Awake uniportal VATS for the evacuation of an extensive, superinfected hemothorax

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Conflict of Interest: The authors declare that they have no conflict of interest.

Abstract:
Background: The so-called non-intubated or awake Video-assisted thoracoscopic surgery (NIVATS) is performed on spontaneously breathing patients, which was shown to reduce postoperative complications and shorten hospital stay.

Case Description: Awake uniportal VATS was indicated for the evacuation of an extensive, superinfected hemothorax with symptomatic mediastinal shift in a patient with advanced mediastinal SMARCA4-deficient tumor and declined condition, who did not allow a general anaesthetic procedure and was not a candidate for extensive surgery.

Conclusion: This short micro-invasive intervention was a prerequisite to stabilize the threatened in his life patient and thus potentially enable for any further tumor specific therapy.

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Introduction

SMARCA4-deficient thoracic malignancies are rare sarcomas, identified by certain genetic mutations, particular at the SMARCA4-gen, coding for important ATP-dependent transcription and chromatin reconfiguration mechanisms. (1) For the first time they were defined by transcriptome analysis and gene profiling among unclassified sarcomas only few years ago and can be located in mediastinum, pleura or the lung. On histopathology the tumors show rhabdoid to epithelioid patterns with high proliferation and mitotic activity. (2, 3) Beside the typical poor differentiated morphology, diagnosis is confirmed by the loss of SMARCA4-expression and further special immunohistochemistry staining procedures. In literature, the affected patients are described mid-aged, mostly between 40 and 50 years, and smoking is discussed as a possible risk factor. Despite novel and innovative therapeutic approaches, including systemic chemo- and immunotherapies, as well as radiotherapy, possibly by particle therapy, SMARCA4-deficient tumors show limited treatment response and are associated with relatively poor prognosis. (3, 4) During recent years, minimally invasive procedures by Video-assisted thoracoscopic surgery (VATS), and even more recently also robotic assisted (RATS), became new standard for many indications in thoracic surgery. (5) Video-assisted thoracoscopic surgery (VATS), is most often perfomed via three access sites but can also be done via one single thoracentesis, called uniportal-VATS (uVATS). (6) Besides minimizing the pure surgical
trauma, also anesthesiological adoptions may contribute to reduce the overall procedural invasiveness as well as to faster recovery: NI (Non-Intubated)-VATS procedures are performed on nearly awake, spontaneously breathing patients. (7)

Case Description
A male patient in his fifties was referred to our thoracic surgery department for further treatment of an extensive left sided pleural effusion. The underlying diagnosis of an undifferentiated SMARCA4-deficient mediastinal tumor was made by radiologically guided biopsy during work-up of extensive weight loss several months before. Initial systemic chemotherapy had included Carboplatin and Etoposid and was later extended by Pembrolizumab and Paclitaxel. In addition, simultaneous radiation therapy with protons up to a cumulative dose of 50 Gray was performed at a particle irradiation centre. On re-staging the mediastinal tumor showed minimal regression in size; a newly emerged left sided pleural effusion was treated by insertion of a small chest tube, and the patient was discharged in stable condition. Two days after an outpatient follow-up in cardiopulmonary stable status at our emergency unit, the patient re-presented himself in a very poor clinical condition, with tachycardia (approximately 150 beats per minute), hypotension, severe dyspnoea, as well as increased inflammation parameters (leukocytes 23.3/nl, CRP 71 mg/l). On emergency CAT-scan, an extensive, loculated left sided pleural effusion with intense mediastinal shift was shown (FIGURE 1 A). No immediate chest tube was re-applied due to effusion’s morphology with distinct loculations, solid tissue organizations and potential post-interventional major bleeding. Suspecting an acute, potentially superinfected hemothorax (Hb-value decreased from 8.8 to 5.7 g/dl) with progressive, hemodynamically effective mediastinal shift, we indicated minimally invasive thoracoscopic evacuation. Because of the poor patients’ condition, the procedure was performed in close collaboration with the department of anaesthesiology without general but in local anaesthesia in the awake and spontaneously breathing patient. After disinfection according to WHO standards and sterile draping multilevel intercostal nerve infiltration with bupivacaine was performed. One single thoracocentesis was placed in the 5th intercostal space at the anterior axillary line. After blunt opening of the pleura, a soft tissue retractor was placed and the hemothorax was evacuated; approximately 2 litres of mostly coagulated, organised effusion was aspirated. No active bleeding was detected. Pneumo-pleural adhesions were taken down and the lung was carefully mobilised. Only then, the mediastinal tumour could be exposed and approached and several biopsies were taken (histological picture, FIGURE 1D). After insertion of a (24 Charrière) chest drain and extensive irrigation, the wound was closed in several layers. Operative time was 30 minutes during which the patient was breathing spontaneously and communicating. Postoperative images (CAT scan and X-ray, FIGURE 1 B and C) confirmed significantly decreased left sided opacity with a respectively better-expanded left lung as well
as regression of the mediastinal shift. Postoperatively, vital signs, especially heart rate normalized immediately and leukocytes decreased to 13.6/nl within 5 days. In addition, the patient’s dyspnoea improved gradually enabling for short walks on ward. The patient showed a clinically significantly improved condition after surgery which allowed to consider further tumor-specific therapies (including tumor debulking surgery) shortly after. 11 days after the initial micro-invasive uniportal VATS approach with the awake and spontaneously breathing patient, a second elaborate surgery was performed under general anesthesia for the evacuation of residues of the hemothorax and tumor debulking. After a total of 20 days following the awake VATS intervention, the patient was able to leave the hospital in continued reduced but stable general condition. The patient was seen again by his primary oncologist to consider further tumor-specific therapy.

Discussion
Uniportal video-assisted thoracoscopic surgery on spontaneously breathing patients without any relaxation, with only minimal sedation and adequate local anaesthesia (“awake uVATS”) is for now the least invasive concept in thoracic surgery. Although all different types of thoracic procedures including extensive anatomic pulmonary resections have been shown to be feasible by this approach, awake uVATS is not an established standard approach and it remains unclear which patient groups benefit most from it. (8) It might enable for operating on a specific cohort of severely co-morbid patients with restricted cardiorespiratory function which otherwise would not qualify for any type of surgery. Our herein presented oncological end staged patient tolerated and quickly recovered from the procedure despite his devastated condition. This case suggests, that awake uVATS should be considered for short interventions in high-risk patients and might be a link between pure conservative and more invasive therapeutic strategies. Though awake uVATS will never represent the routine standard concept in thoracic surgery it is a very helpful tool for particular challenging situations and thus should be part of the portfolio of every advanced thoracic unit.

References

Legends
FIGURE 1: Extensive, loculated left sided pleural effusion with intense mediastinal shift pre-surgery in A (CAT-scan); Postoperative images (CAT-scan and X-Ray, FIGURE 1 B and C) confirmed significantly decreased left sided opacity with a respectively better-expanded left lung and regression of the mediastinal shift; D: Histological image of the described SMARCA4-deficient tumor with rhabtoid morphology (In cooperation with ).