CASE REPORT

Bladder explosion, a rare complication following transurethral resection of the prostate

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SUMMARY

We present a man aged 69 years who suffered from bladder explosion during transurethral resection of the prostate. Exploratory laparotomy was performed and the bladder was primarily repaired with running sutures. This patient was discharged without symptoms of urinary dysfunction on day 8 after operation. We provide prevention methods that can decrease the risk of this important complication.

BACKGROUND

Transurethral resection of the prostate (TURP) and bladder tumours is one of the most common operations in urology.¹ Bladder rupture is estimated to occur in ~0.02% of transurethral surgeries.² Intravesical explosion during TURP is an extremely rare but serious complication. Bladder explosions can be encountered during all kinds of transurethral surgeries with diathermy. It might be associated with various grades of bladder injury ranging from simple mucosal tear to bladder rupture. Bladder rupture must be recognised immediately and always needs immediate surgical intervention. We report a patient who suffered a bladder explosion following TURP.

We present our case to remind urologists that it is preventable by taking precautions. They must learn from this severe complication. Careful manipulation and prevention methods can reduce the risk of this complication.

CASE PRESENTATION

A man aged 69 years had lower urinary tract symptoms of urinary frequency, nocturia and weak stream and had taken medicines for 5 years. Recurrent acute urine retention occurred in recent 2 months. Digital rectal examination showed enlarged prostate without nodule. The transrectal ultrasonography revealed that his prostate volume was about 30 mL. He underwent TURP under spinal anaesthesia because of urinary obstructive symptoms and prostate enlargement. We used a 24 Fr resectoscope with a monopolar loop electrode. The power was set at 70 W for coagulation and 90 W for cutting. Distilled water was used as the irrigation fluid. Prostate tissues were removed with the Ellick evacuator. The operating time from start to resection of 15 g of the prostate was 60 min. During the final phase of the operation, while coagulating some remaining bleeding vessels, the operator heard a loud 'pop' sound like an explosion and found a wide laceration of the posterior bladder wall endoscopically.

TREATMENT

The surgery was converted to exploratory laparotomy immediately via a lower abdominal midline incision. At laparotomy, the bladder was found to be ruptured, the lesion appeared wide, resembling the appearance of an open flower, with irregular margins, involving the posterior walls; the peritoneum was intact. Other abdominal organs were not injured. The bladder was primarily closed in a running fashion with a double layer of 3-0 Vicryl (polyglactin 910) sutures, and the operation was completed.

The drainage was guaranteed postoperatively by a 22 Fr Foley catheter.

OUTCOME AND FOLLOW-UP

The postoperative course was uneventful. On day 7 after surgery, retrograde cystography revealed normal intravesical wound healing and the Foley catheter was removed. The patient was discharged without symptoms of urinary dysfunction on day 8 after operation. Pathological diagnosis of the prostate was benign hyperplasia.

DISCUSSION

Bladder explosion during TURP is a really rare complication and was reported as early as 1926.³ The bladder injury can cause mucosal tears or bladder rupture and that can either be extraperitoneal or intraperitoneal which requires bladder repair by exploratory laparotomy or laparoscopic method.⁴⁻⁶ Davis⁷ demonstrated in vitro that hydrogen constituted 30–50% of the gases produced by electrocautery, whereas oxygen constituted no more than 3%. Hansen and Iversen⁵ also claimed that hydrogen was the major gas (30–65%) produced during TURP, and oxygen was produced in small quantity. They considered that the major gases were generated from human tissues pyrolysis or intracellular water electrolysis because of high temperature when cutting and coagulation of tissue.⁸ The possible mechanism for bladder explosion is the generation during resection of human tissue and trapping of explosive gases in the bladder which eventually detonates by sparks from the cutting electrode during TURP. Combination of hydrogen and oxygen is the most dangerous. Only hydrogen is not explosive, but it turns into explosive when mixed with oxygen. Atmosphere is 21% oxygen and is sufficient to support an explosion. Oxygen is not generated in adequate amount during electrodiathermy to generate explosions but can be introduced into the bladder during endoscopic surgeries by changing the irrigation fluid bag or handling of the evacuator bulb inappropriately.

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The heated resectoscope in the combination of explosive hydrogen gas with a sufficient quantity of oxygen then induces an explosion.^{5 7 9–11} The quantity of gas produced and the explosion risk are corresponding to the temperature of the electrocautery wire loop and operating time. This rare complication can be avoided by preventing the room air enter into the bladder during the surgery to maintain a low concentration of

oxygen inside the bladder.^{5 7} Air bubble in the bladder dome should be evacuated repeatedly. We can change the position of the patient by shifting the patient to the Trendelenberg position.¹² The character of the irrigation fluid does not seem to play a role in increasing the explosions risk.⁸

Contributors I-SL wrote this article. T-YH is a supervisor.

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Learning points

A prevention strategy should be considered to avoid an increased risk of this serious complication.

- ▶ Reduce the resection time by means of precise coagulation of tissues.
- ▶ Evacuate the air in the bladder with suprapubic pressure while managing bladder dome tumour or resecting prostate anterior lobe (at 12 o'clock position) or a ureteral catheter or suprapubic catheter.
- ▶ During manual irrigation, reduce the load of room air push into the bladder while handling the resectoscope, evacuator or irrigation tube.
- ▶ Abstain high-temperature cautery and use proper power during coagulation and cutting to decrease the accumulation of explosive gases.
- ▶ Keep away electrocautery wire loop from the air bubble during resection and coagulation.
- ▶ Move away the air bubble from the tumour in the bladder dome by placing the patient in the lateral decubitus or Trendelenberg position.

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