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CASE REPORT

Potential airway obstruction after shoulder arthroscopy: a case report of an exceedingly rare fluid retention

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ABSTRACT

Shoulder arthroscopy is considered a safe procedure, but complications such as irrigation fluid extravasation may lead to airway obstruction, particularly in high-risk patients. We report a rare case of significant cervical edema following arthroscopy, highlighting key risk factors including high irrigation volume, obesity, and prolonged surgical time. This case emphasizes the importance of intraoperative vigilance, recognition of early signs of airway impairment, and structured decision-making regarding extubation. Awareness of this uncommon complication and implementation of preventive strategies are essential to reduce morbidity and ensure safe postoperative outcomes.

KEYWORDS

Airway obstruction; arthroscopy; edema; shoulder

INTRODUCTION

Shoulder arthroscopy is a minimally invasive surgery, generally performed with short-term hospitalization and associated with lower postoperative pain scores compared to open surgery, and low incidence of complications. Despite these advantages, complications, such as brachial plexus injuries, bleeding, infection, rhabdomyolysis, subcutaneous emphysema, compartment syndrome, and fluid extravasation, have been described and can lead to potential airway obstruction and respiratory impairment[1-7].

Irrigation fluid extravasation, as described in the literature, can cause edema in the chest, neck, and face, potentially spreading to the upper airway. The amount of extravasated fluid depends on several factors, such as the volume of solution used during the surgery, infusion pressure, surgeon's experience, patient's position during the procedure, and patient's body mass index[2,3].

This report presents a case of a patient who underwent shoulder arthroscopy with a high volume of irrigation fluid. At the end of the procedure, we encountered significant edema around the surgical site, extending to the chest, back, neck, and face, distorting the cervical anatomy. Supportive measures, including evaluation of airway patency, resulted in a safe tracheal extubation several hours after the end of the surgery. Written informed consent was obtained from the patient for publication

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of this case report, in accordance with institutional and ethical standards.

CASE REPORT

A 63-year-old, 75 kg, 154-cm-tall woman, ASA physical status class II, hypertensive, and obese (grade 1), currently taking losartan, was scheduled for arthroscopic repair of a rotator cuff tear in the right shoulder. She had no known allergies. Laboratory tests, electrocardiogram, and chest X-ray (CXR) were devoid of alterations.

In the operating room, pulse oximetry (SpO2), electrocardiography (ECG), and noninvasive blood pressure (NIBP) were within normal limits. After venipuncture in her left arm, sedation was initiated with midazolam (3 mg) and fentanyl (50 mcg) intravenously (IV). Oxygen was delivered via a nasal cannula at 2 liters per minute (L/min). An interscalene block with 0.3% ropivacaine was performed using ultrasound and neurostimulation to target the upper trunk of the brachial plexus.

General anesthesia was induced with IV fentanyl (100 mcg), propofol (150 mg), and rocuronium (40 mg). Tracheal intubation was carried out uneventfully using a 7.5 mm cuffed endotracheal tube under direct laryngoscopy, revealing a Cormack-Lehane (CL) grade 1 view, confirmed by auscultation and capnography. The patient was connected to volume-controlled mechanical ventilation with the following settings: fresh gas flow of 1 L/min (O_2:air at a 1:1 ratio), tidal volume of 450 mL, respiratory rate of 12–14 breaths per minute, inspiratory-to-expiratory ratio of 1:2, PEEP of 5 cmH_2O, and peak inspiratory pressure of 20–22 cmH_2O. Anesthesia was maintained with 1–2% sevoflurane.

The patient was positioned in left lateral decubitus with traction on the right arm and slight neck extension. The total volume of IV fluids administered was 100 mL of 0.9% saline and 500 ml of lactated Ringer's solution.

Monitoring during the surgical procedure remained within normal limits, with heart rate ranging from 60 to 80 bpm, NIBP 20% below baseline (140 x 70 mmHg), SpO2 between 98 and 99%, and exhaled CO2 levels ranging from 34 to 36 mmHg. The surgical procedure lasted 180 minutes, during which 90 liters of gravitational pressurized 0.9% saline bags were used.

Once the surgical drapes were removed and the patient was repositioned to a horizontal supine position, tissue infiltration and edema were observed extending from the surgical site to the chest, back, neck, and ipsilateral face. The cervical circumference appeared to be twice its initial size, which was a significant concern.

Due to uncertainty about airway patency, we performed a second direct laryngoscopy, which revealed that the CL classification had shifted to class 2. Airway ultrasound (US) confirmed that the trachea remained centered. A cervical X-ray was taken for documentation, and a cuff leak test was performed. Additional measures included repositioning the patient to a 30-degree inclined position, administering 20 mg of furosemide IV, and inserting an indwelling bladder catheter to monitor diuresis.

