

## ORIGINAL ARTICLE

## Complementary Roles of Hysterosalpingography and Transabdominal Ultrasonography in The Assessment of the Uterus Among Women with Infertility in A Developing Nation

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## DISCLOSURE

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**ABSTRACT**

**Background:** The uterus plays a vital role in female infertility. In our environment, it is commonly separately examined with either transabdominal ultrasonography (TAUS) or hysterosalpingography (HSG) which are cheap and readily available. A concurrent use of the two procedures might have a complementary effect with a good outcome especially in a developing economy where three dimensional (3-D) ultrasound, sonohysterography and magnetic resonance imaging (MRI) which are more sensitive are neither readily available nor affordable.

**Objectives:** To document the uterine, tubal and adnexal lesions diagnosed using each of the two procedures and to check if the procedures can complement each other in a poor resource economy.

**Methodology:** This is a six month, paired group and analytical observational study of 200 women with infertility. HSG was booked in keeping with the ten-day rule and TAUS was performed on the same day before HSG. Statistical Package for Social Sciences, version 21 was used for the analysis.  $P \leq 0.05$  was considered statistically significant.

**Results:** With TAUS evaluation, 158(79%) of the subjects appeared normal. Fibroids were detected in 39(19.5%) subjects, and in 37(94.9%) of this subset, they were localized. Intrauterine adhesions were seen in 0(0%), endometrial polyp in 1(0.5%), and endometrial hyperplasia in 2(1%). With HSG, 149(74.5%) appeared normal. Fibroids were detected in 27(13.5%) and in 19(70.4%) of this subset, they were localized.

Intrauterine adhesions were seen in 23(11.5%), endometrial polyp in 1(0.5%) and endometrial hyperplasia in 0(0%). With HSG, tubal occlusion was seen in 63(31.5%), peritubal adhesions in 34(17%), hydrosalpinges in 5(2.5%) and loculated spill in 7(3.5%). None of these were seen with TAUS. With TAUS adnexal masses were in 12(6%) and with HSG they were

demonstrated in 2(1%). There was significant difference between TAUS and HSG findings with regard to detection of fibroids, localization of fibroids, detection of tubal lesions and detection of adnexal lesions.

**Conclusion:** The two modalities played important complementary roles since TAUS was able to detect more lesions on the wall of the uterus and in the adnexae, while HSG was able to detect more intracavitary and tubal lesions. The combined study is recommended especially in a poor resource economy where other more sensitive modalities are neither available nor affordable.

**Keywords:** *Hysterosalpingography, Ultrasonography, Fibroids, Intrauterine adhesions, Endometrial hyperplasia*

## INTRODUCTION

Infertility is a major challenge facing women of childbearing age especially in the low and medium income countries.<sup>1,2,3</sup> It has a profound psychological impact and can lead to marital disharmony, physical abuse, neglect, and divorce.<sup>1,2,3</sup> The rate of infertility is 5-15% in the high income countries, and 10-20% in tropical Africa.<sup>4,5,6</sup> The prevalence also varies, with an overall median prevalence of 9%.<sup>7</sup>

The uterus plays a vital role in female infertility and can be readily examined radiologically with transabdominal ultrasonography (TAUS) and hysterosalpingography (HSG). The two modalities are affordable and readily available in our environment but are often used independently to assess the uterus in infertile women. Ultrasonography (transabdominal or transvaginal) is the mainstay of imaging of the pelvis, and is accepted as the primary imaging technique for examining the female pelvis, but transvaginal sonography (TVS) is more difficult to learn and may not be readily available in a developing nation.<sup>8,9,10,11</sup> Transvaginal sonography may also not be readily acceptable to patients.

