

CASE REPORTS

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Bladder explosion during transurethral resection of bladder tumour: a case report and review of literature

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Abstract

Background Bladder explosion during transurethral resection of bladder tumors (TURBTs) is a rare and less recognised, but terrifying complication.

Case presentation We present a case of 72-year-old male patient of a large bladder tumour who sustained an intravesical explosion during TURBT requiring an emergency exploratory laparotomy and repair.

Conclusions Urologists should be cognizant of this unique complication and ensure the necessary techniques and precautions for its prevention.

Keywords Transurethral resection of bladder tumour (TURBT), Intravesical explosion, Bladder explosion, Case report

1 Background

Bladder explosion is a rare but dreaded complication following transurethral electrosurgical procedures. Literature reports an incidence of <0.02%. Most such cases have been reported following a transurethral resection of prostate (TURP) [1]. However, a bladder explosion during a transurethral resection of bladder tumour (TURBT) has been scarcely reported, with only a handful of cases reported till date [2–5]. In this article, we report such an incidence, during TURBT along with a review of the available literature.

2 Case presentation

A 72-year-old man presented to us with macroscopic haematuria for two months. An ultrasound of the abdomen showed a 5 × 4 cm bladder mass in the left posterolateral wall. On examination, there was no contributory

findings. A CT abdomen (Fig. 1) corroborated with the same, with no metastases.

Subsequently, he was taken up for a TURBT under general anaesthesia using a 26 Fr continuous flow resectoscope (Karl Storz GmbH, Tuttlingen, Germany) and electrocautery (Covidien, USA) with a monopolar electrode at 100 watts of cutting and 60 watts of coagulating current and 1.5% glycine as the irrigant. The large solitary solid tumour located at the anterior wall with neovascularisation masked a clear surgical field. Both ureteral orifices were identified away from the tumour. As resection ensued, gas bubbles due to resection accumulated near the dome. After about 45 min of resection, while resecting at the anterior wall, a sudden loud “pop” sound was heard by the theatre personnel, and a strong jolt (“shudder”) was felt by the operating surgeon. On careful inspection, a large rent was noted at the dome, with collapse of the bladder walls. An on-table cystogram confirmed the intraperitoneal nature of the injury.

An immediate exploratory laparotomy was done, where a large rent of around 6 cm was seen at the bladder dome (Fig. 2). The entire bowel was thoroughly inspected, and no other injuries were found. The bladder was repaired in two layers using Vicryl 2-0 (round

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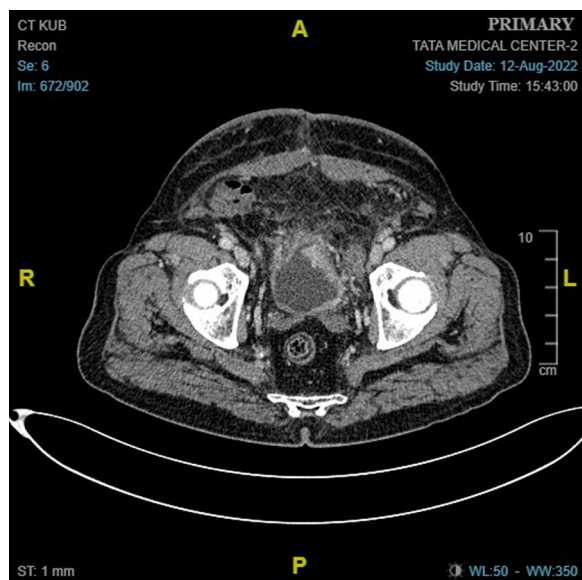


Fig. 1 CT KUB showing the bladder tumour

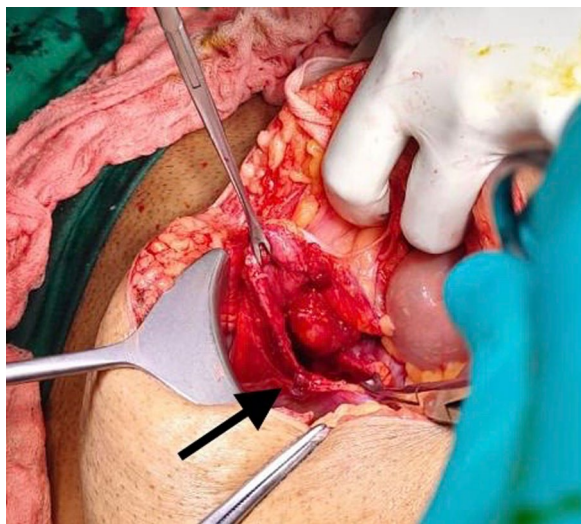


Fig. 2 Intraoperative image showing the bladder rent

body) continuous interlocking sutures. Post-operative period was uneventful, and the patient was discharged on day five without event.

