The Value of Transabdominal Sonography in the Diagnosis and Management of Pelvic Inflammatory Disease

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ABSTRACT

Purpose: To determine the clinical utility of transabdominal sonography (TAS) in the diagnosis of pelvic inflammatory disease (PID) in the locality.

Methods: In a prospective study of four radiodiagnostic centres in Lagos, South West Nigeria, the sonography reports of 105 women of child-bearing age referred for pelvic ultrasound scan that met the minimum ultrasound marker for (PID) were analyzed. The sonographic findings were matched against reports of microbiological culture of high vaginal swab (HVS) specimen which was used as a gold standard. The sensitivity, accuracy, specificity and positive and negative predictive values were calculated using Bayes Theorem.

Results: The commonest sonographic feature consistent with PID demonstrated by the study is significant fluid in the punch of Douglas. The sensitivity for diagnosing PID with TAS is 90% (N = 98). The specificity 73% (N == 34) and accuracy 84% (N= 88). The prevalence is 60% for the locality and the positive predictive value is 89% while the negative predictive value is 83%.

Conclusion: Based on the high sensitivity and accuracy of TAS established by this study, we recommend its routine use in the diagnosis and management of PID as a quick and cost-saving diagnostic tool.

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INTRODUCTION

Pelvic inflammatory disease (PID) is an infection which spreads from the uterine tubes and ovaries to the entire, pelvic floor due commonly to gonorrhea or chlamydia. However, streptococcal infection has also been implicated.[1] Among the common predisposing factors are sexually transmitted infections (STI), foreign bodies such as intrauterine contraceptive devices (IUCD), and non-sterile instrumentation, for example, during septic abortion.

Clinical findings include, pain, bilateral adnexal tenderness, pyrexia, purulent vaginal discharge, itching and lencocytosis.[2] The risk of acquiring PID is associated with high prevalence of sexually transmitted diseases (STD), complications of unsafe abortion and post abortion infection.[3] The increased incidence of PID noted in the locality,[4] poses serious health problems as it may lead to increased cases of infertility, ectopic pregnancy and maternal mortality and morbidity.

Early and precise diagnosis of this condition is important if the complications and long-term effects are to be avoided.

Clinical diagnosis has been noted to be associated with high degree of error as symptoms are not constant.[2] The use of microbiological test is expensive and results take time to be available for necessary intervention.

This study is therefore aimed at investigating the value of sonography a new entrant to diagnostic tools in the diagnosis of this condition because of its availability and cost.

MATERIALS AND METHODS

105 non-pregnant females of child-bearing age who were referred for abdomino-pelvic sonography at four Radiology Centres in Lagos mainland from January 2005 to May, 2006 were enlisted. Only those patients who met the centre for Disease Control and Prevention minimal criteria for acute PID or those referred for non-classic clinical signs were eventually included and simultaneously sent for high vaginal swab (HVS) specimen culture.

With a full-bladder providing acoustic window, each patient was scanned transabdominally, using a Sonoline SL 2 medical ultrasound unit manufactured by Siemens. The sonographic features consistent with PID according to Boardmax et al[3] were noted in the longitudinal and transverse scans.

The diagnostic yield of TAS for PID was obtained by noting all cases that had positive sonographic markers for PID. The sonographic features were then matched with the laboratory findings in terms of microbial growth. Bayes theorem was used to calculate the sensitivity, accuracy, specificity and positive and negative predictive values.

RESULTS

Table 1 shows the age distribution of the participants. Females within 25 years – 39 years (mean of 30.4years) reported most with clinical symptoms of PID.

From Table 2, the commonest ultrasound feature in PID was significant fluid in the pouch of Douglas accounting for 49.5% (N = 52). The commonest reason for ultrasound referrals is infertility and the diagnostic yield of TAS for PID is 95% (N = 100) as shown in Table 2.

Table 3 shows that the commonest organisms involved in the infection are coliform SPP and streptococcus accounting for 43.8%, (N = 46).

Using the laboratory result as gold standard for the detection of PID table 4 presents the signal detection scores for TAS. Applying the Baye's Theorem, the accuracy and sensitivity of TAS in detecting PID are 89% and 90% respectively whereas the specificity and prevalence are 73% and 60% respectively.

DISCUSSION

Early diagnosis and treatment of PID particularly among women of child-bearing age are essential to prevent further sequalae including infertility, ectopic pregnancy and chronic pelvic pain. In this locality, PID is diagnosed either by clinical impression or microbiological culture of high vaginal swab (HVS) specimen. However, clinical diagnosis has been shown to have high error as symptoms are not constant. Although clinical and laboratory criteria are traditionally used to judge the clinical severity, these criteria also have low predictive value and are not reliable in the individual patient.[4]

From this study, the highest number of subjects referred for sonography for symptoms related to PID were those within the age range of twenties and thirties. (Table I) with a mean age of 30 years. This is the sexually active group and these findings confirm earlier studies that the incidence of PID is higher among the sexually active.[5,6]

The commonest sonographic feature that is positive for PID in this study is fluid/pus in the pouch of Douglas which was present in 52 subjects and represent 49.5% of the total population.

Boardman et al[6] also noted fluid in the pouch of Douglas in addition to discrete tubes with or without tubal fluid, multicystic ovaries and adnexal masses as common sonographic features associated with PID.[7]

The clinical presentations that had the highest yields for PID were infertility and lower abdominal pain as shown in Table 2.

