The Role of Transrectal Power Doppler Ultrasonography in the Detection of Prostate Cancer

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Objective. This study aimed to evaluate the clinical utility of power Doppler ultrasonography (PDUS) in the detection of prostate cancer and determine its predictive ability compared to digital rectal examination, serum PSA levels and gray-scale transrectal ultrasonography, using biopsy as the reference standard.

Materials and Methods. This is a prospective cross-sectional study of 100 consecutive patients, who underwent prostate needle biopsies at the National Kidney and Transplant Institute. All patients were seen at the Out-patient Department, suspected of having prostate cancer because of abnormally high serum PSA levels (>4 ng/ml) and/or abnormal digital rectal examination. Patients previously diagnosed with prostate cancer were excluded in the study. All patients underwent gray-scale TRUS before power Doppler imaging of the prostate using the Siemens Sonoline Elegra high resolution digital ultrasound with a 6.5 MHz endocavitary probe. After power Doppler imaging, a systematic 12-core and lesion-directed TRUS-guided biopsy of the prostate was performed.

Results. A total of 100 patients (mean age 65, SD 7, range 41-83) were included in this study. Prostate needle biopsy confirmed 37 prostate cancer cases. Of the 37 patients diagnosed with prostate cancer, 18 had an abnormal DRE, 26 had abnormal TRUS findings, and 14 had positive power Doppler flow. PDUS has a positive predictive value of 66.7% and a specificity of 88.9%. Logistic regression analysis with the odds ratio computed at 95% C.I. showed that the probability of having prostate cancer when DRE is positive, PSA is elevated, hypoechoic lesion is present on Gray-scale TRUS and hypervascularity of the peripheral zone is present on PDUS are significantly higher than if all of these tests were negative with PDUS in combination with DRE showing the highest predictive ability for prostate cancer.

Conclusion. Power Doppler imaging increases the specificity and positive predictive value of Gray-scale transrectal ultrasound in prostate cancer detection. The addition of PDUS to the screening tool of digital rectal exam increases the probability of the patient having cancer when both tests are positive, thus increasing its predictive power.

Key words: prostate cancer, power Doppler ultrasonography, Gray-scale ultrasonography

Introduction

Prostate cancer has the highest incidence rate and second highest mortality rate among American men.1 It is the fourth most common male malignant neoplasm worldwide.2 Mortality rate has been decreasing at ~4% per year since 1994 while incidence rate has been increasing at ~2% per year since 1995.1 In the Philippines, prostate has been the 3rd leading cancer site in men since 1980.3

The detection of prostate cancer is based on the “diagnostic triad” of digital rectal examination (DRE), serum prostate specific antigen (PSA), and gray-scale transrectal ultrasound of the prostate (TRUS).4,5,7
Previous studies have shown that the combined use of these three examinations improves the detection of prostate cancer. The most easily recognized feature of prostatic cancer in TRUS is the hypoechoic area. However, a hypoechoic lesion is malignant in 17 to 57 percent of cases highlighting the need to biopsy these lesions but recognizing they are not pathognomonic for cancer. Moreover, some tumors are isoechoic (39%) and a few may even be hyperechoic (1%), thus decreasing the specificity of TRUS. To improve lesion detection and differentiation with TRUS, investigators have sought additional features to detect the presence of cancer such as loss of natural boundaries, bulging or contour abnormalities and finally increased color-coded flow with the use of the color Doppler ultrasonography (CDUS). Investigators have reported that color-flow signal intensity is generally low or absent in the normal prostate gland and that focal hypervascularity in the peripheral zone should alert the examiner that a malignant lesion could be present, regardless of its morphological appearance. However, the blood flow in prostatic tumors is often insufficient to allow detection by CDUS. With the advent of power Doppler ultrasonography (PDUS), which displays the integrated power of the Doppler signal instead of its mean Doppler shift, has significantly improved the ability to detect lower-speed blood flow or in small and weak tumor vessels compared with CDUS. Thus, PDUS could be a useful tool to improve the diagnostic yield of small malignant prostate tumors or to evaluate patients with prostate lesions that appear unclear on gray-scale TRUS. Several studies done in the U.S., Turkey and Japan have provided with promising results with the use of PDUS in prostate cancer detection. This study is undertaken to reaffirm existing studies and generate information on the use of PDUS in the diagnosis of prostate cancer in the local setting.

This study aimed to evaluate the clinical utility of power Doppler ultrasonography (PDUS) in the detection of prostate cancer. Specifically, this study aimed: a) to compare the clinical characteristics of patients with and without prostate cancer; b) to compare the sensitivity, specificity, positive and negative predictive values of digital rectal examination (DRE), prostate specific antigen (PSA), gray-scale ultrasound and power Doppler ultrasound; and c) to compare the probability of prostate cancer between PSA, gray scale ultrasound and power Doppler ultrasound in patients with positive DRE.

**Materials and Methods**

This is a prospective cross-sectional study of 100 consecutive patients (mean age 65, SD 7, range 41-83), who underwent prostate needle biopsies at the National Kidney and Transplant Institute. All patients were seen at the Out-patient Department, suspected of having prostate cancer because of abnormally high serum PSA levels (>4 ng/ml) and/or abnormal digital rectal examination. A chemiluminescent enzyme immunoassay was used to estimate PSA. Patients previously diagnosed with prostate cancer were excluded in the study.

Patients were given oral quinolone and metronidazole 1 day before the procedure and continued for 1 week. Bowel preparation the night prior to the procedure was likewise done. All biopsies were done under local anesthesia with the application of xylocaine jelly.

All patients underwent gray-scale TRUS before power Doppler imaging of the entire prostate gland in the sagittal and transverse planes. Imaging was performed by a single sonologist using the Siemens Sonoline Elegra high resolution digital ultrasound with a 6.5 MHz endocavitary probe, with the patient in the left lateral decubitus position. The size and weight of the gland were calculated from the anteroposterior, transverse and cephalocaudal measurement (0.52 x D1 x D2 x D3). Written informed consent was obtained from all patients before the procedure.

Gray-scale TRUS was performed first. Hypoechoic lesions in the peripheral zone as well as any nodule present were labeled as positive. Patients with no abnormality suspicious of malignancy on TRUS were labeled negative.

Power Doppler imaging (PDI) was then performed using the same ultrasound system as for conventional TRUS. Images were documented on film. Power settings were optimized to detect slow flow; the pulse repetition frequency (PRF) set at 868 Hz. The power Doppler gain was set to a point just below the threshold, so that blood flow could be identified with the least background noise. The power flow signal from any area of abnormal gray-scale appearance was documented. If no gray-scale abnormality was seen, power Doppler imaging was then used to screen the gland for areas of abnormal vascularity in the peripheral zone. The presence of any accumulation of power Doppler flow signals was considered positive.

After PDI, biopsy was performed with an 18-gauge automatic core-biopsy needle by the same operator under TRUS guidance. All patients underwent systematic 12-core biopsies. For gray-scale TRUS-positive cases, additional biopsy was targeted at the lesion in question. Two passes were made. In PDI-positive, gray-scale TRUS-negative cases, biopsy was targeted at the region of abnormal color stain. Specimens were inspected visually for adequacy of tissue core and placed in formalin. Specimens taken from all focal lesions were placed in individual containers as well as those taken from the 12-core biopsy (6 taken from each lobe of the prostate). Bottles were labeled numerically and were arbitrarily assigned as right prostate gland, left prostate gland, and suspicious lesion/s. Each site was interpreted.
Descriptive analysis was done by computing means and standard deviation for quantitative variables and frequencies and percentages for qualitative variables. T test for unpaired samples was done to determine differences between quantitative variables. The chi square test was used to determine differences between qualitative variables.

Sensitivity, specificity, positive and negative predictive values were computed to determine the validity of the diagnostic tests.

A logistic regression model was made to determine the odds ratio with their corresponding confidence intervals and ß coefficient of the different combination of diagnostic tests. The probability of disease was computed using the logistic regression model.

Stata 10 was used in all statistical calculations. A p value <0.05 was considered significant.

Results

A total of 100 patients were included in the study with 37 patients having prostate cancer and 63 patients were negative for malignancy (Table 1). The mean age and PSA level of patients with cancer was significantly (P=0.0006) higher compared to those patients without cancer.

The distribution of DRE results in the patients was significantly (P=0.01) different. More patients had normal DRE results among those who had no prostate cancer. PSA results were also significantly (P=0.001) different between the two groups. The proportion of patients who had very high PSA also had prostate cancer by histopathology.

The distribution of gray scale ultrasound result was also significantly (P<0.0001) different between the two groups. The proportion of patients who tested positive for the test had prostate cancer and the proportion of patients who tested negative for the test did not have prostate cancer were high. Likewise, the proportion of patients who were tested for power Doppler ultrasound was also significantly (P=0.002) different between the two groups. There were more patients who tested negative for power Doppler ultrasound and did not have prostate cancer.

