AWAKE VIDEOTHORACOSCOPIC RESECTION WITH THE HELP OF THORACIC PARAVERTEBRAL BLOCK: TWO CASE REPORT AND REVIEW OF LITERATURE

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ABSTRACT

Thoracic paravertebral block (TPB) can be administered for VATS (video-assisted thoracic surgery) method and often used for analgesic purposes and provides good results. Awake VATS (AVATS) has been increasingly employed in a variety of procedures involving pleura, lungs, and mediastinum. AVATS had been reported local anesthesia and sedation, intercostal blocks or TEA was used regarding regional anesthesia in many studies. We present our experience with the two cases undergoing AVATS accompanied by TPB due to such cases are rarely seen in the literature. Specially, our second case of spontaneous pneumothorax surgery using AVATS with TPB anesthesia has not been reported previously in the literature.

KEYWORDS thoracic paravertebral block, awake video-assisted thoracic surgery, wedge resection.

Introduction

Thoracic paravertebral block (TPB) is one of the regional anesthesia methods that can be administered alone or in combination with general anesthesia during many kinds of surgical operations and also in thoracic surgery. Ensuring more effective analgesia and fewer side effects compared to other regional anesthesia methods makes paravertebral anesthesia as a current approach for minimally invasive thoracic surgery operations for recent years. TPB has been used in many surgical procedures such as thoracotomy, VATS (Video Assisted Thoracoscopic Surgery), breast surgery, minimally invasive cardiac surgery, inguinal hernia repair, cholecystectomy, and nephrectomy. One paravertebral injection block can be administered for VATS method and often used for analgesic purposes and provides good results [1]. Awake VATS operations without mechanical ventilation were earlier used only for pleural biopsy for diagnostic purposes. However, by the advances in minimally invasive technology such as spontaneous pneumothorax surgery, bullous emphysema, pulmonary nodule resection of lung volume reduction surgery, the decortication, and treatment of mediastinal mass and in lung anatomic resection, in recent years implementation of case series and randomized controlled trials are available showing that AVATS (Awake Video-Assisted Thoracoscopic Surgery) is a safe and effective technique. Potential cases for AVATS technique performed with awake regional anesthesia are minor cases for healthy patients and high-risk cases where intubation is inconvenient to apply. The short duration of the operation and careful patient selection is necessary. The unwillingness of the patient to be awake during operation, a risk of contamination of the other lung, massive bleeding, infectious conditions such as inflammation, alveolar proteinosis, bronchopleural fistula is among the contraindications of the procedure [2-4].

We present our experience with the two cases undergoing VATS accompanied by TPB with spontaneous breathing without being intubated due to such cases are less seen in the literature.

Written informed consent form was obtained from each patient and was given face to face detailed explanation by the anesthesiologist and surgeon before the intervention.

