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Original Article

Transabdominal Vs Transvaginal Sonography - Comparison in Pelvic Pathologies

Manal Niazi[1], Mahjabeen Mahmood Kamal[2], Naushaba Malik[1], Muhammad Ashraf Farooq[1],Neelum Wahid[1]
1.Department of Radiology, Islamabad Medical and Dental College,Islamabad;2.Department of Radiology ,KRL Hospital Islamabad

Abstract

Background: To compare and find diagnostic accuracy and efficacy of trans-vaginal and trans-abdominal sonographic techniques in female pelvic pathologies and to compare both the procedures against the gold standard of biopsy.

Methods: In this comparative study two hundred patients with clinical evidence of pelvic disease of gynaecologic origin and patients with suspected ectopic pregnancy already planned to undergo surgery and/or biopsy were included. Trans-abdominal ultrasounds and trans-vaginal ultrasounds were performed by different radiologists. Uterus, adnexa and ovaries were viewed in sagittal, transverse and oblique views. The endovaginal transducer was sheathed in a condom into which a small amount of ultrasound gel had been placed. Biopsy being the gold standard was done on all the patients. The information provided by TAS, TVS and biopsy was categorized as: (+)Disease Positive and (-)Disease Negative. Sensitivity, specificity and predictive value of both the tests were calculated. Chi-square test was used to compare sensitivity of TVS and TAS. Student t-test was used to compare the difference between TAS and TVS for size of pelvic masses.

Results: Trans-vaginal sonography (TVS) had sensitivity of 96%, specificity of 89%, positive predictive value of 97%, negative predictive value of 84%. Trans-abdominal sonography (TAS) had sensitivity of 91%, specificity of 83%, positive predictive value of 96%, negative predictive value of 68%. The comparison between the two tests was statistically significant ($p<0.05$). On the basis of image quality TVS was superior in 62%, equal in 30% and inferior in 08% of cases as compared to TAS.

Conclusion: Trans-vaginal sonography is more sensitive and specific than trans-abdominal sonography.

Key Words: Trans-abdominal sonography, Trans-vaginal sonography,

Introduction

Ultrasound is the initial and a well-recognized method of imaging for pelvic pathologies[1]. The current methods of pelvic sonography in use are trans-abdominal sonography (TAS) and trans-vaginal sonography (TVS). In TAS uterus and ovaries are visualized by using 3-5MHz transducer at a depth of 10-15cm through full urinary bladder, which acts as an acoustic window whereas with TVS, same structures are visualized at a depth of 1-8cm by 5-7MHz transducer, which does not require a full urinary bladder. TVS unquestionably provides excellent depiction of pelvic organs.[2] The TVS has proved useful in the investigation of pelvic pathologies,size and internal texture of pelvic masses, myometrial and endometrial status, polycystic ovaries, suspected cases of ectopic pregnancy, infertility (follicular monitoring and endometrial studies),endometriosis and staging of gynaecological malignancies.[3-6]

TAS provides an overview of both normal structures and pathological lesions. It is particularly useful in defining the full extent when large masses or fluid collections are present.[7] TVS is superior in obese patients,in patients with retroverted uterus , it also bypasses obstacles such as gas filled bowel and extensive pelvic adhesions and there is no need for the patient to have uncomfortably full bladder as in TAS.[8] Evaluation of soft markers (e.g the degree of ovarian motility , tenderness or obliterated pouch of Douglas) have the potential to improve the diagnostic efficacy of TVS.[9]Both techniques have their limitations. TVS though generally considered superior still has some limitations. The examination may present difficulties depending on social factors, age and marital status of the patient.[10] Patients may refuse TVS by a male doctor. It cannot be carried out in unmarried females and may be quite uncomfortable for the elderly ladies. The use of high frequency transvaginal probe (5-10MHz) provides resolution at the expense of limited

depth penetration, which may fail to show the full extent of large masses or high placed ovaries. There may be some difficulty in interpretation due to altered image orientation.

Patients and Methods

This comparative study was conducted at Punjab Employees Social Security Institute hospital Islamabad. It was carried out from October 2014 till April 2015. Two hundred patients with clinical evidence of pelvic disease of gynaecologic origin and patients with suspected ectopic pregnancy already planned to undergo surgery and/or biopsy were included in the study. All unmarried females, patients unwilling for TVS, patients having non-gynaecologic pelvic diseases,very old debilitated females and who were menstruating at the time of examination were excluded.All the trans-abdominal ultrasounds were carried out by a senior radiologist in radiology department. An optimally distended urinary bladder was ensured before a trans-abdominal ultrasound. Uterus, adnexa and ovaries were viewed in sagittal, transverse and oblique views. Necessary images were obtained.Transvaginal ultrasound was done after the patient had completely emptied the urinary bladder by another consultant radiologist.Theendovaginal transducer was sheathed in a condom[11] into which a small amount of ultrasound gel had been placed. Scanning was done to get appropriate views of the pelvic organs. The transducer was angled during scanning to depict uterus, ovaries and adnexal regions. Transvaginal ultrasound was done with 5-7MHz (triple frequency) transvaginal convex probe.

