Case Report

Respiratory compromise in shoulder arthroscopies - A case series

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Abstract

Shoulder arthroscopy is a minimally invasive procedure performed for various diagnostic and therapeutic purposes. Irrigation fluid under pressure is used to distend the joint space and enhance visualization. This irrigation fluid has the potential to migrate into adjacent soft tissues and systemic circulation leading to complications. In this case series the patients who underwent shoulder arthroscopic repair for shoulder injures developed hypoxemia due to alveolar pulmonary edema caused by extravasation of irrigation fluid used during surgery.

Key words: shoulder arthroscopy, irrigation fluid, fluid extravasation, alveolar pulmonary edema, hypoxemia, respiratory compromise

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Received Date: 11/07/2019 Revised Date: 16/08/2019 Accepted Date: 25/09/2019
DOI: https://doi.org/10.26611/101512125

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 01 November 2019

INTRODUCTION

Arthroscopic repair is becoming the standard of care [1]. This requires use of large volumes of irrigating fluid, at high pressures. This may lead to extravasation of irrigating fluid into the surrounding areas leading to complications [2]. Different techniques to reduce the complications include minimizing the amount of irrigation fluid, use of pump driven system (controlled pump pressure of 40-80 mmHg) than using gravity driven pumps for the purpose of irrigating fluid and minimizing the duration of surgery.[3] We report three cases of arthroscopic shoulder repair, with respiratory compromise.

CASE 1

A 25-year-old male ASA Grade I patient was posted for arthroscopic repair of Bankart's lesion of right shoulder. The patient's pre-anaesthetic checkup was unremarkable. The patient was anaesthetized, intubated and positioned in the lateral decubitus position. After 2 hours of surgery, the patient's saturation decreased to 90% and the FiO_2 had to be increased to 0.5 to maintain a SpO_2 of 99-100%. ABG showed PaO_2 of 100mmHg (at FiO_2 of 0.50). The patient's chest was normal on visualization and on auscultation and were clear. After 3 hours of surgery, the FiO_2 required to maintain a saturation of 99-100% had steadily increased to 1.0. The patient's right chest wall appeared tumescent but the chest on auscultation was clear. The ABG taken, at this point had a PaO_2 of 66 mmHg on 100% FiO_2 with a PCO_2 of 35 mmHg. Around 50 liters of normal saline had been used as irrigating fluid for the surgery. Under C-arm thickening of interlobar fissures was seen. A diagnosis of interstitial pulmonary edema was made, and injection Lasix given. After improvement of PaO_2 66 mmHg at an FiO_2 of 1.0 the patient was extubated. The difficult airway cart including emergency tracheostomy was made ready. The cuff leak test was positive. Extubated uneventfully. In the post-operative period, the patient complained of hoarseness and change in voice. ABGs in the post-operative period showed persistence of mild hypoxemia with PaO_2 50-60 mmHg on O_2 by face mask at FiO_2 of 0.4. The PaO_2

How to site this article: Tarang Jain, Anil Kumar Thakur, Rafia Khan, Renu Bansal. Respiratory compromise in shoulder arthroscopies - A case series. *MedPulse International Journal of Anesthesiology.* November 2019; 12(2): 84-86.
http://medpulse.in/Anesthsiology/index.php

returned to normal by day 3. The change in voice resolved after one week. Serum sodium levels were within normal range in the intraoperative and post-operative period. The chest x-ray done on post-operative day 1 was normal and the patient was able to maintain oxygen saturation of 100% on room air by post-operative day 4.

CASE 2

A 26-year-old male patient posted for diagnostic shoulder arthroscopy, underwent 4 hours of surgery. His preoperative ABG was done due to high index of suspicion due to previous case and the same was within normal limits. Intraoperative period was uneventful. Post operatively patient developed mild hypoxemia with PaO_2 of 50 mmHg on FiO_2 of 0.21. Chest x-ray was done in post-op period which was normal. Patient was given supplementary oxygen at FiO_2 of 0.3 for 2 days post operatively following which ABG normalized and patient was discharged uneventfully. In this case total irrigation fluid used was around 32 liters.