Three dimensional ultrasound (3-D US) and magnetic resonance imaging (MRI) are more modern techniques of more diagnostic accuracy in assessment of uterine lesions, but are costly and not readily available in a developing nation.<sup>12,13</sup>

The TAUS features of fibroids include, round or oval, well defined hypoechoic masses within the uterine body with recurrent shadowing or isoechoic, hyperechoic or heterogeneous masses with degenerative changes.<sup>8,9,14</sup> Adenomyoma/adenomyosis can be differentiated from fibroids by its appearance as a less well defined area of heterogeneity with no recurrent shadowing effect.<sup>8,15</sup>

On HSG, submucosal myoma can appear as a smooth or irregular, single or multiple, small or large filling defects seen clearly during early filling of the uterine cavity which fill up in later films, and enlargement of the uterine cavity.<sup>9,16,17</sup> Possible differentials of small intrauterine filling defects include air bubbles, and endometrial polyps.<sup>17</sup> However, repositioning the patient or aspiration and refilling of the uterine cavity helps to resolve the problems with air bubbles.<sup>17</sup> Submucosal myomas usually alter uterine contour and size,

whereas polyps usually appear as small sharply marginated filling defects in an otherwise normal uterine cavity.<sup>16,17</sup> Uterine cavity enlargement is a reliable sign of the presence of a myoma on HSG, but it may not indicate its exact location unless there is an accompanying indentation of the wall or a filling defect.<sup>9,16,17</sup>

Intrauterine adhesions are poorly demonstrated by TAUS but present on HSG as irregular linear filling defects in the cervical canal and uterine cavity.<sup>16,18</sup> There may also be reduction in size, or distortion of the shape and orientation of the uterine cavity.

Since TAUS and HSG are commonly used independently to examine these women in our environment, a concurrent study using the two modalities might reveal their important complementary roles in detecting uterine and adnexal lesions.

#### METHODOLOGY

This is a paired group analytical observational study of 200 women with infertility, each subject acting as a control, carried out over an interval of six months (September 2011 to February 2012). It was carried out simultaneously at the department of Radiation Medicine of the University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu state and Hansa Clinics (a radiology centre located in Enugu). Ethical clearance was obtained from the University of Nigeria Hospital Research Ethics Committee prior to the study.

Subjects were women with history of infertility booked for HSG or for both HSG and TAUS who gave their consent to be included for the study. They were recruited in a consecutive pattern. Patients that were booked for other reasons than infertility or who did not give their consent were excluded.

Hysterosalpingography was booked in compliance to the 10 day rule. Transabdominal ultrasound was carried out on the same day but before HSG so as to avoid misinterpreting contrast spill into the peritoneal cavity during HSG procedure as pathological fluid collection when examining with TAUS.

Each day every subject was assigned a particular number for both procedures. The TAUS were performed and reported by a radiologist while the HSG were performed and reported jointly by two radiologists without referring to the TAUS report.

For TAUS, each subject was instructed to drink water about thirty minutes to one hour before the exam so as to achieve full bladder and create acoustic window for easy visualisation of the uterus. A clear water-based gel was applied over the pelvic area for acoustic coupling, B-mode transabdominal scan was performed on each subject and real-time information were obtained in both transverse and sagittal planes. Relevant images were also acquired.

The machine used for the TAUS was Aloka SSD-550 manufactured by Aloka, Japan 1995. It was fitted with a curvilinear probe of 3.5-5.0MHz frequency and has B-mode as well as Doppler facilities.

Before HSG, each subject was counselled. Antispasmodic agent was administered when necessary. Subject was then placed in lithotomy position and under aseptic condition, Cusco's speculum was introduced into the vagina, anterior lip of the cervix held firmly in place with a vulsellum forceps and uterus was sounded.

Appropriate size Leech-Wilkinson's cannula was inserted into the cervical canal and about 5-60ml of water soluble contrast medium,

sodium diatrizoate/meglumine diatrizoate 76% (Urografin 76%) was slowly injected into the uterine cavity through the cannula. Because of non-availability of functional fluoroscopy machine, injection was done in stages to demonstrate the cervical canal, uterine cavity, fallopian tubes and peritoneal spill. Films were taken at breath-holding and in anterioposterior projection. The images were acquired with screen-film combination and processed manually.

The numbers earlier assigned to them were used to identify the corresponding subjects for data entry and analysis.

The Statistical Package for the Social Sciences (SPSS) version 21.0 by IBM Corp. Armonk, New York, USA was used for the analyses. Frequency tables and charts, measures of central tendencies, measures of dispersion as well as McNemar’s test for differences were performed.  $P \leq 0.05$  was considered statistically significant. Cases of missing data or data outliers were not included in the analyses.