The validity of the different diagnostic tests for prostate cancer is shown in Table 2. The sensitivity is highest for PSA (4 ng/ml cut off) and lowest for DRE. On the other hand, specificity was highest for power Doppler ultrasound and lowest for PSA (4 ng/ml cut off). The positive predictive value was highest for the power Doppler ultrasound and lowest for PSA (4 ng/ml cut off) while the highest negative predictive value was highest for PSA (4 ng/ml cut off) and lowest for power Doppler ultrasound.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Prostate cancer</th>
<th>No prostate cancer</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>N = 37</td>
<td>N = 63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>68.2</td>
<td>63.3</td>
<td>0.0006</td>
</tr>
<tr>
<td>PSA (ng/ml)</td>
<td>105.2</td>
<td>14.5</td>
<td>0.0001</td>
</tr>
<tr>
<td>DRE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>18 (48.6)</td>
<td>15 (23.8)</td>
<td>0.01</td>
</tr>
<tr>
<td>Negative</td>
<td>19 (51.6)</td>
<td>48 (76.2)</td>
<td></td>
</tr>
<tr>
<td>PSA Low risk (PSA &lt;4 ng/ml)</td>
<td>0</td>
<td>7 (11.1)</td>
<td>0.001</td>
</tr>
<tr>
<td>Intermediate risk (PSA ≥4 - 9.99 ng/ml)</td>
<td>6 (16.2)</td>
<td>27 (42.9)</td>
<td></td>
</tr>
<tr>
<td>High risk (PSA ≥ 10 ng/ml)</td>
<td>31 (83.8)</td>
<td>29 (46.0)</td>
<td></td>
</tr>
<tr>
<td>Gray scale ultrasound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>26 (70.3)</td>
<td>21 (33.3)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Negative</td>
<td>11 (29.7)</td>
<td>42 (66.7)</td>
<td></td>
</tr>
<tr>
<td>Power Doppler ultrasound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>14 (37.8)</td>
<td>7 (11.1)</td>
<td>0.002</td>
</tr>
<tr>
<td>Negative</td>
<td>23 (62.2)</td>
<td>56 (88.9)</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Validation of the different diagnostic tests for prostate cancer.

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Negative Predictive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRE</td>
<td>48.6%</td>
<td>76.2%</td>
<td>54.4%</td>
<td>71.6%</td>
</tr>
<tr>
<td>PSA*</td>
<td>98.7%</td>
<td>11.7%</td>
<td>39.9%</td>
<td>93.8%</td>
</tr>
<tr>
<td>PSA**</td>
<td>83.8%</td>
<td>54.0%</td>
<td>51.7%</td>
<td>85.0%</td>
</tr>
<tr>
<td>Gray scale ultrasound</td>
<td>70.3%</td>
<td>66.7%</td>
<td>55.3%</td>
<td>79.2%</td>
</tr>
<tr>
<td>Power Doppler ultrasound</td>
<td>37.8%</td>
<td>88.9%</td>
<td>66.7%</td>
<td>70.9%</td>
</tr>
</tbody>
</table>

* PSA cut off for malignancy is ≥4 ng/ml  
** PSA cut off for malignancy is ≥10 ng/ml

The logistic regression model of the different diagnostic tests for prostate cancer (Table 3) showed that there is a significant association between positive DRE with prostate cancer (P=0.01). The odds of having prostate cancer is 3.03 times (95% CI 1.11, 7.16) higher among those with positive DRE. The probability that the patient has prostate cancer when the DRE is positive is 54.5%.

When PSA (10 ng/ml) is added in the model, there is also a significant (P<0.0001) association between positive PSA and prostate cancer, with an odds ratio of 3.85 (95% CI 2.37, 15.45). However, the addition of PSA to positive DRE reduces the probability of the patient having prostate cancer when the PSA is ≥10 ng/ml to 35.0% compared to DRE alone.

The addition gray scale ultrasound with DRE in the model shows that the former test is significantly (P=0.004) associated with prostate cancer. The odds of having prostate cancer when gray scale ultrasound is positive is 1.96 (95% CI 1.53, 9.69) times more compared to those whose gray scale ultrasound is negative. The addition of the ultrasound to DRE increases the probability of a patient having prostate cancer to 63.4% when both tests are positive compared to DRE alone and DRE plus PSA (10 ng/ml cut off).

Power flow Doppler is likewise significantly (P=0.01) associated with prostate cancer. The odds that the patient has cancer is 2.15 times more when the power flow Doppler is positive compared to those whose power flow Doppler is negative. The addition of the Doppler test to DRE increases the probability of the patient having cancer to 74.8% when both tests are positive compared to DRE alone, DRE plus PSA (10 ng/ml cut off) and DRE plus gray scale ultrasound.

Discussion

The development of TRUS has allowed the earlier detection of prostate cancer. Earlier studies have shown that ultrasound scanning combined with digital rectal examination and determination of PSA level is an appropriate diagnostic tool. The positive predictive value of ultrasound scanning increases as the PSA level elevates and as the palpability and size of a lesion increases. In the 1990s, the most frequently used sonographic characteristic to identify or at least suggest the presence

Table 3: Logistic regression model of different diagnostic tests for prostate cancer.

<table>
<thead>
<tr>
<th>Variable</th>
<th>ß coefficient</th>
<th>Odd ratio</th>
<th>95% Confidence Interval</th>
<th>P value</th>
<th>Probability of Malignancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRE</td>
<td>1.11</td>
<td>3.03</td>
<td>1.27, 7.21</td>
<td>0.01</td>
<td>54.5%</td>
</tr>
<tr>
<td>DRE</td>
<td>1.56</td>
<td>1.96</td>
<td>1.70, 13.44</td>
<td>0.003</td>
<td>35.0%</td>
</tr>
<tr>
<td>PSA*</td>
<td>1.80</td>
<td>3.85</td>
<td>2.37, 15.45</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>DRE</td>
<td>0.67</td>
<td>1.96</td>
<td>0.76, 5.03</td>
<td>0.16</td>
<td>63.4%</td>
</tr>
<tr>
<td>Gray scale ultrasound</td>
<td>1.35</td>
<td>3.85</td>
<td>1.53, 9.69</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>DRE</td>
<td>0.86</td>
<td>1.10</td>
<td>0.95, 5.91</td>
<td>0.06</td>
<td>74.8%</td>
</tr>
<tr>
<td>Power doppler</td>
<td>1.38</td>
<td>2.15</td>
<td>1.37, 11.46</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

*PSA cut off for malignancy is 10 ng/ml
of prostate cancer was a focal, peripherally-oriented hypoechoic area. However, even in combination with abnormal findings and/or PSA level, a hypoechoic lesion is not diagnostic; not all cancers have an identical appearance.

Inahara, et al. have demonstrated that color Doppler ultrasonography (CDUS) improves the detection of poorly-defined lesions on gray-scale TRUS. However, CDUS has a limited benefit in diagnosing cancer because CDUS has a tendency for noise if the gains are too high. It is angle-dependent and cannot detect flow that is perpendicular to the plane of insonation. Likewise, CDUS has low sensitivity in small vessels. To overcome these shortcomings, PDUS was developed. PDUS uses a high gain and is angle-independent. It is considered to be more sensitive in detecting lower-speed flow. The vascular density in prostate cancer is about twice that in benign tissue and is composed basically of many capillaries disposed randomly and with no apparent orientation. Thus, PDUS has the advantage that it can distinguish vessels with low-speed flow independently of flow direction in prostate cancer.

Sakarya, et al. found that most patients with prostate cancer had a hypervascular site of PDUS, suggesting a relative increase in blood flow to the infiltrated areas, which accords with known angiographic malignancy patterns in prostate cancer, such as variation in vascular caliber, loss of regular distribution, intratumoral pooling, parenchymal staining and early venous drainage. Overall, results showed that focally increased peripheral zone flow on PDUS was associated with a high likelihood of focal carcinoma on biopsy. PDUS seems to increase the predictive value of TRUS from 57% to 82%. Overall comparison of previous studies on the use of PDUS showed sensitivity ranging from 57.1% to as high as 98%, specificity of 75% to 96%, PPV of 59% to 82%, and NPV of 74% to 99%. In the present study, PDUS has a low sensitivity but has the highest specificity of 88.9%. Similar results were obtained by Angelos, et al. suggesting that PDUS improves the specificity for prostate cancer but reduces the sensitivity. Among the different diagnostic modalities, PDUS had the highest positive predictive value of 66.7% (Table 2). In a screening setting, the increased predictive value may have a greater role. The loss in sensitivity for improved predictive value may be acceptable on a population basis and be cost-effective.

The logistic regression of the different diagnostic tests for prostate cancer (Table 3) of this study showed that for a patient with positive DRE findings, there is more than 50% probability of him having prostate cancer. Furthermore, abnormal DRE findings combined with a hypoechoic lesion on gray-scale transrectal ultrasound and hypervasularity of the peripheral zone on power Doppler imaging increases the probability of the patient having prostate cancer to 63.4% and 74.8%, respectively with PDUS in combination with DRE showing the highest predictive ability for prostate cancer. On the basis of these results, with a patient with abnormal DRE findings and a positive finding on PDUS, the urologist can highly recommend that a prostate biopsy be done because of a significantly high probability of the patient having prostate cancer. Moreover, PDUS can be an important adjunct to TRUS to help improve the biopsy yield by determining the most appropriate site for biopsy in patients with abnormal DRE findings and/or elevated PSA levels and no focal gray-scale abnormality. However, since prostate cancer is a serious disease, a negative finding on power Doppler imaging does not preclude the need for biopsy especially if patient has the risk factors and clinical suspicion for prostate cancer is high.

