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Araştırma / *Research Article*

Analgesic Effectiveness of Serratus Anterior Block for Video-Assisted Thoracoscopic Surgery

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Video Yardımlı Torakoskopik Cerrahide Serratus Anterior Plan Bloğunun Analjezik Etkinliği

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ABSTRACT

Objective: *In patients who underwent Video-Assisted Thoracoscopic Surgery (VATS) for effective analgesia, multimodal analgesia should be used. Serratus anterior plane block (SAPB) was introduced in 2013. SAPB is used in our clinic for postoperative analgesia in VATS. The aim of this study was to evaluate the total analgesic consumption within 24 hours and the postoperative pain scores in patients in whom we performed VATS under SAPB.*
Method: *After approval of the ethics committee was obtained for the study, anesthesia and pain follow-up forms of a total of 34 patients who underwent VATS between May 2016 and June 2017 were screened retrospectively. The demographic data of the patients (age, gender, operation type, and duration) were obtained from the anesthesia forms. Total analgesic consumption in 24 hour, postoperative pain scores evaluated with a visual analog scale (VAS) at 1., 6., 12 and 24 hours and complications developed were analyzed.*
Results: *The data of 34 patients who underwent VATS surgery were accessed when the records were examined. As retrieved from records SAPB was applied for only 24 patients. The patients were divided into 2 groups as those who received and did not receive SAPB. The demographic characteristics of the patients and operating times were similar. Total analgesic consumption within 24 hours and VAS scores at postoperative 1., 6., 12. and 24. hours were statistically significantly lower in SAPB group. No difference was determined between groups in respect of complications.*
Conclusion: *SAPB is an effective and preferable analgesia method and can be one of the multimodal analgesia components for postoperative pain management in VATS operations.*

Keywords: *postoperative pain, block, serratus anterior plane*

ÖZ

Amaç: *Video Yardımlı Torakoskopik Cerrahisi (VATS) ameliyatı geçiren hastalarda etkili bir analjezi için multimodal analjezi uygulamak gerekmektedir. Kliniğimizde VATS ameliyatlarında postoperatif analjezi amaçlı yeni tanımlanan Serratus anterior plane bloğunu (SAPB) kullanmaktayız. Biz bu çalışmada, SAPB uyguladığımız VATS ameliyatlarını, hastaların 24 saatte kullandığı toplam analjezik kullanımını ve ağrı skorlarını incelemeyi ve sunmayı amaçladık.*
Yöntem: *Etik kurul onayı alındıktan sonra Mayıs 2016-Haziran 2017 tarihleri arasında VATS uygulanmış hastalar anestezi ve ağrı takip formlarından retrospektif olarak tarandı. Hastaların demografik verileri (yaş, cinsiyet, ameliyat tipi, süresi) anestezi kayıtlarından elde edildi. Hastaların 24 saatte kullandıkları analjezik tüketimi, postoperatif 1., 6., 12., 24. saat visuel ağrı skorları (VAS) ve gelişen komplikasyonlar incelendi.*
Bulgular: *Kayıtlar incelendiğinde toplam VATS ameliyatı yapılan 34 hastanın verilerine ulaşıldı. Kayıtlardan hastaların 24'üne SAPB uygulandığı, 10 hastaya SAPB yapılmadığı anlaşıldı. Hastalar SAPB yapılan ve yapılmayan olarak 2 gruba ayrıldı. Hastaların demografik özellikleri ameliyat tipleri ve süreleri benzerdi. Hastaların 24 saatlik total analjezik tüketimi ve postoperatif 1., 6., 12., 24. saat VAS skorları SAPB yapılan hastalarda anlamlı olarak daha düşük bulundu. Komplikasyonlar açısından 2 grupta da anlamlı fark olmadığı görüldü.*
Sonuç: *SAPB etkili ve tercih edilebilir bir analjezi yöntemidir ve VATS ameliyatlarında postoperatif ağrı yönetimi için multimodal analjezi bileşenlerinden biri olabilir.*

Anahtar kelimeler: *postoperatif ağrı, blok, serratus anterior plan*

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INTRODUCTION

Video-Assisted Thoracoscopic Surgery (VATS) has started to be used more frequently in thoracic surgery than thoracotomy as it is a surgical procedure carried out with smaller incisions and is less invasive [1].

Several operations can be implemented such as wedge resection, decortication, and sympathectomy for diagnosis and treatment with endoscopic instruments that can be used in the thoracic cavity under video imaging [2,3].

