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Original study

Non-intubated single surgeon single-port video-assisted thoracic surgery: A retrospective evaluation of the first experiences in a secondary care hospital

Entübe olmayan tek cerrahlı ve tek portlu video yardımlı torasik cerrahi: İkinci basamak bir hastane ilk deneyimlerinin retrospektif değerlendirmesi

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ABSTRACT

Performing thoracic surgical procedures in a secondary care hospital is often challenging due to shortness of staff and lack of technical opportunities. Non-intubated thoracic surgery can be performed in patients with high risk for general anesthesia. Our aim is to share our non-intubated video-thoracoscopic surgery experience in such a public hospital.

We have performed 11 non-intubated video-thoracoscopic surgery between March 2022 and November 2023. Seven patients were male. Single thoracic surgeon performed all the operations. Patients were analyzed in terms of characteristics, diagnosis, procedure type, operative time, analgesic methods, pain score, complications and follow-up data.

Mean age was 62 (29-90). Six patients underwent pleural drainage, deloculation and talk insufflation performed in two patients. Pleural biopsy was performed in one patient. Five patients were operated on due to insufficient drainage of coagulum and poor lung expansion after chest tube insertion for hemothorax. No patients required intubation. Operative mortality wasn't seen. Eight patients received erector spinae plane block. The mean operation duration was 41 minutes. No operation related complication was observed. Average Visual Analogue Scale in 24 hours was 0-1 The mean length of hospital stay was 5 (2-10) days.

Carefully planned thoracic surgeries for pleural pathologies can be performed with a non-intubated video-thoracoscopic approach safely. Respiratory management during surgery and perioperative management of pain is crucial to achieve best results with low operative risk. Authors suggest that the surgeon and anesthesiologist must be trained in a high-volume thoracic surgery center.

Keywords: Non-intubated; awake; thoracic surgery; minimally invasive; VATS

ÖZET

İkinci basamak bir hastanede göğüs cerrahisi işlemlerinin gerçekleştirilmesi, ekip yetersizliği ve teknik imkanların yetersizliği nedeniyle sıklıkla zordur. Genel anestezi riski yüksek olan hastalarda entübasyon yapılmaksızın göğüs cerrahisi yapılabilir. Amacımız böyle bir devlet hastanesinde sedasyon ve bölgesel anestezi altında yapılan video-torakoskopik cerrahi deneyimimizi paylaşmaktır.

Mart 2022 ile Kasım 2023 tarihleri arasında entübasyon yapılmadan 11 video-torakoskopik cerrahi gerçekleştirdik. Hastaların sekizi erkekti. Tüm ameliyatları tek göğüs cerrahı gerçekleştirdi. Hastalar özellikleri, tanıları, işlem şekli, ameliyat süresi, analjezik yöntemleri, ağrı skoru, komplikasyonları ve takip verileri analiz edildi

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Ortalama yaş 62 (29-90) idi. Altı hastaya plevral drenaj, delokülasyon ve iki hastaya talk insüflasyonu uygulandı. Bir hastaya plevra biyopsisi yapıldı. Hemotoraks nedeniyle göğüs tüpü takıldıktan sonra hematom drenajının yetersiz olması ve akciğer ekspansiyonunun zayıf olması nedeniyle beş hasta opere edildi. Hiçbir hastada entübasyon gerekmedi. Operatif mortalite görülmedi. Sekiz hastalara erektör spina plan bloğu uygulandı. Ortalama operasyon süresi 41 dakikaydı. Operasyona bağlı herhangi bir komplikasyon görülmedi. 24 saatteki ortalama Vizüel Ağrı Skalası 0-1 idi. Hastanede kalış süresi ortalama 5 (2-10) gündü.

Plevral patolojilere yönelik dikkatle planlanmış toraks ameliyatları entübasyon yapılmadan videotorakoskopik yaklaşımla güvenli bir şekilde gerçekleştirilebilmektedir. Ameliyat sırasında solunum yönetimi ve perioperatif ağrı tedavisi, düşük ameliyat riskiyle en iyi sonuca ulaşmak için oldukça önemlidir. Yazarlar cerrahın ve anestezi uzmanının yüksek hacimli bir göğüs cerrahisi merkezinde eğitim almış olması gerektiğini belirtmektedir.

Anahtar kelimeler: Entübasyonsuz; uyanık; göğüs cerrahisi; minimal invaziv; VYGC.

INTRODUCTION

Mainstream anesthesia method of choice for thoracic surgical procedures is endobronchial intubation with double-lumen tubes allowing selective lung ventilation, deflating lung on the surgical side providing a better intrathoracic exploration and access (1,2). The incline of minimally invasive surgical approach and efforts of enhanced recovery after surgery (ERAS) helps risked patients to have a surgical chance with lower risk and complications (3).

