Ultrasound observation of tissue fluid infiltration causing stridor in a woman undergoing shoulder arthroscopy

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Abstract
Respiratory stridor developed rapidly during an interscalene brachial plexus block for shoulder arthroscopy in an obese woman. Extensive cervicothoracic edema due to tissue diffusion of the arthroscopic fluid was suspected. The outcome of patient after conservative management was satisfactory. We give a brief review of how this complication develops, the ultrasound findings, and briefly discuss similar cases.

Keywords: Regional anesthesia: interscalene brachial plexus block. Complications. Surgery: shoulder arthroscopy. Ultrasound.

Resumen
Una paciente obesa sometida a artroscopia de hombro anestesiada con un bloqueo interscaléncio del plexo braquial presentó de manera súbita estridor respiratorio. La causa que se sospechó fue un edema cervicotorácico extenso debido a la difusión tisular del líquido de la artroscopia. La paciente se recuperó con tratamiento conservador. Se revisa el mecanismo de esta complicación y se presenta la evidencia con ultrasonidos. Se discute brevemente casos similares.


INTRODUCTION

Surgical treatment is recommended for some shoulder diseases refractory to conservative management, specially rotator cuff tears. These are commonly performed by means of arthroscopic techniques that are considered ‘minimally invasive’ by orthopedic surgeons. Among regional anesthesia procedures interscalenic brachial plexus block is chosen to provide intra and postoperative anesthesia and analgesia, with or without general anesthesia or sedation. Although infrequent, both the surgical and the anesthetic procedures are not without complications.

We present the case of a patient who suffered respiratory distress due to neck tissue dissection during fluid irrigation for a therapeutic shoulder arthroscopy that was demonstrated by ultrasound (US) imaging.

CASE REPORT

A female patient 58 years old, 89 kg weight, 153 cm height, American Society of Anesthesiologists physical status class II, was scheduled for arthroscopic surgical repair of a rotator cuff tear in their left upper extremity. Apart from overweight, the preoperative evaluation showed no diseases, drug treatments or allergy, and laboratory testing, ECG and chest X-ray were normal. The patient gave their written informed consent for the procedure.

In the operating room, the patient was monitored with pulse-oximetry, electrocardiography and noninvasive blood pressure. The proposed anesthetic procedure was an US-guided interscalene brachial plexus block under light sedation. This consisted initially of iv midazolam 2 mg plus fentanyl 50 mcg. The neck was explored with a GE Logic-e US machine (General Electric. Jiangsu. China) and a 3.8 linear probe setting at 10-12 MHz frequency. A short axis, out of plane approach was selected, and a 22G 45º bevel insulated needle (Stimuplex-A, BBraun, Melsungen. Germany) was inserted in a parascalenic approach. The position of the needle tip was then confirmed by neurostimulation (0.0-0.25 mAmp slow increase, 2Hz, 200 msec), obtaining a triceps contraction response. 1.5% mepivacaine 20 ml were injected in 5 ml aliquots by US direct observation of the local anesthetic spread. There were no immediate incidences. Spontaneous ventilation was maintained and additional O2 by nasal prongs was provided with capnogram monitoring. Intraoperative sedation was obtained by means of a variable rate midazolam infusion (approximately 0.5-1 µg/kg/min) plus fentanyl 50 mcg boluses for a 4-5 score in the Ramsay sedation scale.
After adequate surgical anesthesia was confirmed by pinprick, the patient was positioned in the right lateral decubitus with traction on their left hand, with the neck in slight extension. Surgery proceeded under gravitational-pressurized saline bags (35 litres total infused) at variable pressure to obtain a clear arthroscopic view. No pumps were used to infuse the fluid. Timing of inflow to outflow was checked, but no strict fluid outflow was checked for, this being passive (no motorised shaver). Arthroscopic cannulae with sealing damms were used.

The surgical repair was technically difficult and after 130 min, the patient presented with respiratory stridor and arterial oxygen desaturation (lowest $O_2$ saturation 95%). At this time a tense cool swelling due to tissue edema was noted, involving the shoulder, left upper thorax and breast, and the neck, with progression to the right side. The patient remained sedated and no complaint of dyspnea was noted. Additional airway management was judged unnecessary. Hemodynamic status was otherwise normal throughout the procedure. Breath sounds were diminished, but present bilaterally. As the US machine was available, exploration of the soft tissues was performed, showing severe tissue infiltration and distension, with internal jugular vein and carotid artery compression (Fig 1A and B) and incomplete tracheal displacement. The surgeons were informed, and surgery finished in a few minutes. The soft tissues at the thoracic level were punctured with a 14g iv catheter in order to drain some fluid but this was not useful. Some manual fluid dressing was done. Stridor disappeared slowly in a few minutes and the postoperative recovery was uneventful, with complete edema resolution in hours. A postoperative chest X-ray 2 h after the procedure finished, was normal. No laboratory testing alterations (including electrolytes) were observed at this time.

Permission was requested from the patient in the postoperative recovery room for the possible publication of the case.

DISCUSSION

Soft tissue edema after arthroscopic shoulder surgery is frequent. In addition systemic absorption of the irrigation fluid, that is directly related with the duration of surgery and the amount of fluid used could have deleterious effects especially in elderly patients. Migration from the irrigated shoulder structures, mainly those not encapsulated (as are the subacromial ones) is the proposed mechanism.

Airway or respiratory compromise during arthroscopic shoulder procedures, although infrequent, has been previously described. Other technique-related life-threatening complications such as subcutaneous emphysema and pneumomediastinum or pneumothorax have been reported.

As the ones in our case report, other respiratory features have been observed in the cases published, as difficult spontaneous ventilation, difficult or impossible ventilation by laryngeal mask, difficulties in passing an endotracheal tube due to laryngeal tissue edema, or direct visualization of retro-laryngeal engorgement. In our patient laryngoscopy or airway instrumentation was deemed unnecessary.

To our knowledge, US imaging related with this event has never been reported. This is now possible due to the availability of US devices in the operating rooms. Clinical symptoms are sufficient to diagnose this complication, but, if the airway compromise is sudden and severe, other possibilities should be considered, as anaphylaxis, pulmonary edema, cardiac failure of any cause, pneumothorax, and others. In these cases US exploration could rapidly exclude such a mechanical compression.

Treatment depends on the respiratory compromise, but airway instrumentation must be considered early because of impossibility to intubate the trachea. Diuretics could be used in order to decrease fluid accumulation. Otherwise conservative treatment and close observation of the patient until spontaneous resolution might be sufficient, as tissue edema resolves in a few
In the case tracheal intubation was performed, careful extubation is warranted, because laryngeal edema could persist.

In our case, and other case reported, regional anesthesia allowed a rapid suspicion of the cause of the respiratory distress in a conscious or spontaneously breathing patient, that could have been difficult in the case general anesthesia was used, especially at the time of extubation. US was a useful tool for confirming the diagnostic suspicion. US images of displacement and compression of vascular structures was very demonstrative of the pressure of the infiltration fluid. In addition, close communication with the surgical team is important to prevent this complication mainly related with long procedures and large amounts of fluids infused.

REFERENCES