The logistic regression, on the other hand, showed that the addition of PSA to positive DRE reduces the probability of the patient having prostate cancer to 35% compared to DRE alone (54.5%) when the PSA is >10 ng/ml. This showed that some of the patients with prostate cancer would have been missed if the cut-off level for prostate biopsy is a PSA level of > 10 ng/ml. However, there is not enough data to establish the number of patients with probability of prostate cancer if DRE is positive and PSA of < 4 ng/ml.

**Conclusion**

Power Doppler imaging increases the specificity and positive predictive value of Gray-scale transrectal ultrasound in prostate cancer detection. The probability of having prostate cancer when DRE is positive, PSA is elevated, hypoechoic lesion is present on Gray-scale TRUS and hypervasularity of the peripheral zone is present on PDUS are significantly higher than if all of these tests were negative. The addition of PDUS to the screening tool of digital rectal exam increases the probability of the patient having cancer when both tests are positive, thus increasing its predictive power.

**References**


The Use of a Scoring System to Diagnose Voiding Dysfunction in the Pediatric Population

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Objective
Voiding dysfunction is a common occurrence in the pediatric population and is currently diagnosed using its various symptoms. There are few studies which objectively assessed these symptoms. The authors validated a scoring system using a questionnaire in Filipino and English form to quantitatively assess the symptoms of voiding dysfunction in the pediatric population.

Materials and Methods
Fourteen questions were formulated based on the symptoms of voiding dysfunction with corresponding severity and score. One hundred forty six questionnaires were obtained from 180 patients suspected of having voiding dysfunction and 69 questionnaires from a normal population. Receiver operator characteristic curve was then used to determine the ideal cutoff to diagnose voiding dysfunction.

Results
Using a cutoff score of >7, the symptom scoring system had a specificity of 92.75% and a sensitivity of 70.55%. The positive predictive value was at 95.37% and the negative predictive value was 59.81%.

Conclusion
The questionnaire is a valid tool to objectively diagnose voiding dysfunction. This tool can also be used to monitor the treatment response of the patients and as a follow-up tool.

Key words voiding dysfunction

Introduction
Voiding dysfunction is often being used to characterize any child with voiding symptoms or urinary incontinence. A multitude of sign and symptoms can be seen in patients with voiding dysfunction which is a generalized name that has been popularized to denote any abnormality related to bladder filling and/or emptying.1,2 Daytime and nocturnal enuresis which is defined as complete expulsion of urinary contents after a period where urinary control is anticipated3, are common in school age children with a prevalence rate of 2-7%2,4 and can cause considerable anxiety in children and parents.3 Urge syndrome or urge incontinence, also known as an overactive detrusor, is associated with a strong desire to void and is frequently associated with a squatting maneuver to externally retain urine called Vincent’s Curtsey. This could lead to Hinman–Allen syndrome, also known as non-neurogenic neurogenic bladder, where due to a habitual and voluntary tightening of the external sphincter during an overactive detrusor contraction would result in a learned failure to relax the external sphincter during voluntary voiding.2 Children with benign urinary frequency (pollakiuria) would void frequently, as often as 30 times per day but would rarely wet their pants or beds.3 Presence of gastrointestinal disorders also plays an important role in dysfunctional voiding and may be collectively described as dysfunctional elimination syndrome (DES).2,3,5 Voiding dysfunction is also associated with urinary tract infection (UTI), urinary retention and vesicoureteral reflux (VUR) with a potential for significant impact on future lower urinary tract and renal function.2,6

Diagnosing voiding dysfunction is accomplished by a good history and physical examination.2,2 Despite the frequency and varied nature of this condition, physicians may not always obtain a careful history to identify and properly treat children with this condition.3 A questionnaire to guide the physician in the diagnosis would be helpful. This can also serve as a measuring tool...
to assess the response of the patient to the treatment. There are limited studies on using questionnaires in diagnostic and as an outcome tool for voiding dysfunction and they are all written in English. A questionnaire was formulated to capture all the possible symptoms of this condition in the Filipino and English versions and validate it using scientific methods.

**Materials and Methods**

Based on published questionnaires and consult with experts, 14 questions in Filipino were developed for the Dysfunctional Voiding Scoring System. Content validity was done by two pediatric urologists and a pediatrician. Pretests of the questions were given to medical students and interns. Acceptability of the questions was assessed and discussed with the respondents. Modification on the questions was done based from these discussions. The questions were then translated to an English version by a linguist. The questionnaires (Appendix 1) in Filipino with an English translation were given to the parents of pediatric patients that are scheduled for VCUG because of a history of UTI with an inclusion criteria of a child between 3 - 16 years old, toilet trained and with symptoms of voiding dysfunction. Patients with spina bifida, neurogenic bladders and posterior urethral valves were excluded from the study. The parents indicated the severity of the symptoms of their child based on the choices in the questionnaire with a possible maximum score of 65 and a minimum score of 0. The questionnaire was self administered but the parents may request assistance from a urology consultant, resident or urologic nurse. The collected data was then labeled as pathologic. The questionnaires were also given to parents of children 3-16 years of age with no urologic complaints and was admitted in the pediatric ward of two tertiary hospitals. The collected data were then labeled as normal. A verbal consent was also obtained from both groups. From June 2007 to September 2009, a total of 180 questionnaires from the pathologic group were collected. Out of the 180 questionnaires, only 146 were deemed acceptable since the remaining 34 questionnaires were incompletely filled up. A total of 69 questionnaires were also obtained from the normal group. The data were then entered in a spreadsheet software and in Epi info ver 3.5.1. Receiver operating characteristic (ROC) plots were used to define detection cutoff or threshold score that will provide a balance between the sensitivity and specificity of the questionnaire.

**Results**

The pathologic group consisted of 146 patients, 39 (26.7%) males and 107 (73.3%) females with a mean voiding dysfunctional score of 13. The normal group consisted of 69 patients, 20 (29%) males and 49 (71%) females with a mean voiding dysfunctional score of 4.

Receiver operating characteristic curve (Figure 1) was used to determine the threshold value to give the highest combination of sensitivity and specificity. The AUC was 0.873, significantly larger than 0.5, and P=0.0001. Criterion values and coordinates are shown in table 1. It was determined that a cutoff of >7 would give the best combination of a high sensitivity and specificity. For a cutoff of >7, the sensitivity was 70.55% while the specificity was 92.75%.

![Optimum threshold](image)

**Figure 1.** Receiver operating characteristics.

**Discussion**

Voiding dysfunction has a variety of symptoms with a high prevalence rate in the pediatric population. There is no single and a rapid way to eliminate voiding dysfunction in all children.4 Evaluation starts with a good history and usually illicit symptoms of voiding schedule and symptoms such as urgency, frequency, timing of incontinent episodes, squatting, postponement or withholding urination. A voiding diary can be useful to determine a child's voiding frequency and volumes. Bowel habits should also be evaluated since the voiding dysfunction of some patients would improve once the bowel symptoms were addressed. Maternal medical issues, perinatal history, developmental milestones, scholastic performance and behavioral history should also be asked.2,3,4 Physical examination is usually unremarkable and is geared to rule out anatomical cause of the voiding problems of patient. Urinalysis and an ultrasound of the kidneys and urinary bladder are recommended ancillary procedures.2,3,4 Presence of UTI usually mandates VCUG and those patients that are
Using > 7 to label patients as having the disease or not, the positive predictive value and negative predicted value was 95.37% and 59.81%, respectively as seen in table 2.

**Table 2.** 2x2 table for a cutoff score of > 7.

<table>
<thead>
<tr>
<th>Voiding Dysfunction Questionnaire</th>
<th>+ Voiding Dysfunction</th>
<th>Normal Voiding Function</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive &gt;7</td>
<td>103</td>
<td>5</td>
<td>108</td>
</tr>
<tr>
<td>Normal ≤7</td>
<td>43</td>
<td>64</td>
<td>107</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>146</strong></td>
<td><strong>69</strong></td>
<td><strong>215</strong></td>
</tr>
</tbody>
</table>

Sensitivity = 103/ 146 or 70.55%
Specificity = 64/ 69 or 92.75%
Predictive Value Positive = 103/ 108 or 95.37%
Predictive Value Negative = 64/ 107 or 59.81%
refractory to treatment may need urodynamics.\textsuperscript{7,8} Treatment is then tailored with regards to the specific form of voiding dysfunction and its severity. These may include a bowel program to decrease constipation, biofeedback, anticholinergic treatment, botulinum A toxin and clean intermittent catheterization.\textsuperscript{2,3,4} The need for a standardized objective tool to identify and quantify the symptoms of voiding dysfunction would therefore be important. Such a tool can also be used to objectively monitor the treatment response of these patients so that they may be modified accordingly.

Scoring systems are not alien to urologists. The IPSS (International Prostate Scoring System) is currently used by urologists to objectively assess lower urinary tract symptoms in men and monitor the treatment response of their patients. Farhat, et al. and Akbal, et al. have developed questionnaires that can provide accurate, objective and scientific basis to grade symptoms of voiding dysfunction\textsuperscript{9,10} but these questionnaires are in the English language and additional data such as bowel movements and decrease in the frequency of voiding are not mentioned.

