



Cardiac arrest after interscalene brachial plexus block in the sitting position for shoulder arthroscopy : A case report

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The authors report a case of cardiac arrest following interscalene brachial plexus block in the sitting position for shoulder arthroscopy. The cardiac arrest occurred 45 minutes after interscalene brachial plexus block. It seems that it resulted from the activation of Bezold-Jarisch's reflex and a related vasovagal syncope.

INTRODUCTION

Interscalene brachial plexus block has become a popular method of anaesthesia for surgical operations on the upper extremities. It has been shown to provide several advantages compared with general anaesthesia. These advantages include less nonsurgical intraoperative time, shorter stay in the post-anaesthesia care unit, fewer hospital admissions and less intraoperative blood loss (1, 2, 8, 12, 14).

Arthroscopy of the shoulder is becoming more common, particularly with patients in the sitting position which is preferred by most surgeons as it reduces the need for heavy traction on the shoulder, thus decreasing the incidence of traction neuropathies (3, 5, 12, 13). The conversion to open surgery is easy and does not require repositioning of the patient.

Episodes characterised by a sudden decrease in heart rate and/or drop of blood pressure, often associated with nausea and requiring medical intervention have been reported in 17% of the patients undergoing interscalene block in the sitting position (3). It was believed that this is a form of vaso-

vagal syncope mediated by the Bezold-Jarisch reflex, which occurs when venous pooling and increased sympathetic tone induce a low volume, hypercontractile ventricle. This results in sudden activation of the parasympathetic nervous system and sympathetic withdrawal, causing bradycardia and hypotension (6). Asystolic cardiac arrest requiring cardiac resuscitation has been reported in three cases in the literature (3, 4, 10).

Vasovagal syncope is loss of consciousness caused by reduced arterial pressure and blood supply to the brain, mediated through neural mechanisms rather than primary cardiac dysfunction. Bradycardia and vasodilation are the characteristic changes that cause systemic hypotension. The trigger may be central, from psychic stress or pain, or may be initiated peripherally by a reduction in venous return to the heart (7).

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The Bezold-Jarisch reflex overlaps with vasovagal syncope. It was initially described as a bradycardic response to injections of various alkaloid compounds, and later found to be mediated by chemoreceptors in the heart (7). The term has now come to include reactions triggered by cardiac mechanoreceptor activation and it has been used to describe intraoperative bradycardia with hypotension (7).

We report a case of cardiac arrest following interscalene brachial plexus block in the sitting position for shoulder arthroscopy.

CASE REPORT

A 58-year-old woman was admitted to the University Hospital for arthroscopic surgical treatment of a shoulder impingement syndrome. She was 65 kg in weight, 175 cm in height and her past medical history and family history were unremarkable (ASA I). She was scheduled to undergo shoulder arthroscopy in the sitting position. She received no medication for induction of anaesthesia on the morning of the operation.

The usual monitoring devices were applied, including blood pressure, pulse and electrocardiography (ECG). The right side of the neck was prepared and draped in a sterile manner. An interscalene brachial plexus block was performed using a 50-mm needle. When motion was elicited in her hand by stimulation with a 0.5 mA current, she was injected with 30 cc of a mixture of 20 cc bupivacaine 0.5%, 10 cc lidocaine 2% and 10 cc saline. The patient noted numbness of her right arm. Aspiration before, during, and after injection revealed no blood or cerebrospinal fluid. Surgical anaesthesia was established in 20 minutes and the patient was then placed in the sitting or "beach chair" position, which is achieved by elevating the upper part of the operating room table to 60-80° and flexing the knees and hips to 90° with the patient's feet resting firmly on a footboard.

Deep hypotension and bradycardia without preceding nausea and vomiting developed 45 minutes after the interscalene block. For treatment, 10 mg ephedrine and 0.5 mg atropine was given with a rapid peripheral intravenous physiological saline

solution replacement. However, carotid and peripheral pulses could not be palpated and the patient experienced cardiopulmonary arrest with an ECG that revealed asystole. The patient was immediately positioned supine and cardiopulmonary resuscitation (CPR) was started. After 20 seconds of CPR, ECG returned to sinus rhythm and the patient regained consciousness. As the blood pressure had returned to a normal value, the operation was continued with the patient in supine position and arthroscopic acromioplasty was performed.

DISCUSSION

Complications following interscalene brachial plexus block reportedly include haematoma formation, subarachnoid injection, phrenic nerve paralysis, Horner's syndrome, recurrent laryngeal nerve paralysis, pneumothorax, and development of transient cardiac bruits (3).

Pharmacologically, bupivacaine has been reported to produce cardiac arrhythmias, anaphylaxis, and cardiac arrest. Among the arrhythmias, bradycardia was the most common (15). Intravenous injection was probably not a factor in our patient, as frequent needle aspiration was carried out during the procedure. In our case, cardiac arrest developed in 45 minutes after block and symptoms related to local anaesthetic toxicity were not seen. The peak local anaesthetic uptake from interscalene block is 30 minutes for bupivacaine and less than 20 minutes for lidocaine with or without epinephrine (3, 9, 11, 16).

The combination of the sitting position, regional anaesthetic technique, an awake patient, and surgical procedure may result in another side effect, vasovagal episodes, which if anticipated, are of minor significance, but which in the extreme may lead to cardiac arrest.

Extensive spread of local anaesthetic to the epidural or subarachnoid space may cause cardiovascular compromise but is rare. Our patient did not experience Horner's syndrome, contralateral arm weakness, or apnea.

The most likely cause of the observed event in our case is a form of vasovagal syncope mediated by the Bezold-Jarisch reflex which is an inhibitory

reflex originating in cardiac sensory receptors with vagal afferents, which are influenced by either chemical or mechanical stimuli (8). The mechanism of the Bezold-Jarisch reflex is thought to be venous blood pooling (induced by sitting position) and a heightened cardiac contractile state which result in reflex arterial vasodilation (mediated by the activation of the parasympathetic nervous system) and a subsequent vagally mediated bradycardia (3).

Although a 13.3% incidence of episodes of bradycardia and/or hypotension requiring treatment with vasoactive medication has been reported in shoulder arthroscopy in the sitting position with interscalene brachial plexus block, cardiac arrest was rare (6, 10). In the reported cardiac arrest cases, asystole was observed immediately after or within 10-20 minutes of interscalene block and resulted from intravenous access of the local anaesthetic solution. However, our case is unique in that cardiac arrest occurred 45 minutes after the block, probably due to activation of Bezold-Jarisch's reflex and patient's anxiety.

We believe that during shoulder arthroscopy, the sitting position causes pooling of the blood in the lower extremities, thus decreasing ventricular volume, while the epinephrine added to both the local anaesthetic and the arthroscopic irrigating solutions may increase ventricular contractility. The activation of Bezold-Jarisch reflex in such situations can be prevented by one of at least three intraoperative interventions : preventing the decrease in ventricular volume using intravenous fluids ; preventing ventricular hypercontractility by using beta-adrenergic blocking drugs ; or inhibiting the afferent limb of the reflex using a vagolytic drug.

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