Case Report / *Olgu Sunumu*

DOI: 10.4274/haseki.91885
Med Bull Haseki 2018;56:256-8

Bladder Explosion, A Rare Complication of Transurethral Resection of the Prostate: Two Case Reports

Prostatın Transüretral Rezeksiyonunda Nadir Bir Komplikasyon Olan Mesane Patlaması: İki Olgu Sunumu

Ömer Koraş, Sinan Avcı*, Ali Erhan Eren**, Mehmet Erhan Aydın***

Mustafakemalpaşa State Hospital, Clinic of Urology, Bursa, Turkey

**University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital, Clinic of Urology, Bursa, Turkey*

***Egepol Hospital, Clinic of Urology, İzmir, Turkey*

****University of Health Sciences, İzmir Bozyaka Training and Research Hospital, Clinic of Urology, İzmir, Turkey*

Abstract

Transurethral procedures are common urologic procedures performed in daily clinical practice. Bladder explosion during transurethral resection is very rare. There are various theories to explain the underlying mechanism for intravesical explosion. Here, we report two patients who suffered a bladder explosion during transurethral resection of the prostate and discuss how to prevent this complication.

Keywords: Bladder rupture, intravesical explosion, transurethral resection

Öz

Transüretral girişimler, günlük klinik uygulamada yapılan yaygın ürolojik işlemlerdir. Transüretral rezeksiyon sırasında mesane patlaması çok nadir görülmektedir. İntravezikal patlama için altta yatan mekanizma ile ilgili çeşitli teoriler bulunmaktadır. Bu yazımızda transüretral prostat rezeksiyonu sırasında mesane rüptürü gelişen iki hastayı sunduk ve bu komplikasyonu nasıl önleyebileceğimizi tartıştık.

Anahtar Sözcükler: Mesane rüptürü, intravezikal patlama, transüretral rezeksiyon

Introduction

Transurethral procedures are common urologic procedures performed in daily clinical practice (1). Electrocautery is widely used in endoscopic urological surgery, and although regarded safe, explosions related to electricity have been reported. Bladder explosion during transurethral resection is very rare (2). The earliest reported case was in 1926 (3). In 1934, Kretschmer (4) reported two intravesical explosions with rupture of the bladder during transurethral resection of the prostate (TURP). We report two patients who suffered bladder explosion during TURP as well as a review of the literature and a summary of the mechanism of explosion, and a discussion how to prevent this complication.

Cases

Case 1

A 75-year-old male was admitted to our clinic with the complaints of lower urinary tract symptoms for 10 months. Physical examination revealed grade two enlargement of the prostate. Abdominal ultrasonography showed bilateral hydroureteronephrosis and a prostate size of 55 cc. Serum creatinine level was 3.0 mg/dL and after catheterization, it was reduced to 1.4 mg/dL four weeks later. The patient was operated under spinal anesthesia. Cystoscopy was performed and multiple bladder diverticulae were observed with the largest being in the dome of the bladder. Resection was done using 24 French (Fr) discontinuous flow resectoscope (Karlz Storz). Electrocautery (Force FX;

Address for Correspondence/Yazışma Adresi: Mehmet Erhan Aydın
University of Health Sciences, İzmir Bozyaka Training and Research Hospital, Clinic of Urology, İzmir, Turkey
Phone: +90 505 228 81 91 E-mail: merhanaydin@gmail.com ORCID ID: orcid.org/0000-0002-3567-9987
Received/Geliş Tarihi: 26 July 2017 **Accepted/Kabul Tarihi:** 30 January 2018

