Introduction: Prostatic utricles (PUs) are the remnants of Mullerian ducts found in the male posterior urethra. Enlarged symptomatic utricles are known to be associated with hypospadias. There is a dearth of literature defining an enlarged utricle and also its clinical significance.

Aims: The aim of this study was to describe anatomical difference of PUs of cases with severe hypospadias and also to find their clinical significance if any.

Materials and Methods: A prospective study was carried out, and all patients with proximal hypospadias were enrolled. Cystoscopy was performed in all cases. Symptomatology, size, and location of PU were recorded. PU of >0.5 cm was considered enlarged.

Results: In the present series, a total of 70 cases were included over a period of 2 years. Enlarged utricle was found in 47/70 (67.14%) on cystoscopy. They were wide-mouthed and negotiated 9 Fr/11 Fr cystoscope with ease. Recurrent epididymo-orchitis, recurrent urinary tract infection, and obstructive features were the most common complications requiring intervention.

Conclusions: PUs in boys with hypospadias are enlarged as well as wide-mouthed. Most of these remain asymptomatic, but few of them carry the potential of complications. Cystoscopy helps in direct visualization of utricular anatomy, so it should be a preferred investigating modality for investigating a PU.

Keywords: Cystoscopy, hypospadias, prostatic utricle, voiding cystourethrogram
of urinary system was done to look for the presence of PU, postvoid residual volume, and backpressure changes in kidney, ureter, and bladder. The presence of other unregressed Mullerian ductal structures in continuity with utricle was also noted.

Patients were subjected to cystourethroscopic examination to look for the anatomy of PU. Cystoscopy was done before starting urethralplasty, under the same anesthesia. Oh et al., in a study on cadavers, reported the maximum diameter of PU to be 1.98 mm. We considered any utricle in which a cystoscope of at least 9Fr (3 mm) could be negotiated for ≥6 mm (length as is defined for normal adults) as enlarged. Length of PU in these cases was calculated by measuring the length of cystoscope which could be negotiated into the PU starting from orifice of PU. The presence of cervical impression was also noted. Depending on the length of PU, all enlarged utricles were categorized into three grades [Table 1]. Any abnormality in clinical features or laboratory investigations was then correlated with the size of the utricle. A voiding cystourethrogram (VCUG) was performed in cases where cystoscopy suggested an enlarged utricle to see filling of utricle during micturition and subsequent obstruction to urine outflow. Cystoscopic grading of size of PU was compared with the VCUG grading by Ikoma et al. [Table 1].[4] Clinical descriptive statistics including counts and percentages were analyzed. Statistical analysis was performed using STATA (State corp. 2017. State statistical software release 15. Colleges, Staloon, Texas, USA) for all calculations.

**RESULTS**

The median age of presentation in the series was 4 years (interquartile range: 2.55–6.0). Proximal penile, penoscrotal, and scrotal hypospadias were seen in 25, 28, and 17 patients, respectively.

Only 10% (7/70) were symptomatic, out of which four had a history of occasional dysuria only. Two patients had multiple episodes of acute retention of urine. Patient presented with episodes of acute retention of urine.

Urine analysis revealed the presence of few red blood cells (RBCs) in 4/70 (5.72%) patients with occasional dysuria. Dysuria was ignored by the caregivers and believed to be clinically insignificant. Pus cells in urine were found in 6/7 symptomatic patients.

Chromosomal analysis was done in 9/70 patients. Mixed gonadal dysgenesis was seen in three patients (XY/XO mosaic).

Ultrasoundogram of urinary tract revealed cystic mass in approximation to prostate in five cases; all of which were later diagnosed as grade II or III PU on cystoscopy. Additional Mullerian ductal structures were seen in three patients with Difference in sexual development (DSD). Ultrasoundogram also revealed single kidney with hydrourteronephrosis in one patient, bilateral mild hydrourteronephrosis in two patients, and features of cystitis in eight patients. None of the patients had significant postvoid residual volume.

Cystoscopy was performed in all the patients. PU with wide orifice (negotiating 9Fr/3 mm cystoscope) was demonstrated in 47/70 (67%) patients. In 36 of these patients, even 11-Fr cystoscope could be negotiated. Grading based on the length of PU suggested grade 0 PU in 31 (44.2%) patients, grade I PU in 7 (10%) patients, grade II PU in 4 (5.7%) patients, and grade III PU in 5 (7.1%) patients [Table 2]. Cystoscopy also revealed bladder trabeculations in 12 patients, posterior urethral dilatation in one patient, and flat verumontanum in one patient; however, the opening of seminal vesicles could not be visualized in any of the patients.