In this study’s data the mean voiding dysfunction scores of both males and female are not statistically significant, and the cutoff score of >7 can be applied to both genders. There was also a significant difference of the mean score of the pathologic group from the normal group. We were not able to include social and family problems in our questionnaire since the authors felt that these should be asked personally by the physician to better assess whether a particular situation has an effect on the quality of life of the patient. Further study to stratify patients according to the severity of the symptoms is recommended.

**Conclusion**

The questionnaire is a valid tool to objectively diagnose voiding dysfunction. This tool can also be used to monitor the treatment response of the patients and as a follow up tool.

**References**

Comparative Study of a Simplified Urinary Stone Analysis Devise Kit and Quantitative Urinary Stone Analysis

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Objective: The information gathered by the various stone analysis reports is valuable to both the urologist and the patient. The study aimed to compare a urinary stone analysis devise kit and determine its sensitivity and specificity with the chemico-quantitative analysis offered by another tertiary hospital. Materials and Methods: A total of 25 urinary stone samples were collected from patients seen in a government chartered tertiary hospital from January to September 2009. The stones were submitted to the study’s qualitative stone analysis and for the chemico-quantitative analysis. Results: The two analyses have identical results in reporting for the presence of oxalates and phosphates. Calcium was determined in almost all of the stones by the devise kit except for two that were seen from the standard. Six out of the 7 stones with uric acid components were detected by this study. Overall, the sensitivity of the devise kit in determining for the presence of calcium, oxalate, phosphate and uric acid were 92%, 100%, 100% and 86%, respectively. Conclusion: The urinary stone analysis devise kit formulated is simple and cost effective and has high sensitivity in determining for the presence of calcium, oxalate, phosphate and uric acid components. Based on this study, this devise kit is recommended in the in-patient and out-patient services as well as in other diagnostic laboratories.

Key words: urinary stone

Introduction

Chemical qualitative stone analysis offers a faster and cheaper way of examining urinary stones compared to quantitative stone analysis, the latter being available in tertiary hospitals of the country. The investigators wish to formulate a simplified stone devise kit to analyze qualitatively urinary stones and hopefully can be performed in the clinics.

Developing countries, like the Philippines, still depend on chemical methods of analyzing urine stone samples. Tertiary hospitals in the country offer semi-quantitative chemical analysis at a much expensive cost. Outside Metro Manila and highly urbanized cities, urologists in resource-poor areas in the provinces, and cities/ municipalities do not have the benefit of analyzing their extracted stones.

The information gathered by the stone analysis report is valuable to both the urologist and the patient. It will help predict the next logical step by the urologist in preventing stone recurrences. Patients can be advised of proper dietary and therapeutic regimen after their stone extraction.

The most frequently analyzed stones contain calcium oxalate, calcium phosphate and uric acid components. Each one serves as nidus for the other to produce a mixture of stones. Various known chemical reactions that can qualify these three components were reviewed. Identities of reagents were noted and procured as pure analytical grade reagents.
Previous studies done comparing qualitative and quantitative urinary stone analysis were reviewed. In 1995, M. Orozova, et al. analyzed 220 stone samples using chemical quantitative and qualitative methods. They claimed that their improved methods are simple and highly reliable based on objective chemical reactions. They recommended and marketed their method for wide use in inpatient and outpatient clinics. Various methods of analyzing urinary calculi were done by Vergauwe, et al. in 1994 and they found that physical methods can distinguish the different minerals in the stones more accurately by x-ray diffractometry and infrared spectroscopy. The addition of Rietveld method in x-ray diffraction is considered as the most innovative and accurate in crystallographic analysis of complex urinary stones as proposed by Euler, et al. in 2008. The procedures currently accepted as standard for stone analysis are: x-ray diffraction, infrared spectroscopy, polarization microscopy and chemico-quantitative analyses.

The study aims to validate the utility of the formulated simplified urinary stone analysis devise kit. Specificity and sensitivity of the kit shall be determined by comparing its results over the chemico-quantitative analysis offered by another tertiary hospital.

Materials and Methods

Twenty five (25) stone samples were collected from patients seen in a government chartered tertiary hospital from January to September 2009. These were urinary stones from patients who underwent surgical extraction or stones that were spontaneously passed out were gathered, washed, air dried, and cut into halves.

Each half was submitted to the study's qualitative stone analysis and the other half underwent a standard chemico-quantitative analysis.

Qualitative Stone Analysis

Stones were pulverized using mortar and pestle until it reaches uniform in texture. A small amount of a coffee stirrer-spoonful of particles, estimated weight of 0.225 gram, dissolved in a test tube with 10 mL of concentrated nitric acid (HNO₃). Solution is then filtered and labeled accordingly. The reagents included in the qualitative stone analysis devise kit were prepared as pure analytical grade (AR) reagents and were accurately calculated based on their molecular weights.

To test for the presence of calcium ion (Ca²⁺) in the solution, 2 mL is added with 1 mL of 0.5M sodium oxalate (Na₂C₂O₄). A white precipitate of calcium oxalate (CaC₂O₄) would form to confirm the presence of Ca²⁺ in the solution and entered in the data as a positive result. A maintained clear solution after addition of Na₂C₂O₄ was entered as negative. Side by side in doing each of the Ca²⁺ tests for all the urinary stones, separate test tube with solution of pure known calcium was subjected to the same test to verify the results of the samples.

Oxalate (C₂O₄²⁻) test was done by adding drops of 0.02M potassium permanganate (KMnO₄) to 2ml of filtrate sample solution. Positive result would show bleaching of the dark violet color of the permanganate solution because of the oxidation reaction created by the C₂O₄²⁻ to the MnO₄⁻. A solution containing pure known oxalate was simultaneously tested side by side in each stone sample solution.

To test for the presence of phosphate (PO₄³⁻) ions in sample solutions, 1 mL of 5% ammonium molybdate [(NH₄)₂MoO₄] was added to 2 mL of sample solution. The test tube was then lowered to a container with hot water until yellow precipitates appeared in the sample test tubes. Formation of the said yellow precipitate was entered as a positive result. Separate solutions containing pure known phosphate (PO₄³⁻) ions were tested side by side with the stone sample solutions.

Finally, to test for the presence of uric acid, a pinch of sodium carbonate crystals (Na₂CO₃) was added to test tubes containing 1mL of sample solutions until it becomes basic. On a piece of filter paper resting on a glass slide, a drop of 0.1M silver nitrate (AgNO₃) was placed then followed by a drop of test solution with Na₂CO₃. A grayish to brownish color would appear on the paper suggesting a positive result. Negative result would show no discoloration on the paper. The tests were done simultaneously with solutions containing pure AR grade uric acid.

Data Processing and Data Analysis

Data were entered using Epi-Info v6.04 statistical software (CDC, Atlanta, USA). Sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios were computed using the UK Catmaker statistical software at 95% confidence interval. The chemico-quantitative analysis served as the gold standard.

Results

The patients’ ages ranged from 27 to 69 years. Eighty four percent (84%) of the study population were males. The kidney was the most common location of the stones and only two stones were noted to be radiolucent on x-ray films. All stones were surgically removed except for one which was previously located on the ureter.

Table 1 shows the comparative data of this study’s stone analysis report compared with that of chemico-
quantitative stone analysis report. All of the sample stones contain oxalates and were detected by both tests. Calcium was determined by the devise in almost all of the stones kit except in two, seen using the standard. Two stones which contained only 5% calcium each were labeled as negative and failed to be detected by the devise kit.

All the stones that contained phosphates were detected by the devise kit. Two samples that did not really have phosphates showed positive results in the devise kit compared to the standard.

In testing for uric acid content, the standard found seven samples to contain uric acid. In one out of the 7 stones, the devise kit failed to detect the presence of uric acid. Five of the 18 stone samples that did not really contain uric acid gave a false positive result in the devise kit.

The stone analysis test kit for oxalate and phosphate content determination had a 100% sensitivity compared to the stone analysis being done in the hospital facility. However, the test kit for phosphate determination had a specificity of 71% and a negative predictive value of 100%. As for calcium determination, the sensitivity of the test kit was only 92% (Table 2).

### Table 1 Comparison of stone devise kit results and chemico-quantitative analysis report by percentages, Quezon City, Metro Manila, September 2009

<table>
<thead>
<tr>
<th>Stone No.</th>
<th>Test Ca</th>
<th>Test Oxa</th>
<th>Test Phos</th>
<th>Test Uric Acid</th>
<th>Ca (%)</th>
<th>Oxa (%)</th>
<th>Phos (%)</th>
<th>Uric Acid (%)</th>
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<td>+</td>
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<tr>
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<td>–</td>
<td>+</td>
<td>5</td>
<td>40</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>

### Table 2 Diagnostic utility of an office-based stone analysis kit compared to conventional hospital-based laboratory stone analysis test, Quezon City, Metro Manila, September 2009

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Positive Predictive Value (%)</th>
<th>Negative Predictive Value (%)</th>
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<td>Calcium</td>
<td>92</td>
<td>Not applicable</td>
<td>100</td>
<td>Not applicable</td>
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<tr>
<td>Oxalate</td>
<td>100</td>
<td>Not applicable</td>
<td>100</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Phosphate</td>
<td>100</td>
<td>71</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>Uric Acid</td>
<td>86</td>
<td>72</td>
<td>55</td>
<td>93</td>
</tr>
</tbody>
</table>
Compared to the hospital-based stone analysis, the test kit’s ability to determine uric acid levels showed a sensitivity of 86%, specificity of 72%, positive predictive value of 55% and a negative predictive value of 93%. In addition, the positive likelihood ratio was 3.09 and the negative likelihood ratio of 0.2.