**RESULTS**

A total of 200 subjects were studied. The age range was 20-49 years with mean of  $33.1 \pm 5.6$  years. As seen in Table 1, lesions that were

located on the uterine wall such as fibroids and endometrial hyperplasia were detected more with TAUS while intracavitary lesions such as intrauterine adhesions were detected in higher frequency with HSG.

Uterine fibroids were the most common lesions seen with both modalities. With TAUS, they were seen in 39(19.5%) of the study population and with HSG they were seen in 27(13.5%). Table 2 shows localization of the fibroids. The locations were identified in 37(94.9%) of the 39 subjects with TAUS diagnosis of fibroids and in 19(70.4%) of the 27 subjects with HSG. With TAUS, the locations in decreasing frequencies were intramural, subserosal, and submucosal; while with HSG, the locations in decreasing order of frequencies were intramural, submucosal and subserosal.

Both modalities detected submucosal fibroids in equal frequencies but TAUS detected intramural and subserosal fibroids in higher frequencies than HSG. McNemar’s test showed significant differences between TAUS and HSG findings with regards to detection ( $p = 0.004$ ) and localization of fibroids ( $p = 0.001$ ).

With HSG, intrauterine adhesions were detected in 23(11.5%) of the subjects, none was seen in TAUS (see Table 1).

**Table 1.** Findings on uterine, tubal and adnexal evaluation with TAUS and HSG

Findings	TAUS		HSG	
	Frequency	Percentage	Frequency	Percentage
Fibroids	39	19.5	27	13.5
Intrauterine adhesions	0	0.0	23	11.5
Polyps	1	0.5	1	0.5
Endometrial hyperplasia	2	1.0	0	0.0
Tubal occlusion	0	0.0	63	31.5
Hydrosalpinges	0	0.0	5	2.5
Loculated spill	0	0.0	7	3.5
Adnexal masses	12	6.0	1	0.5

**Table 2.** Localization of uterine fibroids with TAUS and HSG

Location	Frequency	
	TAUS	HSG
Submucosal	5	5
Intramural	20	10
Subserosal	10	4
Intramural and Subserosal	2	0
Not able to localize	2	8
<b>Total</b>	<b>39</b>	<b>27</b>

Endometrial polyp was detected in 1(0.5%) of the subjects with each of the modalities. Endometrial hyperplasia was detected with TAUS in 2(1%) of the subjects, HSG detected none. No Mullerian duct anomaly was detected with any of the modalities.

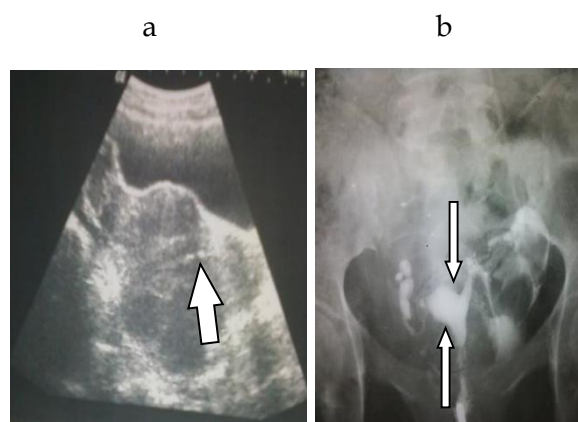
Tubal lesions and tubal associated lesions seen with HSG included tubal occlusion 63(31.5%), peritubal adhesions 34(17%), hydrosalpinges 5(2.5%) and loculated spill 7(3.5). None of these were seen with TAUS. With TAUS adnexal masses were in 12(6%) of the subjects and with HSG they were demonstrated in 2(1%). There were significant differences between TAUS and HSG with regards to the tubal and adnexal findings ( $p = 0.001$ , and  $p = 0.002$  respectively).

**DISCUSSION**

In this study, TAUS and HSG played important complementary roles in the detection of uterine, tubal and adnexal lesions which are useful in female infertility work-up. The 20-49 years' age range of the subjects in the study reflected the active reproductive age of women in this environment. It fairly compared with the 21-45 years' age range reported by Malek *et al.* and 19-53 years reported by Udobi and Aronu.<sup>19,20</sup> Ibinaiye *et al.* in Zaria reported an age range of 18-40 years and Danfulani *et al.*

in Sokoto reported 17-40 age range.<sup>21,22</sup> The low minimum ages in the later cases might be due to religious and cultural background.

