Bladder explosion during transurethral resection of prostate: Bladder diverticula as an additional risk factor

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INTRODUCTION

Bladder explosion during transurethral resection is very rare. The earliest report of this complication was in 1926. Bladder injury can range from mucosal tear to bladder rupture.

Most of these explosions occur during transurethral resection of the prostate (TURP). Explosions have also been described during bladder tumor resection and ureteroscopic fulguration of renal pelvic tumor. Only few cases have been reported so far in the literature.

CASE REPORT

A 75-year-old male presented with the complaints of obstructive and irritative lower urinary tract symptoms for...
6 months. Physical examination revealed Grade 3 enlargement of the prostate. On evaluation, he was found to have benign enlargement of the prostate with chronic retention. Ultrasound examination of the abdomen revealed bilateral hydroureteronephrosis up to the urinary bladder with a prostate size of 81 cc and residual urine volume of 268 cc. His serum creatinine was 3.8, and after catheterization, it reached a nadir of 1.5 after 4 weeks. His urine culture grew *Klebsiella* and he was treated with a course of culture-sensitive antibiotics.

He is a known case of coronary artery disease and chronic obstructive pulmonary disease on treatment. He had an episode of unstable angina in the meanwhile and was treated by the cardiologist. He was a very high-risk candidate for surgery due to his comorbidities. He was stabilized and taken up for TURP after 2 months.

He was operated under epidural anesthesia. Cystoscopy revealed Grade 3 trilobar enlargement of the prostate. Bladder had multiple diverticula largest being in the dome of bladder. Resection was done using 26 Fr continuous flow resectoscope. Valleylab cautery was used with a monopolar cutting current of 100 W and coagulation current of 60 W. 1.5% glycine was used as the irrigant. When the median lobe and most part of the left lobe were resected, he developed bradycardia and breathing difficulty and it was decided to terminate the procedure. The total resection time was 35 min. While hemostasis was being achieved near the bladder neck, there was a sudden loud pop sound. The irrigation fluid returns decreased, and bowel loops were visible through the bladder. Intraperitoneal bladder explosion was suspected, and lower midline laparotomy was performed. The large diverticulum had exploded, and there was a large rent in the dome of the bladder extending in a “V” fashion along the posterior wall up to the trigone [Figure 1]. The anterior wall muscular and mucosal layers had two large lacerations, but the serosa was intact. The margins were ragged and irregular. The ureteric orifices were not injured. There was no bowel or vascular injury. Bladder was repaired with two layers of continuous polyglactin sutures. Suturing was extremely difficult due to the multiple bladder diverticula. Suprapubic catheter and drain were placed along with 22 Fr perurethral catheter.

He had an uneventful postoperative recovery. Drain was removed on the 2nd day and was discharged on the 4th day. Suprapubic catheter was removed after 7 days. Retrograde cystogram [Figure 2] was performed through the perurethral catheter after 2 weeks. There was no leak of contrast, and the perurethral catheter was removed. He voided with good flow after catheter removal. His postvoid residual urine was only 10 cc, and his serum creatinine was stable at 1.4. The biopsy report was benign. He remains asymptomatic at 6 months of follow-up.

**DISCUSSION**

Hansen and Iversen[2] described *in vitro* and *in vivo* gas formation during TURP which were analyzed by means of an oxygen electrode and gas chromatographs. Hydrogen is formed by pyrolysis of prostatic tissue and by hydrolysis of intracellular water. Ning *et al.* and Davis[3,4] showed *in vitro* that hydrogen constituted 30%–50% of the gasses produced by electrocautery, while oxygen made up no more than 3%. The mere accumulation of hydrogen itself does not cause explosion. Therefore, oxygen from the atmosphere must enter the bladder to form a highly explosive gaseous mixture.[3-5]

The intravesical accumulation of explosive gas can be ignited when the electrosurgical electrode loop comes into contact with gaseous formation.

**Figure 1:** Large rent in the dome of bladder with posterior wall extension

**Figure 2:** Retrograde cystogram showing no extravasation of contrast
The amount of gas formed and the risk of explosion are proportional to the operating time and the power of the cutting and coagulating current. The nature of the bladder irrigation fluid does not appear to play an important role.

There have been various suggestions for prevention of this untoward complication:

- The use of moderate power current during coagulation and decreasing the tissue resection time
- Minimize the entry of air into the bladder by keeping all connections and joints leak proof
- Evacuating the bladder either frequently or continuously to reduce the size of the air bubble as small as possible
- The bladder should be allowed to evacuate completely by angling the beak of the resectoscope toward the bladder dome.

All these precautions were taken in this particular case except for the use of a suprapubic trocar for continuous aspiration of the air bubble which is not practically feasible for all cases. In this particular case, the bladder exploded at the site of the diverticulum, and there were extensive tears in both the anterior and posterior wall extending from there. The presence of diverticulum near the dome could be an additional risk factor for explosion as the bladder is thinned out and also due to possible trapping of air within the diverticulum. In such select cases with multiple diverticula, the employment of a suprapubic trocar for continuous emptying of the air bubble could be a practical consideration.

**CONCLUSION**

Although very rare, bladder explosions can occur during all forms of transurethral procedures using diathermy. Urologists must be aware of this potential complication. Careful operative technique and prevention strategies can reduce the risk of this complication. This case is presented to highlight the fact that the presence of multiple diverticula could be an additional risk factor for this rare complication and the employment of continuous suprapubic air bubble drainage in such selected cases could be a point to ponder.

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**REFERENCES**