CASE REPORT

A patient with a history of syncope experiencing cardiac arrest after brachial plexus block

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Abstract

A 65-year-old male with a history of hypertension and diabetes, experienced syncope and cardiac arrest during shoulder arthroscopy after receiving a brachial plexus block. The patient, who was sedated with dexmedetomidine, developed bradycardia after being positioned in the beach chair position, which lead to cardiac arrest. Prompt cardiopulmonary resuscitation restored the patient's heart rate and consciousness. This report discusses the possible causes, including the vasovagal reflex, dexmedetomidine effects, and Bezold-Jarisch reflex, and proposes preventive measures. Recognising high-risk individuals and implementing preventive strategies is crucial.

Keywords: Brachial plexus block, Bezold-Jarisch reflex, cardiac arrest, syncope.

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Introduction

Vasovagal syncope (VVS) is a common type of syncope, usually triggered by external stimuli such as stress, pain, or changes in body position. This type of syncope is primarily caused by excessive stimulation of the vagus nerve, leading to bradycardia and hypotension, resulting in transient cerebral ischaemia and syncope.[1] In this case, the patient had a history of syncope triggered by stress and pain on two previous occasions, indicating a predisposition to vagal reflex activation. Additionally, dexmedetomidine, an α2-adrenergic receptor agonist commonly used for sedation, has been shown to induce bradycardia and hypotension, increasing the risk of cardiac arrest.[2] Moreover, the Bezold-Jarisch reflex (BJR) is another mechanism that can cause bradycardia and hypotension, often seen in cases of low blood volume or during anaesthesia, especially when accompanied by positional changes.[3] The patient in this case developed sudden bradycardia after being placed in the beach chair position, which may have been associated with this reflex.

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Case Presentation

The patient, a 65-year-old male, was admitted to Changhai Hospital, ShangHai, China, on 14 April 2020. He had a history of hypertension, diabetes, and two episodes of syncope. His hypertension was controlled with metoprolol tartrate and felodipine, and his diabetes with metformin. The patient reported that both his blood pressure and blood glucose levels were well-controlled. A preoperative electrocardiogram (ECG) revealed sinus bradycardia and first-degree atrioventricular block. His preoperative blood pressure was 120/75 mmHg, and his heart rate was 75 bpm. The patient underwent an ultrasound-guided brachial plexus block via the interscalene approach using a mixture of 0.375% ropivacaine and 1% lidocaine to block the C5 and C6 nerves. After the block was completed, dexmedetomidine was administered for sedation at a dose of 0.3-0.5 μg/kg/h without a loading dose. Approximately 50 minutes after the nerve block, the patient was placed in the beach chair position, and about 5 minutes later, his heart rate dropped rapidly from 72 bpm to 52 bpm. Despite the administration of 6 mg of ephedrine and 0.3 mg of atropine, his heart rate continued to fall, eventually leading to cardiac arrest. The patient was immediately repositioned to the supine position, and cardiopulmonary resuscitation (CPR) was initiated. After about 20 seconds, the patient's heart rate returned, and he regained consciousness. His blood pressure measured 115/68 mmHg. Following one hour of observation, the patient remained asymptomatic, the surgery was successfully completed, and no postoperative complications were observed. Written informed consent was obtained from the patient for publication of this case report.

Discussion

The vasovagal reflex is a major mechanism leading to excessive vagal activation, causing bradycardia and hypotension.[4] It is usually triggered by external factors such as pain, emotional stress, or changes in body position, leading to an imbalance between the sympathetic and parasympathetic nervous systems.[5] In this case, the patient had a history of vasovagal syncope, occurring once in 2000 during a stressful meeting and again in 2010 during a colonoscopy due to pain. Anaesthetic agents, medications,

and changes in surgical position during the procedure may have further triggered this reflex, resulting in bradycardia and cardiac arrest.

For patients with a history of vasovagal syncope, a thorough medical history assessment should be performed before surgery. Measures should be taken to prevent vagal reflex activation. Excessive positional changes, particularly sudden transitions to sitting or upright positions, should be avoided during surgery. Pain stimulation during the procedure should be minimised, and appropriate analgesics should be used. If the vasovagal reflex occurs, immediate restoration of the supine position is essential. Additionally, medications such as atropine can be used to counteract excessive parasympathetic activation. If persistent hypotension or bradycardia occurs, vasopressors like ephedrine may be required.[6]

Dexmedetomidine is a commonly used sedative, which mainly works by inhibiting sympathetic activity in the central nervous system, producing sedation, analgesia, and anxiolytic effects. However, its common side effects include bradycardia and hypotension.[7,8] The patient developed significant bradycardia after dexmedetomidine use, which likely contributed to the cardiac arrest.[9] In this case, although no loading dose was administered, marked bradycardia still developed. Given the patient's pre-existing sinus bradycardia and first-degree atrioventricular block, dexmedetomidine likely exacerbated the reaction. Therefore, careful use of this drug is advised, particularly in patients with a history of heart disease or bradycardia.

The Bezold-Jarisch reflex (BJR) is triggered by mechanical or chemical stimulation of cardiac receptors, typically leading to bradycardia, hypotension, and peripheral vasodilation. This reflex is often activated when there is reduced cardiac volume, such as during rapid positional changes in surgery or reduced venous return from the lower extremities. In this case, the beach chair position likely decreased venous return from the lower limbs, triggering the BJR and contributing to cardiac arrest.[3]

During surgery, positional changes should be made gradually, avoiding rapid transitions from the supine to the beach chair position. Preoperative evaluation should include assessing for dehydration or hypovolaemia, which may predispose to BJR. Timely fluid replacement and, when necessary, the use of vasopressors during surgery can help prevent reflex-induced bradycardia.

Brachial plexus block involves blocking the C5 to C8 and T1 nerve roots to reduce pain sensation, but it may also affect the balance of the autonomic nervous system.[10] Local anaesthetics can inhibit sympathetic nerve activity, resulting in bradycardia and fluctuations in blood pressure. After the brachial plexus block, increased vagal nerve excitability may reduce heart rate variability, potentially leading to arrhythmias.

Conclusions

Although most cases of cardiac arrest following the beach chair position are attributed to the Bezold-Jarisch reflex, it is relatively rare to encounter such patients in clinical practice. Recognising high risk individuals and implementing preventive measures in advance may be of greater clinical importance. For patients with similar histories, comprehensive preoperative evaluation, close intraoperative monitoring, and timely preventive measures can significantly reduce surgical risks.

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