CASE 3

A 40-year-old male patient posted for Bankart's lesion repair underwent one and half hours of surgery. In this case also the preoperative ABG was normal. A total of 5 liters of irrigation fluid was used intra operatively. Intraoperative period was uneventful. Post operatively patient did not develop hypoxemia. Post-operative period ABG and chest x-ray both were normal. Patient was discharged uneventfully.

DISCUSSION

Shoulder arthroscopy is the new standard of care as it causes less post-operative pain and faster rehabilitation [4]. General or regional (interscalene block) anaesthesia can be given to these patients [2]. In our case we chose general anaesthesia keeping in mind that the patient may experience chest discomfort in the lateral decubitus position, in view of the expected long duration of surgery. Multiple case reports have been reported of fluid extravasation into adjoining soft tissues in arthroscopic surgeries. Among the complications reported, the most common include neck swelling and chest wall swelling. [5]. Tracheal compression secondary to soft tissue swelling leading to stridor, prolonged intubation and ICU stay and negative pressure pulmonary edema have also been reported [1,8,9,10,11]. Smith and Shah found a strong correlation between amount of weight gain during surgery and the amount of fluid used and duration of surgery (6). A study by Gawk *et al* demonstrated that respiratory dysfunction after arthroscopic shoulder surgery was of a combined obstructive and restrictive pathology. They demonstrated a decrease in static compliance, FEV1 and FVC in the arthroscopic group [12]. In our first case, approximately 50 litres of irrigation fluid was used and the total duration of surgery was 4 hours 30 minutes. Chest X-ray done on C-arm for expediency showed no onset pulmonary edema and the chest on auscultation was clear. The need for increasing inspired oxygen concentration in our patient could be explained by development of interstitial edema as the chest x-ray showed thickening of the interlobar fissure. A high index of suspicion lead to ABG where the PaO_2 was found to significantly decreased as compared to the FiO_2 being delivered to patient. The patient developed hypoxemia requiring supplementary oxygen and hoarseness of voice which resolved in a week's time.

Factors promoting interstitial pulmonary edema in our first case might be due to lateral position (gravity assisted movement). Irrigation fluid flow was given by assisted method (110-180 cm height), which may have contributed to the pressure during irrigation. In our second case, 32 litres of irrigation fluid was used and total duration of surgery was around 4 hours which was almost similar to our first case and here also the patient developed hypoxemia, requiring supplementary oxygen, which resolved after two days. In our third case, 5 litres of irrigation fluid was used and total duration of surgery was only 1 hour 30 minutes. The patient did not develop hypoxemia intra-operatively, which shows that the amount of irrigation fluid used during arthroscopic surgeries and the total duration of such surgeries are risk factors for extravasation of fluid which may consequently lead to interstitial pulmonary edema which cause hypoxemia in such patients. Irrigation fluid may spread down along the joint capsule to reach the axillary space. It may track deep into the mediastinum, along with axillary and subclavian vessels. This may lead to pleural effusion and interstitial pulmonary edema. Factors which promote fluid extravasation includes high pressure irrigation pumps, long duration of arthroscopic procedure (more than 120mins), obesity, and lateral position, massive irrigation fluid (more than 20 litres) and acromioplasty, surgical resection of the anterior capsule of the glenohumeral joint and iatrogenic deltoid tear [13,14,15]. Gupta *et al* found a correlation between the change in neck circumference with no same parameters and suggested pre and post-operative measurements of the parameters like neck circumference at the level of thyroid cartilage, chest circumference at the level of axilla in supine position, mid arm circumference between acromion and olecranon, pre and post-operative weight measurement (1hour after surgery), pre and post-operative hemoglobin and hematocrit and pre and post-operative serum sodium levels [1]. In all three of our cases

there was no significant decrease in serum sodium or hemoglobin levels. Daniel *et al* found that a statistically significant increase in deltoid compartment pressures occurred after arthroscopic rotator cuff repair and hence suggested that intramuscular pressures should be recorded with an intra-compartmental pressure monitor system [15]. A review by Memon *et al* gave recommendations including limit of pump pressures to be maintained below 150 mm Hg, normal saline is the irrigation solution of choice, volumes lower than 20 L may be considered safe, the maximum operative time should be limited to between 90 and 120 minutes, continuous monitoring for the swelling of structures near the shoulder, including the neck, face, and chest and appropriate placement of surgical drapes to expose the shoulder, structures at the base of the neck, and a portion of the nearby chest wall (5). Since there were no signs and symptoms in any of the cases other than increased need for FiO_2. These cases may be easily missed. Therefore, a high index of suspicion is necessary.

