

Tracheal Compression during Prolonged Shoulder Arthroscopy Surgery under General Anesthesia

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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, neck, pharynx and upper airway. Here, we present the case of a 32- year- old male in whom the use of general anesthesia with endotracheal intubation for shoulder arthroscopy surgery may have protected the patient from a possible fatal complication; he developed fluid accumulation in to the extra-articular soft tissues with subsequent tracheal compression - a very rare complication associated with this surgical technique. We recommend general anesthesia with endotracheal intubation for procedure performed by surgeons without an adequate experience, and periodic neck examination of any patient undergoing arthroscopic shoulder surgery, especially under general anesthesia as anesthetized patients cannot complain of breathing difficulty.

Keywords: Arthroscopic shoulder surgery; Airway obstruction; General anesthesia

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Introduction

Arthroscopic shoulder surgery is an accepted technique for managing rotator cuff tears, recurrent joint instability, and subacromial pathology [1]. Shoulder arthroscopy has several important advantages over open techniques, including less postoperative pain and more rapid rehabilitation [2]. Regional anesthesia for arthroscopic shoulder surgery is increasingly used. Advantages include less overall anesthetic drugs received by the patient, reduced postoperative analgesic requirements, lower rates of postoperative nausea, and reduced admission rates [3]. Rarely, arthroscopic shoulder surgery under regional anesthesia produces complications that compromise the patient airway [4-10]. However, airway obstruction under general anesthesia is infrequently described and underreported [11, 12]. Here, we present a case of a patient who experienced life threatening airway obstruction during arthroscopic shoulder surgery performed under general anesthesia, using a cuffed endotracheal tube.

Case Description

A 32-year-old, 78 kg man, with an American Society Anesthesiology- status I, was scheduled for elective shoulder arthroscopic surgery for recurrent anterior dislocation of the left shoulder under general anesthesia. History of patient was not suggestive of any drug allergies, medications, alcohol and cigarette use. Airway examination revealed Modified Mallampati class I airway with adequate neck movements. After establishing standard monitoring, patient was premedicated,

with intravenous 1.5mg midazolam, and 6 mg of morphine, and general anesthesia was induced, using intravenous propofol 150 mg. Tracheal intubation was facilitated by intravenous vecuronium bromide 6mg using a cuffed polyvinyl chloride endotracheal tube size 8.0mm (Cormack- Lehane, CLI). Anesthesia was maintained with oxygen, nitrous oxide, isoflurane (MAC 1) and intravenous vecuronium. Patient urinary bladder was catheterized in view of anticipated long duration of surgery. The patient was placed in the right lateral position with traction on their left hand, and the neck in slight lateral extension, surgery proceeded under gravitational-pressurized saline bags at variable pressure. No pumps were used to infuse the flow; no strict fluid outflow was checked for, this being passive.

During the operation (120 minutes after the start of surgery), it was found that peak airway pressures were on rising trends (18→34 cm H₂O), despite adequate depth of anesthesia, analgesia and muscle paralysis. Chest auscultation revealed presence of bilateral air entry. Compliance of breathing bag was getting poorer leading to difficulty in ventilating the patient. At the completion of surgery, on removing the surgical drapes we found that his left chest wall, shoulder and neck were noted to be swollen, tense and cool on palpation. On auscultation, breath sounds were markedly decreased on left side of the lung with minimal basal crepts. Surgery lasted for 270 minutes and a total of 42 liters of irrigation fluid was used. It was determined that extra-articular extravasation of irrigating fluid is causing tracheal compression and ventilation difficulty. Intravenous furosemide 40 mg was given. Patient was placed in head up position and intravenous fluids were restricted. Patient was also found to be hypothermic and active re-warming by warm fluids and warming blanket was started. After the completion of surgery, patient was warmed up over 30minutes and additional bolus of furosemide 20 mg was given intravenously. Reduction in neck swelling was noted also no longer lung crepts was audible. Patient peak airway pressure and compliance of breathing bag was back to normal, and there was no difficulty in ventilating the patient. Air entry was still decreased on left side of lung due

