently resorbs to form a single uterine cavity. Mullerian duct abnormalities develop as a result of either improper fusion of the two ducts or incomplete resorption of the median septum.

The main form of abnormality found was arcuate uterus followed by septate uterus. Arcuate uterus is characterized by a small indentation at the fundal area shorter than 1 cm with a shallow and broad base. Septate uterus is the next most common MDAs. It results from incomplete resorption of the median septum after the fusion of the two Mullerian ducts. The reproductive consequences of MDAs include recurrent miscarriage, dysmenorrhea, infertility and chronic pelvic pain.

Although the actual incidence of MDAs within the general population is unknown previous studies reported rates ranging from 0.16% to 10%.^[29-31] However, among women with infertility and recurrent miscarriages, the rate was 8-10%.^[30] MDAs are graded according to the AFS classification.^[32] According to this classification system, arcuate uterus and septate uterus belong to class vi and class v respectively while uterus didelphys belongs to class iii.

Combined hysteroscopy and laparoscopy is the gold standard in the diagnosis and surgical treatment of MDAs. Other investigative modalities include HSG, ultrasonography especially 3-D scan and saline infusion sonography. The surgery of choice is hysteroscopic resection of the Mullerian abnormalities under laparoscopy. Hysteroscopic resection was done for all our patients.

A rare but significant uterine cause of secondary infertility is retained fetal bone that usually follows second trimester termination of pregnancy by dilatation and evacuation. This usually present with abnormal uterine bleeding, deep dyspareunia, secondary dysmenorrhea, chronic pelvic pain and secondary infertility.^[29]

We found 4 cases of Retained fetal bones (RFBs) in this study causing secondary infertility. All the bones were found within the cavity and were successfully removed using the hysteroscope. Intrauterine retained fetal bone seen at hysteroscopy has been variously reported.^[13,33-35] RFBs are usually suspected in cases where ultrasound shows a linear echogenic material within the cavity especially in patients with a history of mid trimester termination of pregnancy.

Sometimes, retained fetal bone is asymptomatic and found only during routine evaluation for infertility either with ultrasonography or hysteroscopy, as was the case with our patients. The diagnosis therefore requires a high index of suspicion especially among women with a history of second trimester pregnancy termination by dilatation and evacuation.

The mechanisms of infertility by retained fetal bones (RFBs) are not clearly understood. However, it is postulated that retained bones close to the fundal area can trigger local release of prostaglandins which may cause prevention of blastocyst implantation.^[33,34] Also, RFBs lying within the uterine cavity can act as intrauterine contraceptive devices impairing fertility.^[32]

Overall, the impact of RFBs on fertility appears to depend on whether the bones are completely embedded or lying freely within the uterine cavity. It seems there is evidence to suggest that the completely embedded bones do not affect fertility.^[33]

Hysteroscopy is the gold standard in both the diagnosis and management of RFBs causing infertility as it allows the visualization of the uterine cavity under magnification and also additionally, enables the removal of the bones under vision. However, hysteroscopy can miss the bone pieces if the bones are embedded deeply within the endometrial-myometrial junction.

Therefore, in cases with a highly suggestive clinical history and ultrasonographic picture in which hysteroscopy shows an empty cavity, there is need for further evaluation.

Our study also found three cases of uterine perforation with incarceration of the omentum following two cases of dilatation and curettage for abortion and a case of uterine perforation by IUCD. There was associated chronic pelvic pain, dyspareunia and dysmenorrhea in all cases.

The omentum was successfully teased out of the uterus with laparoscopy followed by laparoscopic closure of the myometrial wound in two cases while the remaining case required laparotomy as the omentum was involved with adhesions precluding laparoscopic management.

Cases of uterine perforation with incarceration of the omentum have been reported previously in the literature.^[36,37] The omentum acts as a tamponade limiting bleeding and walling off the site from pathogens. Most cases are recognized soon after the injury by a consternation of clinical signs and symptoms including abdominal pain and vaginal bleeding. Sometimes, it goes unnoticed and discovered during evaluation for infertility.

CONCLUSION

There was a high prevalence of abnormal findings on hysteroscopy among the studied women comprised mainly of intrauterine adhesions, endometrial polyps, submucous fibroids and Mullerian duct abnormalities. These findings indicate a need to incorporate hysteroscopy in the routine evaluation of female infertility in the region as this will improve the outcome of management.

