

Pneumothorax after Shoulder Arthroscopy: A Rare but Life-threatening Complication

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What to Learn from this Article?

Beware of rare but dangerous complications in simple straightforward orthopedic procedures.

Abstract

Introduction: Arthroscopy has become a major diagnostic tool and treatment option for shoulder pathology. However rare, respiratory complications such as a pneumothorax have been reported in patients undergoing shoulder arthroscopy. Surgery - as well as anesthesia-related factors and respiratory comorbidity have been hypothesized to intervene in the onset of respiratory complications.

Case Report: We report the case of a 42-year-old male patient who underwent an arthroscopy of the left shoulder. The anesthesia, the surgical procedure as well as the post-operative course went uncomplicated. The patients were discharged 6 h after the end of the surgical procedure. 4 h after discharge, however, the patient developed severe respiratory distress and signs of hemodynamic shock due to an ipsilateral (tension) post-operative pneumothorax. The available literature is reviewed focusing on the possible pathogenic mechanisms implying the development of this complication.

Conclusion: The presence of a pneumothorax after shoulder arthroscopy is a rare but dangerous complication. It can primarily be attributed to rupture of parietal pleura, rupture of visceral pleura, and alveolar rupture or trauma during anesthesia. In our patient, we speculate that a rupture of parietal pleura was the underlying cause. This can be related to the surgical methodology (portal placement and continuous pump infusion with intermittent suction) and subacromial distention used during the procedure. Awareness, prompt recognition, and treatment are necessary.

Keywords: Shoulder arthroscopy, complications, pneumothorax.

Introduction

Arthroscopy has become a major diagnostic tool and treatment option for shoulder pathology. Arthroscopic surgery of the shoulder is characterized by a 5.8-9.5 cumulative risk of complications such

as hemarthrosis, infection, thromboembolic disease, compartment syndrome, neuromuscular damage, instrument failure, fluid extravasation, pulmonary edema, gas embolic brain death, and pneumothorax. Unfortunately, fixed data regarding complications associated with

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arthroscopic shoulder surgery are unreliable as there is a tendency of underreporting [1, 2, 3].

However rare, respiratory complications such as a pneumothorax have been reported in patients undergoing shoulder arthroscopy [1, 2, 3, 4, 5, 6].

Surgery - as well as anesthesiology-related factors and respiratory comorbidity have been hypothesized to intervene in the onset of respiratory complications [1, 2, 3, 4, 5, 6, 7, 8, 9].

We report on one patient who developed an ipsilateral post-operative (tension) pneumothorax after diagnostic shoulder arthroscopy. The available literature is reviewed focusing on the possible pathogenic mechanisms implying the development of this complication.

Case Report

We report the case of a 42-year-old male patient who underwent an arthroscopy of the left shoulder. He had no prior pulmonary conditions and was a nonsmoker.

The procedure was performed in the 1-day clinic under general anesthesia with an endotracheal intubation in the lateral decubital position and without an interscalene block. Anteriorly and posteriorly placed portals were used together with continuous pump infusion and intermittent suction. After the procedure, the portals were closed using Ethilon 3/0 skin stitches.

The anesthesia, the arthroscopic/surgical procedure as well as the post-operative course went uncomplicated. The patients were discharged 6 h after the end of the surgical procedure.

Four hours after discharge, however, the patient developed an acute left chest pain with difficulty breathing/difficulty to breath. Furthermore, he established a swelling of the subcutaneous soft tissues of the left shoulder and left neck region. He consulted his general practitioner who referred him to the emergency department of our center. When the patient arrived at the emergency department, he was in severe respiratory distress and rapidly developed signs of hemodynamic shock.

The diagnosis of an ipsilateral post-operative pneumothorax was established on radiographic imaging (Fig. 1). There was a tension component notable. An emergency chest tube was placed (Fig. 2) which immediately relieved the symptoms.

The patient was discharged symptom free 4 days later from our department. Radiographic imaging of the thorax on discharge, just before removal of the chest tube, revealed a regression of the pneumothorax

The anesthesia records, as well as the operative report, have been re-examined and no complications were noted.

Follow-up by computed tomography (CT) imaging could not reveal an underlying condition (bullae) or bleb(s) as a contributing factor to this complication.

Our patient was lost for follow-up after a symptom-free interval of 3-month.

Discussion

Pneumothorax presented by subcutaneous emphysema, dyspnea, and tachypnea following arthroscopic shoulder surgery represents

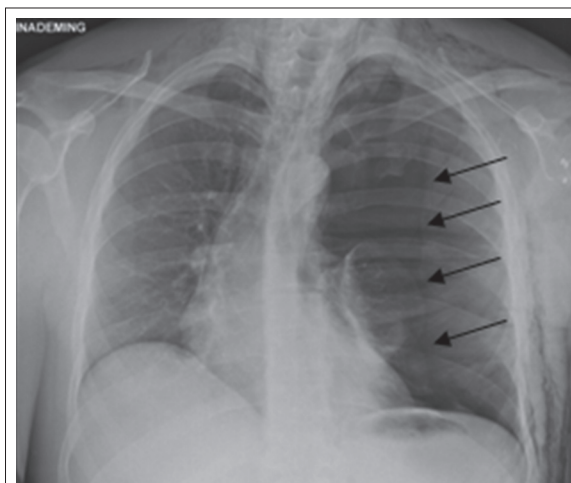


Figure 1: Diagnostic imaging of the post-operative pneumothorax (arrows). A tension component is notable (note the mediastinal shift to the right).