Table 2 summarizes the diagnostic utility of the test kit as compared to the standard hospital-based stone analysis.

**Discussion**

Many of the qualitative tests for the analysis of urinary calculi are discussed in standard laboratory manuals (Murov, 2004; Skoog 2004; Clovio, 1994). However many of these tests are unnecessary and contain reagents that are either too expensive or not locally available.

Physical methods in quantifying exact component concentrations in urinary stones have already been developed and modified in other countries. Currently, the most accurate method of analyzing stones is through the use of x-ray diffraction and infrared spectroscopy as discussed by Vergauwe (1994) and Korn (1993). Further modification has been made in x-ray diffraction using the combination of a Rietveld structure refinement as described by Euler (2008) and was recommended as the first choice in quantitative analysis.

At present, tertiary hospitals in the Philippines still use the chemico-quantitative method in analyzing urinary stones. This somehow already gives the nearest quantitative concentrations of the calculus components. On the contrary, expensive cost for the patients and delay in the reports of these tertiary hospitals often prohibit the physicians to submit the extracted stones.

Using this study, the authors were able to detect the presence of calcium, oxalate, phosphate and uric acid in the stones submitted with high sensitivity compared to the standard, 92%, 100%, 100%, 86%, respectively. These tests were selected by the authors among any other qualitative tests based on the availability and cost of the reagents and as well the simplicity of the formed reactions. From this the stone devise kit can be formulated using the reagents mentioned in the study and can be made available for out-patient, in-patient and other diagnostic laboratory services.

**Conclusion**

The urinary stone qualitative analysis devise kit is simple and cost effective and has high sensitivity in determining for the presence of calcium, oxalate, phosphate and uric acid components. This may be used as an alternative method of analyzing urinary stones in our setting.

**References**

Urologic Complications in Obstetric and Gynecologic Surgery:  
A Four Year Philippine General Hospital Experience

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2 National Institutes of Health - University of the Philippines Manila

Objective  To describe the urologic injuries associated with obstetric and gynecologic surgery.  Study Design  This is a 4-year retrospective study of all patients referred to the Division of Urology by the Department of Obstetrics and Gynecology, Philippine General Hospital.  Results  Forty five cases of urinary tract injuries during obstetric and gynecologic surgery were noted from April 2003-2007. There were 26 (57.7%) bladder injuries and 19 (42.2%) ureteral injuries. Thirty one injuries (69.9%) occurred during procedures for benign conditions. Total hysterectomy with bilateral salpingooophorectomy (THBSO) was the most common surgery associated with iatrogenic injury to the bladder and ureter. Conclusion  Urinary tract injury during obstetric and gynecologic surgery is rare. It is most common during the performance of THBSO.

Key words  urinary tract injury, gynecologic surgery, obstetric surgery

Introduction

Injuries to the urinary tract during obstetric and gynecologic surgery are not uncommon. These are serious morbidities especially when discovered late, and usually require another operation to correct the problem. They are stressful for both the patient and the surgeon. Medico-legal issues may even ensue in such cases. Complications following these injuries include vesicovaginal fistula, ureteric stenosis and hydronephrosis, all of which may lead to renal impairment and failure. Urologic complications arising from obstetric and gynecologic operations are therefore important among surgeons dealing with pelvic surgery. Careful planning, sound surgical technique, excellent understanding of pelvic structural anatomy and high index of suspicion for urologic complications should all be in the armamentarium of the surgeon.

The purpose of this study was to describe the incidence of urologic injuries arising from obstetric and gynecologic surgeries at the Philippine General Hospital.

Materials and Methods

This is a 4-year retrospective review of all patients who underwent obstetric or gynecologic surgery and was subsequently referred perioperatively to the Division of Urology from April 2003 to April 2007. Data collection was done using the computerized database of patients in the Department of Surgery, Philippine General Hospital.

The patients’ files were reviewed. Included were those referred for iatrogenic injuries to the urinary tract identified intra-operatively and those with evidence of injury presenting in the immediate postoperative period. Referrals for intraoperative assessment of the urinary tract during obstetric and gynecologic procedures as well as referrals for preoperative stenting were excluded. Other referrals that were excluded were perioperative referrals for urinary retention and voiding dysfunction, urinary
diversion for cervical cancer, urologic involvement in gynecologic malignancies, outpatient referrals for vesicovaginal fistulas and for possible urologic injuries in surgeries performed in another institution, and other urologic conditions such as urinary stones.

Patients who were discharged asymptomatic but were subsequently referred to the Urology Division for urologic injuries were not included in this review and hence is one of the study’s limitations.

Urologic injuries were classified according to the organ involved, type of operation performed, gynecologic condition, and type of urologic intervention done.

**Results**

There were 276 referrals from the Department of Obstetrics and Gynecology to the Division of Urology from April 2003 to April 2007. Only 45 were referrals for urinary tract injuries incurred during gynecologic or obstetric surgery.

There were 26 (57.7%) bladder injuries and 19 (42.2%) ureteral injuries. Thirty one injuries (69.9%) occurred during procedures for benign conditions.

Bladder injuries involved lacerations of various lengths and depths in the different areas. Figure 1 shows the distribution of bladder injuries according to the type of surgery when the injury occurred. The greatest proportion of bladder lacerations occurred during a total hysterectomy with bilateral salpingo-oophorectomy (THBSO) (40%). There were 3 (14%) cases of cesarean section who had bladder lacerations. Cystorrhaphy with or without suprapubic tube cystostomy (STC) were done on all bladder injuries except for one whom a perivesical bleeder was ligated.

A ll ureteral injuries were sustained during THBSO. Complete transection of the ureter was managed by ureteroneocystostomy and ureteroureterostomy while partial transection and serosal tears were managed with ureterorrhaphy.

**Discussion**

This study showed that there were 45 cases of iatrogenic injury referred intraoperatively and in the immediate postoperative period to urologists by obstetrician-gynecologists at the Philippine General Hospital from April 2003 to April 2007. Twenty six cases (57.7%) were bladder injuries and 19 (42.2%) were ureteral injuries.

The prevalence of urinary tract injury during benign gynecologic and obstetric surgery is less than 3%, while in gynecologic cancer surgery, the prevalence rises to 1.1 to 5.3%. On the average, the Department of Obstetrics and Gynecology, based on its annual report from 2004 to 2006, performed an average of 1278 gynecologic surgery per year. Based on this, the overall incidence of urological injuries was 0.001% for gynecologic surgery. This value, however, may be an underestimation because the study was limited to injuries detected intraoperatively and in the immediate postoperative period. Those patients who presented with iatrogenic injuries after they were discharged, or consulted at the outpatient clinic were not included.

The bladder is the most commonly injured organ in the urinary tract followed by the ureter. The prevalence of bladder injury is five-fold higher than that of ureteral injury. In this study, however, bladder injuries were only slightly higher in number than ureteral injuries. The incidence of bladder injury is between 0.4% and 3.7, while ureteral injury occurred in 0.4% to 2.5%. Most bladder injuries are recognized during the surgery while one-third of ureteral injuries go unrecognized. Gilmour, however, reported 5.8 missed ureteral injuries per 1000 cases and 10.9 missed bladder injuries per 1000 cases in his metaanalysis with routine use of cystoscopy. In this study, there were more bladder injury than ureteral injury.

The ureter is usually damaged when it is mistaken to be a blood vessel, when it is displaced and compressed by a pelvic mass, when it is located in abnormal positions or during rapid surgery, in cases of significant pelvic bleeding, without appropriate identification of anatomy. The “danger zones” or areas where ureteral injury is most likely to happen include: level of infundibulopelvic ligaments, level of the uterosacral ligaments, and at the level of the cardinal ligament close to the ureterovesical junction.
There are several reports on the prevention of urinary tract injuries using different methods. Prevention and detection of iatrogenic injuries using routine cystoscopy, intravenous pyelography, ureteral stenting and bladder catheterization have been studied. Gilmour and Vakili studied the role of cystoscopy in detecting iatrogenic injury but had inconclusive results. The same is true for bladder catheterization. Tang and coworkers found that non-catheterization of bladder prior to laparoscopic gynecological surgery is safe and prevents postoperative urinary symptoms and UTI-related to catheterization. Routine pre-operative stenting has no clear advantage. IVU is also not recommended for routine use unless abnormal anatomy is suspected. Hence, the best way to prevent iatrogenic injuries lies on the hands of the surgeon. Keys in the prevention of iatrogenic injury include: a good knowledge in the anatomy of the urinary tract and its variants with special emphasis on the "danger zones", adequate lighting, incision and exposure, assistants, traction and countertraction, careful visualization, sharp dissection, and identification through palpation cannot be overemphasized. Careful pre-operative planning with the help of imaging especially in cases of distorted anatomy, and routine identification of urinary tract structures at the beginning of the operation are essential.

