

# Severe Life Threatening Cardiovascular Complications Following Spinal Anaesthesia: A Case Series

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## **ABSTRACT**

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Spinal anaesthesia, one of the safe and commonly given regional anaesthetics throughout the world<sup>1</sup> was introduced by Dr August Bier in 1899. It is faster, easier to perform and patients are more comfortable than with general anaesthesia. Patan Hospital is one of the tertiary care referral hospital where many surgeries are performed every year. Obstetric, orthopaedic and general surgical cases are done under spinal anaesthesia in this hospital. We present here, a series of two life threatening complications following spinal anaesthesia in our patients who had undergone surgery under spinal anaesthesia.

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## INTRODUCTION

Spinal anaesthesia, one of the safe and commonly given regional anaesthetics throughout the world<sup>1</sup> was introduced by Dr August Bier in 1899. It is faster, easier to perform and patients are more comfortable than with general anaesthesia.<sup>2</sup> Most of the surgeries of the lower limb, pelvis, uterine surgeries including hysterectomy and caesarean section, cervical surgeries, hernia, bladder and prostatic surgeries are performed under spinal anaesthesia. These days, surgeries including upper abdominal organs including pyelolithotomy or even cholecystectomy are performed under spinal anaesthesia.<sup>1</sup> The type of the anaesthetic agent, its concentration and amount determine the level of block produced.<sup>3</sup> Total dose of the anaesthetic administered into the sub arachnoid space is the most important determinant of both therapeutic and unwanted effects of spinal anaesthesia.<sup>4</sup> Motor block can be evaluated by asking the patient to raise the lower extremities; sensory block be determined using wet cotton or pin prick sensation.<sup>3</sup>

Some complications occur with spinal anaesthesia. Female patients are more likely to develop complications than their male counterparts.<sup>5</sup> Postdural puncture headache is a well documented.<sup>4,6</sup> Incidence of serious life threatening complications following spinal anaesthesia is rare<sup>4</sup> accounting for less than 0.1% in average.<sup>1</sup> Hypotension is the most common cardiovascular response to spinal anaesthesia. Different studies have shown its prevalence to be around 10-40% of the patients.<sup>4,7</sup> Cardiovascular de-compensation can lead to shock; even cardiac arrest. High level of sensory block has been correlated with higher sympathetic blockade and higher degree of hypotension and cardiovascular shock.<sup>7</sup> It is however, an unlikely complication of spinal anaesthesia, especially when we use hyperbaric agents. Sudden and unexpected cardiac arrests without warning signs do occur with spinal anaesthesia; in such conditions, complications cannot be predicted.<sup>8</sup> It can lead to life threatening cardiovascular compromise and requires immediate intervention. Although rare, it may occur in clinical practice. Estimated risk of severe life threatening complications following a spinal anaesthesia is very low.<sup>9</sup>

Patan Hospital is one of the tertiary care referral hospital where many surgeries are performed every year. Obstetric, orthopaedic and general surgical cases are done under spinal anaesthesia in this hospital. We present here,

a series of two life threatening complications following spinal anaesthesia in our patients who had undergone surgery under spinal anaesthesia.

### Case I:

23 years primi, on regular ANC checkup and uneventful pregnancy, was admitted to maternity ward at 37+2 weeks of gestation (39+6 weeks by first scan) with reduced fetal movement for 1 day. At admission her vitals were stable; uterus was term size with cephalic presentation, head at 4/5 station. Non stress test was reactive. She was kept for observation. Next morning she was induced for labour; as there was light meconium stained liquor, emergency caesarean section was planned. She was then transferred to the operating room. She had repair of her right congenital club foot 12 years back under general anaesthesia without any undue complications. She had no history of allergy. In the operation theatre, her pulse was 72 per minute, Blood pressure 120/90 mm of Hg; chest and cardiovascular examination were normal. She was preloaded with 500 ml of normal saline. With all aseptic precautions, she was given sub arachnoid anaesthesia with 2.5 ml of 0.5% sensoricaine heavy into L<sub>4</sub>-L<sub>5</sub> disc space after confirming free flow of cerebrospinal fluid. She was immediately kept in supine position with a left lateral tilt.

At 5 minutes, patient's autonomic block was at sixth thoracic (T<sub>6</sub>) level. At 8 minutes, her heart rate dropped to 48 and then to 32 per minute; saturation dropped to 24%. She was unresponsive to verbal commands and pain. 0.6 mg of atropine was administered; bag mask ventilation was started with high flow oxygen. Senior anesthesiologist was called from the other operation theatre. There was no response even to pain. Diagnosis of high spinal was made and basic support was continued. At this stage sensory block was at T<sub>2</sub> level. She regained her consciousness after 4 minutes. Her GCS was 13; saturation improved to 96%, BP 110/60 mmHg and pulse 126/minute. Operation was started.

