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An insight into the management of urinary bladder diverticulum: a retrospective observational study

Soumish Sengupta*, Supriya Basu, Saurabh Gupta

Department of Urology, RG Kar Medical College and Hospital, Kolkata, West Bengal, India

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*Correspondence: Dr. Soumish Sengupta,

E-mail: soumishuro@gmail.com

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ABSTRACT

Background: The aim of the study is to retrospectively analyse the best mode of treatment for patients presenting with urinary bladder diverticulum.

Methods: This study includes 46 patients who presented to the outpatient department between January of 2018 to March of 2020. They had lower urinary tract symptoms (LUTS) and were later found on investigations with imaging like ultrasound and voiding cystourethrogram (VCUG) as having bladder diverticulum with some cases associated with bladder outlet obstruction. Secondary causes were treated surgically or conservatively with clean intermittent catheterisation (CIC). Diverticulum was addressed with diverticulectomy when conservative management failed with recurrent LUTS or if the diverticulum was of a large size with significant post void residual urine.

Results: Most of the patients with diverticulum associated with prostatomegaly or stricture urethra fared well after treatment of the underlying cause except one who underwent subsequent diverticulectomy. Four out of 5 patients with neurogenic bladder did well with CIC alone barring one who underwent diverticulectomy for a large sized diverticulum and refractory LUTS. Two patients with bladder growth involving the neck of diverticulum underwent partial cystectomy along with diverticulectomy. Four out of the remaining 8 patients with primary diverticulum were taken up for diverticulectomy directly and one underwent subsequent diverticulectomy for failed CIC.

Conclusions: Not all urinary bladder diverticulum required surgical management per se. Most fared well with treatment of the underlying cause. So only those with large size, recurrent LUTS and failed management with CIC should be considered for diverticulectomy.

Keywords: Clean intermittent catheterisation, Neurogenic, Retrospective, Urinary bladder diverticulum, Ultrasound, Voiding cystourethrogram

INTRODUCTION

Urinary bladder diverticulum (BD) is a herniation of bladder urothelium through the detrusor muscles. This is a unique disease. It presents in various forms, with different aetiologies and produces a myriad of symptoms. Detection is by different investigations and has various modalities of treatments related or unrelated with the diverticulum itself.

This article in discussion presents our experience with this diversity of bladder diverticulum. We have also tried to highlight the different modes of management offered to them and their variable response.

METHODS

We performed a retrospective analysis of 46 patients of bladder diverticulum of various sizes who presented with various symptoms to the outpatient department of RG Kar Medical College and Hospital, Kolkata between January of 2018 and March of 2020. Ethical committee clearance was taken from the institution in March 2020. Subjects were thoroughly examined and investigated to

come to this definitive diagnosis. They were offered different modes of treatment according to their merits and suitable indications.

All the patients irrespective of their age and sex, presenting with features of LUTS and radiological imaging showing bladder diverticulum were included in the study. Only pregnant patients were excluded from the study. Patients were grouped and categorised according to their number, presentations, aetiology and the mode of management. Ultimately, they were followed up and analysed for their response to treatment.

Here, we present our cases for an overview of this bladder pathology for a guideline to decide the proper plan of management and assess their outcome.

Based on number, we had 8 patients with single diverticulum and 38 patients with multiple diverticula. There were 36 patients with secondary causes of diverticulum. Nineteen subjects had prostatomegaly, 12 had stricture urethra and 5 patients had neurogenic bladder.

No identifiable organic cause of obstruction (primary/congenital) was seen in 10 patients, out of which 2 had concurrent urinary bladder space occupying lesions (SOL).

Besides haematological and blood biochemistry e.g. serum creatinine, all patients underwent urine culture and sensitivity. USG is the baseline imaging modality with occasional surprising findings like bladder tumour. Bladder diverticulum can be nicely visualised with a cystogram. VCUG is especially useful because it fills up the diverticulum and to demonstrate vesicoureteral reflux (VUR). Few patients underwent CT scan especially those with haematuria. All the patients underwent cystourethroscopy assessment to corroborate the imaging findings to find out the number, size, and location of the diverticulum as well as to have an idea about the proximity of the diverticular neck to the ureteric orifice.

We have used IBM SPSS 26.0 software for statistical analysis.

Management

Four patients without any evidence of organic outflow obstruction were placed under expectant management with CIC. Inspite of that, one patient suffered from persistent LUTS and relapsing UTI. Subsequently, he was taken up for diverticulectomy.

Twelve patients who underwent optical internal urethrotomy (OIU) or urethroplasty did fairly well in postoperative period and did not require any further management for diverticula.

Nineteen patients were operated for prostatomegaly-prostatectomy or transurethral resection of prostate (TURP). Out of those, ten patients had improved international prostatic symptom score (IPSS) and improved Qmax with negligible post void residual urine (PVRU). They are under regular follow up with satisfactory outcome. The remaining eight out of nine patients required continuous medical management with CIC and occasional UTI, managed with antibiotics barring one who had breakthrough UTI and one episode of haematuria. He was taken up for diverticulectomy.