Biopsy being the gold standard was done on all the patients. The information provided by TAS, TVS and biopsy was categorized as: (+)Disease Positive and (-)Disease Negative Evaluation of the images of TVS and TAS was done and scores were assigned to TVS depending on the extent of diagnostic information provided by the examination techniques. Sensitivity, specificity and predictive value of both the tests were calculated.Mean and standard deviation was computed for quantitative variable. A 2x2 table was used to calculate sensitivity ,specificity ,positive predictive value and negative predictive value of TAS and TVS. Chi-square test was used to compare sensitivity of TVS and TAS. Student t-test was used to compare the difference between TAS and TVS for size of pelvic masses, with level of significance.

Results

Ages of the patients were between 35 to 39 years of age.(n=49).Major clinical indication for a pelvic ultrasound examination was abnormal bleeding per vaginally *n* = 53 (26.5%) followed by primary infertility *n* = 43 (21.5%).As the study population was very heterogeneous so patients were grouped into categories on the basis of biopsy (Table 1).In this study TVS had a sensitivity of 96% and specificity of 89% in comparison with gold standard biopsy.The positive predictive value was 97% and negative predictive value was 84%. TAS had a sensitivity of 91% and specificity of 83% in comparison with biopsy. The positive predictive value was 96% and negative predictive value was 68%.These results showed higher sensitivity and specificity of TVS as compared to the TAS (Table2).

The results of TVS and TAS were compared using Chi-square test of significance and the relationship between the two variables was found to be significant ($p<0.05$). The size of pelvic masses calculated on TAS and TVS were compared using t-test of significance and the difference was found to be insignificant ($p>0.05$).On the basis of better image quality including completeness of anatomical detail, better visualization of internal architecture of the mass and other pelvic structures not significantly affecting the diagnostic outcome,transvaginal image quality was superior in 62% of the cases, gave equal information in 30% of cases and was inferior in 8% of cases.

Table 1: Transabdominal Vs transvaginal ultrasonography for pelvic pathologies-Diagnosis

Diagnosis on Histopathology	No(%)
Normal	36(18)
Fibroid	62(31)
Ovarian cysts/masses	41(20.5)
Adenomyosis	10(5)
Ectopic pregnancy	15(7.5)
Polycystic ovaries	10(5)
Fibroid and ovarian cysts	13 (6.5)
Endometrial hyperplasia	5 (2.5)
Endometrial polyps	6(3)
Tubo-ovarian masses	2(1)

Table 2: Test Performance Characteristics of Transabdominal- sonography and transvaginal-sonography

	TAS*	TVS**
Sensitivity	91%	96%
Specificity	84%	89%
Positive predictive value	96%	97%
Negative predictive	68%	84%

*Trans-abdominal sonography; ** Trans-vaginal sonography

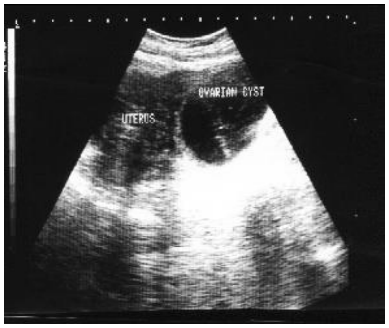

Figure 1: TAS showing an ovarian cyst

Figure2:TVS of the same patient. Comparison of TVS and TAS. Multiple septae clearly seen on TVS are barely seen on TAS.

