Case Report

Vesical explosion during transurethral resection of prostate: A dreadful complication associated with common endoscopic procedure

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ABSTRACT

Vesical explosion during transurethral resection of the prostate (TURP) is an extremely rare, serious and dreadful complication, which should be considered as a blast injury requiring urgent exploratory laparotomy and repair. Until 2019, only 38 cases have been reported in the International English literature. The underlying mechanism for this rare intravesical explosion is the generation and trapping of explosive gases under the dome of the bladder, which eventually detonates by sparks from the cutting electrode during TURP. Herein, we report a case of a 67-year-old man, where an explosion occurred during TURP, resulting in a large intraperitoneal rupture of the urinary bladder. After confirmation of the diagnosis clinically, endoscopically, and radiologically, the patient underwent a successful emergency laparotomy to repair the bladder tear. He had uneventful post-operative recovery, and he is symptoms free at 6 months and 1 year of follow-up. Although uncommon, vesical explosion during TURP may occur and some preventive measures, discussed here, can be carried out to avoid this dreadful complication. In addition to the discussion of its mechanism, we will discuss the preventive measures of this dreadful event. To the best of our knowledge, this is the first case of a vesical explosion reported in our department.

Key words: Benghazi, Benign prostatic hyperplasia, Bladder explosion, Electrocautery, Explosive gases, Repair, Transurethral resection of the prostate

Benign prostatic hyperplasia (BPH) is a frequent disease, affecting 12% of the male population over 65 years of age; about 20–30% of patients will require prostatectomy. Despite the introduction of newer techniques, TURP still represents the gold standard in the operative management of BPH [1]. Several common complications of this surgical procedure such as hematuria and perforations have been reported in the literature [2,3]. However, the vesical explosion during transurethral resection of the prostate (TURP) is an extremely rare event. The earliest report of an intravesical explosion was reported by Cassuto [4] who in 1926 reported an intravesical explosion during TURP on a patient with a large middle lobe. Until 2019, only 38 cases have been reported in the English literature [5]. Aim: Our presentation aims to bring attention to this rare complication and associated morbidities and to remind those who perform TURP on daily practice with a literature review and emphasis on the necessary precautions needed to prevent it.

CASE REPORT

A 67-year-old Libyan patient presented with a 1-year history of the lower urinary tract symptoms. He scheduled for TURP due to failed medical treatment of BPH. He had a history of the right renal cyst excision in the past years. His medical history is unremarkable. On the digital rectal examination, a grade II gland with firm consistency was felt. On ultrasound, the prostate volume was 65 grams. All routine laboratory investigations (Hematological and biochemical) were within normal range except urinalysis that revealed microhematuria (12–20 RBCs/HPF). TURP planned and under spinal anesthesia, the procedure started using a Karlstorz 26 Fr continuous flow resectoscope and 1.5% glycine as an irrigant. The monopolar electrocautery current was set at 80 W for coagulation and 120 W for cutting. The procedure was straight until the last phase, when hemostasis was being achieved at the anterior lobe at the 1-o'clock position, a loud sound was heard with jolts on the abdomen, and a sudden decrease in endoscopic vision. There was no return of the irrigation fluid, and a lower abdominal pain and distension started. The endoscopic examination of the bladder was not conclusive due to poor vision. The procedure concluded and a 20-Fr three-way Foley catheter left in place, and a cystogram ordered, which showed extravasation of contrast near the dome and free flow of contrast into the peritoneal cavity. After confirmation of vesical rupture both clinically

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and radiologically, the operation was converted immediately to laparotomy via a low midline incision which revealed about 300–400 mL of blood tinged fluid which was suctioned from the pelvis and intraperitoneal space and 3 cm laceration just near to the dome which was freely communicating with the peritoneal cavity. Fortunately, the large and small bowels and great vessels were intact. The urinary bladder was closed in two layers by a watertight fashion using Vicryl® (polyglactin 910) 3/0. 20Fr perurethral threeway Foley's catheter and a 20Fr twoways suprapubic catheter guaranteed urinary drainage. The abdomen closed with a pelvic drain. He made an uneventful recovery and the drain was removed on the day 3 postoperatively and discharged home on the 7th day. On the 10th post-operative day, the urethral catheter removed, and on the 14th day, the suprapubic catheter was removed after a cystography demonstrated a normally appearing bladder without evidence of extravasation. Postoperatively, the patient did well apart from mild urge incontinence, which resolved over a couple of weeks after surgery. Histopathological examination of the resected chips confirmed the diagnosis of benign prostatic hyperplasia.