Limitations of the study

The study is a hospital based study and therefore the findings may not be generalizable.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Karshima JA, Pam VC, Atim T, Abata PP, Reich MI. Indications for gynaecological consultation by women at a rural outreach centre in North-central Nigeria. *Int J Trop Dis Health* 2014;2014:696-712.
2. Adeyemi AS, Adekanle DA, Afolabi AF. Pattern of gynaecological consultations at Ladoko Akintola university of technology teaching hospital. *Niger J Clin Pract* 2009;12:47-50.
3. Orhue A, Aziken M. Experience with a comprehensive university hospital-based infertility program in Nigeria. *Int J Gynaecol Obstet* 2008;101:11-5.
4. Ikechebelu JI. Prevalence of gynaecological diseases in Nnewi, Nigeria. *Niger J Clin Pract* 2005;8:136-7.
5. Karshima JA, Daru PH, Ekedigwe JE. Hysterosalpingographic evaluation of 998 consecutive infertile women in Jos, Nigeria. *Int J Gynaecol Obstet* 2010;108:255-7.
6. Okafor CO, Okafor CI, Okpala OC, Umeh E. The pattern of hysterosalpingographic findings in women being investigated for infertility in Nnewi, Nigeria. *Niger J Clin Pract* 2010;13:264-7.
7. Ibekwe PC, Udensi AM, Imo AO. Hysterosalpingographic findings in patients with infertility in South Eastern Nigeria. *Niger J Med* 2010;19:165-7.
8. Snowden EU, Jarrett JC 2nd, Dawood MY. Comparison of diagnostic accuracy of laparoscopy, hysteroscopy, and hysterosalpingography in evaluation of female infertility. *Fertil Steril* 1984;41:709-13.
9. Hourvitz A, Lédée N, Gervaise A, Fernandez H, Frydman R, Olivennes F, *et al.* Should diagnostic hysteroscopy be a routine

