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Original Research Paper

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SPECTRUM OF BLADDER DIVERTICULI PRESENTING WITH UNUSUAL SYMPTOMS: A CASE SERIES STUDY

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ABSTRACT Diverticula of the urinary bladder can occasionally appear as complex pelvic masses not obviously connected to the bladder. Such presentations can lead to diagnostic confusion and interpretative error. Sonographic findings and clinical histories were reviewed in 10 patients in whom bladder diverticula were initially mistaken for other types of pathologic pelvic processes. Sonographic techniques that were helpful in elucidating the true nature of the lesions included scanning from different perspectives with increasing increments of bladder distension, post void images, colour Doppler interrogation and Valsalva manoeuvre. The sonographic findings were correlated with micturating cystourethrogram and CT finding. The diagnosis of bladder diverticula should be considered and actively pursued when sonologists are confronted with pelvic masses of ambiguous origin.

KEYWORDS : Diverticula, bladder; Pelvic masses; Sonography, MCU

INTRODUCTION:

Diverticula of the urinary bladder are protrusions of bladder mucosa that have herniated through detrusor muscle fibres to form perivesical cystic masses (1).The identity of these masses is usually unambiguous with contrast radiographic studies, but it can be obscure with routine pelvic sonographic imaging. Such ambiguity results partly from the remarkably variable sonographic appearances that the diverticula can assume and partly from difficulties in demonstrating the often-inconspicuous connection to the bladder. In this paper, we describe a series of perivesicular masses that caused initial interpretive confusion but were ultimately demonstrated to be bladder diverticula after various helpful manoeuvres were performed and correlated with other imaging modalities.

METHODS AND MATERIALS:

In the performance of routine pelvic ultrasonography over a 1.5-year period, we encountered 10 patients (eight male, two female) with pelvic masses that initially were of uncertain origin but were later proved to be bladder diverticula. The study group ranged in age from 1 to 62 years old.

For five of the 10 studies, the clinical indication was to investigate for the possibility of obstructive uropathy in various clinical contexts. These included benign prostatic hypertrophy (two cases), neurogenic bladder (one case), ectopic ureterocoele (one case) and posterior urethral valves (one case). Two patients were evaluated for inguinal hernia. Two additional patients were examined because of symptoms suggesting urinary tract infection. The final patient had symptoms of pelvic organ prolapse.

All studies were performed with 4-6 MHz linear and 1-3MHz curvilinear transducers via GE Logiq S8 ultrasound machine. Initial imaging of the pelvis was from the transabdominal perspective using the urine-filled bladder as an acoustic window.

When a pelvic mass was seen and the origin of the mass was not readily apparent, additional manoeuvres were attempted to clarify the nature of the structure (Table 1). Various combinations of techniques were attempted depending on the working diagnosis and the clinical judgment of the investigators. Bladder volumes were increased by passive filling and decreased by partial or complete voiding or catheterization. Colour Doppler and pulsed Doppler interrogation of the masses was performed. The diagnosis of a mass as a bladder diverticula was established when a communication between the mass and the urinary bladder was demonstrated. The findings were confirmed on micturating cystourethrogram and Computerised Tomography.

RESULTS:

The sonographic appearances of the pelvic masses are listed both before and after the connection between the bladder and the mass became evident (Table 1). Although all masses were perivesicular in location, they were of varying sizes, shapes, and echo textures. Eight of the 10 masses were cystic in character. One mass appeared to be complex, having both cystic and solid components. One mass seemed to be solid.

Seven masses were round or oval at the beginning of the examination; three were irregular. Four masses were tapered, or pointed, toward the bladder.

Initial working diagnoses for the pelvic masses included a wide range of possibilities: abscess, necrotic bladder tumour, aperistaltic bowel, ureterocoele, urinoma, lymphadenopathy, cystic ovarian tumour, ascites, and seminal vesicle cyst.