DISCUSSION

Intravesical explosion is one of the most infrequent complications of the transurethral procedures with an incidence of 0.01–0.02% [1,6,7]. Intravesical explosions are rare but well-recognized complication of transurethral resections of endoscopic surgery. They are often related to TURPs than transurethral resection of bladder tumors (TURBTs) [8]. A case of renal pelvic explosion during ureteroscopic fulguration of renal papillary transitional cell carcinoma was reported in 1941 [9], and during colonic surgery by Levy [10].The degree of bladder injury secondary to an explosion varies from a loud "pop" sound only to a ruptured bladder needing surgical repair [8]. The injury can also be categorized into an intraperitoneal or extraperitoneal rupture [11,12]. Bladder explosion during transurethral surgery is a rare phenomenon and it is commonly occurring due to over distension of bladder [1]. The mechanism of intravesical explosion is the formation and accumulation of explosive gases under the dome of the bladder. A mixture of hydrogen (30–65%) and oxygen (5%) are formed by hydrolysis of water by diathermy. The atmospheric air contains 21% Oxygen and it may enter the bladder due to leaking irrigation tube, during replacement of irrigation fluid bottles or improper use of Ellik's evacuator bulb [11,13]. The intravesical accumulation of explosive gases can be ignited when the electrosurgical electrode loop comes into contact with gaseous formation [14]. The amount of gas formed and the risk of explosion is proportional to the operating time and the power of the cutting and coagulation current [15]. The nature of the bladder irrigation fluid does not appear to play an important role [16].

The intravesical explosions during TURP can present as minor pop sound suggesting a subclinical explosion to a loud explosion associated with bladder rupture [17].

Following the intravesical explosion with bladder injury, patients who are under spinal anesthesia during TURP may report a jolt in the lower abdomen. They may complain of sudden onset of severe abdominal pain and there could be an increase in bleeding which may obscure vision. In some cases where there is bladder rupture, there may be abdominal swelling with decrease in irrigation fluid output [18].

Although it is extremely rare complication, intravesical explosion leading to bladder rupture is associated with morbidities and mortality if not identified and treated promptly. It is important to keep this in mind and take every precaution to avoid this unfavorable complication, especially in patients who have a diseased bladder as a result of radiation therapy and tuberculosis [19].

There are several strategies for prevention of such dreadful complication.

- The use of cutting and coagulation current of moderate power, since the higher the temperature of the resectoscope loop the more gas is accumulated in the bladder [13,14,17].
- Decreasing the tissue resection time [14].
- One should avoid hyper distension of bladder using continuous flow resectoscope. Extreme caution must be exercised to prevent resectoscope loop activation inside the air bubble. The amount of air that enters the bladder can be reduced using the Ellik evacuator correctly, replacing the irrigating fluid on schedule, and maintaining leak-proof connections throughout. By tilting the resectoscope's beak in the direction of the bladder's dome, the bladder can be entirely drained [20].
- We should avoid high power current during coagulation, as high temperature causes more gas formation [4].

In case of closed system resectoscope, use suprapubic cystostomy to create a low-pressure continuous flow circuit during TURP. It also reduces frequency of manual irrigation. Air bubble can be dislodged away from area of resection by suprapubic pressure [20].

CONCLUSION

Despite the intravesical explosion is extremely rare but serious complication of TURP, it should be kept in mind for those that perform transurethral resections in daily practice, as it is a preventable complication by taking certain precautions.

CONSENT FOR PUBLICATION

Written informed consent was obtained from the patient for publication of this case report. The patient understands that while every effort is made to maintain the confidentiality of their identity, names, and initials, anonymity cannot be guaranteed.

AUTHORS' CONTRIBUTIONS

All authors contributed to the completion of this work. The final manuscript was read and approved by all authors.

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