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Case Report

Bladder Distension Precipitates Severe Bradycardia Under Spinal Anaesthesia

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Abstract

Bladder distension with increased intravesical pressure during transurethral resection of the prostate (TURP) and bladder tumours (TURBT) under spinal anaesthesia occurs frequently and unintentionally. It may precipitate significant harmful effects especially to patients suffering from compromised cardiovascular functions.

The establishment of the sympatholytic effects and overriding parasympathetic effects following the introduction of a spinal anaesthetic block (SAB) can disturbs the balanced functions between the two components of the autonomic nervous system. The precise establishment of SAB, adequate hydration, intimate monitoring, positioning of the patient and strict availability of resuscitation drugs are crucial precautionary aspects to monitor during this procedure.

Optimizing the surgical conditions regarding: the bladder volume, intravesical pressure, height of the irrigating fluid and duration of the resection are all of paramount importance to prevent any untoward events.

Here is a presentation of two cases that suffered from severe bradycardia and hypotension during TURP under spinal anaesthesia with discussion of the possible causes; emphasizing the effects of bladder distension during the procedures.

Verbal consent for the presentation and publication of these case reports was kindly given by both patients.

Keywords: Complications; Bradycardia; Hypotension; Spinal Anaesthesia; Bladder Distension; Elderly.

Patients with benign prostatic hypertrophy are prone to chronic retention of urine which can cause negative physiologic effects. It may precipitate injuries such as ischemia and chronic damage to the detrusor muscle and increased vulnerability to urinary tract infections if the bladder pressure is high enough [1,2].

Here is a presentation of two cases presented for TURB; both sustained life threatening events. Retrospective analysis of the possible causes and emphasising the effects of bladder distension as a possible precipitating factor.

Case One

A 73 years old gentleman scheduled for TURP, suffering from coronary heart disease and chronic atrial fibrillation (AF). His pre-hospital admission medication included isosorbide dinitrate 40 mg twice daily orally, digoxin 0.25 mg and aspirin 75 mg orally daily. Preoperative examination and investigations confirmed the diagnosis of AF; otherwise, he had compensated cardiac conditions.

An 18 gauge peripheral venous cannula was inserted and an infusion of Compound Sodium Lactate solution was started. Spinal anaesthesia using 2.5 ml of 0.5% hyperbaric bupivacaine through a 24 gauge Sprotte spinal needle inserted in L3/4 intervertebral space was uneventfully administered. The level of sensory block was T8-10. His head was raised on two pillows. Oxygen supplementation 5 L/minute was provided through a Hudson's facemask. The prostate showed massive hyperplasia and the bladder was distended several times via an intermittent irrigation system with a 90 cm height for the irrigating fluid. The procedure was uneventful for the first 50 minutes. The patient experienced sudden progressive bradycardia. The ECG monitor showed a slowing heart rate reaching 22 beats /minute. At the same time, the patient showed a couple of hiccup movements and made a choking noise. Blood pressure was unrecordable; carotid pulse was palpable but very slow and the patient became unconscious for a few seconds. Chest compressions were started immediately; while atropine 0.6 mg and ephedrine 12 mg were administered with the support of the IV fluid infusion. Within a few seconds, the heart rate picked up and acceler-

ated with a palpable peripheral pulse and recordable blood pressure. The patient regained consciousness without any residual neurological or cognitive dysfunction and reported that he was asleep. The operating surgeon reported that the draining port was occluded, which he immediately released and emptied around 600-700 ml of irrigating fluid. Within 20 minutes, the procedure was completed and the patient had an uneventful immediate and late postoperative recovery until successful discharge from hospital.

Case Two

A 77 year old gentleman was scheduled for TURP. The preoperative visit revealed that he was asymptomatic while the ECG showed Left Bundle Branch Block (LBBB). He was receiving aspirin 75 mg orally daily. The echocardiographic examination revealed mild to moderate mitral regurgitation with dyskinetic movement of the posterior wall of the left ventricle, but the overall contracting power was well maintained.

An 18 gauge peripheral venous cannula was inserted and IV infusion of Compound Sodium Lactate solution was started. Spinal anaesthesia using 2.5 ml of 0.5% hyperbaric bupivacaine through a 25 gauge Whitacre spinal needle inserted in L3/4 inter-vertebral space was conducted uneventfully. The sensory block level was established at T8-10. Oxygen was provided through a transparent facemask. The head was raised on two pillows. The procedure was uneventful. The heart rate remained between 65-70 beat/minute, however the blood pressure remained elevated with a mean arterial blood pressure between 100-130 mmHg. There was significant bleeding from the resection field and the bladder was distended repeatedly with the intermittent irrigating system with a height of 90 cm. After 30 minutes and within a few seconds the ECG monitor showed progressive bradycardia with doubling of the width of the QRS complex which was already wide. The heart rate slowed down to 28 beat/minute and the recorded blood pressure at that moment was 91/34 mmHg. Clinically the patient was conscious and communicating but he instantly felt chest discomfort and a faintness. He also showed severe pallor and excessive cold clammy sweating. Immediately 0.6 mg of atropine was given, accompanied with intravenous fluid resuscitation. The heart rate improved within a minute. The blood pressure was still relatively low, so ephedrine 9mg IV was given. At the same time the surgeon released the bladder occlusion and emptied over 700 ml of irrigating fluid. The procedure was completed within another 20 minutes. The patient underwent an unremarkable immediate and late postoperative recovery until discharge from the hospital.