In benign gynecologic and obstetric operations, the prevalence of iatrogenic injuries is less than 3% while in gynecologic cancer surgery, the prevalence is between 1.1 to 5.3%. It is further increased in radiated patients and in those with more advanced stages. However, in this study, there were 31 injuries (69.9%) incurred in benign conditions compared to only 14 (31%) in malignant conditions. This may be attributed to the fact that hysterectomies and other procedures for benign conditions are performed more frequently than in malignant conditions. Furthermore, increased incidence in benign condition and surgery may be due to overconfidence on the part of the surgeon since performance of such operations becomes routine. These operations are relatively easier compared to cancer surgeries, hence surgeons tend to be less meticulous in doing the surgery. This study shows potential injuries even in benign surgery can occur and therefore whether benign or malignant, the surgeon should maintain careful dissection and a high index of suspicion for iatrogenic injury.

**Conclusion**

This study showed that urinary tract injuries during obstetric and gynecologic surgery are rare but occur. The bladder is the more commonly injured organ. Injuries can be sustained during surgeries for both benign and malignant conditions. Urinary tract injuries are most often associated with the performance of THBSO.

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A Prospective, Observational Study in the Quality of Life After Trans-Urethral Resection of Prostate for Patients with Benign Prostate Hyperplasia

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**Objective** The objective of the study was to determine the effect of transurethral resection of prostate (TURP) on the quality of life (QOL) and urinary symptoms on patients with benign prostatic hyperplasia (BPH) at Jose R. Reyes Memorial Medical Center using the International Prostate Symptom Score (IPSS) and global quality of life symptom and Health Related Quality of Life Short Form (SF-12) questionnaires. **Materials and Methods** A prospective, observational study on patients without significant co-morbidities who underwent TURP for benign prostatic hyperplasia. The patients were given series of questionnaires: The International Prostate Symptom Score (IPSS) and Global quality of life symptom and Health Related Quality of Life Short Form (SF-12) questionnaire. The questionnaires were completed a day prior the operation as a baseline, 1st, 2nd, and 3rd month post-operatively. Data were gathered and analyzed. **Results** November 2007 to July 14, 2008, 52 patients diagnosed to have benign prostatic hyperplasia underwent transurethral resection of prostate in saline solution (TURIS). The health related quality of life SF12 questionnaire, and IPSS showed that scores on all questions significantly improved from pre-operative to the 3rd month post-operatively. **Conclusion** TURP remains the treatment of choice for men with acute urinary retention secondary to benign prostatic hyperplasia because of its effectiveness for improving the voiding symptoms and overall quality of life. **Key words** Transurethral resection of prostate, quality of life, benign prostatic hyperplasia.

**Introduction**

Benign prostatic hyperplasia (BPH) is one of the common causes of lower urinary tract symptoms (LUTS) as well as acute urinary retention in aging men. The International Prostate Symptom Score (IPSS) is recommended as the symptom scoring instrument to be used for the baseline assessment of symptom severity in men presenting with LUTS and the primary determinant of treatment response or disease progression in the follow-up period.

Since BPH is rarely a life threatening disease and primarily affects the quality of life, special attention should be given to quality of life outcome when evaluating the impact of BPH treatment. Most men who present for surgical correction of their urinary outlet obstruction are those in whom medical therapy or alternative procedures have failed or are inappropriate for some reason. To this day, transurethral resection of the prostate (TURP) remains the criterion standard therapy for obstructive prostatic hypertrophy and is both the surgical treatment of choice and standard of care when other methods fail.

Health Related Quality of Life questionnaires address general health perceptions, sense of overall well-being and function in physical, emotional and social domains.
The SF-36 is a generic health status instrument to assess health related quality of life which contains 36 items. The SF-12 summary replicates the SF-36 summary measures well and shows similar responsiveness to change, reduces the burden on both the patients and investigators, and saves resources.

The objective of the study was to determine the effect of TURP on the quality of life and urinary symptoms on patients with BPH at the Jose R Reyes Medical Center using the IPSS and global quality of life symptom and Health Related Quality of Life Short Form (SF-12) questionnaires.

Materials and Methods

A prospective, observational study was performed to examine whether TURP would improve the quality of life in addition to improvement of urologic symptoms. This study followed 52 patients without significant co-morbidities who underwent TURP for BPH from November 2007 to July 14, 2008 at Jose R. Reyes Medical Center. Patients with a known history of prostate cancer, urethral stricture and bladder stones who underwent TURP were excluded from the study.

The patients were given series of questionnaires. The IPSS and Global quality of life symptom and SF-12 questionnaires. Informed consent was obtained from all patients before treatment. The patients had to fully understand and answer appropriately the given questions. Sometimes, relatives have to read the questionnaires in cases when the patients have an error of refraction. No Tagalog version was done. The questionnaires were completed a day prior to the operation as a baseline. Trans-Urethral Resection of Prostate using Saline solution (TURIS) was done in a standard fashion using a 24Fr Olympus resectoscope with the patients under spinal anesthesia. All procedures were performed by consultants and senior residents in our department. A 3-way Fr 22 foley catheter was inserted for cystoclysis for 2-3 days, and then removed. Patients were discharged after a successful trial voiding.

Patients were reevaluated on Out-Patient basis at 1st and 2nd week after discharge. Patient with final histopathologic diagnosis of prostate cancer were further excluded from the study. Patients were followed up 1, 2 and 3 months after the operation and the same series of questionnaires were given to the patients. Patients who did not return received telephone calls as reminders.

Data were gathered and mean, standard deviation, frequency counts and percentages were used to describe the data. A nalysis of variance for repeated measures was used to compare scores pre- and post-operative. A 95% confidence level was considered significant.

Results

From November 2007 to July 14, 2008, 52 patients diagnosed to have benign prostatic hyperplasia underwent TURIS. The mean age of the subjects were 69 years old and mostly are married (79%). Majority of the subjects were in urinary retention (88%), had no co-morbidities (90%) and most were non-smokers (73%).

The health related quality of life SF12 questionnaire in table 1 showed that scores on all questions regarding quality of life significantly changed from poor/fair health status of the subjects pre-operatively to a very good/excellent condition on the 3rd month post-operative. These parameters include general health perceptions (SF Q1), physical functioning (SF Q2A & SF Q2B), role-physical functioning (SF Q3A & SF Q3B), role emotional (SF Q4A & SF Q4B), bodily pain (SF Q5), mental health (SF Q6A), vitality (SF Q6B & SF Q6C), and social functioning (SF Q7).

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The International Prostate Symptom Score are shown in Table 2 for BPH patients with moderate to severe LUTS. All postoperative scores decreased from pre-operative scores except for IPSS question 4 (Urgency). Urinary frequency (Q2) was the most improved urinary problem while nocturia (Q7) was the least improved.

Table 3 shows the IPSS scores for those BPH in retention. It can be seen that all subjects showed significant decrease in the frequency of all urinary problems included in the IPSS problems. Most improved urinary problem was frequency (Q1) and the least improved was nocturia (Q7).

**Discussion**

The bothersomeness of LUTS is a major reason patients seek therapy. LUTS impede habitual activities and reduce quality of life. BPH, one of the most common diseases of aging men, can be associated with bothersome LUTS that affect quality of life by interfering with normal daily activities and sleep patterns. TURP is the first choice of operative intervention for the surgical treatment of men with BPH. The IPSS for BPH include sensation of incomplete bladder emptying, urinary frequency, intermittency, urgency, weak urinary stream, straining, and nocturia. Patients may also present with acute or chronic urinary retention, urinary tract infections, gross hematuria, renal insufficiency, bladder pain, a palpable abdominal mass, or overflow incontinence.

Symptom analysis and quality of life assessment are most useful in selecting patients for transurethral resection of the prostate. The goal of prostate surgery for BPH is to remove the obstructing tissue while minimizing damage to surrounding structures. In general, TURP surgery is indicated for patients with symptomatic prostatic hyperplasia who have acute, recurrent, or chronic urinary retention; in whom medical management and less-invasive prostatic surgical procedures failed; who have prostates of an unusual size or shape (eg, a markedly enlarged median lobe, significant intravesical prostate encroachment); who have azotemia or renal insufficiency due to prostatic obstruction; or who have the most severe symptoms of prostatism.

Although TURP is the standard of care for the management of BPH, it is an elective procedure that is not recommended for some patients. Most contraindications are relative, based on the co-morbidities of the patient and his ability to withstand the surgical procedure and anesthesia. Some relative contraindications include unstable cardiopulmonary status and a history of
uncorrectable bleeding disorders. An active urinary tract infection is another contraindication for TURP surgery. Usually, the surgery can be rescheduled following a course of appropriate antibiotics.

The most relevant complications of TURP were failure to void, surgical revision, significant urinary tract infection, bleeding requiring transfusions and transurethral resection syndrome.\(^4\) The main advantage of TURIS is increased patient safety because saline irrigation is used, which virtually eliminates TUR syndrome and dilutional hyponatremia. It also allows larger prostates to be resected without the usual time limitations. Long-term complications include incontinence, urethral strictures and bladder neck contractures, and retrograde ejaculation and erectile dysfunction.

