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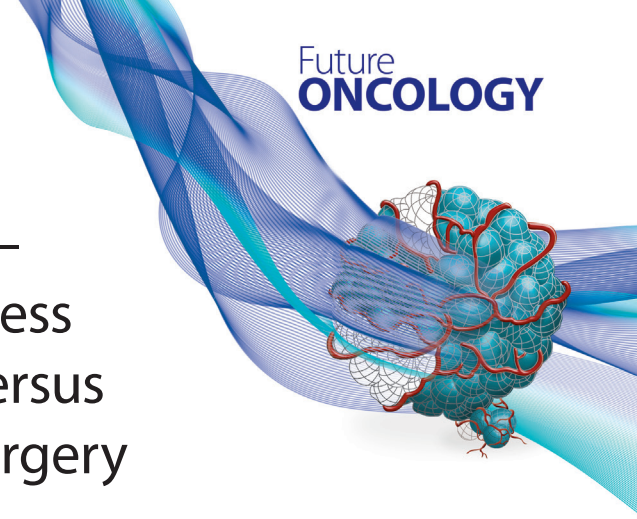

SUPPLEMENT

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Thoracoscopy in pleural effusion – two techniques: awake single-access video-assisted thoracic surgery versus 2-ports video-assisted thoracic surgery under general anesthesia

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Awake single access video-assisted thoracic surgery with local anesthesia improves procedure tolerance, reduces postoperative stay and costs. **Materials & methods:** Local anesthesia was made with lidocaine and ropivacaine. We realize one 20 mm incision for the 'single-access', and two incisions for the '2-trocars technique'. **Results:** Mortality rate was 0% in both groups. Postoperative stay: 3dd ± 4 versus 4dd ± 5, mean operative time: 39 min versus 37 min ($p < 0.05$). Chest tube duration: 2dd ± 5 versus 3dd ± 6. Complications: 11/95 versus 10/79. **Conclusion:** Awake technique reduce postoperative hospital stay and chest drainage duration, similar complications and recurrence rate. The authors can say that 'awake single-access VATS' is an optimal diagnostic and therapeutic tool for the management of pleural effusions, but above extends surgical indication to high-risk patients.

KEYWORDS
• awake VATS • pleural effusion • single port • VATS

The history of video-assisted thoracic surgery (VATS) utilizing the local anesthesia and sedation is almost one century old with Jacobeus and Bethune [1].

The authors started an 'awake single port VATS' program because they hypothesized that the use of just one access associated with local anesthesia might be feasible and could result in a better procedure acceptance, in a more rapid recovery, in a reduced procedure-related cost and in a more less invasive procedure.

A single access associated with local anesthesia aims to improve procedure tolerance, shorten recovery and reduce costs.

Materials & methods

The authors retrospectively analyzed 174 patients with pleural effusion treated by awake technique or general anaesthesia. At admission, patients underwent complete laboratory assay, blood gases, chest roentgenograms, ectrocardiogram and eventually chest computed tomography (CT) scan and cardiological evaluation. An informed consent was obtained from all patients, including possibility of endotracheal intubation and thoracotomy. Premedication consisted in atropine 0.01 mg/kg and ondansetron 8 mg. Pain control and sedation were obtained by remifentanile (0.05–0.1 μg/kg/min) and midazolam (0.02–0.04 mg/kg). In the operating room, the patient was turned to a full lateral decubitus position and the table was flexed to widen the rib spaces on the operation side. A small antidecubitus mattress was placed below the dependent hemitorax to obtain a slight splitting of intercostal spaces without patient's discomforts. The position of the lonely trocar was usually defined with the help of utrasound (US). The using of US to choose the site of access was a rapid and safe method that helped to visualize the pleural effusion and that guided the operator to define the site of access, keeping away from some 'hazardous areas.' A line which included the plan of incision was drawn and the standard antiseptic procedure was performed. Local anesthesia was obtained with

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lidocaine and ropivacaine 10 ml injected in the planned intercostal space, corresponding to the site of thoracoscopic port. A 20-mm skin incision was made on the 6th intercostal space for the VATS 'single-access technique' (VATS-sa), and two incisions were made for the VATS '2-trocars technique' (VATS-2t; 15–mm at fifth space and 10–mm at sixth/seventh space), followed by the dissection of muscle-fascial plans down to the top edge of the rib below; thus the trocar and finally the videothoracoscope were inserted. 5- or 10-mm thoracoscopes were used with a 0- or 30-degree lens and three-chip CCD video camera. The 5-mm 0-degree camera was preferred for single-access technique. At the beginning the effusion was not totally drained in order to maintain the lung collapsed, getting a better view of pleural cavity. Otherwise, it could be useful insufflating CO_2. After the careful inspection of the entire pleural cavity including pleural recesses, liquid samples, multiple biopsies and eventual pleurodesis were performed. At the end of the procedure, a chest tube was positioned into the pleural cavity and was fixed to the patient's skin.