All patients with enlarged PU proven on cystoscopy (47/70) underwent voiding cystourethrogram to see filling of PU, if any, during micturition and also to see any obvious obstruction to outflow during micturition. Out of 47 cystoscopically labeled enlarged PU, VCUG could demonstrate only 17 PU (36%). When

### Table 1: Anatomical grading of prostatic utricle as is used by Ikoma et al. Versus corresponding anatomical grading using findings of cystoscopy

| Anatomical grading of prostatic utricle | On cystourethography (grading used by Ikoma et al.) | On cystoscopy (grading used in the present series) |
|----------------------------------------|---------------------------------------------------|--------------------------------------------------|
| Grade 0                                | Opening located on prostatic urethra but the utricle does not extend over verumontanum | Length of PU 0.5 to 1 cm, opening at prostatic urethra, allowing negotiation of 9 fr/11 fr urethroscope |
| Grade I                                | Larger than grade 0, but does not reach bladder neck, opening located on prostatic urethra | Length of PU 1 cm - 2 cm, opening at prostatic urethra, allowing negotiation of 11 fr (3.3 mm) scope |
| Grade II                               | More enlarged and its dome extends over the bladder neck, opening located on prostatic urethra | Length of PU ≥2 cm, opening at prostatic urethra |
| Grade III                              | 2 cm or more, opening at bulbar urethra            | Length of PU 2 cm or more, opening at bulbar urethra |

PU: Prostatic utricle
Table 2: Enlarged prostatic utricles: cystourethrography and cystoscopy

| Grade of prostatic utricle | Cystourethrography | Cystoscopy |
|----------------------------|--------------------|------------|
| Grade 0                    | 8                  | 31         |
| Grade I                    | Nil                | 7          |
| Grade II                   | 6                  | 4          |
| Grade III                  | 3                  | 5          |

classified as per Ikoma grading, it was evident that many of the grade I utricles look like grade 0 in VCUG probably due to their underfilling. Furthermore, it is always not possible to differentiate type 2 and type 3 in VCUG. None of the utricles where we could negotiate cystoscope had shown any sign of inflammation or infection. Seven out of 67 patients with grade I or greater had difficult catheterization during their hypospadias repair. These patients were catheterized by mounting the catheter over urethral dilator.

Of all the 67 patients of severe hypospadias (excluding patients with MGD), four patients required surgical correction of enlarged utricles. Indications for surgery were recurrent episodes of epididymorchitis (2/7), retention of urine (1/7), and recurrent disruption of hypospadias repair in one patient (1/7). All patients who required surgical correction had grade II/III PU on cystoscopy. All these patients were operated laparoscopically. Cystoscopy aided in identifying the PU during laparoscopy and also helped in grasping PU for dissection.

**Discussion**

PU is a rudimentary structure, and an enlarged PU in normal population is very rare. Failure of the PU to regress in children with hypospadias is presumably a consequence of inadequate androgenic stimulation.[3,4,6] The incidence of enlarged PU is higher in patients with severe variety of hypospadias. Although many authors have mentioned about the presence of enlarged utricle with hypospadias, there is no clarity regarding its definition.

In effort to standardize the definition of enlarged PU, we considered any utricle in which a cystoscope of at least 9 Fr (3 mm) could be negotiated as enlarged. Patience is required to identify PU on cystourethroscopy as the utricular orifice opens and closes sponatenously. This modality in our scenario neither increased morbidity of patient nor added to cost of treatment. If done patiently and carefully, there is very less chance of missing the entity.

Incidence of enlarged PU in the present series is 67%. This is much higher than the series of Devine et al. (14%) and Ikoma et al. (35%). Higher incidence in our series is attributable to inclusion of all utricles with abnormally wide orifices.[3,4]

Cystourethreoscopic examination not only helps in the diagnosis but also in the management of the patient with PU. In the authors opinion, this modality not only provides more reliable diagnosis but also helps in more accurate categorization of enlarged PU. Cystoscopy also aids in early identification for the cause of nonspecific symptoms such as perineal pain and epididymitis; thus, early decision for surgery in these symptomatic patients can also be undertaken. We investigated all cases of proximal hypospadias for PU, as clarity in knowing, this entity as a whole provided a whole new insight in its management, even if it was not to be surgically intervened.

In the present series, VCUG was done in all cases with cystoscopic finding of enlarged utricle but it revealed PU in only 17/47 (36.4%) cases. It could show grade II and grade III PU but missed many cases of grade 0 and I PU. In two cases, although size and anatomy of PU were clearly shown, site of opening of PU in urethra was misinterpreted. Ikoma et al. also observed that, sometimes, even very large utricles could be missed on cystourethrogram.[6] Meisherri et al. proposed cystoscopy with identification of utricular orifice as the most useful investigation in cases of enlarged utricle.[6] They also suggested performing a contrast study of utricle by catheterizing it during cystoscopy wherever required. They concluded that both VCUG and cystoscopy must be used adjunct in patients with severe hypospadias. Hester et al. in their recent publication suggested that all boys with proximal hypospadias, boys with hypospadias and associated cryptorchidism, and those with hypospadias with associated urinary symptoms or signs should undergo an initial VCUG before proceeding with hypospadias repair and cystoscopy at the onset of the repair as the repair procedure may be modified if a large utricle is diagnosed.[9]

Although majority of enlarged PU are asymptomatic, grade I, grade II, and grade III PU may be associated with dysuria, recurrent epididymorchitis, and asymptomatic bacteriuria. Out of 17 cases of grade I PU, four patients were found to have RBCS and pus cells in their urine microscopy examination. These patients had a history of occasional dysuria too. They are followed up yearly with urine routine microscopy and ultrasonogram, as most of the cases with complications in PU are reported in adults. Although majority of patients with enlarged PU are asymptomatic, the possibility of these becoming symptomatic later in life remains. Gualco et al. reported clear cell adenocarcinomas arising from PU in young...
children.[8] Patients with grade 0 PU in cystoscopy neither had any urinary symptoms nor had any positive findings in urine analysis; however, long-term follow-ups studies are warranted for proper management of these patients.