Discussion

Bladder distension may occur during urology and uro-gynaecology surgery; it can be induced either intentionally for therapeutic purposes or inadvertently unnoticed due to overfilling of the bladder.

SAB for urology surgery including TURP is a popular technique. It precipitates temporary reversible block to the synchronised functions of the autonomic nervous system [3, 4]. The urinary bladder has a nerve supply which transmits pain, touch and temperature sensation through the sympathetic nerves T10-L2. The parasympathetic nerves S2-4 innervate the stretch receptors in the wall of the bladder [5].

Bladder distension may trigger a severe deep visceral painful stimulus. The sympatholytic effect of SAB omits the excitatory sympathetic response to this stimulus leaving the patient with the unbalanced parasympathetic response which might precipitate severe bradycardia and hypotension [6,7].

However, SAB is not without risks. Severe bradycardia and cardiac arrest have been reported in many case reports even in healthy adult patients [8-10]. The overall incidence of cardiac arrest under spinal anaesthesia is 6.4 in 10,000 cases [11].

The recommended maximum intravesical pressure is 10 mmHg during TURP [12] Bladder pressure over 15 mmHg was noted to precipitate patient discomfort under spinal anaesthesia. When the bladder pressure exceeds this limit during TURP surgery under general anaesthesia it is usually accompanied by tachycardia.

Most of the patients presenting for TURP are elderly with several medical co- morbidities and receive different medications due to the prevalence of cardiovascular diseases within this age group and this may contribute to significant morbidity and even mortality.

Bradycardia under spinal anaesthesia for TURP could be attributed to either cardiac causes like ischaemic heart disease, myocarditis and various degrees of heart block. Iatrogenic causes include atrioventricular blocking drugs such as: digoxin, beta-adrenergic receptor blockers and calcium channel blockers.

Distension of the bladder with increased intravesical pressure can provoke an extreme autonomic response. Bladder distension and manipulation of the external genitalia represents 75% of stimuli which precipitates the abnormal exaggerated autonomic sympathetic response in patients sustaining autonomic dysreflexia secondary to spinal cord lesions above T5. The most prominent feature for this is sudden hypertension and dysrhythmia in the form of tachycardia.

In the two cases above, both surgeons acknowledged that the bladder was distended and they emptied a significant volume of irrigating fluid. Therefore it might be hypothesised that repeated bladder distension could be a possible precipitating factor of severe bradycardia and hypotension. The first patient may have sustained this condition because of spinal anaesthesia combined with the effects of digoxin and isosorbide dinitrates. In the second patient, this may be due to the combination of spinal anaesthesia, LBBB and repeated bladder distension. The observed bleeding during the procedure may be attributed to the initial high blood pressure. It could also be due to fibrinolysis induced by released prostatic activators which convert plasminogen to plasmin as a possible presentation of TURP syndrome.

TURP syndrome occurs when large amounts of the irrigating- electrolyte free - fluid is absorbed through the opened venous sinuses during prostatic resection. It causes an acute increase in the intravascular volume combined with acute electrolyte dilution effects resulting in decreased serum sodium concentration. It may present as hypertension, tachycardia and congestive heart failure. Hyponatraemia could be presented by disorientation, convulsions and coma. The clinical status and postoperative investigations excluded this assumption.

Iatrogenic bladder perforation may cause peritoneal irritation due to accumulation of the leaking irrigating fluid and precipitate parasympathetic stimulation, which exaggerates the bradycardia and hypotension in patients under spinal anaesthesia. Bladder perforation was unlikely but it could be suspected by the combination of bradycardia, consistent progressive hypotension with abdominal and shoulder pain

in awake patients under spinal anaesthesia.

Positioning and changing the position of the patient under and after spinal anaesthesia could lead to several hazardous results [13]. This may be due to the discrepancy between the venous return and the altered capacitance of the circulation. The head up (both these two patients were head up at 15-30 degrees) and legs up position might lead to pelvic congestion with pooled blood in the dependent pelvic region which increases bleeding from the congested prostatic bed and consequently reduces the blood pressure. Therefore, the classic lithotomy position is preferred.

Healthy patients may develop unexplained varieties of heart block under spinal anaesthesia [14]. It may be warranted that patients suffering from significant conduction defects would benefit from general anaesthesia.

Conclusion

The anaesthetic management of elderly patients with especially compromised cardiovascular reserve and potential dehydration undergoing TURP under spinal anaesthesia could be a challenge for the anaesthetist. It requires careful anaesthetic planning, adequate venous access and reasonable hydration before establishing the SAB. Close monitoring of the heart rate, blood pressure, oxygen saturation and the level of consciousness for patients under spinal anaesthesia is crucial. Readily available vagolytic drugs like atropine and vasoactive drugs like ephedrine should be prepared and ready to use. It is prudent to discuss and liaise with the surgeon regarding limiting the bladder volume and pressure to reasonable limits to safeguard against occurrence of these significant events.

Establishing rapport with the patients under spinal anaesthesia is also advisable to detect and correct any harmful events as early as possible. Warning signs for ominous events including nausea, vomiting, sweating, hiccups, choking, dizziness and loss of consciousness should be considered carefully and treated promptly.

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