Intravesical Explosion in a Bladder Diverticulum during Transurethral Resection of Prostate

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ABSTRACT

Introduction: Urinary bladder explosion during Trans Urethral Resection of Prostate (TURP) is an extremely rare complication. Bladder explosion heralds itself by a loud blast sound from within the patient which is equally alarming to the surgeon, anaesthetist as well as the patient.

Case report: We herein present a case of vesical explosion in a bladder diverticulum in a 60-year-old gentleman undergoing TURP. We also review the literature regarding the mechanism of explosion and discuss possible preventive measures to prevent this unique complication.

Conclusion: The consequences can range from a minor mucosal injury to full thickness multiple bladder lacerations.

Keywords: Intravesical Explosion, Bladder Diverticulum, Transurethral Resection of Prostate

INTRODUCTION

Bladder explosion during transurethral resection of prostate is a rare complication. The first case was described by Cassuto in 1926.[1] Since then less than thirty cases have been reported. Bladder explosion heralds itself by a loud blast sound from within the patient which is equally alarming to the surgeon, anaesthetist as well as the patient. The surgeon must be aware of this complication to immediately recognize the cause of the blast and anticipate possible bladder rupture. Bladder rupture as a result of this requires urgent exploration and repair.

We present this case to make the urologists acquainted with this complication so that they can learn from our experience. We also discuss simple measures that may reduce the incidence of this dangerous event.

CASE REPORT

A 60 years old gentleman presented to us with refractory urinary retention for three months and recurrent urinary tract infections in last one year. Digital rectal examination revealed an enlarged grade 3, smooth and firm prostate. Ultrasonography showed 38 grams prostate with intravesical median lobe and post void residue of 180 cc. Urine routine and microscopic examination showed plenty of pus cells. Urine culture grew Escherichia Coli with Colony forming Units (CFU) > 10^5/ml.

He was a known case of chronic obstructive pulmonary disease (COPD), well controlled on oral steroids and sympathomimetics. After treatment of urinary infection with culture specific antibiotics and optimization of COPD, patient was posted for TURP under spinal anaesthesia. Transurethral resection was performed using 26 Fr continuous flow resectoscope (Karl Storz GmbH, Tuttlingen, Germany) electrocautery (Covidien, USA) at 110 watts of cutting and 70 watts of coagulating current. 1.5% glycine was used as an irrigant. Initial cystoscopy showed enlarged median lobe with two diverticula in the bladder at right postero-lateral wall and anterior wall respectively. Resection of prostate was done from bladder neck to veru montanum till surgical capsule. All chips were then evacuated with Elick evacuator. While achieving haemostasis at 12-o clock towards the end of the procedure there was a sudden loud sound from within the patient's lower abdomen. The patient described it as feeling a jolt also along with the alarming sound. Cystoscopy showed a collapsed bladder with only posterior wall visible. The anterior wall had ruptured and extraperitoneal fat was visible anteriorly. Hemostasis in the prostatic fossa was secured with difficulty due to poor vision as irrigant was leaking out into space of Retzius.

Thereafter an exploratory laparotomy was done via lower abdominal midline incision. The bladder had a long rent of 6 centimetres in the anterior wall of bladder and passing through the diverticula on the anterior wall. The rent reached inferiorly till the bladder neck (figure 1). The peritoneum was intact with no evidence of bowel injury. A suprapubic cystostomy was done and the bladder was repaired in two layers. The inner layer was closed with continuous running vicryl 2-0 (polygalactin 910) while outer layer was sutured with interrupted vicryl 3-0. A perivesical drain was placed and abdomen closed in layers.

Postoperatively, the patient had an uneventful course. On the third postoperative day, the perivesical drain was removed. Urethral catheter was removed on post-operative day 7 after confirming bladder healing by cystogram. The suprapubic tube was removed on post-operative day 10. Patient reported a good urinary stream and was discharged on the next day.

Histopathology of the prostatic chips showed benign prostatic hyperplasia.