Techniques that were helpful in elucidating initially confusing lesions included scanning from different perspectives with increasing degrees of passive bladder filling (five cases), post void or post catheterization images (two cases), colour Doppler interrogation (one case), and Valsalva manoeuvre (two cases). Colour Doppler sonography demonstrated jets of urine flow between the bladder and the adjacent mass in one case, revealing an otherwise inconspicuous connection between the bladder and mass (Fig. 4). The patients were taken for micturating cystourethrography (MCU) and computerised tomography (CT) and the sonographic finding was confirmed.

DISCUSSION:

The sonographic diagnosis of bladder diverticula depends on the demonstration of a communication between the bladder and the mass (2,3).When such a communication, or neck, is not apparent at the time of the ultrasonographic examination, a bladder diverticula can simulate other types of cystic pelvic masses. In our study, alternative diagnostic considerations included a wide variety of possibilities: tumour, abscess, loculated ascites, ureterocoele, lymphocele, urinoma, lymphadenopathy, seminal vesicle cyst, ovarian cyst, and aperistaltic bowel. Additional considerations could have included hematoma, mesenteric cyst, duplication cyst, and urachal cyst (4-7).Diverticula can be mistaken for other lesions for several reasons. First, the communication with the bladder may be small and narrow (8). Second, a narrow opening can interfere with emptying of the diverticula, resulting in urinary stasis and infection (4).This can change the echogenicity of the urine filling such a diverticula and thereby obscure its true cystic character. In a similar way, stones, blood, and tumours can occur within diverticula and create complex appearing masses (9-14). Third, the establishment of the diagnosis can be strongly influenced by under filling or overfilling of the bladder (15) As a rule, increasing intravesicular pressure facilitates the opening of the diverticular communication. Such a pressure increase can be effected by filling the bladder to capacity or by contraction of the detrusor muscle during voiding or partial voiding (Fig. 1). Finally, identification of a diverticulum depends on accurate identification of the bladder. Diverticula that are particularly large may themselves be mistaken for the bladder, particularly if the true bladder is collapsed (2-11). We have used several helpful manoeuvres to demonstrate the communication between the diverticulum and the bladder. Some of these techniques improved the resolution of the imaging, such as Valsalva manoeuvre (Fig. 2). One case (Fig. 3) was associated with pelvic organ prolapse, where the diverticulum was prominent with prolapse of the urinary bladder on straining. Other methods enhanced the opportunity to demonstrate the walls of the diverticulum neck, such as scanning from different perspectives. Increasing bladder distension and post void images changed the intravesicular pressure and produced visible, sometimes transient, patency of the communication (Fig. 1). Finally, colour Doppler interrogation can demonstrate bidirectional urine flow between a diverticulum and the bladder, even when the communication was not visible on grey scale ultrasonography (Fig. 4) (6, 7).Colour Doppler technique also was useful in demonstrating the location of ureteral jets in the bladder, distinguishing the neck of the mass from the ureteral orifice, and thereby dispelling the potential confusion with dilated ureters. With these considerations in mind, we recommend that perivesicular masses be studied from varying transabdominal perspectives for possible connection to the bladder. As the bladder passively fills to greater distension, the mass and the tissue interposed between the mass and the bladder should be examined with grey scale and colour Doppler techniques. The location of ureteral urine jets should be noted. If no connecting channel can be seen directly or surmised indirectly by detection of exchanging currents of urine flow, the patient could be instructed to void partially and then completely, and the mass is re-examined at each step for changes of size or shape. The appearance of the bladder diverticulum often changed in response to the manoeuvres. When under filled with urine, diverticula often contained internal echoes that made them appear complicated, complex, or even solid. With greater filling and the opening of the communication with the bladder, the true cystic character of the diverticulum became more evident. In four cases, the diverticular contour developed an apparent tapering toward the bladder as it increased in size, heralding the site of connection to the bladder.

CONCLUSION

Urinary bladder diverticula can present as unexpected shapes and features that disguise their true identity. These masses can, therefore, be significant pitfalls in pelvic sonography. We recommend that when a sonologist is confronted with a pelvic mass of ambiguous origin, the diagnosis of bladder diverticula be considered and actively pursued with the help of techniques outlined in this paper.