At 15 minutes, she again became unresponsive, saturation dropped to 58%, BP to 73/46 mmHg; pulse at the moment was 130/minute. She was again given cardio respiratory support with high flow oxygen, bag mask ventilation. By this time, male baby was delivered. Mefentermine 30mg, added in the drip, improved BP to 130/80 mmHg while saturation improved to 84%. She was intu-

bated; vecuronium and isoflurane was given for continuation of anaesthesia. During this entire period, she had been given adequate amount of intravenous fluids. She extubated herself 15 minutes after the administration of reversal and was shifted to the recovery room. Lasix, given in the mean time improved urine output. Patient was shifted to the ward after 2 hours observation in the recovery room. During transfer, her pulse was 86/minute, BP 100/54 mmHg and saturation 96% at room air. Post operative period was uneventful and she was discharged on 4<sup>th</sup> post operative day.

#### Case II:

64 years male, with benign enlargement of prostate, was planned for transurethral resection of prostate (TURP). He gave history of hernia repair 3 months back under spinal anaesthesia which was uneventful. He had history of shortness of breath for past 4 years with occasional exacerbations, mostly in the winter and was under medication with salbutamol inhaler and some herbal medicines. He didn't have hypertension but did have diabetes under dietary control. He was non alcoholic and non smoker. He had no history of drug allergy. Physical examination revealed pulse 72/min, BP 140/90 mmHg. Chest examination revealed bilateral wheezes with no other significant examination findings. Pre-operative investigations were normal except for ECG which showed 1<sup>st</sup> degree heart block. However, echo was normal. He was started with bronchodilators.

In the operation theatre he was preloaded with 500 ml of Normal Saline. Subarachnoid block was given with 2.8 ml of 0.5% hyperbaric bupivacaine into L<sub>4</sub>-L<sub>5</sub> disc space after ensuring free flow of CSF. He was then kept in supine position and the operation table was slightly inclined with leg end downwards. He was comfortable after spinal and his vitals were normal with a pulse of 66/min and BP of 126/74mmHg. Operation was started in lithotomy position.

At 75 minutes into spinal anaesthesia and 55 minutes into the operation, resection of prostate was complete and operation was almost over. At this time, he suddenly complained of chest discomfort and shortness of breath. He was nebulized with 2ml of salbutamol. As he did not improve, 40mg of intravenous frusemide was given. In spite of these medications, he did not improve. All of sudden he lost consciousness, had no spontaneous res-

piration and went into asystole. 100% oxygen was administered. Bag mask ventilation was started with chest compression. In the mean time, adrenaline 1mg was administered for 3 times. Resuscitation efforts were successful. Patient regained consciousness. His GCS score was 11/15 (E<sub>4</sub>M<sub>6</sub>V<sub>1</sub>). He developed ventricular tachycardia which was managed with 80mg intravenous xylocard. He then had sinus rhythm and spontaneous respiration. He was stable after resuscitation. Arterial blood gas revealed respiratory acidosis and he was transferred to the recovery room and then to the Intensive care unit for observation. At the time of transfer he was drowsy but easily arousable and had irrelevant speech. He became fully conscious and aware in the evening. His post operative period went uneventful. He was transferred to the surgical ward next morning and discharged on the 4<sup>th</sup> post operative day.

#### DISCUSSION

Spinal is preferred more in obstetric cases as it is easy and safe for both mother and the fetus. Maternal complications are less as mother's airway is not compromised. Fetal complications are reduced as they are less sedated.<sup>10</sup> Other reasons for preference of spinal anaesthesia include reduced blood loss due to vasodilatation. As relaxation is not produced at the gastro-esophageal sphincter, problems of regurgitation are also avoided. Moreover, patients feel comfortable soon after operation.<sup>11</sup>

Hypotension, most common complication following spinal block, is the physiological consequence of sympathetic blockade.<sup>12</sup> Bradycardia is common in surgeries involving bowel or uterus; and is always associated with hypotension. In pregnant ladies, hypotension may be compounded by aortocaval compression by the gravid uterus.<sup>13</sup> In addition, most of the patients are normally shifted to the operation theatre during emergency or elective operations without assessing them properly before surgery. Most of the complications of spinal anaesthesia can be avoided, if preoperative assessment can be done before surgery as we can identify co-morbid conditions earlier.<sup>10</sup>