Four patients with suspected neurogenic voiding dysfunction were treated with expectant management and one patient was initially taken up for diverticulectomy for its huge size (Figure 1). Two patients underwent partial cystectomy for bladder tumour. Four patients with primary diverticulum underwent diverticulectomy at the very outset for huge size of diverticulum, severe LUTS (high IPSS score), palpable bladder and recurrent UTI. In total seven patients underwent diverticulectomy.



Figure 1: VCUG post void film of urinary bladder with grade III obstructive changes along with a huge diverticulum. Patient gave a history of frequency of micturition and recurrent UTI.

We performed diverticulectomy by open surgical methods. One case underwent transvesical diverticulectomy. In this case, the right ureter was draining into the diverticulum (Figure 2). So, we had to perform a simultaneous ureteric re-implantation (Figure 3). The other three cases were done by combined intravesicle and extra-vesicle approach. In none of the cases, the diverticulum was adherent to the lateral pelvic walls and thus eversion could be accomplished without much technical difficulty.



Figure 2: VCUG lateral view showing reflux into the right ureter which opens into the diverticulum.

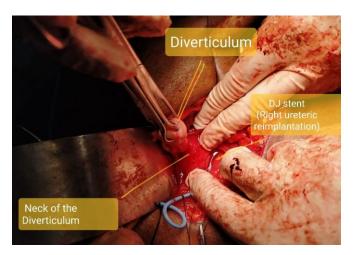


Figure 3: Simultaneous ureteric re-implantation (DJ stent *in situ*) done during transvesical diverticulectomy in a case of right ureter draining into the diverticulum.

RESULTS

In our series, 31 out of 46 patients were identified with organic obstruction. Nineteen patients with prostatomegaly were treated with surgery i.e. open prostatectomy or TURP to alleviate the obstruction. Eighteen of them could achieve good outcome which was evidenced by reduced IPSS score, low PVRU and

improved Qmax. But one patient had persistent dysuria, sense of incomplete voiding and relapsing UTI. He was taken up for subsequent diverticulectomy.

Twelve patients who underwent OIU/urethroplasty did fairly well. They could void with satisfactory urinary stream and their Qmax was acceptable. They were comfortable without any further management.

Two patients demonstrated concomitant bladder tumour with bladder diverticulum on USG. In one patient, bladder tumour involved the neck of the diverticulum (Figure 4). In another, a small growth was seen in the diverticulum itself. Both these cases were operated with partial cystectomy including a wide segment of diverticular neck. On histopathological examination, the former showed evidence of muscularis propria invasion and underwent radical cystectomy. In the latter, there was no evidence of extra-vesicle extension per-operatively corroborating with CT findings.

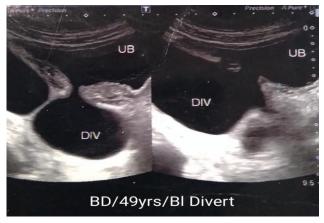


Figure 4: USG of bladder diverticulum with its neck involved by a bladder SOL.

One among the five patients of neurogenic voiding dysfunction was primarily taken up for diverticulectomy for severe dysuria, straining, significant PVRU, huge size and recurrent UTI. The remaining 4 patients were treated with expectant management with CIC. Anticholinergics were prescribed for symptoms suggestive of urgency after ruling out UTI.

Table 1: Study population with diagnosis and mode of treatment.

No. of patients	Primary diagnosis	Mode of primary management	Subsequent diverticulectomy
4	Primary diverticulum	Expectant Mx	1
12	Stricture urethra	OIU/Urethroplasty	NIL
19	Prostatomegaly	Open prostatectomy or TURP	1
4	Neurogenic Bladder	Expectant Mx	NIL
1	Neurogenic Bladder	Diverticulectomy	NIL
2	Bladder Tumour	Partial cystectomy	NIL
4	Primary diverticulum	Diverticulectomy	NIL

We had 8 patients with congenital bladder diverticulum. Four patients were primarily taken up for diverticulectomy for their massive size, high IPSS score, significant PVRU and recurrent UTI. They were satisfied with their surgical outcome. Expectant management was tried in the other 4 patients. Three patients showed improvement on treatment except one who underwent diverticulectomy for persistent symptoms (Table 1).

DISCUSSION

Urinary bladder diverticulum is not an uncommon entity. Small bladder diverticula do not require any surgical management apart from relief of their cause. On the other hand, large diverticula, which may lead to infection, lithiasis, inadequate voiding, or damage to the upper urinary tract, should be treated surgically. It often remains under-diagnosed unless it prompts the clinician to investigate the case thoroughly due to its symptoms, complications or some other factors associated with it.

Most of the urinary symptoms appear because it does not contain proper functional muscular layer which can evacuate urine during the act of voiding. The retained urine is the source of initial symptoms and subsequent complications.