Covidien) was used with a monopolar cutting current of 140 W and coagulation current of 100 W. 1.5% glycine was used as the irrigation solution. The total resection time was 45 minutes. While hemostasis was achieved near to the bladder neck, there was a sudden loud pop sound, and the bowel loops were became visible through the bladder. Intraperitoneal bladder explosion was suspected. The patient underwent an urgent laparotomy under general anesthesia. Following laparotomy, the abdomen was explored and it was seen that the rupture involved the diverticulum in the bladder dome. No additional injuries were seen in the internal organs. The bladder was repaired by double layer continuous stitching with synthetic absorbable suture. Suprapubic catheter and drain were placed along with 22 Fr urethral catheter, and the operation was completed. Postoperative recovery was uneventful. The drain was removed on the third day and patient was discharged on the fourth postoperative day. The suprapubic catheter was removed seven days later. The urethral catheter was removed 10 days later. The patient voided with good flow after catheter removal. The biopsy specimen was reported as benign. Informed consent was obtained from the patient for publishing this case.

Case 2

A 72-year-old male was admitted to our clinic with refractory urinary retention for six months. Physical examination revealed grade two enlargement of the prostate. Ultrasound evaluation showed a prostate size of 60 cc and normal bladder. All other preoperative parameters were within the normal limits. Following spinal anesthesia cystoscopy was performed and the bladder was found to be normal. TURP was performed using 24 Fr discontinuous flow resectoscope (Karlz Storz). Electrocautery (Force FX; Covidien) was used with a monopolar cutting current of 140 W and coagulation current of 100 W. 1.5% glycine was used as the irrigation solution. Initial 55 minutes of the procedure were uneventful, while resecting the lateral lobes of the prostate, a loud snap was heard. Subsequently, intestinal loops were seen in the bladder. TURP was immediately aborted. The patient underwent an urgent laparotomy under general anesthesia. Following laparotomy, the abdomen was explored and intraperitoneal rupture was observed in the bladder dome. No additional injuries were seen in the internal organs. The bladder was repaired by double layer continuous stitching with synthetic absorbable suture. A suprapubic catheter was introduced intraoperatively to secure the bladder drainage postoperatively. Drains were placed along with 22 Fr urethral catheter and the operation was completed. Postoperative recovery was uneventful. Three days after the operation, the drain was removed and suprapubic catheter was removed five days after the operation. The urethral catheter was removed 10 days later. The patient had a successful trial of void. Biopsy specimen was reported as benign. Informed consent was obtained from the patient for publishing this case.

Discussion

Bladder explosion, a rare and frightful complication of TURP, is estimated to occur in approximately 0.02% of transurethral procedures (5). The degree of bladder injury due to an explosion varies from a loud "pop" sound to only a ruptured bladder requiring surgical repair (6). One of the most common causes of bladder perforation during transurethral surgery is hyper distension of the bladder wall when the amount of fluid infused is in excess, when the patient has a low vesical compliance or when excessive pressure is applied during evacuation of prostatic fragments (7). Although there are some cases of bladder explosion when the continuous drainage system is used (8), it occurs most commonly when a continuous drainage system is not used. We think that bladder explosion could be caused by discontinuous drainage system, a probable mechanism for intravesical explosion that has been previously described (9), used in our both cases. The other etiology of intravesical explosions may be related to the formation of hydrogen gas during resection of tissue. Ning et al. (10) performed *in vitro* experiments showing that hydrogen constituted approximately 30-50% of the gases produced by electrocautery, while oxygen made up no more than 3%. Gases containing hydrogen are produced by electrolysis of intracellular water. *In vitro* experiments performed by Davis (11) confirmed at least 30% hydrogen formation in diathermy gases. Whereas hydrogen gas alone is not explosive, when mixed with atmospheric oxygen, it may become combustible. Air from the room can enter the bladder while changing the irrigation bag, or inappropriate handling of the evacuator bulb. 21% oxygen of the room air is sufficient for explosion. In the presence of explosive hydrogen gas with a sufficient amount of oxygen, heated resectoscope may trigger an explosion (12). Air can be introduced into the bladder through the irrigation tubing during manual irrigation whenever the resectoscope is opened for any reason (10). Due to the fact that discontinuous drainage system was used in our cases, we had to remove the resectoscope for the bladder drainage. Therefore, we think that oxygen entrance into the bladder was provided. Other risk factors are the use of high-power current during coagulation and prolonged surgery time (9). We think that bladder explosion could be caused by high-power current used in our cases. The amount of gas formed and the risk of explosion are proportional to the operating time (11). The nature of the bladder irrigation fluid does not appear to play an important role (12). The

