

CASE REPORT - TOTAL SPINAL ANAESTHESIA

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This is a report of a patient who suffered an unexpected high level of block during spinal anaesthesia. This review will describe the symptoms, predictive factors and the management of a “total spinal”.

Case Report

A 35-year old primigravida was scheduled for caesarean section because of expected difficult delivery due to a narrow pelvis. She had no relevant medical history. Her height was 1.58m. and she weighed 85kg. After discussion with the patient spinal anaesthesia was planned.

In the theatre electrocardiography, blood pressure monitoring, pulse oximetry and peripheral venous access were established and 500ml of normal saline was given. The spinal anaesthesia was performed in the sitting position at L4/L5 with 2.4ml. bupivacaine 0.5% in hyperbaric dextrose solution - “*Heavy Marcaine*”. Immediately following the block the patient was put back in the supine position, and the operating table altered with left lateral tilt to diminish aorto-caval compression.

About 5 minutes later the patient complained of nausea and “not feeling well” and experienced progressive difficulty to breathe. The blood pressure fell to 65/40mmHg.

Definition of total spinal

- Total spinal is a local anaesthetic depression of the cervical spinal cord and the brainstem. It may follow excessive spread of an intrathecal injection of local anaesthetic, or inadvertent spinal injection of an epidural dose of local anaesthetic.

Predicting factors

Spread of block is influenced by many factors:

- **Local anaesthetic dose** - volume, dosage and baricity of local anaesthetic.
- **Position of the patient** - especially important when a hyperbaric solution of local anaesthetic is used.
- **Patient characteristics** - height, age, gender, intra-abdominal pressure and anatomical configuration of the spinal cord.
- **Technique** - type of needle, site of injection, direction of needle, velocity of injection and use of barbotage.

The patient in our case was a pregnant woman. Pregnant women have a raised intra-abdominal pressure and a diminished volume of the lumbar spinal canal caused by distension of the epidural veins. We therefore gave her a reduced dose of local anaesthetic (2.4ml bupivacaine 0.5% hyperbaric).

The spread of spinal block is sometimes very rapid. The level of the block should be tested within 4 minutes after the injection of local anaesthetic. Commonly used methods of assessing the block are: loss of temperature sensation, loss of pinprick sensation and

loss of light touch sensation. Temperature sensation is lost first and light touch sensation last. A block may continue to extend for at least 30 minutes after injection.

Clinical symptoms

Early recognition is the key to management in case of total spinal.

- The first signs of high spinal block are hypotension, bradycardia and difficulty in breathing. Before hypotension is detected, the patient often complains of nausea or “*not feeling well*”. Tingling in the fingers indicates a high block at the level of T1 (occasionally anxious patients who are hyperventilating may complain of this).

- Hypotension is due to venous and arterial vasodilation resulting in a reduced venous return, cardiac output and systemic vascular resistance. It should be treated with volume infusion and vasopressors. The head-down (Trendelenburg) position should be used with caution because it may raise further the level of blockade. A better alternative is to raise the legs.

- Bradycardia is caused by several factors. Extensive spread results in a widespread sympathetic block leading to unopposed vagal tone and blockade of the cardio-accelerator fibres arising from T1-T4. Heart rate may also decrease as a result of a fall in right atrial filling. Bradycardia can be treated with anticholinergic agents, like atropine, or β -adrenergic agonists, like ephedrine.

- Cardiac output is the product of heart rate and stroke volume. As we have seen, heart rate and stroke volume decrease. The most important reason for the decrease in stroke volume is the decreased volume of blood in the ventricle at the end of diastole (end-diastolic volume), often called “preload”. This is due to a reduction in venous return because of marked venous dilatation following spinal anaesthesia and compression of the vena cava by the pregnant uterus. Venous return is reduced further, if the patient is ventilated, due to the increase in intra-thoracic pressure during the inspiratory phase. Any bleeding which reduces blood volume is poorly tolerated, (*see Cardiovascular Physiology and also the Pharmacology of Inotropes and Vasopressors in Update in Anaesthesia No 10*).

- Respiratory difficulty is caused by loss of chest wall sensation caused by paralysis of the intercostal muscles. Patients often describe their breathing as feeling abnormal, but can demonstrate a good inspiration and can cough and speak normally. When a total spinal occurs the nerve supply to the diaphragm (cervical roots 3-5) is blocked and respiratory failure develops rapidly. Early warning signs include poor respiratory effort, whispering and an inability to cough. Sudden respiratory arrest is usually caused by hypoperfusion of the respiratory centres in the brainstem.

- Cardiac arrest may occur due to hypotension and hypoxaemia. Prevent this by adequate ventilation and use of vasopressors.

- Other symptoms of total spinal are upper extremity weakness, loss of consciousness and pupillary dilatation.
- Pregnant patients in this situation are at risk of aspiration and severe reductions in placental blood flow.

Management

Our patient was immediately treated with 100% oxygen by mask, volume infusion and ephedrine. However she remained hypotensive despite a total of 30mg ephedrine IV and her condition continued to deteriorate. A rapid sequence induction was performed with thiopentone (100mg) and succinylcholine (100mg) and mechanical ventilation was started. After further volume loading with 1500mls crystalloid and 500mls of colloid solution she became haemodynamically stable without the further use of vasopressors. Anaesthesia was continued using isoflurane 0.6 % and nitrous oxide in oxygen (50/50%). A baby boy was born who had a good Apgar scores (7-9-10 after 1-5-10 minutes). Our patient was mechanically ventilated during 30 minutes in the recovery room under propofol sedation until her breathing pattern had normalized. When she was fully awake we explained her what had happened.

Treatment of a total spinal

- A total spinal has to be treated symptomatically. Oxygen and intravenous vasopressors (ephedrine 5-10mg or metaraminol 1-2mg, and if necessary adrenaline 50-100microgram (0.5 - 1ml of 1:10,000 solution) will always be needed. If the airway and breathing are satisfactory, the patient should be given oxygen and the blood pressure restored with vasopressors and intravenous fluid.
- If the patient experiences progressive difficulty in breathing and speaking, the level of block is around C3-C5, the patient should be gently ventilated and the airway secured. Cricoid pressure should be used if practical.

- If apnoea develops, ventilation should be started immediately and the patient intubated. In this case we used thiopentone because it was immediately available. Some anaesthetists prefer a less cardiovascularly depressant agent like etomidate or ketamine, but a small dose of thiopentone is also safe. When the patient has been intubated and mechanically ventilated it is important to sedate the patient until they can breathe effectively.

Outcome

The patient in our case recovered without harm and also the baby suffered no ill effects. The outcome of a total spinal is good when it is recognised early and treated effectively. All the clinical problems associated with a high spinal will reverse when cardiovascular and respiratory support are provided. After some time the level of the block will recede and wear off. It is important to start treatment immediately to prevent damage and harm to the patient. Afterwards explain to the patient and family what happened because a total spinal can be a very frightening experience.

The length of time that the block will last depends on the dose of local anaesthetic injected. With a spinal anaesthetic which spreads unexpectedly high, the block should start to recede after 1 - 2 hours. After a total spinal due to an epidural injection being delivered into the intrathecal space (subarachnoid or spinal) the block may last several hours due to the increased amounts of local anaesthetic injected. During the whole time of the high block the patient will need to be ventilated, if necessary by hand, until the anaesthetic wears off. Since the patient will recover consciousness before being able to breathe effectively some sedation (diazepam, midazolam or propofol) will be useful. Indications for extubation will include a good cough reflex on the endotracheal tube and effective spontaneous respiratory effort.