Hypotension is manifested by decrease in both systolic and diastolic blood pressure. Vascular tone is maintained by sympathetic fibers arising from T<sub>5</sub>-L<sub>1</sub>, which innervate vascular smooth muscles.<sup>14</sup> Compensatory vasoconstriction at the level of T<sub>1</sub>-T<sub>4</sub> level compensate for this vasodilatation. Blockade of these fibers prevent vaso-

constriction and leads to hypotension. This unopposed parasympathetic tone can sometimes result in sudden cardiac arrest. Hypotension can be reduced by raising the leg of the patient. This will increase the venous return and further, the blood pressure. Prolong fasting and inadequate preloading lead to hypotension during surgery.<sup>14</sup> Hypotension can be reduced by increasing blood volume by adequate preloading before surgery. A Study in Yemen has shown that preloading a patient with at least 500 ml of intravenous fluid significantly reduced hypotension and bradycardia.<sup>10</sup>

Complete spinal block has not been well defined in the literature. Clinically, this term implies anaesthetic block involving the cervical spine and neurons of brain stem and cranial nerves.<sup>15</sup> Hypotension, bradycardia, respiratory compromise, apnea, difficult speaking or coughing, cardiac arrest being the cardiorespiratory symptoms where as nausea, anxiety, parasthesia paralysis or high sensory block being the neurological manifestations of complete spinal block.<sup>15</sup> High block may be associated with numbness and weakness of the hands, starting with numbness on the ulnar border and little finger. Dyspnoea may accompany due to motor and sensory blockade of the intercostals nerves.<sup>13</sup>

Heart block or asystole may occur when level of spinal block is at the level of upper thoracic vertebrae, attributed due to the blockade of preganglionic cardiac accelerator fibres arising from the nerve roots T<sub>1</sub>-T<sub>4</sub>.<sup>14</sup> It usually starts within few minutes of anaesthesia; literatures have reported complications at about half hour but can occur anytime following spinal anaesthesia.<sup>3-5,7-8</sup> Such complications usually recede within 15-30 minutes of the onset of symptoms.<sup>13</sup> Total spinal block has been reported to be as high as 2%<sup>10</sup> where as in few studies, this have been reported to be as low as 0.3%<sup>16</sup> or even nil.<sup>17</sup> This has been related to high level of sensory block produced.<sup>7</sup> Treatment requires cardio respiratory resuscitative measures and stabilization of the patient; head lift and jaw thrust to keep airway open, high flow oxygen to maintain oxygen saturation. Intubation may be required to protect the airway.<sup>13</sup>

Our first patient had cardiovascular complications that might have been attributed to the high level of block (T<sub>2</sub> level) in the patient. Venous obstruction by gravid uterus might have aggravated her problem. She was given the

supportive measures; we provided her with intravenous fluids, high flow oxygen and intubated her to protect her airway.

Our second patient had complication that occurred very late after anaesthesia. It was very unlikely due to high spinal blockade at this late hour. He had predominant respiratory component at the beginning which was later followed by cardiac component in the form of ventricular tachycardia. He was also managed conservatively with high flow oxygen, cardiovascular resuscitation. However, he did not required intubation for airway protection. His coexisting respiratory problems may have contributed to the complication. In addition, fluid that we administered may have been excess and contributed for this. Had he undergone preoperative assessment earlier and proper treatment for his condition, he might have escaped the complication.

Cardio vascular complications have either respiratory squeal or cardiac squeal or both. Our first patient had cardiac and respiratory complication that required intubation during the surgical procedure. As hypotension and shock is just the extension of the physiological phenomena, sometimes, it is unpredictable.<sup>8</sup> Our first patient had predictable course of complication but in our second patient, it was sudden and unnoticed. Whatever may be the presentation, most of the life threatening cardio vascular complications can be managed successfully by conservative management.

## CONCLUSION

Although severe life threatening complications occur rarely following spinal anaesthesia, they do occur frequently. Such conditions can arise at any time after anaesthesia. Proper preoperative assessment, adequate preloading, proper anesthetic technique, adequate amount of drug and frequent monitoring of the patient in the operative table are the cornerstones of managing patients undergoing spinal anaesthesia. These complications, if occur, warrant immediate intervention including basic life support mechanisms and teamwork to tackle them.

## AUTHOR CONTRIBUTION

SP wrote the first draft of the manuscript. RP edited the first draft. AS and NBB provided suggestions and guidance for the manuscript. DB was involved in management

of the first patient. GS and BG were involved in the management of the second patient. Rest of the above mentioned authors were involved in management of both of the cases.

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