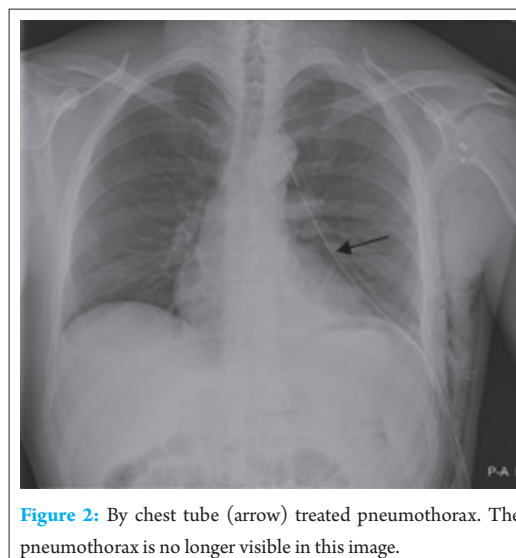


Figure 2: By chest tube (arrow) treated pneumothorax. The pneumothorax is no longer visible in this image.

a major complication of a routinely/commonly performed surgical procedure [1, 2, 3, 4, 5, 6].

Awareness of the different pathogenetic pathways leading to this complication can help surgeons to control for those variables suspected to play a role in the origin of this respiratory complication. To begin with, it is important to realize that arthroscopic shoulder surgery requires the placement of portals into the subacromial space together with a continuous positive pressure driven pump infusion and intermittent suction to obtain and maintain good visualization [1, 2, 3, 4, 5, 8, 9].

Primarily three pathogenetic mechanisms can be responsible for pneumothorax: (1) Rupture of parietal pleura, (2) rupture of visceral pleura, or (3) alveolar rupture [2].

Alveolar rupture (3) is the most common origin of pneumothorax and can be caused by the rupture of a bulla or bleb. Rupture of visceral pleura (2) is to be seen as a result of an airway trauma during an intubation [2, 7].

In our case, however, no problems were reported concerning anesthesia and no blebs or bullae were visible on the postoperatively performed CT scan. Therefore, we speculate that a rupture of parietal pleura (1) is the underlying cause of the pneumothorax. This can either be related to the surgical methodology and subacromial distention used in arthroscopic shoulder surgery or to an anesthesia related complication during interscalene block with perforation of the parietal pleura as this is described in approximately 0.2-0.3% of patients [1, 2, 3, 4, 5, 6]. The latter, however, was not performed in our patient, neither there was evidence of an intubation-related trauma nor a history of bullae or blebs. As such, we reviewed our technical methodology as a possible cause.

Results about surgical methodology associated pneumothorax are unfortunately poorly documented in the literature. We found evidence describing the effect of the subacromial pressure gradient as a possible underlying mechanism [1, 2, 4, 8, 9].

Due to transient changes of pressure in the subacromial space relative to atmospheric pressure, air may be drawn in the anterior arthroscopic portal. When the suction during the procedure is off, the positive pressure from the pump infusion may push the air into the prevertebral space surrounding the trachea and esophagus as the subacromial pressure changes transiently. These results in pneumomediastinum and pneumothorax when the mediastinal pleura ruptures [4].

We believe that this pathway involved the underlying mechanism in our patient and promote the use of pump systems that adjust their inflow in relation to the outflow variation as well as to minimize suction to avoid pressure peaks and gradient changes. Furthermore, air entering the portals

should be detected and purged out, appropriate sealing dams to secure the portals from air entering should be used [1].

Prompt recognition, correct treatment as well as pre-operative information about of this entity is mandatory anyway [1, 2, 3, 4, 5, 6, 7].

Conclusion

The presence of a pneumothorax after shoulder arthroscopy is a rare but dangerous complication. It can primarily be attributed to rupture of parietal pleura, rupture of visceral pleura, and alveolar rupture or trauma during anesthesia.

In our patient, we speculate that a rupture of parietal pleura was the underlying cause. This can be related to the surgical methodology (portal placement and continuous pump infusion with intermittent suction) and subacromial distention used during the procedure.

Awareness, prompt recognition and treatment are necessary. Pre-operative information about a pneumothorax as a possible complication should be mandatory as well as anticipating this complication by proper preparation and manipulation of the arthroscopic procedure.

Clinical Message

A pneumothorax after shoulder arthroscopy is a rare but dangerous complication due to rupture of parietal pleura, rupture of visceral pleura, and alveolar rupture or trauma during anesthesia. Awareness, prompt recognition, and treatment are necessary.

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