Recent decade was another checkpoint for thoracic surgery since minimally invasive thoracic surgeries were performed on non-intubated, spontaneously breathing patients with great success and minimal complications (4–6). This was important especially for patients with high risk for anesthesia due to their comorbidities and conditions (7,8). As always, surgeons and anesthesiologists must work in harmony.

Even though performing standard thoracic surgeries in a secondary care public hospital is already challenging due to shortage of staff and technical disadvantage, a trained team can offer non-intubated thoracic surgery for certain procedures. We wanted to share our experience under such circumstances.

MATERIAL and METHOD

Between March 2022 and November 2023, patients who underwent non-intubated single surgeon single-port thoracic surgery for pleural conditions were investigated. Patients with insufficient follow-up data were excluded. A total of 11 patients were included to the study. Eight patients were male. Mean age was 62 and median age was 63 (29-90). Patients were analyzed in terms of characteristics, diagnosis, procedure type, operative time, analgesic methods, pain score, complications and follow-up data.

Anesthesia and pain management

Routine monitoring including pulse oximetry, electrocardiography and noninvasive blood pressure measurement was applied after the patients were taken to the operating table. After the patients were placed in a sitting position, the thoracic level appropriate to the dermatome of the port entry location on the side where the operation would be performed was determined. In the craniocaudal direction a Pajunk Sonoplex Nanoline 22 gauche 80 mm block needle was used for erector spinae plane block under ultrasonography guidance at this level. By passing the trapezius, rhomboid major, and erector spinae muscles, an erector spinae plane block was performed by injecting 15 mL volume 0.5% bupivacaine solution, not exceeding 0.3 ml/kg, 1 ml 50 µg fentanyl and 4 mL 2% lidocaine, between the erector spinae and the transverse process muscles. After 20 minutes, the pinprick test was applied to the patients to evaluate whether anesthesia was achieved. For patients who did not receive ESP block, in two patients due to unavailable tools and in one patient due to limitation in positioning, the surgeon performed intercostal blocks on three levels prior to making the incision.

General anesthesia preparations were made in case of switching to an open surgical procedure during the operation making intravenous anesthetic drugs, glottic and supraglottic airway equipment available. After venous access was established, Midazolam 0.02-0.04 mg/kg was administered intravenously to the patients for premedication at determined dose ranges, taking the functional capacity and general condition of the patients into account.

The patients were given a lateral decubitus position for the operation and 5 L/min mask oxygen support was provided. Just before the operation started intravenous fentanyl 0.5 mcg/kg and ketamine 0.2 mg/kg were administered to the patients as care was taken to ensure a dose range that would not suppress spontaneous breathing during the procedure, the depth of sedation was increased, and prilocaine 2% 5 ml was injected at the port entrance location in addition to sensory nerve blockade.

During the procedure, the patient's vital signs, spontaneous breathing and pain levels were closely monitored. Care was taken to ensure that the fingertip SpO2 value did not fall below 92%, preserving a safe margin to prevent and/or detect any adverse respiratory event. In cases where this value was decreased, the process was suspended within the framework of its suitability. Inhaler bronchodilator and intravenous methylprednisolone treatment was provided when necessary.

After the procedure the patients were evaluated, and vital signs and pain scores were noted in the recovery room before transferring them back to their rooms.

Minimally invasive approach

Lateral decubitus was the position of choice as a standard. Supine position was selected in one patient due to the patient's condition. In patients with chest drain, the drain incision was extended to 3cm and used for the procedure without additional incision. In patients with no previous chest incision, a 3-cm-incision was made on the midaxillary line through 5th or 6th intercostal space. A 4-mm thoracoscope was used for visualization. After the procedure a 28F chest drain was placed using the same incision.

Postoperative Course

Routine examination and chest X-ray was used for patient follow up. The patients were encouraged to mobilize within the first 24 hours. Any event during follow-up was recorded. To evaluate pain, the Visual Analogue Scale and need for pain killers were noted daily during the hospital stay. Length of hospital stay was recorded.

RESULTS

Five patients were class 4, four patients were class 3, and two patients were class two according to the ASA (American Society of Anesthesiologists) physical status classification system. Eight patients had cardiac comorbidities while three patients had type 2 diabetes and two patients had chronic renal failure (Table 1).

Erector spinae plane (ESP) block was performed prior to surgery in eight patients. Intercostal block was used in three patients. One of the patients without the ESP block required intravenous opioid agents.