- procedure during diagnostic laparoscopy in women with normal hysterosalpingography? *Reprod Biomed Online* 2002;4:256-60.
10. Roma Dalfó A, Ubeda B, Ubeda A, Monzón M, Rotger R, Ramos R, *et al.* Diagnostic value of hysterosalpingography in the detection of intrauterine abnormalities: A comparison with hysteroscopy. *AJR Am J Roentgenol* 2004;183:1405-9.
 11. Zinna M, Gentile M, Torcia F, Bianchi P, Cozza G, Marziani R, *et al.* Diagnostic accuracy of sonohysterography vs hysteroscopy in benign uterine endocavitary findings. *Eur Rev Med Pharmacol Sci* 2015;19:365-71.
 12. Promberger R, Simek IM, Nouri K, Obermaier K, Kurz C, Ott J, *et al.* Accuracy of tubal patency assessment in diagnostic hysteroscopy compared with laparoscopy in infertile women: A retrospective cohort study. *J Minim Invasive Gynecol* 2018;25:794-9.
 13. Okohue JE, Onuh SO, Akaba GO, Shaibu I, Wada I, Ikimalo JI. A 3 years review of hysteroscopy in a private hospital in Nigeria. *World J Laparosc Surg* 2009;2:26-9.
 14. Ajayi A, Biobaku O, Ajayi V, Oyetunji I, Aikhuele H, Afolabi B. Detection of intrauterine lesions by hysteroscopy among women with fertility challenges in an *in vitro* fertilization center in Lagos, Nigeria. *Crit Care Obstet Gynecol* 2015;1:1.
 15. Ajayi AB, Ajayi VD, Kolade CO. Hysteroscopic Findings Among a Cohort of Infertile Nigerian Women Undergoing an IVF Program. Available from: <http://www.nordicalagos.org/wp-content/uploads/2015/11/Hysteroscopic>. [Last accessed on 2017 May 03].
 16. Ikechebelu JI, Eleje GU, Bhamare P, Joe-Ikechebelu NN, Okafor CD, Akintobi AO, *et al.* Fertility outcomes following laparoscopy-assisted hysteroscopic fallopian tube cannulation: A Preliminary study. *Obstet Gynecol Int* 2018;2018:7060459.
 17. Ugboaja JO, Oguejiofor CB, Ogelle OM. Audit of operative hysteroscopies among infertile women in a resource-poor setting. *Int J Gynaecol Obstet* 2018;141:57-62.
 18. Neerja JK. Role of laparoscopy-hysteroscopy in cases of infertility with pregnancy outcome. *J Indian Med Assoc* 2014;112:85-6, 88.
 19. Robinson JK, Colimon LM, Isaacson KB. Postoperative adhesiolysis therapy for intrauterine adhesions (Asherman's syndrome). *Fertil Steril* 2008;90:409-14.
 20. Valle RF, Sciarra JJ. Intrauterine adhesions: Hysteroscopic diagnosis, classification, treatment, and reproductive outcome. *Am J Obstet Gynecol* 1988;158:1459-70.
 21. Richlin SS, Ramachandran S, Shanti A, Murphy AA, Parthasarathy S. Glycodelin levels in uterine flushings and in plasma of patients with leiomyomas and polyps: Implications for implantation. *Hum Reprod* 2002;17:2742-7.
 22. Oehninger S, Coddington CC, Hodgen GD, Seppala M. Factors affecting fertilization: Endometrial placental protein 14 reduces the capacity of human spermatozoa to bind to the human zona pellucida. *Fertil Steril* 1995;63:377-83.
 23. Bosteels J, Kasius J, Weyers S, Broekmans FJ, Mol BW, D'Hooghe TM, *et al.* Hysteroscopy for treating subfertility associated with suspected major uterine cavity abnormalities. *Cochrane Database Syst Rev* 2013;1:CD009461.
 24. Stamatellos I, Apostolides A, Stamatopoulos P, Bontis J. Pregnancy rates after hysteroscopic polypectomy depending on the size or number of the polyps. *Arch Gynecol Obstet* 2008;277:395-9.
 25. Pérez-Medina T, Bajo-Arenas J, Salazar F, Redondo T, Sanfrutos L, Alvarez P, *et al.* Endometrial polyps and their implication in the pregnancy rates of patients undergoing intrauterine insemination: A prospective, randomized study. *Hum Reprod* 2005;20:1632-5.
 26. Casini ML, Rossi F, Agostini R, Unfer V. Effects of the position of fibroids on fertility. *Gynecol Endocrinol* 2006;22:106-9.
 27. Check JH, Choe JK, Lee G, Dietterich C. The effect on IVF outcome of small intramural fibroids not compressing the uterine cavity as determined by a prospective matched control study. *Hum Reprod* 2002;17:1244-8.
 28. Rackow BW, Taylor HS. Submucosal uterine leiomyomas have a global effect on molecular determinants of endometrial receptivity. *Fertil Steril* 2010;93:2027-34.
 29. Heinonen PK, Saarikoski S, Pystynen P. Reproductive performance of women with uterine anomalies. An evaluation of 182 cases. *Acta Obstet Gynecol Scand* 1982;61:157-62.
 30. Stray-Pedersen B, Stray-Pedersen S. Etiologic factors and subsequent reproductive performance in 195 couples with a prior history of habitual abortion. *Am J Obstet Gynecol* 1984;148:140-6.
 31. Rock JA. Surgery for anomalies of the mullerian ducts. In: Tompson JD, Rock JA, editors. *TeLind's Operative Gynecology*. 9th ed. Philadelphia, Pa: J.B. Lippincott Williams & Wilkins; 2003. p. 705.
 32. The American fertility society classifications of adnexal adhesions, distal tubal occlusion, tubal occlusion secondary to tubal ligation, tubal pregnancies, müllerian anomalies and intrauterine adhesions. *Fertil Steril* 1988;49:944-55.
 33. Srofenyoh E, Addison M, Dorte B, Kuffour P. Intrauterine retained fetal bones as a cause of secondary infertility. *Ghana Med J* 2006;40:105-9.
 34. Bahçeci M, Demirel LC. Osseous metaplasia of the endometrium: A rare cause of infertility and its hysteroscopic management. *Hum Reprod* 1996;11:2537-9.
 35. Cepni I, Kumbak B, Ocal P, Idil M, Aksu F. Infertility due to intrauterine residual fetal bone fragments. *J Clin Ultrasound* 2004;32:253-5.
 36. Myounghwan K. Incarcerated omentum with tamponade effect in the uterine perforation scar after dilation and curettage: A case report. *J Med Case* 2014;5:204-7.
 37. Lothe S, Mali K, Warke HS, Satia MN. Uterine perforation with omental incarceration during suction evacuation. *JPGO* 2015;3:5. Available from: <http://www.jpgo.org/2016/05/uterine-perforation-withomental.html> [Last accessed on 2017 May 03].