**Figure 1.** (a) TAUS and (b) HSG evaluation of the uterus for fibroids in the same subject. TAUS shows distinct intramural masses that can be numbered and measured. The endometrial echo (thick arrow) is well visualized. HSG shows distorted uterine cavity with multiple indentations due to fibroids (thin arrows), the outline of the masses is not distinct.



The TAUS finding of uterine fibroids in 19.5% of our subjects is slightly higher than 18.6% reported in India by Duta and Guha in the pelvic US of women with infertility.<sup>3</sup> With HSG, fibroids were the commonest uterine lesions in this study. Imo and Adeoye similarly noted uterine fibroids as the leading uterine abnormality with HSG.<sup>23</sup> The frequency of fibroids in the study which was 13.5%, was similar to 14% obtained by Nwankwo and Akani; higher than 9.5% noted by Ibinaiye *et al.*<sup>21,24</sup> but lower than that reported by Abasiattai *et al.*<sup>1</sup> Anyanwu and Agwuna,<sup>25</sup> and Eze *et al.*<sup>26</sup>

In this study, TAUS detected higher frequency of fibroids than HSG. In concordance with this finding, Philips *et al.* noted higher frequency of fibroids with TVS than HSG.<sup>27</sup> This indicates

that ultrasonography, whether carried out with the transvaginal approach as in TVS or transabdominal approach as in TAUS, is more sensitive than HSG at evaluating the uterus for fibroids.

Due to direct view of the uterus and its contents with TAUS, it proved very useful in uterine evaluation by allowing localization, enumeration, characterization and measurement of uterine masses as well as detection of their effects on the uterus (See figure 1). On the other hand, HSG evaluation of the uterus for fibroids and other masses was based on the effects of the masses on the uterine cavity and such effects include filling defects, indentation, displacement, enlargement, and bowing. This neither allowed precise localization and measurement of their sizes nor clear distinction of such lesions from other pelvic masses. In keeping with the above observations, Begum and Khan opined that ultrasonography is the simplest and effective diagnostic tool as well as the most useful confirmatory method with regards to fibroids.<sup>28</sup>

The finding of intrauterine adhesions in 11.5% of our subjects is higher than the 7% recorded by Eze *et al.* but smaller than the 12.8% documented by Nwankwo and Akani.<sup>24,26</sup> This study found HSG more sensitive than TAUS with regard to detection of intrauterine adhesions which are intracavitary lesions. The usefulness of HSG in the evaluation of uterine adhesions is supported by the study carried out by Omelu *et al.* which noted that both HSG and hysteroscopy were effective in evaluating intrauterine adhesions.<sup>29</sup> Since women with intrauterine adhesions commonly present with

while HSG could detect more intracavitary lesions and tubal lesions. Hence the two

infertility, HSG proved invaluable in the evaluation of the uterus in this respect.<sup>30,31</sup>

Extra-uterine findings like tubal associated lesions and adnexal lesions in the study are not further discussed as the study seeks to emphasize the uterine findings.

The presence of significant difference between TAUS and HSG findings as seen in this study with regard to the detection of intrauterine adhesions on the one hand, and the detection and localization of fibroids on the other hand, shows that HSG or TAUS alone has obvious limitations in the assessment of the uterus in these subjects. The detection of tubal lesions with HSG which are missed by TAUS and the detection of significantly more number of adnexal masses with TAUS than HSG, further shows that in tubal and adnexal evaluation of the subjects each of these modalities has obvious limitation which can be overcome by concurrently performing the two studies in the evaluation of women with infertility. This complementary study will be a more effective and realistic approach in a low and medium income countries.

The availability and affordability of both studies in developing countries make it advisable to use the combined studies in female infertility work-up .

This study is limited by non-availability of functional fluoroscopy machine and transvaginal ultrasound machine both of which would help in a better demonstration of the uterus and adnexae.

#### CONCLUSION

This study has shown that TAUS could detect more lesions on the uterine wall and adnexae

modalities play important complementary roles in the evaluation of the uterus and

adnexae among women with infertility. The combination of the two procedures should therefore be encouraged in investigating women with infertility, especially in low and medium income countries where more modern and more sensitive facilities like 3-D ultrasound and MRI may not be available or accessible.

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