Discussion

Results of present study showed that the diagnostic outcome of TVS was significantly better than TAS giving better image quality, which provided improved anatomic detail, better visualization of the pelvic structures and more information about the internal texture of mass in majority of patients. This result was in accordance with the study of Leibmanet al[12].Ilyaset al[7]has reported 100% sensitivity and 85% specificity for ultrasound (TAS or TVS) in adnexal masses. Mohsinet al has shown that ultrasound (TAS and TVS combined) has an efficacy of 96.4% in detecting ectopic pregnancy. [4]

Transabdominal ultrasound has been used for the evaluation of female pelvis with good results. Ahmad et al has reported that TAS has an accuracy of 92.6% in pelvic pathology. Our study gave almost similar results TAS showing sensitivity of 91% and specificity of 83%. [6] TVS showed higher sensitivity of 96% and specificity of 89%. This was in accordance with other studies. [1,13-17] Cases in which TVS was considered inferior were having large pelvic mass. In two cases normal ovaries could not be visualized by TVS. These ovaries were placed high and were beyond the focal limits of TVS transducer. Our results were comparable to previous studies. Qureshi et al showed that TVS was superior in 63% of cases, equal in 27% and inferior in 10%.[1]Tessleret al. showed that endovaginal ultrasound was superior in 60.2%, equal in 36.1% and inferior in 3.7%.[13] The difference in proportion of cases with inferior TVS was due to inclusion of some cases having large masses, in our study.

In our study operator bias was avoided by having TVS and TAS independently performed and interpreted by two radiologists. Our study suggested that TAS was better in the evaluation of large pelvic masses. These masses extended beyond the reach of the TVS transducer due to its limited field of view. TAS was found to be better in showing the relations of a large mass with the adjacent pelvic organs giving a panoramic view of the pelvis. TVS was superior in cases of small adnexal masses, which were difficult to be separated from the uterus transabdominally. TVS was superior in two cases of serous cystadenoma, which clearly showed the internal architecture of the mass having multiple septations missed on TAS. It was also superior in preoperative characterization of a case of dermoid cyst in which TAS could not achieve accurate characterization of the mass. This was in accordance to Maher et al[3]. TVS was definitely superior to TAS in cases having polycystic ovaries, and in the evaluation of suspected ectopic pregnancy. Normal endometrium was also seen much better with endovaginal ultrasound. Due to its close proximity to the region of interest TVS transducer showed greater detail in almost all these cases. Our study suggested that in these cases TVS was more useful and could effectively replace TAS. This was in accordance with results reported by Chew et al, Botash et al and Pellegrinl et al, Mascaretti et al.[17-20] Advantages of TVS noted during the study were (a) Due to closeness of the transducer to the pelvic organs, the problems of image deterioration by gas-filled bowel, adhesions or obesity were significantly reduced (b) High frequency probe improved the spatial resolution and image quality . (c) There was no need for bladder filling. (d) The vaginal probe could be used like an examining finger to decide about local tenderness, demonstrate movements of the ovaries and organ of origin of a small pelvic mass.

Limitations of TVS as noted in this study were: (a) Altered image orientation, which posed some problem during the initial weeks. (b) The limited field of view that required use of trans-abdominal approach to provide overall anatomic view especially in the evaluation of large pelvic masses were difficult to see with TVS (c) Inability to image superiorly placed ovaries. (d) The procedure takes more time as compared to TAS. (e) In addition it is not possible to use the technique in cases of intact hymen in

virgins,congenital stenosing vaginal abnormalities or vaginal surgery.(f) Similarly for very old patients the examination can be uncomfortable.

Social and religious implications in our setup need special consideration. In our study only four patients refused the examination. This was similar to Leibman et al who gave excellent patient acceptance with only one virgin patient refusing TVS. [12] In sharp contrast Sohail and Qureshi et al described 27 patients refusing the examination out of 212 patients referred. [1,21] The reason of this difference was that in our study all the TVS were done by a female radiologist. Most of the patients were a little hesitant about the pain before the procedure but when they were assured of having no such problem they were quite comfortable and cooperative. All these factors increased the overall time of the procedure.

Tessler et al has advocated replacing TAS by TVS as an initial examination technique. [13] In the light of our study we recommend using TAS as the initial technique in the routine evaluation of female pelvis. In cases of unclear pelvic pathology TVS in conjunction with TAS should be used. However in cases of suspected ectopic pregnancy, polycystic ovaries and evaluation of endometrium, TVS can effectively replace TAS. While TVS provides better anatomic detail of the individual pelvic organs, TAS gives more information in cases of large pelvic masses, gives a better overall view of the pelvis and is an easy to perform technique.

Conclusion

1.Trans-vaginal sonography is more sensitive and specific than trans-abdominal sonography in the diagnosis of pelvic pathologies.

2. There should be wider utilization of TVS in the examination of female pelvis particularly when visualization of the ovaries is suboptimal on trans-abdominal scans and also for better characterization of pathology seen on trans-abdominal scans.

3.TAS should be used as the initial technique in the routine evaluation of female pelvis .TVS can replace TAS in cases of suspected polycystic ovaries, ectopic pregnancy and in the evaluation of endometrium.

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