The final histopathology reported a high-grade transitional cell carcinoma which was muscle invasive. Thereafter, the patient was staged with CT scan of thorax, abdomen and pelvis, and was found to have disease localised to bladder. The patient finally underwent a radical cystoprostatectomy with ileal conduit urinary diversion as per the standard protocol, without event.

The final histopathology was T2N0 high-grade urothelial papillary cancer.

3 Discussion

Transurethral resection of bladder tumour(s) (TURBT) is an essential intervention in the diagnosis and treatment of bladder cancer. It is a commonly performed urological procedure. Urologists are well aware of bladder perforations due to deep resections and obturator jerks. However, bladder injury due to intravesical explosion during TURBT has been sparsely reported and is not widely recognised [2]. A PUBMED literature search revealed only a handful of cases of intravesical explosions during transurethral electrosurgeries, with less than 30 cases reported during TURP. We could find only a few reported cases of bladder explosion related to TURBT [2–5].

Ning et al. [6] through their in vitro experiments found that hydrogen is produced in high concentration during transurethral electrosurgery. They postulated that the majority of hydrogen is derived from electrolysis of intracellular water, and only with the addition of outside oxygen does the gaseous mixture become potentially explosive. Davis revealed similar results and concluded that this gas is formed by the pyrolysis of animal tissue. An explosive gas may form when hydrogen and oxygen are mixed in critical proportions. The mere accumulation of hydrogen itself does not cause explosion. Oxygen from atmosphere must enter. The intravesical accumulation of explosive gas can be ignited when the electrosurgical electrode loop comes into contact with the gaseous formation: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$. This is an exothermic reaction which leads to the explosion [7].

In our case, the extensive bladder tumour was situated at the anterior wall, a difficult location for tumour resection. The resection was assisted by the urologist's suprapubic pressure, a manoeuvre which may have caused bubbles to transfer to the anterior wall from the dome. Faulty connections, leaky tubings and faulty use of Ellik's evacuator, could have caused ingress of the atmospheric oxygen into the bladder, and formed a combustible mixture with hydrogen. Other possible causes in our case were the failure to empty the bladder frequently by the surgeon, and activating the electrode inside an air bubble.

There are some precautions that might decrease the chances of this dire complication. All steps to prevent entry of atmospheric air should be ensured [3]. These include ensuring absence of leaks in the tubings, and confirming that there is no air present in the Ellik's evacuator or the irrigation fluid. The evacuator should be air-tight when connected to the cystoscopic sheath. The accumulating gases in the bladder should be promptly discharged by angling the beak of the resectoscope towards the dome where the gases collect. Takeshita et al. described

a method of removing scum and bubbles under direct vision by positioning the beak of the resectoscope near the air bubble, closing the drainage channel of the resectoscope and detaching the irrigation tube from the irrigation channel, and then opening the channel. The bubble with entangled scum will be retrogradely aspirated from the beak of the resectoscope to the irrigation channel [8]. Resection duration should be minimised, and electrocautery used judiciously with lower power settings. The surgeon should also avoid contact of the activated electrode with the gas bubbles. Once dealt adequately, long-term complications have not been reported.

4 Conclusions

Bladder explosion during a TURBT is a rare complication and can have drastic consequences. Urologists should be cognizant of this unique complication and ensure the necessary techniques and precautions for its prevention. As is rightly said—“what the mind knows is what the eyes see”.

Abbreviations

TURBT	Transurethral resection of bladder tumour
TURP	Transurethral resection of prostate
CT	Computed tomogram

Acknowledgements

None.

Author contributions

MG formed the idea, reviewed the literature, prepared the manuscript and is also the corresponding author. GA contributed in the revision and editing of the manuscript. SG supervised the preparation and provided technical inputs. MPG helped in the overall process of manuscript preparation and editing.

Funding

No funding was done for this study.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analysed.

Declarations

Ethics approval and consent to participate

This was a retrospective case report, hence approval from IRB and consent was not needed.

Consent for publication

Written consent was obtained from the patient.

Competing interests

The authors declare that they have no conflict of interest.

Received: 1 June 2023 Accepted: 22 March 2024

Published online: 05 April 2024

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