to massive chest edema. Patient was hemodynamic ally stable. Difficult airway cart, resuscitation and intubation drugs were kept ready. Patient's trachea was extubated after confirming that he was able to inspire air around the endotracheal tube with cuff deflated and the tube occluded. His condition remained stable, and later he was transferred to the recovery room. Patient was warned to inform stat in case of any breathing problem, choking sensation or heaviness in the throat. A portable chest x-ray showed soft tissue swelling in the left shoulder and neck with evidence of tracheal deviation to the right. There was no evidence of pneumothorax and pulmonary edema. He was observed overnight in post operative area. The subcutaneous swelling gradually resolved over the next few hours and completely disappeared 12 hours after surgery. Patient was discharged on post operative day 3.

Discussion

Shoulder arthroscopy is generally a safe and effective method for treating a wide variety of shoulder pathology. Complications related to shoulder arthroscopy are not infrequent. Bigliani et al. characterized the frequency of complication as 1-3.2%, depending on the nature of procedure [13]. Complications described include extravasation of fluid, traction neuropraxias, intra-operative haemorrhage, infections, cartilage injury, and reflex sympathetic dystrophy. However, respiratory compromise related to shoulder arthroscopy is rare. Causes include air embolism [1], pneumo thorax [6], mediastinal air [7], tracheal compression [5], and complete airway obstruction from edema [4]. To date; several clinical reports have described airway obstruction during arthroscopic shoulder surgery under interscalene brachial plexus block [4, 5, 8-10]. In these clinical reports, patients were either awake or slightly sedated, hence were able to alert regarding the ominous signs of respiratory distress. Sign and symptoms of ventilatory compromise included, chest tightness, neck discomfort, choking sensation, heaviness in the throat, agitation, restless and struggling to breathe. A single case report of airway obstruction that occurred in a patient under general anesthesia using an LMA has also been reported [11]. Here, we present a first case report of airway

obstruction during shoulder arthroscopy surgery performed under general anesthesia, in a tracheally intubated patient.

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. [14] Extravasation into the deltoid muscle and the chest frequently occurs, but usually it is clinically asymptomatic and reabsorbed within 12 h. [14, 15, 16] Airway compromise related to arthroscopic shoulder surgery is uncommon, but once it happens, the outcome can be life-threatening. [4, 5, 8-11] In six earlier reports on airway obstruction during arthroscopic shoulder surgery, tracheal intubation was performed in four patients, [4, 10, 11] a tracheotomy was done in one patient, [10] and only one patient was closely observed. [5] All intubations were difficult due to extensive pharyngeal, laryngeal and neck edema. Thyroid and cricoid cartilages were obscured almost completely by anterior neck swelling. Had intubation failed, emergent cricothyrotomy or tracheostomy was likely to be extremely difficult considering the obscurity of the neck structures. As the neck and face are under the drapes, the swelling generally goes unnoticed and it is the patient who alerts first. The case reports also shows that it is the patients who have suddenly complained about neck discomfort or breathing difficulty during surgery, thereby notifying their surgeons and anesthetists of the impending crisis. However, our patient was anesthetized and therefore could not complain of neck discomfort or breathing difficulties. Thus ominous signs of airway compromise like poor chest compliance, the rising trends of peak airway pressure, tachycardia and hypertension were missed until the Spo_2 dropped.

Several risk factors contribute to the extensive loss of irrigation fluid into the subcutaneous soft tissues. High pump pressure, obesity, lateral decubitus, protracted duration of the procedure, large volume of irrigation fluid and subacromial arthroscopy are some of them [9]. A lateral position may also contribute to the movement of subcutaneous fluid from the shoulder to the neck by gravity [4]. The duration of surgery is directly correlated