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How to cite this article: Abhinav Agrawal, Prashant Darakh, Martand Patil, Abhay Mahajan. Intravesical explosion in a bladder diverticulum during transurethral resection of prostate. International Journal of Contemporary Medical Research 2018;5(7):G6-G7.

DOI: http://dx.doi.org/10.21276/ijcmr.2018.5.7.3

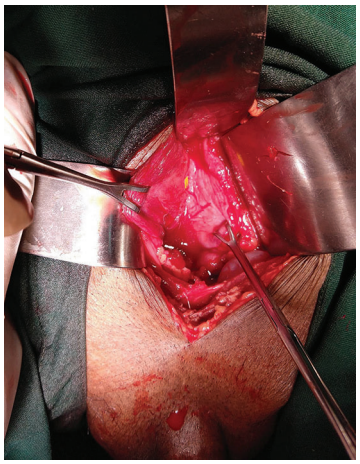

Figure-1: Intraoperative picture showing anterior midline bladder perforation

DISCUSSION

Bladder explosion due to electrocautery use is a rare event with less than 35 cases reported so far. Although the use of electro-cautery is generally considered safe, explosions due to electrocautery have been reported in all parts of urinary tract including prostatic urethra, bladder, ureter, and renal pelvis.[2]

Various etiologies have been proposed to explain the phenomenon of intravesical explosion. Nang et al and Davis conducted in vitro experiments which showed that hydrogen constituted 30-50% of the gasses produced by electro-cautery.[3,4] This hydrogen is formed by pyrolysis of prostatic tissue and hydrolysis of intracellular water. The nature of the irrigation fluid has no effect on the amount of hydrogen formed.[5] Hansen also detected the presence of inflammable hydrocarbon gases in the gaseous mixture formed during electrocautery which can further support combustion.[6]

It is interesting to note that these gases (hydrogen and hydrocarbon) are not combustible in themselves but require presence of oxygen to cause an explosion. This oxygen is not generated by electro-cautery. Rather, the oxygen is derived from atmospheric air which enters the bladder due to faulty connections, leaky tubing's, faulty use of Elick evacuator which causes egress of atmospheric air into bladder. When the oxygen entered the bladder, it forms an explosive and combustible mixture with hydrogen and hydrocarbon gases which may explode in presence of heat generated by electrocautery loop.

A number of strategies have been proposed to reduce this ghastly complication.[7,8] While emptying the bladder during TURP, a gentle suprapubic pressure should be applied to allow accumulated hydrogen at the dome of bladder to escape. Angling the beak of resectoscope towards the dome of bladder may further help in achieving this. Care should be taken to avoid entry of atmospheric air into irrigant tubings by avoiding faulty leaky connections and correct technique in use of Elick evacuator. Gases may get trapped in vesical diverticula which may have been the case in our patient also. Use of suprapubic catheter as additional outlet may help in better egress of accumulated gases. Placing the patient in mild reverse Trendelenburg or lateral decubitus position in such a way that it increases the distance between the bubble and resectoscope. Finally, the judicious use of electrocautery can be useful. Use of low power settings while avoiding long current pulses will keep intraurethral temperature low and avoid possible explosion. Newer technologies like lasers or bipolar cautery which generate less heat are other ways to circumvent this complication.

CONCLUSION

A preventive strategy employing these measures should be able to minimize occurrence of this unique problem:

- Gentle suprapubic pressure to remove gases from dome while emptying bladder.
- Angling the beak of resectoscope towards dome while emptying bladder.
- Avoid leaky connections which can cause atmospheric oxygen to enter bladder
- Suprapubic catheter for better bladder drainage
- Low power electrocautery settings
- Use of continuous flow resectoscope

AUTHORS' CONTRIBUTIONS

Abhinav Agrawal conceived and wrote the manuscript. Prashant Darakh reviewed the manuscript and reviewed the literature. Martand Patil and Abhay Mahajan supervised the treatment of the patient and collected clinical photographs. All authors read and approved the final manuscript.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 12-06-2018; **Accepted:** 15-07-2018; **Published:** 25-07-2018