

## CASE REPORT

# Intravesical Explosion during Endoscopic Transurethral Resection of a Bladder Tumor

Sataa Sallami, Sami Ben Rhouma, Adel Dahmani, Karim Cherif, Ali Horchani, Yassine Nourira

Department of Urology, La Rabta University Hospital, Tunisia.

\*Corresponding author: Dr. Sataa Sallami      Email: sataa\_sallami@yahoo.fr

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## Abstract

Explosion inside the bladder occurring during transurethral resection is rarely recognized as a complication of endoscopic resection of bladder tumors. We report a case of intravesical explosion during an endoscopic resection of a bladder tumor. Damages to the bladder were minor. We discuss the possible causes of this complication as well as the different preventive measures. A focused review of the English literature is given.

**Key Words:** bladder neoplasms, transurethral resection, bladder injuries, intraoperative complications - incident – accident.

## Introduction

Transurethral resection of bladder tumors is one of the most common surgeries in urology (1). Several intraoperative and postoperative complications of these surgeries have been reported in literature. One of the most uncommon complications of this technique is intravesical explosion

during endoscopic surgery, and it is rarely documented (1,2). Although, most reported cases involve transurethral resection of the prostate, we report a case of an intravesical explosion during transurethral resection of bladder tumors and we discuss its mechanism and possible preventive measures.

## Case Report

A 73-year-old white male, a heavy smoker, underwent transurethral resection of bladder tumors under spinal anesthesia. A 26 Fr resectoscope was used with a wire loop electrode set at a cutting current of 90 watts (pure cut) and a coagulating current of 80 watts. Glycocol solution was used as the irrigating fluid. Three areas of tumor within the bladder were resected. and these resected fragments of the bladder tumors were removed with simple irrigation.

On final inspection, a 2 cm papillary lesion at the dome was identified within the air bubble and was removed by cutting. Cauterization of the area was attempted by applying

suprapubic pressure to the lower abdomen to force the dome of the bladder down. After complete resection of the tumor, the resected area was coagulated to control bleeding. On initiation of the coagulation, a loud pop was heard and a jolt was felt at the lower abdomen by the surgeon, and also by the patient. The latter was under spinal anaesthesia so he felt no pain. However, he was anxious as were the surgeon and staff. Inspection revealed no lesion in the bladder mucosa, especially in the dome. The explosion was not accompanied by any significant complications. Afterwards, the amount of washing liquid returned was equal to the amount instilled. Abdominal examination was normal. A transurethral catheter was left in to drain the bladder. Postoperative course was uncomplicated and the catheter was removed after 48 hours. Pathological study concluded the tissue was transitional cell carcinoma T1G1. Intravesical instillations with bacillus Calmette-Guerin (BCG) were given weekly for six weeks, then every month for six months. Sixteen months later, follow-up of the patient shows he remains tumor-free.

insufflation are the main factors involved in cases of colonic explosion (6). Three factors are necessary to trigger off an explosion of intestinal gases: the presence of combustible gases (hydrogen, methane), the presence of combustive gases (oxygen, nitrous oxide) and an initiating heat source (endoscopic or surgical electrocautery). Electrocautery provides the spark triggering the explosion (7). When several lacerations were found in the colon, colectomy, hemicolectomy and partial sigmoid resection with primary anastomoses were performed (6,7).

As in intestinal explosion, the etiology of intravesical explosions is related to the formation of explosive gases, mainly oxygen and hydrogen, during resection of human tissue (2, 3). Ning et al. performed *in vitro* experiments showing that hydrogen constituted 40% to 50% of the gases produced by electrocautery, while oxygen made up no more than 3% (1). They proposed that the majority of hydrogen was derived from the electrolysis of intracellular water. Davis also performed in vitro experiments that confirmed

Table 1. The recommendations of Rezaee and Horger for prevention of intravesical explosion, (Modified from 2&3).	
1	Avoidance of high-temperature cautery during TUR.
2	Decreasing the mean time of tissue resection with judicious coagulating of tissues.
3	Use of a moderate power setting for the coagulation current.
4	Use of continuous irrigation sheets (Since intermittent sheets, some air enters the bladder during its evacuation that causes explosion)
5	Evacuation of the gas bubble in the bladder using a suprapubic catheter in case of prostate resection, ureteral catheter or suprapubic pressure during bladder dome tumor fulguration (at 12 o'clock position)
6	Placement of the patient in the Trendelenburg position may shift the air bubble more caudally.

Discussion

Intravesical explosion is an extremely rare complication during endoscopic resection of prostate and bladder surgeries (3). Bladder explosion during tumor resection is very rare. According to PubMed data, only three cases have been reported (2,4,5). We describe this dramatic event in our patient and discuss whether this complication might be avoidable in the future. This complication is not limited to the urinary bladder. Intraluminal colonic explosions have been previously reported during a colonic surgery and polypectomy procedure using snare loop electrocautery (6,7).

Colonic bacteria, fecal fluids and their accompanying methane gas, certain cleansing solutions, and oxygen

a low percentage (<3%) of oxygen formation with at least 30% hydrogen content in diathermy gases (8). He theorized that the majority of gases were produced during pyrolysis of tissues. In all reported cases, as in ours, the authors were sure that they made no bladder perforations. Moreover, the endoscopic aspects are not the same.

Intracellular fluid electrolysis results in the release of the explosive gases during cutting and resection of the organs due to the high temperature of the resectoscope. The higher the temperature of the resectoscope, the greater the accumulation of gas (8). Though the accumulated hydrogen, itself, does not cause explosion, it becomes flammable when mixed with oxygen (atmospheric oxygen)

(9). Therefore, care should be taken to minimize the amount of air introduced in the bladder during irrigation of chips (2). Urologist should take care not to introduce air during irrigation and aspiration procedures to remove tumor fragments from the bladder. A mild explosion in the bladder generally does not cause complications; but, if it is severe, bladder rupture may occur by intravesical hyperpression, leading to severe complications, especially when the surgeon does not notice the rupture and treatment is delayed (3,4,10). In the present case, explosion was without any serious consequence. Diagnosis should be made immediately and the patient treated correctly. To prevent intravesical explosion, several measures were recommended by Rezaee and Horger (2,3) and these are summarized in Table 1.

In conclusion, intravesical explosion during endoscopic resection is an extremely rare but very serious complication. All urologists must be aware of this potential concern so that they may be able to either prevent its occurrence or offer early diagnosis and treatment.

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