Six patients underwent pleural drainage, deloculation and talk insufflation performed in two patients. Pleural biopsy was performed in one patient. Five patients were operated on due to insufficient drainage of coagulum and poor lung expansion after chest tube insertion for hemothorax. Four patients had rib fractures, and one patient had penetrating injury. The surgeries were not on emergency bases. By the time the surgery made, the patients were not suffering from severe pain. All the procedures were performed through a single 3-cm incision. Eight patients underwent right-sided surgery (Table 2).

No patient suffered from hypoxia or hypercarbia. Patients didn't require conversion to intubation or postoperative admission to the intensive care unit after careful evaluation by the anesthesiologist.

Average duration of operations were 41 minutes (20-55). Average blood loss was 50 mL (5-75). Average postoperative drainage was 150 mL (75-350). Postoperative early pain score was 0 in 10 patients and 1-3 in one patient (Table 2). Patient number was limited to compare ESP and intercostal nerve blockage. Nine patients required single dose intravenous paracetamol within the first 24 hours. No patient needed any opioid agents.

Table 1: The list of main patient comorbidities

Patient comorbidities	n
Hypertension	6
Diabetes Mellitus	3
Coronary Artery Disease	2
Renal Failure	2
Lung Cancer	1

Table 2: The parameters of the surgical cases.

Parameters	n
Age	
Mean (Range)	63 (29-90)
Median	66
Gender	
Male	8
Female	3
Surgical side	
Right	8
Left	3
Regional block	
Erector Spinae Plain	8
İntercostal	3
Surgery duration (minutes)	
Mean (Range)	41 (20-55)
Median	45
Hospital stay (days)	
Mean (Range)	4 (2-10)
Median	5
Pain score average	
Peroperative	1-3
First 24 hours	0-1
Discharge	0

Patients were able to mobilize in the first postoperative hours, except for one patient who was hemiplegic due to a trauma two decades ago. All patients were educated for incentive spirometry exercises. Two patients suffered from mild pneumoderma which was resolved in 2-3 days. None of the patients developed pneumonia. No postoperative revision

was required. Average length of hospital stay was 4 days (2-10). The patients were discharged after the removal of the chest tubes. The pain score at discharge was 0 in all patients. No readmission was necessary in any patient.

DISCUSSION

Minimally invasive techniques in thoracic surgery makes it possible to operate on patients with high risk for general anesthesia due to their conditions. On top of that non-intubated techniques are spreading across experienced centers to minimize surgical and anesthetic risks.

The hemodynamic effects, muscle paralysis, delayed recovery and increased pneumonia due to general anesthesia and other possible complications of tracheal or bronchial intubation can be avoided with non-intubated technique (9). On the other hand, hypoxia and hypercarbia is a challenge in this approach. The rate of requiring intubation while surgery is ongoing in a decubitus position ranges from 2% and 11% (8).

Most common thoracic surgery procedures include management of pleural effusion, pneumothorax, biopsy and pulmonary nodules. A survey study conducted by European Society for Thoracic Surgeons interest group suggests that intercostal block with mild sedation is currently preferred by most responders as anesthesia protocol. Pompeo et al comments that surgeons may consider thoracic epidural anesthesia for technically demanding surgeries (10).

In the non-intubated approach, the anesthetist must be vigilant against hypoventilation and hypercapnia due to the sedation. To prevent cough remifentanil and intravenous lidocaine is suggested (11). In order to reduce surgical pain, avoiding multiple ports can be more beneficial than application of epidural anesthesia, reported by Ambrogi et al (12). They also suggested there may be benefit in terms of intraoperative lung volumes. We used intercostal block in three patients in our non-intubated thoracic surgery experience.

Alagöz et al shared their experience combining erector spinae plane block with thoracic paravertebral block for wedge resection. Postoperative VAS scores were below 3 yet it is stated that morphine was necessary (13). In our study opioid agents weren't required during postoperative follow-up.

More advanced thoracic surgeries such as anatomical lung resections require a large and experienced team and center (5,7,14). However minor surgeries and standard operations for pleural diseases can be performed safely with non-intubated single incision video-thoracoscopic technique in a secondary care hospital.

In conclusion carefully planned thoracic surgeries for pleural pathologies can be performed with a non-intubated single incision video-thoracoscopic approach safely in a secondary care hospital. Respiratory management during surgery and perioperative management of pain is crucial to achieve best results with low operative risk. Authors suggest that the surgeon and anesthesiologist must be trained in a high-volume thoracic surgery center with non-intubated thoracic surgery experience.

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Conflict of interest

Regarding this study, the authors and/or their family members do not have any scientific and medical committee memberships or relationships with members, consultancy, expertise, employment in any company, shareholding, or similar situations that may have a potential conflict of interest.

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