TABLE:

Sl. no.	INITIAL SONOGRAPHIC APPEARENCE	MANOUVER	ADDITIONAL FINDINGS
1	Tubular structures internal echoes posterior to bladder	Bladder filling	Decreased echogenicity, more cystic, connected to bladder.
2	Cystic lesion in inguinal canal	Valsalva	Connection to bladder evident
3	Round, solid appearing pelvic mass	Bladder filling	Decreased internal echoes, connected to bladder.
4	Round cyst in adnexa with low level echoes.	Post Void	Decreased internal echoes, obvious neck to bladder
5	Fluid collection posterior to bladder	Colour Doppler	Track of colour doppler signal linking mass and bladder
6	Single small rounded cyst superior to prostate	Bladder filling	Several irregular diverticula with funnelled connection to bladder.
7	Complicated cystic structure between superiortobladder	Bladder filling	Decreased internal echoes, connection to bladder evident
8	Round cystic structure within the expected confines	Catheterisation	Extra luminal location, distinct from origin of ureteral jets.
9	Small round cyst superior to prostate	Bladder filling	More irregular shape, tapering towards bladder, connection seen
10	Hypo echoic cystic lesion in right inguinal canal.	Valsalva	Decreased echoes, connection to bladder evident.

FIGURES:

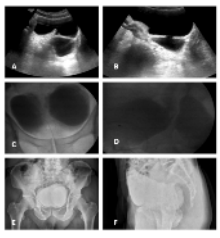

FIGURE 1:70 years male presented with features of obstructive uropathy. A well-defined cystic lesion seen behind urinary bladder(fig. 1A) which shows communication when bladder is fully distended(fig. 1B). MCU in AP(fig. 1C) and Lateral(fig. 1D) showing the diverticulum which is separated from urinary bladder. Radiograph of contrast filled bladder in AP (fig.1E) and Lateral(fig.1F) is also demonstrating the diverticulum.

FIGURE 2: 45-year-old man came with complain of left inguinal swelling. Ultrasonography revealed a cystic lesion in the left inguinal canal (fig.2A) which shows communication with urinary bladder on Valsalva(fig.2B). Fig.2C and 2D showing the MCU image of the bladder hernia during Valsalva. Radiograph of contrast filled bladder in AP (fig.2E) and Lateral(fig.2F) is also demonstrating the diverticulum. Fig 2G, 2H and 2I showing different sections of the bladder diverticulum which is filled with contrast,

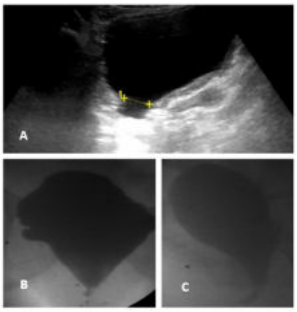

FIGURE 3: Fig 3A showing a small diverticulum in posterolateral wall of urinary bladder of a woman with pelvic organ prolapse. Fig 3B and 3C show the MCU image of prolapsed urinary bladder with the prominent diverticulum.

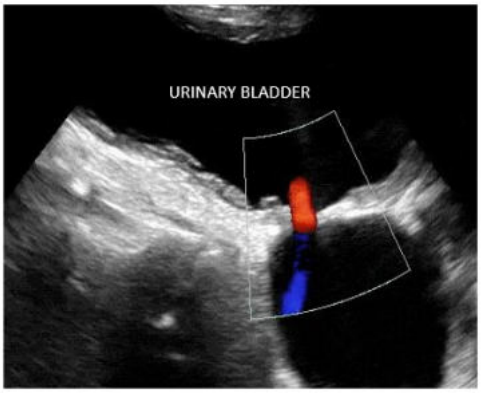

FIGURE 4: Colour Doppler imaging demonstrated an exchange of urine flow between the bladder and the adjacent mass which was proved to be urinary bladder diverticulum.

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