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Case Report
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Beware the Large Air Bubble: A Case Report of Bladder Explosion during Transurethral Resection of Bladder Tumour

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Abstract

Background: Intravesical explosions are rare but well recognised complication of transurethral resection of bladder tumours, they range from small explosions with no major consequences to large explosions causing bladder rupture and significant morbidity to the affected patient.

Case Presentation: We present a case of 83-year-old male patient who underwent transurethral resection of bladder tumour and sustained a major bladder injury secondary to a loud explosion during the procedure which resulted in large bladder defect at the dome requiring an emergency repair with open laparotomy.

Conclusions: Urologists should be familiar with bladder explosion during transurethral resection procedures including the main risk factors and more importantly the different steps that could be taken to minimize this significant complication.

Footnotes and Abbreviations

TUR: Transurethral Resection; TURP: Transurethral Resection Of Prostate; TURBT: Transurethral Resection Of Bladder Tumour; Turis: Transurethral Resection In Saline

Introduction

An 83-year-old male patient with a history of non-muscle invasive bladder cancer ten years ago, (pTa G2 with focus of pT1, May 2006) had previously undergone radical radiotherapy for Gleason 7 (3+4, tertiary 5) prostate cancer (Jan 2006) and was discharged from cystoscopic surveillance in 2011 with no evidence of bladder cancer recurrence. The patient was investigated in 2016 for weight loss and anorexia and a CT abdomen and pelvis revealed a bladder wall thickening. He underwent transurethral resection of bladder tumour (TURBT) under general anaesthetic. A 24 Fr. continuous flow transurethral resection in saline (TURis) resectoscope was used with a bipolar loop electrode. The electrocautery current was set at 80 Watts for coagulation and 120 Watts for cutting. Solid, necrotic bladder tumour over the right lateral and anterior wall was resected with the assistant pressing on the abdominal wall to aid resection. These resected fragments of the tumour were removed with Ellik evacuator. During the resection, a large air bubble was identified around the dome of the bladder. This hampered the resection on one occasion where the diathermy machine made an error sound. On resuming resection, a sudden loud "pop" was heard by the theatre staff and a strong jolt was felt by the assistant, subsequently the intravesical field of vision became poor and on careful inspection it was apparent that a large bladder perforation into the intraperitoneal space had resulted and small intestinal loops were visible in the cystoscopy field.

The operation was converted immediately to laparotomy via a low midline incision. The bladder had a large defect at the dome. Fortunately, the large and small intestines were intact. The intraperitoneal bladder wall was repaired in double layers. A 22 Fr. Foley catheter was left in situ. The abdominal cavity was irrigated with sterile water. The patient made a good recovery and was discharged few days later. The catheter was removed few weeks later after a normal cystogram. The histology revealed sarcomatoid urothelial carcinoma (T1 at least) and the post-operative CT scan raised a suspicion of T4 disease. Unfortunately, the patient deteriorated rapidly and died 10 weeks later.

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Observation

Only few reports of intravesical explosions are found in the international literature [1]. They are more often related to transurethral resection of prostates (TURPs) than TURBTs [1].

The earliest report of an intravesical explosion was published by Cassuto [2] who in 1926 reported an intravesical explosion during TURP on a patient with large middle lobe.

Explosions have also been reported during endoscopic renal pelvis surgery [3] and during laparoscopic and colonic surgery [4].

Bipolar or Monopolar diathermycauses formation of explosive gases during either cutting or coagulation due to both electrolysis of water (decomposition of water into oxygen and hydrogen) [5] and pyrolysis (decomposition by heat energy) of tissues. These gases include hydrogen and carbon monoxide with smaller proportions of nitrogen, carbon dioxide, oxygen and other hydrocarbons. Hydrogen makes up 30%–50% of the gasses released by electrocautery, while oxygen constitutes no more than 3% which is not sufficient to generate ignition. It is therefore hypothesized that oxygen from the atmosphere enters the bladder, mixing with other explosive gases produced intra-operatively causing ignition mediated by electrical current [5].

Minor intravesical "pops" during cystodiathermy are common and no treatment is usually necessary. Major bladder explosion during transurethral resection (TUR) is usually a serious complication and must be immediately recognised and almost invariably requires surgical treatment.

Immediate operative repair with postoperative catheterisation for few days is usually successful.

Conclusions

We learned from this case to be wary of large air bubbles in the bladder during TUR procedures and to adhere to the following points to minimize their occurrence:

- Reducing the current and resection time (The authors recommend using intermittent current if possible when air bubbles cannot be completely evacuated).
- Ensuring that all connections are leak proof.
- Evacuating the bladder frequently.
- Avoiding unnecessary use of Ellik evacuator and ensuring that no air is trapped before use.
- Ensuring irrigation tubes are free of air.
- Using continuous irrigation.
- Avoiding bladder distention.
- Evacuating or displacing the air bubble.

This could be achieved by:

- Insertion of suprapubic catheterduring TURP (This is contraindicated in cases of bladder cancer due to the risk of tumour seeding).
- Angling of the beak of the resectoscope to aspirate the air at the domethis can be achieved by disconnecting the irrigation channel and closing the drainage channel to create a reverse flow in the irrigation channel.
- Suprapubic pressure.
- Positioning the patient in Trendelenburg or reverse-Trendelenburg positions.

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