

Airway obstruction involving a laryngeal mask airway during arthroscopic shoulder surgery

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Abstract

Several earlier reports have described life-threatening airway obstruction during arthroscopic shoulder surgery performed under regional anesthesia, caused by the leakage of irrigation fluid out of the shoulder joint space into the surrounding soft tissues and then the neck and the pharynx. Here, we present a case of airway obstruction that occurred in a patient under general anesthesia. A 77-year-old woman with a rotator cuff rupture who was to undergo right-shoulder arthroscopic surgery was anesthetized with fentanyl and propofol. Her airway was secured with a flexible laryngeal mask airway (LMA). During surgery, the compliance of her breathing bag became gradually poorer, and finally we were not able to ventilate her at an airway pressure of 60 cmH₂O. We found that her chest wall, neck, and face were swollen and tense. Laryngoscopy revealed massive swelling of the pharyngeal soft tissues. The vocal cords were not visible. Her trachea was intubated blindly, and adequate ventilation was re-established. She was placed in the Fowler position and furosemide was given intravenously. Her neck and chest swelling were reduced over the next 2 h and she was extubated without any problem. We recommend that physicians should periodically examine the neck of any patient undergoing arthroscopic shoulder surgery, especially when general anesthesia is used, because anesthetized patients cannot complain of breathing difficulty and the airway swelling may progress until it becomes life-threatening.

Key words Airway management · Complications · Shoulder arthroscopy · Shoulder surgery

Introduction

Although arthroscopic shoulder surgery has become common because it is less invasive than open shoulder surgery, it is not free of complications [1]. Several clinical reports have described patients who suffered

life-threatening airway obstruction during arthroscopic shoulder surgery performed under regional anesthesia [2–4]. Here, we present a case of a patient who experienced life-threatening airway obstruction during arthroscopic shoulder surgery performed under general anesthesia, using a laryngeal mask airway (LMA).

Case report

A 77-year-old, 40-kg, 144-cm woman with a painful rotator cuff rupture was scheduled for right-shoulder arthroscopic surgery. Physical examination revealed a Mallampati class 2 airway and normal range of motion of her cervical spine.

General anesthesia was induced, using 100 µg of fentanyl and 80 mg of propofol administered intravenously. Then, a size 4 flexible LMA (LMA Flexible; The Laryngeal Mask Company, Oxon, UK) was inserted, and secure manual ventilation without oropharyngeal gas leakage at an airway pressure of 20 cmH₂O was confirmed. General anesthesia was maintained with propofol at 6 to 10 mg·kg⁻¹·h⁻¹ and additional boluses of fentanyl. The patient was manually ventilated with air and oxygen at an inspired oxygen concentration of 50% and end-tidal carbon dioxide tension (EtCO₂) of between 35 and 45 mmHg. Monitoring included pulse oximetry, capnography, electrocardiography, and noninvasive blood pressure measurement.

The patient was placed in the left lateral position with her right shoulder up. After insertion of the intraarticular instruments, her shoulder joint space, including the subacromial space, was inflated and irrigated with 0.9% saline, using a pressure pump (AR-6450 continuous wave II arthroscopy pump; Arthrex, Naples, FL, USA), at an intraarticular pressure of 40 to 80 mmHg, throughout the surgery.

The surgery and anesthesia were uneventful during the first 85 min of the surgery. The patient underwent

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manual controlled ventilation throughout this period, and pulse oxymetric oxygen saturation (Sp_{O_2}), Et_{CO_2} , and systolic blood pressure (SBP) remained at 99% to 100%, 39 to 42 mmHg, and 110 to 190 mmHg, respectively. After the first 85 min, we noticed that the compliance of her breathing bag was gradually becoming poorer. At 95 min of surgery, we were not able to ventilate the patient at an airway pressure of 60 cmH₂O. We initially suspected laryngospasm or the “lead-pipe” phenomenon induced by fentanyl, but treatment with intravenous suxamethonium 40 mg was not effective. When we tried to auscultate the patient’s chest, we found that her chest wall, neck, and face were swollen, tense, and cool on palpation (Fig. 1). Leakage of a large



Fig. 1. Photograph of the patient immediately after the end of surgery. The face and neck are swollen and tense

amount of irrigation fluid from the shoulder articular space into the extraarticular soft tissues was highly suspected because the fluid loss was approximately 2000 ml. Sp_{O_2} decreased to 92% even with 100% inspired oxygen, and her SBP declined to 75 mmHg. Surgery was discontinued and the patient was quickly undraped and placed in the supine position, while a bronchofiberscope and an emergency cricothyrotomy catheter set were prepared for a difficult tracheal intubation. After the administration of an additional dose of suxamethonium, at 40 mg, we attempted laryngoscopy, using a Macintosh size-3 blade for orotracheal intubation, which revealed massive swelling of the pharyngeal soft tissues. Only the uppermost edge of the epiglottis was visible. Backward, upward, and rightward pressure maneuvers on the larynx did not improve the pharyngolaryngeal view, due to the patient’s rigid neck, and the surface laryngeal landmarks were not distinguishable by palpation. A 7.0-mm cuffed tracheal tube was passed blindly, and the proper placement in the trachea was confirmed by auscultation of the chest and an Et_{CO_2} of 79 mmHg. Adequate ventilation was established, and Sp_{O_2} improved to 100%. The arthroscopy portals were closed, and the patient was placed in the Fowler position. Furosemide 30 mg was given intravenously. A chest X-ray showed soft-tissue enlargement in the right chest compared with that before surgery (Fig. 2). The patient’s neck and chest swelling gradually reduced over the next 2 h and she was extubated without any problem. After confirmation of respiratory and cardiovascular stability, she was transferred to the recovery room. There were no complications related to this event during her remaining hospital course.