Indications for excision of PU in our series were recurrent episodes of epididymorchitis in two cases, retention of urine in one, and recurrent complete disruption of hypospadias repair in one patient. The last-mentioned case had complete disruption of urethroplasty, twice, within 2 weeks of hypospadias repair. Recurrent, early and complete disruption were an unusual finding in patients undergoing hypospadias reconstruction. Patient had successful hypospadias reconstruction after excision of PU.

PU can be excised by extravesical abdominal, perineal, or transtrigonal approach. Ikoma et al. found transtrigonal approach best for good exposure of the lesion.[9] Meisheri et al. found satisfactory exposure with posterior sagittal rectum retraction approach.[6] Electrofulguration of an enlarged PU is a simple procedure that has a high rate of success, does not require prolonged hospitalization, and is associated with minimal morbidity, but the procedure has limited indications and has theoretical risk of injury to adjacent organs.[10] Babu et al. in their report of seven patients with isolated prostatic utricle have found cystoscopic widening of mouth of PU as an alternative method for the management of these cases even in patients who are symptomatic after partial PU excision.[11]

Recently, many authors have reported successful laparoscopic excision of PU.[12,13] We too found laparoscopy a very good option for grades II and III PU. Cystoscope inside the PU eases the process of identifying the PU laparoscopically and it also helps in grasping it for dissection. Direct visualization of vas with laparoscope helped us in preserving the vas in three patients where the fusion point of vas was closure to urethra. These patients were managed by partial/subtotal excision of PU. However, in one patient, vas was sacrificed as it was densely adhered to the utricle throughout its course.

**Conclusions**
The incidence of PU is high in severe form of hypospadias; they are usually small with wide mouth and allow passage of 9/11 Fr cystoscope (3 mm/3.3 mm diameter). Most of these urticles are less likely to cause any significant effect; however, treating surgeons must be aware of different anatomical configurations of PU and possible future complications. Cystoscopy is a good tool to diagnose PU as well as to see its configuration.

**Financial support and sponsorship**
Nil.

**Conflicts of interest**
There are no conflicts of interest.

**REFERENCES**
1. Howard FS. Hypospadias with enlargement of the prostatic utricle. Surg Gynec Obst 1948;86:307.
2. Williams PL. Gray’s Anatomy the Anatomical Basis of Medicine and Surgery. 38th ed. New York: Churchill Livingstone; 1995. p. 1842.
3. Devine CJ Jr, Gonzales SL, Stecker JF Jr, Devine PC, Hortum CE. Utricular configuration in hypospadias and intersex. J Urol 1980;123:407-11.
4. Ikoma F, Shima H, Yabumoto H. Classification of enlarged prostatic utricle in patients with hypospadias. Br J Urol 1985;57:334-7.
5. Oh CS, Chung IH, Won HS, Kim JH, Nam KL. Morphological variations of prostatic utricle. Clin Anat 2009;22:358-64.
6. Meisheri IV, Motiwale S, Sawant VV. Surgical management of enlarged prostatic utricle. Pediatr Surg Int 2000;16:199-203.
7. Hester AG, Kogan SJ. The prostatic utricle: An under-recognized condition resulting in significant morbidity in boys with both hypospadias and normal external genitalia. J Pediatr Urol 2017;13:492.e1-5.
8. Gualco G, Ortega V, Ardao G, Cravioto F. Clear cell adenocarcinoma of the prostatic utricle in an adolescent. Ann Diagn Pathol 2009;9:153-6.
9. Ikoma F, Shima H, Yabumoto H, Mori Y. Surgical treatment for enlarged prostatic utricle and vagina masculina in patients with hypospadias. Br J Urol 1986;58:423-8.
10. Husmann AD, Allen TD. Endoscopic management of infected enlarged prostatic utricle and remnants of recto urethral fistula tracts of high imperforate anus. J Urol 1997;157:1902-6.
11. Babu R, Chandrasekharam V. Cystoscopic management of prostatic urticles. Urology 2021;149:e52-5.
12. Jiwane A, Soundappan SV, Pitkin J, Cass DT. Successful treatment of recurrent epididymo-orchitis: Laparoscopic excision of the prostatic utricle. J Indian Assoc Pediatr Surg 2009;14:29-30.
13. Willetts IE, Roberts JP, MacKinnon AE. Laparoscopic excision of a prostatic utricle in a child. Pediatr Surg Int 2003;19:557-8.