• Statistics

All data are expressed as means ± standard deviation or as percentages. Differences between the two groups at baseline were analyzed with Student's t-test and the chi-square test with Yates' correction.

Results

Over a period of 6 years (from January 2009 to June 2014) the authors performed a total of 174 VATS. The first group of 95 patients, consisting of 51 male and 44 female with a mean age of 69.7 years, was treated using the awake technique, while the second group of 79 patients, formed by 43 males and 36 females with a mean age of 63.4 years, had undergone general anesthesia. The authors did not observe significant differences between the two groups in terms of gender, age, characteristics and clinical data. In the first group no patients required intraoperative intubation or conversion in thoracotomy.

Mean operative time was 39 min for VATS-st and 37 min for VATS-2t (Student's t-test $p < 0.05$).

Chest tubes were removed after 2.5 days for VATS-st group and after 3 days for VATS-2t group (Student's t-test $p < 0.05$). Hospital stay was 3.5 days for VATS-st group and 4.5 days for VATS-2t group (Student's t-test $p < 0.05$).

We experienced 11 complications in VATS-st group (11.5%) and 10 in VATS-2t group (12.6%). There were two cases of bleeding (2%) in VATS-st and one in VATS-2t (1%). Two patients of VATS-st group (2%) had subcutaneous emphysema and three patients (4%) from the VATS-2t group too. There was no chylothorax in VATS-st group and one in VATS-2t group (1%). Recurrence was present in five patients of VATS-st group (5%) and in four patients of VATS-2t group (5%). Furthermore, two patients of VATS-st group (2%) had atrial fibrillation considered as morbidity and as well one patient of the other group (1%). The differences though were not statistically significant (chi-square test; $p = 0.9871$).

No patients had wound infection and there was no hospital mortality in both groups.

Discussion

VATS procedures are usually performed in general anesthesia and double lumen intubation [2]; progressively, it was observed a progressive tendency to reduce the number of accesses and it has tried to eliminate the need of general anesthesia, especially for patients with suboptimal clinical conditions. Reducing the number of accesses allows to avoid multiple skin incisions, thus could decrease the risk of intercostal nerve damage and postoperative chest pain [3] and also could minimize the spread of infection and tumor cells to the chest wall in infectious and malignant diseases [4]. Moreover since 1987 the advantages of thoracoscopy under regional anesthesia have been known, as Rusch and Mountain described [5]. Those reasons pushed the authors to try to perform small thoracic procedures like thoracoscopy for pleural effusions for benign and malignant disease. These patients have a great tolerance to monolateral ventilation due to gradual developing of the effusion [3,5]. Unfortunately pleural effusions are more common in old population, this leads to treat patients with several co-morbidities, that often preclude the possibility to perform surgery under general anesthesia [6]. At the same time, they need to be treated, even if only to give them relief from the disease as palliative care. In the authors experience, in collaboration with the authors anesthesiological team, the authors found the way with local anesthesia, sedation in spontaneous ventilation [7,8]. During the VATS, unless than in emergency condition, the effusion was not totally drained in order to maintain collapsed

the lung and to have a better view of pleural space. Otherwise, it could be useful to create a pneumothorax insufflating CO_2, and to nebulize lidocaine in pleural space to suppress cough [9]. Of course it must be considered that the feasibility in complex empyema or in old pleural effusion decreases. [3] In the authors experience the success rate is total and complications are minimal, overlapping the standard technique with two entrances and under general anesthesia. The majority of procedure that included talc pleurodesis, this did not impact on the length of the operation as it took just 2 or 3 min more. As already described by different authors [8,10–11], awake technique allows a reduction, although slightly, of postoperative hospital stay and duration of chest drainage, while the authors registered similar complications and recurrence rate. The single access appears to decrease the discomfort postoperatively, although it is probably a psychological factor, presenting patients the procedure with a single access.

Conclusion

The authors can say that 'awake single-access VATS' is an optimal diagnostic and therapeutic tool for the management of benign and malignant pleural effusions, but above all it extends surgical indication to high-risk patients, who might be not qualified for general anesthesia procedure, utilizing safe and well-known drugs. Maybe that in the next future, there will be more opportunity to use awake VATS in patients with major thoracic surgery resection. Reducing the postoperative stay, the operative time and avoiding the use of general anesthesia, the authors could economize on the use of major anesthesiological devices and drugs, optimizing the cost/benefit ratio. But the real advantage is the good compliance obtained during this procedure; it is very rare that patients feel discomfort during it; moreover this simple and safe procedure could also be a good setting to train residents.

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