Bladder diverticulum may be broadly classified as either primary (congenital) or secondary (acquired). Primary bladder diverticulum is due to inherent weakness of bladder musculature whereas secondary bladder diverticulum is due to some kind of urinary outflow obstruction.

However, occasionally congenital bladder diverticulum may be caused by obstruction eg. posterior urethral valve (PUV). In a case report by Bokil AA et al, a 7-month-old male child presented with obstructed voiding. On exploration it was evident that compression and displacement of bladder neck and urethra by the extended diverticulum was the cause of obstructed voiding. They also had to do ureteric reimplantation during diverticulectomy because the ureter was draining into the diverticulum.² Similar case was also reported by Sheldon et al.³ We had 5 patients with palpable bladder. It was not possible to establish the exact reason whether it was for obstructed outflow or detrusor under-activity because UDS was not conducted. Similar report is also available in the literature by Kwan et al.⁴

On the other hand, an acquired bladder diverticulum may develop without any demonstrable organic obstruction e.g. neurogenic sphincteric dysfunction. This kind of bladder diverticulum may be seen in long standing detrusor sphincteric dyssynergia (DSD) following Spinal cord injury (SCI) (Table 2).

When investigated, bladder diverticulum may be diagnosed by different imaging modalities like USG, VCUG, CT and MRI scans.

Table 2: Classification of urinary bladder diverticula.

Variables	Primary	Secondary
Cause	Usually congenital	Usually acquired
Sex and age	Boys <10 years	Men >60 years
Number	Usually solitary	Usually multiple
Size	Usually large	Usually smaller
Location	Close to VUJ	Close to VUJ
Cystoscopy	No or minimal trabeculation	Bladder grossly trabeculated

USG also helps in detection of bladder SOL. Cystogram with antero-posterior, lateral and oblique views will help to identify the number, size and location of the diverticula. This information will guide the therapeutic planning. VCUG may demonstrate VUR which will require concomitant ureteral re-implantation at the time of diverticulectomy. Cystogram should be taken from different angles because only AP view may overshadow the bladder diverticulum and diagnosis may be missed. Similar warnings were issued by Yovchevski et al.⁵

CECT or MRI scan can give an exact idea about the anatomical configuration of bladder diverticulum and about the insertion of the ureter. Insertion of the ureter into or very close to diverticulum may require a concomitant ipsilateral ureteric re-implantation.

Intravenous urogram (IVU), though not a first choice of investigation after widespread availability of CT scan, may raise suspicion of bladder diverticulum when the ureter is deviated from its usual course.

Urodynamic study (UDS) is invaluable for the planning of management protocol of a patient with bladder diverticulum. UDS helps to identify an existing underlying neurological problem. This problem should be recognised before surgery to prognosticate the outcome of diverticulectomy. It may guide further management to tackle the neurological problems to prevent recurrence and other complications. This is a lacuna in our study that UDS was not done.

All our patients underwent cystoscopic visualisation of whole UB for assessment and treatment planning.

It was not possible to enter the bladder diverticulum with the scope when neck was too narrow to accommodate it. In those cases, we investigated them with urine for malignant cytology and CT scan to exclude any bladder growth.

As we consider this pathology a disease of diversity, the same is true for its treatment options too: Observation and expectant management and close follow up, Endoscopic management (TUR of BD), Open trans vesical diverticulectomy, Open combined intravesical and extravesical diverticulectomy, Submucosal excision of the diverticulum, diverticulectomy with or without electro fulguration of diverticular mucosa, partial

cystectomy including BD with SOL, laparoscopic intra peritoneal or transvesical diverticulectomy diverticulectomy, laparoscopic trans vesical diverticulectomy.

Indications of diverticulectomy: Persistent and/or severe symptoms, recurrent infections, stones within BD, VUR, BD causing bladder neck obstruction or dysfunction, upper urinary tract deterioration.

Endoscopic management/diverticulectomy may be considered for very old debilitated or cardiopulmonary compromised patient. However, one report from Denmark shows that even after transurethral resection, the patient could not void and a formal diverticulectomy had to be performed.⁶ Submucosal excision of BD is recommended and practised when eversion of diverticulum is not possible or highly risky because of inflammation or adhesion to lateral pelvic wall or adjacent vital structures like colon or great vessels.

We did not experience these problems and hence never attempted to do these procedures.

CONCLUSION

Urinary bladder diverticulum can be congenital or acquired. A few congenital diverticula can also be acquired e.g. posterior urethral valve, urethral atresia. We mostly encounter secondary bladder diverticulum in practice either due to anatomical obstruction in lower urinary tract or neurogenic bladder. Treatment of obstruction is the prime management strategy either by medical or surgical intervention. Neurogenic UB are usually evaluated using urodynamics and treatment of the underlying medical condition with judicious use of clean intermittent catheterisation. Diverticulectomy is indicated only if it is associated with recurrent UTI or LUTS even

after addressing the underlying cause of diverticula, if any.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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