with the severity of the pathology or injury which required the procedure and the surgeon's experience. The cases reported in literature indicate that compression of the ventilation occurs after 120 minutes from the beginning of the procedure [4, 5, 9, 10]. An increase in surgical time necessarily requires an increased amount of irrigation fluid and thus a major risk of compromising the airways. Fluid introduced almost anywhere in the vicinity of the neck will find its way into tissues surrounding the upper airway. Because of the loose application of the mucosa to the underlying tissue, fluid will accumulate in sub mucosal tissue and can easily obscure visualization of the laryngeal structures Bainton, [17] designed a unique laryngoscope blade to allow visualization of the airway in the presence of pharyngeal swelling. The Bainton blade has a tubular end which opens a passage through the oedematous tissue and thus improves visualization of the larynx. Tracheal intubation is the best way to maintain the airway and may prevent airway compromise during arthroscopic shoulder surgery performed under general anesthesia but undetected tracheal compression can lead to severe respiratory insufficiency after tracheal extubation and emergency reintubation. Thus the recovery period may be prolonged. Therefore, it is very important that anesthetists should maintain a high level of vigilance during shoulder arthroscopy, particularly when the procedure is prolonged and the surgeons lack expertise. It is recommended that the patient should inspire around the tracheal tube with the cuff deflated and the tube occluded before extubating the airway (cuff deflation test).

Conclusion

We recommend general anesthesia with tracheal intubation for procedures performed by surgeons without adequate experience, patient placed in lateral decubitus, or procedure in which difficulties are expected. Periodic examination of the neck both during regional and general anesthesia should always be done. Also, the patency of the airway should be checked by cuff deflation test (as described previously) before extubation.

References

1. Villar RN: Minimally invasive surgery: Arthroscopy. *BMJ* 1994; 308:51-3
2. Gartsman G: Arthroscopic rotator cuff repair. *Clin Orthop* 2001; 390:95-106
3. Brown AR, Weiss R, Greensburg C, Flatow EL, Bigliani LU: Interscalene block for shoulder arthroscopy: Comparison with general anaesthesia. *Arthroscopy* 1993; 9:295-300
4. Hynson JM, Tung A, Guevara JE, Katz JA, Glick JM, Shapiro WA: Complete airway obstruction during arthroscopic shoulder surgery. *Anesth Analg* 1993; 76:875-8
5. Borgeat A, Bird P, Ekatodramis G, Dumont C: Tracheal compression caused by periarticular fluid accumulation: A rare complication of shoulder surgery. *J Shoulder Elbow Surg* 2000; 9:443-5
6. Lee H-C, Dewan N, Crosby L: Subcutaneous emphysema, pneumomediastinum and potentially life threatening tension pneumothorax. *Chest* 1992; 101:1265-7
7. Lau K-Y: Pneumomediastinum caused by subcutaneous emphysema in the shoulder. *Chest* 1993; 103:1606-7
8. Antonucci S, Orlandi P, Mattei PA, Amato F: Airway obstruction during arthroscopic shoulder surgery: anaesthesia for the patient or for the surgeon? *Minerva Anesthesiol* 2006; 72:995-1000
9. Blumenthal S, Nadig M, Gerber C, Borgeat A: Severe airway obstruction during arthroscopic shoulder surgery. *Anesthesiology* 2003; 99:1455-6
10. Orebaugh SL: Life threatening airway edema resulting from prolonged shoulder arthroscopy. *Anesthesiology* 2003; 99:1456-8
11. Yoshimura E, Yano T, Ichinose K, Ushijima K: Airway obstruction involving a laryngeal mask airway during arthroscopic shoulder surgery. *J Anesth* 2005; 19: 325-327
12. Cekmen OO, Mehmet AS, Nedim C, Ceyda OC, Mehmet BE: Tracheal compression during shoulder arthroscopy in the beach –chair position. *Current Therapeutic Research* 2010; 71: 408-415
13. Bigliani LU, Flatow EL, Deliz ED: Complications of shoulder arthroscopy. *Orthop Rev* 1991; 20:743-50
14. Berjano P, Gonzalez BG, Olmedo JF, Perez-Espana LA, Munilla MG: Complications in arthroscopic shoulder surgery. *Arthroscopy* 1988; 14:785-788
15. Ogilvie-Harris DJ, Boynton E: Arthroscopic acromioplasty: extravasation of fluid into the deltoid muscle. *Arthroscopy* 1990; 6:52-54
16. Lilleby H: Shoulder arthroscopy. *Acta Orthop Scand* 1984; 55:561-566
17. Bainton CR: A new laryngoscope blade to overcome pharyngeal obstruction. *Anesthesiology* 1987; 67:767-70