The IPSS is based on the answers to seven questions concerning urinary symptoms and one question concerning quality of life. Each question concerning urinary symptoms allows the patient to choose one out of six answers indicating increasing severity of the particular symptom. The answers are assigned points from 0 to 5. The total score can therefore range from 0 to 35 (asymptomatic to very symptomatic) which currently categorizes symptoms as follows: mild (symptom score less than or equal to 7), moderate (symptom score range 8-19), and severe (symptom score range 20-35).\(^5\)

Quality of life was measured through the short form (SF-12) questionnaire. It was developed to be a much shorter alternative to the Medical Outcomes Study 36-item short-form (SF-36) questionnaire so it could be used in large surveys of general and specific populations. The SF-36 is a generic health status instrument to assess health related quality of life (HRQoL) contains 36 items and thus places a considerable burden on both patients and investigators.

The SF-12 is a 12-item self-administered questionnaire that yields scores for 8 areas on the quality of life. It elicits information on physical functioning (limitations in behavioral performance of everyday physical activities), role-physical functioning (extent of disability in everyday activities because of physical problems), bodily pain (severity of bodily pain and resulting limitations in activities), general health perceptions (perception of health status), vitality (energy level and fatigue), social functioning (limitations in social activities from physical or emotional problems), role emotional (problems with work or daily activities as a result of emotional problems), mental health (psychological distress and well-being), and reported health transition. Two summary scores are obtained: a mental component summary score (MCS-12) and a physical component summary score (PCS-12).\(^6\)

The results of this study showed that all 52 patients who completed the series of self-reporting questionnaires: IPSS and Global Quality of Life and Health-related Quality of Life (SF-12) questionnaire, done prior to the operation until the 3rd postoperative month, stated that they were delighted, pleased or largely satisfied with the therapy, TURP, and showed a significantly greater improvement in quality of life, mentally and physically.

**Conclusion**

IPSS and Global Quality of Life and Health Related Quality of Life short form (SF-12) questionnaires are utilized to assess the well-being, functional status, and overall evaluation of his health, and voiding symptoms of the patient. Indeed, Trans-Urethral Resection of the Prostate improved the voiding symptoms of the patients and associated with significant improvement in the overall quality of life at 1, 2 and 3 months post-operatively.

**References**

CASE REPORT

Renal Cell Carcinoma in a Solitary Functioning Kidney in a Pediatric Patient with Diabetes Mellitus Type I Early Transplantation-A First in the Philippines

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A 17 year old female with diabetes mellitus type 1, with chronic kidney disease. Moreover, hypoplastic left kidney and a renal mass on the functional kidney. The possibility all these medical problems occurring at the same time is close to impossible. The management is likewise very difficult and challenging. Partial nephrectomy as initial choice to treatment but initial ureteroscopic findings and change to radical nephrectomy was prudent. In lieu of chronic dialysis, the decision of early transplantation was done. We present the management choices we had to make in a very difficult case.

Key words: diabetes mellitus type 1, hypoplastic kidney, solitary kidney, renal cell cancer

Introduction

Treatment of a patient with DM type 1 has its many challenges, but added with the presence of a solitary functioning kidney, a mass on that functional kidney moreover a chronic kidney disease a whole gamut of problems is created, the possibility of such conditions occurring at the same time on a single patient is almost impossible. This is possibly the only case in the world. We were then tasked to manage such a case.

Renal tumors on a solitary kidney are managed with a primarily nephron sparing surgical procedure. However, upon thorough and careful review of the intraoperative findings and overall status of the patient, taking into consideration the personal wishes of the patient, the following points were heavily considered. First, a nephron sparing surgical procedure opens the possibility of leaving some tumor behind and subject the patient to kidney transplant and eventually anti-graft rejection therapy, the patient may be left with a cancerous kidney which would not only compromise the graft kidney but the patient's life as well. Second, with the patient's GFR of 39ml/ min and the considerable decrease in function post partial nephrectomy, the certainty that enough nephrons are spared for patient to function well is not assured, which may delay kidney transplant at least, does not justify such a procedure. The last point to consider is that despite the full function of the right kidney, the patient still suffers from kidney failure which may be worsened by any decrease in function. Upon careful review and a fully informed consent from the patient and family, radical nephrectomy was agreed upon and nephron sparing surgery abandoned. The next question in mind was the proper timing of the procedure. With this dilemma, the patient's desires had to be heard. The patient in particular dreaded hemodialysis especially chronic hemodialysis hence the need for a kidney transplant was immediate. Despite the vigorous attempts of finding a living donor, there was repeated rejection of several proposed donors. The patient was enrolled to the cadaveric donor program and 8 weeks post radical nephrectomy, patient underwent kidney transplant.
This paper aimed to report the dilemmas and treatment decision pathways undertaken in a complex case such that of this 17-year-old female diagnosed case of DM type1 with hypoplastic left kidney and renal mass on the right functional kidney, with radical nephrectomy and early transplant, the first and only documented case in the Philippines.

The Case

Presented is the case of a 17 year old female diagnosed to have DM type1 with a hypoplastic left kidney and renal mass on the right functional kidney. The patient was diagnosed as a case of DM type1 at the age of 13 and has been maintained on insulin since. On work-up, ultrasound revealed a hypoplastic left kidney with a mass on the right kidney. Subsequent computed tomography (CT) scan confirmed the presence of the mass. (Figures 1a & 1b). At this time, creatinine elevation to 2.3mg/dl was noted. Referral to a pediatric urologist and further testing revealed a G lomerular Filtration Rate (GFR) of 3ml/min on the left hypoplastic kidney and 39ml/min on the right kidney. Initially, operation decided upon was a partial nephrectomy of the right kidney. Intraoperative retrograde pyelography (RGP) (Figure 2) and ureteroscopy findings however revealed a mass located in the superior pelvis of the right kidney. The mass was smooth, with whitish and hypervascular areas. At this time, partial nephrectomy was not prudent given the size, location and appearance of the mass, hence radical nephrectomy was contemplated. However, the patient's parents opted to defer the procedure and weighed their options given the new circumstances. The family was then oriented with the reality of hemodialysis and radical nephrectomy, the final decision pointed to a kidney transplant. Hemodialysis was initially rejected hence outright kidney transplant after nephrectomy became the option. Despite rigorous efforts, a suitable donor could not be found. Radical nephrectomy was then done which revealed a 5.5cm x 3cm x 2.5cm mass on the superior pelvic area, consequently the mass was signed out as Renal Cell Cancer Furhman Grade II (5.5cm) with extension to the renal capsule. After the procedure, the patient was immediately enrolled to the cadaveric transplant list. Eight weeks and 2 days after radical nephrectomy, cadaveric kidney transplantation was done. Patient's condition improved and was discharged with the creatinine level of 1.7mg/dl.

Discussion

Diabetes mellitus (DM) is a chronic metabolic disorder caused by an absolute or relative deficiency of insulin, an anabolic hormone. Insulin is produced by the beta cells of the islets of Langerhans located in the pancreas, and the absence, destruction, or other loss of these cells results in type 1 diabetes (insulin-dependent diabetes mellitus [IDDM]). Most children with diabetes have type 1 diabetes mellitus (T1DM) and a lifetime dependence on exogenous insulin. Based on the SEARCH for diabetes in youth study in the Asian sub group, it was...
found that 7.4 cases in every 100,000.\textsuperscript{1} There is still no local incidence of T1DM locally but studies have shown Type 1 diabetes mellitus has wide geographic variation in incidence and prevalence.\textsuperscript{2} These variations strongly support the importance of environmental factors in the development of type 1 diabetes mellitus. Most countries report that incidence rates have at least doubled or more in the last 20 years. Incidence appears to increase with distance from the equator.\textsuperscript{3} With regards to renal failure, kidney failure was classified as part of the chronic complications of T1DM. Studies also show that although long-term complications are rare in childhood, maintaining good control of diabetes is important to prevent complications from developing in later life.\textsuperscript{4} The likelihood of developing complications appears to depend on the interaction of factors such as metabolic control, genetic susceptibility, lifestyle (eg, smoking, diet, exercise), pubertal status, and gender.\textsuperscript{5} A very interesting Swedish study analyzed the impact of age at onset on the development of end-stage renal disease (ESRD) due to diabetic nephropathy in a nationwide population-based cohort with childhood-onset type 1 diabetes.\textsuperscript{6} Conclusions from this study showed that with a median duration of 21 years in this population-based Swedish cohort with childhood-onset diabetes, 1 percent of the patients had developed ESRD due to diabetic nephropathy, and a prepubertal onset of diabetes seems to prolong the time to develop ESRD.\textsuperscript{6} Drawing from this conclusion we could infer that in this case, the tumor probably played a role in the diminishing kidney function. Hence rapid and definitive management of the mass was imperative. A study on unilateral renal agenesis showed that children with abnormalities of a solitary kidney often have hypertension, proteinuria or reduced renal function.\textsuperscript{7} A study regarding solitary kidneys aimed at developing a measurement to determine thru GFR the integrity of a solitary kidney. Girls older than 2 years old had mean GFR of 78ml/min.\textsuperscript{8}