presence of diverticulum might be an additional risk factor for explosion owing to the thinned bladder as well as a possible trapping of air within it (13). There have been various suggestions for prevention of this untoward complication: use of moderate power current during coagulation and resection, decreasing the tissue resection time, minimizing the entry of air into bladder by keeping all connections and evacuating bladder either frequently or continuously to reduce the size of air bubble as small as possible (2). Ureteral catheter evacuation of the gas and positioning the patient to displace the bubble have been suggested (10). Suprapubic cycstostomy in the dome would also allow these gases to escape (14). In conclusion, although bladder explosion is a rare complication, it can occur during TURP. All urologists should be aware of this complication and its management. The risk of bladder explosion is increased in discontinued drainage systems but this risk can be reduced by taking simple precautions.

Authorship Contributions

Surgical and Medical Practices: Ö.K., Concept: S.A., Design: A.E.E., Data Collection or Processing: Ö.K., M.E.A., Analysis or Interpretation: A.E.E., Literature Search: S.A., Writing: Ö.K., M.E.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Nieh PT, Marshall FF. Surgery of bladder cancer. In: Wein AJ, Kavoussi LR, Novick AC, et al. editors. Campbell-Walsh Urology, 9th ed. Philadelphia, Saunders; 2007. p. 2479-505.
2. Seitz M, Soljanik I, Stanislaus P, Sroka R, Stief C. Explosive gas formation during transurethral resection of the prostate (TURP). Eur J Med Res 2008;13:399-400.
3. Cassuto A. Explosion dans la vessie au cours d'une électro-coagulation. J Urol 1926;22:263.
4. Kretschmer HL. Intravesical explosions as a complicarion of transurethral electroresection: report of two cases. JAMA 1934;103:1144.
5. Martov AG, Kornienko SI, Gushchin BL, Ergakov DV, Sazonov OA. [Intraoperative urological complications in transurethral surgical interventions on the prostate for benign hyperplasia]. Urologiia 2005:3-8.
6. Khan A, Masood J, Ghei M, Kasmani Z, Ball AJ, Miller R. Intravesical explosions during transurethral endoscopic procedures. Int Urol Nephrol 2007;39:179-83.
7. Ribeiro da Silva MN, Lopes Neto AC, Zambon JP, Verotti MJ, Wroclawski ER. Vesical explosion during transurethral resection of the prostate: report of a case. Arch Esp Urol 2006;59:651-2.
8. Vincent DP. Bladder explosion during transurethral resection of prostate: Bladder diverticula as an additional risk factor. Urol Ann 2017;9:68-70.
9. Di Tonno F, Fusaro V, Bertoldin R, Lavelli D. Bladder explosion during transurethral resection of the prostate. Urol Int 2003;71:108-9.
10. Ning TC Jr, Atkins DM, Murphy RC. Bladder explosions during transurethral surgery. J Urol 1975;114:536-9.
11. Davis TR. The composition and origin of the gas produced during urological endoscopic resections. Br J Urol 1983;55:294-7.
12. Hirai E, Tokumine J, Lefor AK, Ogura S, Kawamata M. Bladder Explosion during Transurethral Resection of the Prostate with Nitrous Oxide Inhalation. Case Rep Anesthesiol 2015;2015:464562.
13. Viville C, de Petriconi R, Bietho L. [Intravesical explosion during endoscopic resection. Apropos of a case]. J Urol (Paris) 1984;90:361-3.
14. Adair EL. Suprapubic shunt. J Urol 1972;108:449-52.