After 60 minutes of observation in the operating room, we proceeded with extubation. The patient awoke fully conscious and cooperative, reporting no pain, with good ventilation parameters and chest expansion, though she had a hoarse voice. Her SpO2 without supplemental oxygen was 99%.

Monitoring and periodic reassessments were continued for six hours in the post-anesthesia care unit. As the edema had already regressed by 30–50%, transfer to the inpatient ward was deemed appropriate, where the patient and her companion were informed about the events. Following 24 hours of hospitalization, with near-complete regression of the edema, the patient was discharged.

DISCUSSION

In shoulder arthroscopy, operative time depends on the surgeon's skill and experience, as well as the clarity of the visual field. The irrigation fluid used – 0.9% saline – is not hypotonic like 1.5% glycine, 3.5% sorbitol, or 3% mannitol, which are typically employed in urological procedures. The glenohumeral joint and subacromial space are not highly vascularized and lack significant capacity for large volumes of irrigation fluid. Consequently, the risk of water intoxication and plasma osmolarity reduction is minimal. However, infiltration into adjacent tissues remains clinically relevant, as it may result in complications related to elevated local pressure, including compartment syndrome, nerve injury, rhabdomyolysis, skin necrosis, and compression of laryngeal structures, in addition to pain and discomfort.

External compression of airway structures can be life-threatening. For this reason, it is important to emphasize the risk factors that increase the likelihood of this occurrence, the mechanisms used to reduce the incidence, the management of such complications, and the outcomes[1-6].

The established risk factors include a high volume of infused fluid (more than 20L), long surgical duration (greater than 150 minutes), high infusion pressure, lateral decubitus position, and obese or elderly patients[2-4]. Shoulder irrigation can be done passively by gravity, depending on the height of the fluid bags, or by pressurized pumps. Both methods can influence the volume infused and its absorption[8].

To improve the surgeon's visibility, reduce surgical time, and consequently reduce the infused volume, it

is possible to add epinephrine to the irrigation solution (1:3,000,000), use electrocautery to control bleeding, and apply induced hypotension in patients without risk factors for ischemia[6].

According to the literature, the irrigation volume varies significantly (from 1 to 76 L), with higher volumes being predictors of more intense edema. Once edema is present, the diagnosis is often made late, as the surgical drapes obscure monitoring of its progression during the procedure. However, it can be anticipated by monitoring intrathoracic pressure during mechanical ventilation and serially measuring the pressure of the tracheal tube cuff[5,9].

When massive edema develops in the cervical region after an arthroscopic shoulder surgery, the most significant concern is the potential loss of airway patency if the trachea is extubated. This happens because the neck may become less mobile due to facial swelling, which limits oral opening and may affect the visibility during subsequent direct laryngoscopy[7,9].

If excessive swelling occurs, certain strategies may be applied, although not yet fully established in the literature. These include elevating the patient's back to improve edema drainage, using IV furosemide to attempt to drain accumulated fluid from the surgical site and surrounding areas, performing a cuff leak test when deflating the tracheal tube cuff, reassessing trachea and larynx alignment with direct laryngoscopy, and utilizing fiberoptic techniques and imaging studies such as ultrasound[10], radiography, and computed tomography of the affected region. An extubation with a tube exchanger can be helpful, too. These approaches are particularly valuable if there is airway obstruction after extubation and reintubation is impossible.

A critical concern in this scenario is the potential for rapid progression to a 'cannot intubate, cannot ventilate' situation, constituting an emergency pathway within the difficult airway algorithm. Furthermore, the option of performing a cricothyroidotomy may be affected due to the inability to palpate cervical landmarks, potentially resulting in additional respiratory complications, such as acute negative pressure pulmonary edema[3].

According to the literature, resolution time ranges from 2 to 48 hours. Once the diagnosis is established, if the anesthesiologist is not confident in proceeding with extubation, the patient should remain under observation in the intensive care unit until extubation is deemed safe.

Shoulder arthroscopy carries a low but significant risk of fluid-related complications, particularly to the airway due to cervical edema. Optimal outcomes depend on identifying risk factors, employing intraoperative strategies to limit fluid accumulation, and maintaining vigilance during perioperative airway management. In cases of extensive edema, extubation should be deferred until airway patency is assured.

In conclusion, this case highlights the potential for airway impairment following shoulder arthroscopy and emphasizes the importance of vigilance and risk mitigation strategies to ensure patient safety.

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