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Case Report 1

The patient was a 58-years-old male who underwent total gastrectomy and Roux-en-Y esopahgo-jejunostomy for gastric adenocarcinoma with stage IB (T1N1M0) 6 months ago was admitted 1 cm spiculated nodule in the left upper lobe lingula (SUV max: 5,2) in PET - CT (Positron Emission Tomography). He has a 20-pack year history of smoking. His physical examination and laboratory investigations were normal. Pulmonary function tests (PFT), FVC : 1.94 L (63%), FEV 1 : 1.73 L (68%), FEV1 / FVC : 89.1 %. AVATS operation was planned accompanied by TPB for diagnosis. Two percent Lidocaine was administered by inhalation 30 min before the operation to suppress cough in the intraoperative period. Electrocardiography, noninvasive blood pressure, peripheral arterial oxygen saturation (SpO2), temperature, pressure, end-tidal carbon dioxide (ETCO2) were monitored at the operation room. Sedation was achieved with IV dexmedetomidine of 1 μ / kg after given right lateral decubitus position. Four points marked in 3 cm lateral to the T4-8 spinous process. Tuohy needle (18G, Braun, Melsungen, Germany) has been entered of these points with a right angle to the skin and advanced until the transverse process. Then the needle was retracted until the skin and redirected again at an angle of 10 ° over transverse process and was achieved paravertebral space using a loss of resistance method by serum physiological. A total of 4 mL including 80 mg of 0.5% bupivacaine were injected into four separate levels (T4-8) (Figure 1A,B). Nor hypotension nor bradycardia were observed during interventions. Anesthesia level were evaluated with "Pinprick test" in the dermatome level after 25 minutes of the roots blockage. After verifying analgesia, 4-5 cm utility incision was made in the 6th intercostal space in the midaxillary line. We introduced the 10-mm thoracoscope into the incision and explored the chest cavity. Thus artificial pneumothorax was created and the left lung achieved to be collapsed. During the exploration approximately 1 cm in diameter nodule was detected in inferior segment of the lingula. Wedge resection was performed with an Endo GIA 60-4.8mm endoscopic stapler with two green cartridges (Covidien Endo GIA Universal Roticulator) which is removed through the same incision using an endobag. The chest cavity was filled with isotonic, air was aspirated by negative aspiration and control leakage was made ensuring the expansion of the lung. The lung expansion is not well as in positive pressure ventilation, but was found to be enough to show the air leaks. Involuntary cough reflex and diaphragmatic contractions during the operation did not create a disadvantage during the excision of lesion. Oxygen was given by mask during the operation to keep SpO2 in range of 92-96%, blood gas analysis was; pH 7.38, PO2 72 mmHg and PCO2 : 34 mmHg HCO3 : 24 mEq / L, BA: 2.2 mEq / L. Pain intensity was measured using a visual analogue scale (VAS): 0 cm is without any pain and 10 cm is the worst pain imaginable. A VAS score of 4 cm or less was considered to be an acceptable level of pain. No supplemental analgesic or sedative drugs were needed during the operation lasting a total of 42 minutes. Postoperative oral feeding was began at the first hour and was mobilized at the second hour. No air leak and drainage was seen on postoperative period and check-expansion was monitored on chest X-ray. Chest drain was taken on postoperative second day and discharged the same day. Pathology results were reported as adenocarcinoma metastases. An outpatient follow-up at the second month, postero-anterior chest radiography was normal and he had no pain.

Case Report 2

A 30-years-old male patient was admitted with right spontaneous pneumothorax and right tube thoracostomy was performed. After persistent air leak for over 7 days we planned undergo surgery via AVATS with TPB performing resection of bullae and abrasive pleurodesis. He has a 10-pack-year history of smoking. His physical examination was unremarkable except for a decrease in breath sounds in the right lung upper zone. Laboratory investigations were normal. Pulmonary function tests (PFT), FVC : 3,30 (%80), FEV1: 2,10 L (%72), FEV1/FVC: %63,6. Two percent Lidocaine was administered by inhalation 30 min before the operation. Sedation was achieved with IV dexmedetomidine of 1 μ / kg after standart anesthetic monitorization. There was no hypotension or bradycardia in his hemodynamic parameters during attempts. Anesthesia level were evaluated with "Pinprick-test" in the dermatome level after 20 minutes of the blockage. Paravertebrally distance has been reached 3 cm lateral from T6 spinous process by the technique previously mentioned above and treated with a single injection into one level (T5-6) of 80 mg of bupivacaine 0.5% in a sitting position (Figure 1 C). The left lateral decubitus position was given to the case after analgesia occurs, then 4-5 cm utility incision was performed in the 5th intercostal space in the midaxillary line (Figure 1 D). During AVATS in right upper lobe apical segment was seen pleural blebs and air leakage. The wedge resection was applied with an Endo GIA 60-4.8mm endoscopic stapler with three green cartridges (Covidien Endo GIA Universal Roticulator) and upper parietal pleura was mechanically abraded. The expansion of the lung was made by negative - pulmonary aspiration ensuring to check for leaks where no leakage was observed. Involuntary cough reflex and diaphragmatic contractions did not create a disadvantage during the manipulation. Oxygen was given by mask during the operation to keep SpO2 in the range of 94-98%; blood gas analysis was; pH: 7,43, PO2: 77 mmHg, PCO2: 37 mmHg, HCO3:24 mEq/L, BE 0,4 mEq/L, preoperatively. The pain and hyperpnea on the 20th minutes the operation was treated successfully with intranasal 1 μ / kg dexmedetomidine administration. Total operative time was estimated to be 38 minutes. Postoperative oral feeding began at the first hour and was mobilized at the second hour. No air leak and drainage were seen on postoperative period and check – expansion was controlled on chest X-ray. A chest drain was taken on the postoperative second day and discharged the same day.