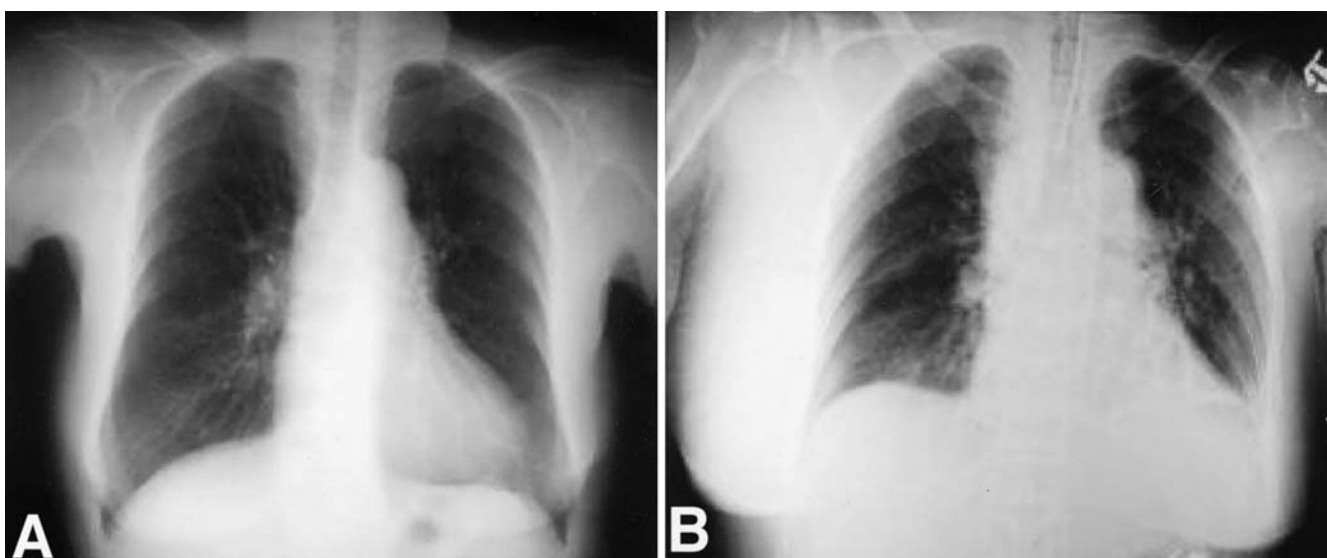


Fig. 2. Chest X-ray films, before surgery with the patient in the upright position (A) and immediately after the end of surgery, in the supine position (B). Note that the image of the right thoracic soft tissues is enlarged after surgery

Discussion

To date, several anesthesiologists and orthopedic surgeons have described airway obstruction during arthroscopic shoulder surgery, all of which events occurred in awake or lightly sedated patients under interscalene brachial plexus block [2–5]. This is the first report of airway obstruction that occurred in a patient under general anesthesia using an LMA.

Although arthroscopic procedures are minimally invasive, the extraarticular leakage of fluid used for continuous flushing of the articular space is a complication of shoulder arthroscopy [1]. Extravasation into the deltoid muscle and the chest frequently occurs [1], but usually it is clinically asymptomatic and reabsorbed within 12 h [6,7]. Airway compromise related to arthroscopic shoulder surgery is uncommon, but once it happens, the outcome is life-threatening [1–4]. In four earlier reports on airway obstruction during arthroscopic shoulder surgery, tracheal intubation was performed in two patients [2,4], a tracheostomy was done in one [3], and only close observation was performed in the remaining patient [5]. Three of these four patients had suddenly complained about neck discomfort or breathing difficulty during surgery, thereby notifying their surgeons of their crisis [2,3,5]. However, our patient was anesthetized and therefore could not complain of neck discomfort or breathing difficulties. The anesthesiologists noticed poor chest compliance, but initially paid no attention to the patient's chest wall, neck, and face under the drapes, and missed an ominous sign of airway compromise until the SpO₂ dropped.

There are several risk factors associated with extensive loss of irrigation fluid into the subcutaneous soft tissues, including high pump pressure, obesity, a prolonged arthroscopic procedure, and subacromial arthroscopy [3]. A lateral position may also contribute to the movement of subcutaneous fluid from the shoulder to the neck by gravity [2]. In addition, looser skin and subcutaneous soft tissues in geriatric patients may facilitate fluid loss out of the shoulder articular space.

Tracheal intubation is the best way to maintain the airway and may prevent airway compromise during arthroscopic shoulder surgery performed under general anesthesia. However, close attention should be paid to the neck region just before extubation if extensive neck swelling is noted, because airway occlusion after extubation is probable. Hynson et al. [2] further recommend that the patency of the airway should be verified before extubation by having the patient inspire around the tracheal tube with the cuff deflated and the tube occluded.

In summary, this is the first report of airway obstruction due to the extravasation of irrigation fluid during arthroscopic shoulder surgery under general anesthesia with LMA insertion. We recommend that anesthesiologists and surgeons should periodically examine the neck of a patient undergoing arthroscopic shoulder surgery under general anesthesia, (as well as carrying out such examinations in those undergoing regional anesthesia), especially because, when general anesthesia is used, the anesthetized patient cannot complain of breathing difficulty and the airway swelling may progress until it becomes life-threatening.

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