CONCLUSION

Shoulder arthroscopies are increasingly done for both diagnostic and therapeutic purposes (2). General and regional anaesthesia are both being used to provide safe intraoperative and post-operative course (12). Surgeons and anesthesia providers must be aware of the potentially life-threatening complications of fluid extravasation and airway compromise and there should be good communication between the two teams to prevent such complications. Though airway compromise is well documented, our case demonstrates that silent respiratory compromise may also be occurring during these cases. This may be missed due to use of high inspired oxygen being used in the intraoperative and post-operative period. A high index of suspicion is necessary to detect and prevent complications. We should consider routine endotracheal intubation in arthroscopic shoulder procedures with multiple risk factors for dangerous fluid extravasation.

REFERENCES

1. Gupta S, Manjuladevi M, Vasudeva Upadhyaya KS, Kutappa AM, Amaravathi R, Arpana J. Effects of irrigation fluid in shoulder arthroscopy. Indian J Anaesth.2016; 60:194-8.
2. Manjuladevi M, Gupta S, Vasudeva Updhyaya KS, Kuttappa AM.Postoperative airway compromise in shoulder arthroscopy:A case series.Indian J Anaesth.2013;57:52-5.
3. Rodosky MW.Fluid management with arthroscopy: A Clinical Perspective (monograph on internet)Buisiness briefing.Global Surgery.2004;106-8.
4. Berjano P, Gonzalez BG, Olmedo JF, Perez-Espana LA, Munilla MG. Complications in arthroscopic shoulder surgery. Arthroscopy. 1998; 14(8):785-788.
5. Memon, M., Kay, J., Gholami, A., Simunovic, N., and Ayeni, O. R. Fluid Extravasation in Shoulder Arthroscopic Surgery: A Systematic Review. Orthopaedic Journal of Sports Medicine.2018;6(5).
6. Smith CD, Shah MM. Fluid gain during routine shoulder arthroscopy. J Shoulder Elbow Surg. 2008;17(3):415-7.
7. Gwak MS, Kim WH, Choi SJ, *et al*. Arthroscopic shoulder surgery under general anesthesia with brachial plexus block. Anaesthesist. 2013;62(2):113-120.
8. Sharma M, Achar SK. Airway oedema during shoulder arthroscopy: How we played it safe! Indian J Anaesth 2013; 57:319-20.
9. Khan F, Padmanabha S, Shantaram M, Aravind M. Airway compromise due to irrigation fluid extravasation following shoulder arthroscopy. J Anaesthesiol Clin Pharmacol 2013; 29:578-9.
10. Ozhan MO, Suzer MA, Cekmen N, Caparlar CO, Eskin MB. Tracheal compression during shoulder arthroscopy in the beach-chair position. Curr Ther Res Clin Exp 2010; 71:408-15.
11. Errando CL. Ultrasound observation of tissue fluid infiltration causing stridor in a woman undergoing shoulder arthroscopy.
12. Brown AR, Weiss R, Greenberg C, Flatow EL, Bigliani LU. Interscalene block for shoulder arthroscopy: comparison with general anesthesia. Arthroscopy. 1993;9(3):295-300.
13. Chellam S, Chiplonkar S, Pathak K. Change in neck circumference after shoulder arthroscopy: an observational study. Indian J Anaesth. 2015;59(6):365-368. 9. Chiplonkar S, Pathak
14. Khan F, Padmanabha S, Shantaram M, Aravind M. Airway compromise due to irrigation fluid extravasation following shoulder arthroscopy. J Anaesthesiol Clin Pharmacol.2013; 29(4):578-579.
15. Daniel E. McBrayer, Benjamin P. Debelak, DO, Patrick J. Fernicola, Renjin Tu, Champ L. Baker Jr. Deltoid Muscle Pressures During Arthroscopic Rotator Cuff Repair. *Orthopedics*. 2013; 36(2):119.

Source of Support: None Declared
Conflict of Interest: None Declared