Only in 11 out of a total of 105 subjects did the referring physician actually suspect PID. These findings are similar to experiences in Ghana[8] where most physicians are not aware of the diagnostic utility of sonography for PID. The high yield for PID from clinical impressions of infertility also confirm the imprecision and lack of any clinical signs in PID which lead to a delay in diagnosis until such women consult for infertility problems.[3] It is also possible that the patients report late probably after self-medication or consulting unqualified practitioners without improvement of condition. Most of the findings in terms of positive sonographic markers for PID are incidental as the referring physician never suspected it. Thus, sonography is able to reveal pathologies that are clinically occult. When complemented by laboratory tests can increase the specificity in the choice of treatment options.

Common microbial organisms isolated from the HVS specimen were coliform SPP, staphyloecus aureus and Candidas as shown in Table 3. The findings differ from those of Paavouen et al[7] that were predominantly Niesseria gonorrhoea or Chlamydia trachomatis. However, failure to isolate Chlamydia may be in keeping with previous observations that it does not readily grow on culture. The sonographic features were however not specific for any microbal infestation. Laboratory tests have the advantage of identifying the causative organism but sonography on the other hand reveals the extent of damage and effects on surrounding tissues. For example, sonography identified associated features like

tubovarian abscess (TOA), hydrosalpinx and ectopic pregnancy as shown in Table 2.

Using the microbiological culture result as gold standard for the presence of infection and active inflammatory process, the application of Baye's theorem for signal detection of sonography yielded an accuracy of 82% and sensitivity of 89%. Its positive predictive value (PPV) is 89% and its negative predictive value is 83% whereas its specificity is 20%. The low specificity necessitates a complimentary laboratory test to identify the causative micro-organism to enable a more specific chemotherapy to be instituted. With a sensitivity of 89%, sonography can be used to first identify cases that may require laboratory confirmation and isolation of causative organisms.

Table 1:
Age Distribution of Participants

Age (years)	Frequency
15 – 19	11
20 – 24	14
25 – 29	23
30 – 34	23
35 – 39	22
40 – 44	7
45 – 49	5
Total	105

Table 2: ULTRASOUND FINDINGS MATCHED WITH CLINICAL PROVISIONAL DIAGNOSIS

Clinical Impression

Ultrasound finding	Infertility ?cause	?cyesis	Lower abdominal pain	?fibroid	amenorrhoea	R/O PID	Scanty Menstruation	Routine	Irregular Menstruation	?Ectopic gestation	Adnexal/ovarian Mass	Others	Total %
Fluid in POD	20	1	17	1	2	2	2	4	1	–	–	2	52(49.5)
TOA	1	1	1	–	1	–	–	–	–	–	–	–	4(3.8)
Endometritis	1	–	–	–	–	–	1	–	1	–	–	–	3(2.8)
Hydrosalpinx /pyosalpinx	2	–	–	–	–	–	–	–	–	–	1	–	3(2.8)
Ovarian/ Adnexal cysts	1	–	1	–	–	–	–	–	–	–	1	–	3(2.8)
Oophoritis/ Adenitis	2	–	–	–	–	–	–	–	–	–	–	–	2(1.9)
Ruptured ectopic with haematocoele	–	–	1	–	–	–	–	–	–	–	–	–	1(0.9)
Perforated uterus	–	–	–	–	–	–	–	–	–	1	–	–	1(0.9)
Uterine fibroid	–	–	–	3	–	–	–	–	–	–	–	–	3(2.8)
Non-specific finding	4	5	3	5	1	5	–	–	1	1	3	–	28(26.7)
Normal	1	–	–	–	–	4	–	–	–	–	–	–	5(4.8)
Total	**32**	**7**	**23**	**9**	**4**	**11**	**3**	**4**	**3**	**2**	**5**	**2**	**105**

Table 3: MATCHINGS SPECIFIC ULTRASOUND FINDINGS WITH LABORATORY REPORT

Lab Findings

Ultra-Sound finding	E. Coli	Leucocytosis + pus cells	Staphylococcus Aureus	Coliform SPP Candida	Staphylococcus Candida	Staphylococcus	Klebissiela + Candida	No growth	Non specific finding	Total
Fluid/pus In POD	3	1	3	16	9	3	1	6	-	47
TOA	-	1	1	–	1	–	–	1	–	4
Hydro-salpinx /pyosal-pinx	1	–	–	–	–	–	–	1	1	3
Adnexal Ovarian/ Cyst Oophoritis	1	–	1	1	1	–	–	1	–	5
Endome-tris	-	–	1	2	–	–	–	–	1	4
Rupture ectopic + haema-tocoele	–	–	1	–	1	–	–	–	–	2
Perfo-rated uterus	–	–	–	–	–	–	–	1	–	1
Normal Scan	–	–	–	2	1	–	1	1	–	5
Non-specific finding	-	-	-	-	-	-	-	–	35	35
Total	**5**	**2**	**12**	**21**	**2**	**3**	**2**	**11**	**37**	**105**

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Table 4a. Sonographic Detection of PID compared with Laboratory result as gold standard

Laboratory report	89 Positive gold standard	11 Negative gold standard
Sonography	85 True positive (TP)	10 False positive (FP)
	4 False negative (FN)	1 True negative (TN)

b)   Signal Scores: Sensitivity   =   89%
Accuracy   =   82%
Specificity   =   20%
Positive Predictive Value (PPV)   =   84%
Negative Predictive Value (NPV)   =   83%

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