Discussion

The first thoracic paravertebral application to provide muscle relaxation and analgesia during abdominal surgery was performed by Hugo Sellhe in 1905 in Leipzig. It many techniques was proposed to improve the efficiency of the process since then. Among these, the most widely used and safe methods are the one of the developed by Greengrass. According to this technique, the paravertebral space is reached advancing the needle to caudal after contacting with the transverse process [5].

In recent years, it has been reported that ultrasound-guided [6] and nerve stimulator-guided [7] TPB, will increase the security and effect of the operation. We also used “transverse process contact technique” recommended by Greengrass in our two cases. TPB practices and techniques is relatively easy compared to other regional anesthesia methods. Technical success rate is higher. The failure rate of PVB is 6.1% with a single injection and 10.7% with multiple injection. The main complications

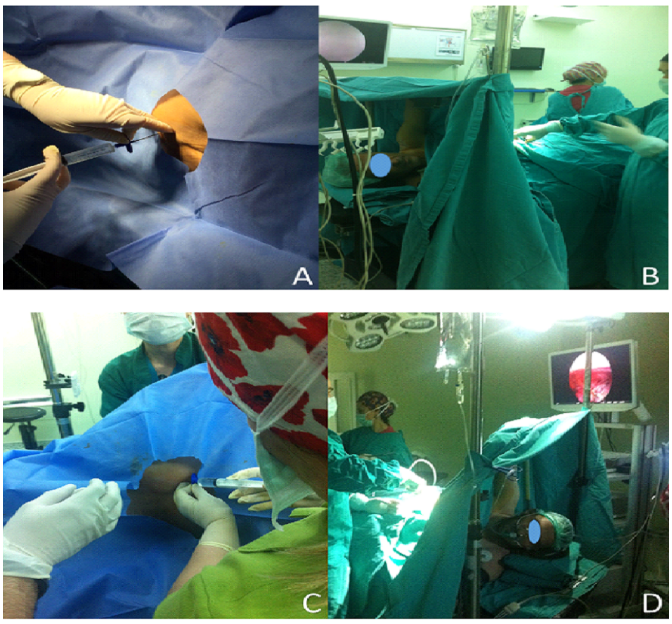

Figure 1: Paravertebral blockade performing(A) and awake VATS operation(B) for case 1 .Paravertebral blockade performing(C) and awake VATS operation (D) for case 2.