Renal cell carcinoma is a rare disease in children and adolescents. In a study from the California Cancer registry, it has been proven that renal cell carcinoma is uncommon and aggressive tumor specially in the pediatric population. Renal cell carcinoma only accounts for 4.3 percent for 21 years old and below. With a <.01/100,000 for Asians with a 61% 5 year survival rate; 53.49 percent were localized. It was also concluded that “the epidemiological characteristics of this tumor differ from adult renal cell cancer and Wilms tumor, suggesting its distinctive biology and potential need for alternative treatment strategies.”\textsuperscript{9} This clearly shows the distinctive difference of renal cell cancer in the pediatric age group, the fact that renal cell cancer is more aggressive than the adult counterpart shows the need for a different path in the management, probably a more aggressive management as well. The survival rate likewise is alarming, the strategy done for this particular case was unorthodox if based on adult literature and management but again no literature was with the exact contributory diseases added up with comminatory effects such as the case presented. A gain,
there is no literature nor protocol on how to proceed with this kind of case. In a similar study done in Germany, it was stated that childhood renal cancer differ histologically and biologically from their adult counterparts. The characteristics of renal cell cancer affected children and their tumors, the influence of treatment, and outcome have so far not been studied in a non-selected, population based study. Hence, study of renal cell cancer in the pediatric population was done using the German Childhood Cancer Registry and the Kiel Pediatric Tumor Registry. They concluded from the study that pediatric renal cancer was predominantly a localized disease. Children with renal cell cancer frequently suffer underlying disorders. Survival rates in localized and regional lymph node positive case are favorable. Because of the rarity of renal cell cancer in childhood, an international study is necessary. A gain, the above study just emphasizes the rarity hence difficulty in management of the patient it confirms that both in the United States-based study and European study that indeed treatment options be sought out and further studies be made. In a study “age at diagnosis is a determinant factor of renal cell carcinoma-specific survival in patients treated with nephrectomy, concluded that the effect of age shows prognostic significance and indicates that follow-up and possibly secondary treatments might need to be adjusted according to the age of the patient. In a study made in the Cleveland clinic, "Factors Predicting Renal Function Outcome After Partial Nephrectomy", there was a 13.3 ml/min decrease for open partial nephrectomy for 4 cm diameter tumors. The study concluded that lower preoperative filtration rate, solitary kidney, older age, gender tumor size and longer ischemic interval all predicted lower glomerular filtration rate after partial nephrectomy. Partial nephrectomy was the initial plan for the case. Given an initial glomerular filtration rate of 39 ml/min, with the computed GFR decrease, an estimated 25 ml/min would be the remaining GFR. Upon ureteroscopy with findings of a protruding mass on the pelvis, consideration of urothelial cancer was now entertained since “90% of pelvic masses are urothelial in origin”.

Management-wise, this increased the dilemma for management since surgery for RCC and urothelial cancer is completely different with RCC as partial nephrectomy and urothelial cancer with nephroureterectomy.

Upon discussing the new findings, with the family, treatment options were discussed and opted for delay of definitive procedure to weigh options, hence no operation was postponed. Now with new findings, other treatment options were presented mainly shifting to radical nephrectomy and ultimately a renal transplant. The patient had a great say on the management which was very evident from the start. The family and the patient resisted the possibility of hemodialysis despite adequate explanation and assurance from the pediatric nephrology and urology team. The final verdict was to do radical nephrectomy with immediate renal transplantation, the family then had family members tested for possible donors but all were rejected due to medical reasons. The timing of transplantation was another treatment dilemma, since patient begged off the idea of dialysis. The family and patient were fully informed of the possibilities of an early transplant. Israel Penn arguably the authority on transplantation noted the in the study "evaluation of transplant candidates with pre-existing malignancies" no waiting period is necessary for incidentally discovered renal carcinoma.

Conclusions

Confronted with a very rare case, we are left with no protocols to revert to, literature search was done but no exact case was present in literature, but it also led us to research present protocol which showed other possible treatment specially in the timing of the transplant of the patient. If it were a war, we won the first battle. A most 6 months post transplant patient’s creatinine was 1. Patient was healthy and happy.

Confronted with a very rare case, literature search, patient and family decisions as well as the most plausible medical option should be reached in order to give the best medical care to our patients.

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Inflammmatory Pseudotumor of the Urinary Bladder in an 11-year Old Girl: A Case Report

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Introduction

Inflammatory pseudotumor of the urinary bladder is a rare benign condition with still unknown malignant potential. It is mesenchymal in origin and occurs about 1-5 percent of all urinary bladder masses. In 1985, the first case of inflammatory pseudotumor (IPT) of the bladder was reported. To date, only 81 cases of IPT have been described and reported, only 10 cases involving children were reported worldwide since then.

This is a case of an 11 year old girl who presented with gross hematuria, was worked up and was found to have a urinary bladder tumor with a rare diagnosis of inflammatory pseudotumor.

The Case

An eleven year old girl presented with an episode of gross hematuria. She also complained of occasional dysuria and hypogastric pain. Initially, she was treated as a case of complicated UTI and was given antibiotics for 1 week. The symptoms persisted prompting consult at another hospital. She had an ultrasound which showed a urinary bladder mass prompting referral to the National Kidney and Transplant Institute (NRTI) for further evaluation and management. Upon consult, physical examination was normal. Urine examination showed some pus cells and RBC. Bleeding parameters and hemoglobin levels were within normal limits. Patient was then admitted and underwent cystoscopy, and ultrasound guided transrectal biopsy of urinary bladder tumor. Cystoscopy showed a 2 cm solid, nodular mass over the left posterolateral wall which was located superolateral to the left ureteral orifice. Central dimpling over the mass was noted. The mucosa, however, was noted to be intact. Transrectal ultrasound prior to biopsy showed a solid mass on the left posterolateral wall of the bladder. No hypervascular areas were noted. Tissue specimen were obtained using transrectal ultrasound guidance. There was bleeding in one of the biopsy site, so fulguration of bleeder was done. (Figures 1-4). French 10 Foley catheter was inserted. The postoperative course was unremarkable and the patient was discharged the following day with the catheter.

Figure 1. The smooth, broad-based urinary bladder mass on the left posterolateral aspect of the bladder wall which appears to be submucosal. It has a dark marking which may be the possible area of bleeding.
On follow-up after one week, the catheter was removed. The histopathology report revealed sections of fibrocollagenous tissues containing scattered lymphoplasmacytic infiltrates and small foci of benign urothelium. It also reported cellular fragments containing spindle cells in a myxoid background which showed no evidence of malignancy.

To date, the patient is asymptomatic with no recurrence of symptoms even without antibiotics. She is on close monitoring, with a regular check-up of every 3 months. Monitoring consisted of a urine examination, and a repeat ultrasound.

**Discussion**

Bladder tumor rarely occurs in the first two decades of life. Since 1950, only approximately 100 cases of transitional cell carcinoma in children have been reported. In 1985, the first case of inflammatory pseudotumor (IPT) of the bladder was reported. To date, only 81 cases of IPT have been described and reported, and only 10 cases involving children were reported worldwide since then.

Inflammatory pseudotumors (IPT) in children resembles clinically and radiologically like a sarcoma and has been described, therefore, by many names which includes pseudosarcomatous myofibroblastic proliferation, pseudosarcoma, reactive pseudosarcomatous response. It was also described as pseudomalignant spindle cell proliferation, and nodular fasciitis of the bladder. Sarcomas of the urinary bladder are rare, representing less than 1 percent of all malignant bladder tumors. Leiomyosarcoma is the most common histologic type of sarcoma of the urinary bladder in the adults. Since IPT and sarcomas of the urinary bladder are clinically and radiologically indistinguishable, and the treatment for each is totally different, the importance of a tissue diagnosis cannot be underemphasized.

IPT usually presents with nonspecific symptoms like hematuria, dysuria, urinary frequency and urgency, and sometimes hypogastric pain. On cystoscopic examination, IPT usually appears as nodular or as polypoid, sometimes ulcerated, exophytic mass with broad attachment to the bladder wall. It is usually found as a solitary lesion 1-4 cm in size.

Histologically, it is characterized with abundant cell cytoplasm, multiforme cell division and vessel distribution. Spindle-shaped cells in loose myxoid background are also common. Macrophages, lymphocytes, neutrophils and inflammatory cells are distributed sparsely and foamy histiocytes are aggregated around the mass. Long strap cells are similar to rhabdomyoblasts and can be mistaken with sarcoma. Electron microscopy, actin, S-100 protein, desmin stains...
are used to differentiate it from a malignant lesion such as sarcoma. Necrosis and myxoid degeneration was key to the diagnosis of sarcoma. Sarcoma also differed from IPT by having moderate to severe nuclear atypia, more than 1 mitotic figures per 10 hpf, predominance of neutrophils over chronic inflammation, and metastatic potential.

Due to the rarity of the condition and the lack of recorded long-term follow-up, the treatment of choice is not yet established. But the treatment options include antibiotic therapy, transurethral resection of the bladder tumor, and partial cystectomy depending on the patient's condition. No recurrence has been reported after tumor excision or transurethral resection. Our patient remained asymptomatic to date. However, should there be recurrence of significant or persistent hematuria, a possibility that she'll undergo partial cystectomy with left ureteral reimplantation may be warranted.

References