associated processing as vascular injury (6,8%) , hypotension (4%), epidural or intrathecal injection (1%), pleural injury (0,8%) and pneumothorax (0.5%). Other possible complications may be listed as infection at the injection site, hematoma, local anesthetic toxicity [8]. In the first case we apply TPB by multiple injection (from T4 to T8, a total of four injections), in the second case by using a single injection (T5-6). Both operations were successful and no complications were observed. However, there was less hyperpnea, diafragm and lung movement and cough reflex during the operation in the first case which multiple injections were administered. Hypotension, bradycardia, urinary retention and pulmonary complications are rare at TPB method when compared to thoracic epidural approach. Also such iatrogenic pathologies like epidural hematoma, epidural abscess, and spinal cord injury that may occur during thoracic epidural analgesia are minimized by TBP due to the direct nature of the process. Pintaric et al. [9] reported in 32 prospective randomized series in thoracotomy cases applied under TPB that the more stable of hemodynamic parameters and equivalent of analgesic efficacy compared to the method of thoracic epidural. They also emphasized that there is less need of colloid and vasopressor drugs in TPB group in the same study. However, it has also been reported that local anesthetic may be spread through bilateral thoracic paravertebral space at extrapleural subserosal facial plan during TPB application could lead to similar hemodynamic deterioration like epidural analgesia [10]. There were no need to treat hemodynamic parameters with colloid and vasopressor support in both of our patients. Kaya et al. [11] have compared patients who applied general anesthesia with double-lumenned tube and regional anesthesia with single or multiple injection paravertebral block methods undergoing VATS operation in randomized prospective study; they reported mobilization and discharge time is not statistically significant, the a single injection administered group is superior in terms of analgesic efficacy, and no complications were observed in both groups. Piccioni et al. (12) applied AVATS biopsy and pleurodesis operation with TPB in two oncological cases which had severe dyspnea reported that a sufficient condition provided for surgery, painless postoperative period, early mobilization, early discharge occurred and brought down to a minimum of respiratory risks of the anesthetic agents and intubation in their case report. Postoperative pain coming down to a minimum of our two AVATS wedge resection cases with TPB, while early mobilization and early discharge have also been abled. Cough is a condition that complicates exploration and surgical manipulation in AVATS. Satellite ganglion, the vagal nerve block or inhalation of local anesthetic can be applied in the preoperative period to suppress cough during the operation [13]. We also applied the 3 mL of lidocaine 5% of inhalation 30 minutes before the operation in our two cases. So less cough reflex was seen not affecting surgical maneuvers during operation in our both cases.

Successful bulla-bleb resection and pleural abrasion with AVATS for spontaneous pneumothorax have been reported in many studies. It was reported local anesthesia and sedation, intercostal blocks or thoracic epidural anesthesia were used regarding regional anesthesia in those works [14,15]. However, our second case of spontaneous pneumothorax surgery using AVATS with TPB anesthesia has not been reported previously in the literature. Pompeo et al. [16] reported a randomized study AVATS-assisted wedge resection caused for solitary pulmonary nodules with thoracic epidural anesthesia at 30 patients in 2004. They believed that compared with intubated patients with general anesthesia; there were more satisfaction of patients, less nursing care requirement, shorter length of hospital stay in awake cases so that it is a safe and feasible technique. However, they reported that they had to undergo intubation and general anesthesia in two patients to extensive resection. In awake non-intubated patients, intubation rate is between 2,7% and 4,3% vary depending on the surgical procedures and learning curve [17,18]. Our awake two cases had satisfactory results regarding early mobilization, the establishment of early oral intake, early discharge, patients satisfaction and reduced pain levels. In both cases, the process could be completed with spontaneous breathing.

It is known that VATS technique with one lung ventilation under general anesthesia increases the risk of pneumonia as a result of deep sedation and muscle relaxation, reduces cardiac performance, causes neuromuscular problems. Also, many complications can develop such as laryngotracheal spasm, esophageal or tracheal rupture, tooth fracture, mandibular subluxation, tracheal aspiration cardiac arrhythmia depending on endotracheal intubation [19]. Also, one-lung ventilation lung damage, and can lead to edema pneumothorax [20]. Although regional anesthesia have such complications as slow start, failed or inadequate block, high or total spinal block, headaches, spinal/epidural hematoma, intravascular injection, local anesthetic toxicity, neurological deficits, nausea, vomiting, hypotension; compared to general anesthesia, mortality; effects on cardiovascular, pulmonary, gastrointestinal and coagulation system, cognitive functions; major morbidity on immune and stress response are known to be less. Although some minor risks of TPB may occur during AVATS with TPB, it is possible to prevent significant complications related to general anesthesia and intubation.

Conclusion

AVATS with TPB constitutes fewer side effects and less risk of complications compared with other regional anesthesia techniques and general anesthesia. This allows early discharge, early

mobilization, early oral feeding and to avoid the risks posed by general anesthesia and intubation. The weak point of our study is that our study is a small group of case series. However, we believe that there is a need for randomized controlled trials including a large case series to determine the contribution of the paravertebral block on awake VATS operation.

Disclosure Statement

There were no financial support or relationships between the authors and any organization or professional bodies that could pose any conflict of interests.

Competing Interests

Written informed consent obtained from the patient for publication of this case report and any accompanying images.

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