The pain due to VATS has a nociceptive (somatic, visceral) and sympathetic origin. Due to the extensive nerve network of the thorax, the use of systemic analgesics for postoperative pain is not sufficient. For effective analgesia, regional methods should be used together with systemic analgesics [4]. Intercostal block, intrapleural anaesthesia, epidural anaesthesia, and paravertebral block provide effective analgesia for postoperative pain in VATS operations [5-7].

With the more widespread use of ultrasound in regional anaesthesia, new regional blocks have been developed for analgesia in thoracic surgery [8,9]. Blanco et al [10] introduced the serratus anterior plane block (SAPB) and reported that it can be used in thoracic surgery. Ultrasound guided SAPB is a facial plane block which maintained analgesia with blockade of lateral branches of intercostal nerves at above or below serratus plane muscle. There are few cases and studies in literature reporting successful analgesia provided by SAPB in VATS operations [11,12].

The serratus plane block is used in our clinic for postoperative analgesia in VATS operations. The aim of this study was to evaluate the total analgesic consumption and the postoperative pain scores in patients performed with the serratus plane block in VATS operations in a 1-year period.

MATERIAL and METHOD

Approval for the study was granted by the Clinical Research Ethics Committee (KAEK-2018/01-29) and all procedures were carried out in accordance with the Helsinki Declaration. The study was registered clinical trials.gov (NCT03496727). A retrospective examination was made of the anaesthesia forms of patients underwent VATS May 2016 and June 2017. Due to incomplete data of 1 of these 35 patients, that case was excluded from the study. The patients were divided into two groups. 24 patients were performed SAPB and iv PCA (intravenous patient controlled analgesia) and 10 patient's pain management were provided with only PCA. No block was administered to 10 patients because of anticoagulant therapy and patient refused block application. The demographic data of the patients (age, gender, operation type and duration) were obtained from the anesthesia forms. The postoperative pain scores of the patients, evaluated with a visual analog scale (VAS) at 1, 6, 12 and 24 hours postoperatively and the postoperative doses of analgesia used were taken from the block pain follow-up forms. Complications such as hypotension, infection in the block site and hematoma were recorded.

General anaesthesia protocol

Anaesthesia induction was achieved to all patients with 2-3 mg/kg iv propofol and 1-1.5 mcg/kg remifentanil, 0.6 mg/kg rocuronium iv and after 2 minutes intubation was performed. Anaesthesia was maintained with sevoflurane inhalation and remifentanil iv infusion and 0.15 mg/kg rocuronium was administered if muscle relaxant was required. Standard monitoring of the patients included heart rate, invasive systolic, diastolic and mean blood pressure, and peripheral oxygen saturation and the operating times were recorded.

According to the need of each patient, a double lumen or single lumen tube was applied and the patient was positioned as required for the operation. For all patients with no contra-indications, 8 mg

dexketoprofen iv was administered at the end of the operation. SAPB was performed under ultrasound guidance to all patients at the end of the operation by the same anaesthetist All patients were followed up for 24 hours postoperatively with patient-controlled analgesia (PCA). Tramadol was given with the PCA. All the patients were extubated at the end of the operation.

Serratus anterior plane block application

At the end of the operation before extubation, with patients who were underwent sympathectomy in a supine position and all other patients in a lateral position, asepsis was provided at the level of the 4th and 5th costa on the mid-axillary line with povidone iodine. Then a sterile-covered, a high-frequency (6-18 MHz) linear ultrasound probe (Esote MyLab Five Genoa, Italy) was placed on the mid-axillary line between the 4th and 5th ribs. When the probe visualized the latissimus dorsi serratus anterior plane and the intercostal muscles, entry was made with a 21-gauge, non-stimulated 50 mm Quinke type sonoplex needle (Sonoplex, Pajunk, Geisingen, Germany) with the in-plane technique. After negative aspiration, 0.5 ml saline applied above the serratus anterior plane muscle and if separation of the fascia was visualized, local anaesthetic was applied. In patients underwent unilateral VATS, SAPB was performed unilaterally with 30 ml 0.2% bupivacaine (Marcaine®, Eczacıbaşı) and in patients who underwent bilateral VATS for sympathectomy SAPB was performed bilaterally with 2x30 ml 0.2% bupivacaine as a total of 60 ml.

PCA protocol

At the end of the operation, a PCA device was attached to all the patients set to deliver 10 mg tramadol (Contramal®, Abdi İbrahim, Istanbul, Turkey) iv at every press with a 20-min locked period and a maximum of 3 doses per hour.

Statistical Analysis

Statistical analyses of the study data were performed using SPSS for Mac, version 17.0 software (SPSS, Chicago, IL, USA). Descriptive statistics were stated as mean±standard deviation (SD), and as number of cases (n) and percentage (%) for nominal variables. The Mann-Whitney U test was used in the comparison of non-parametric variables. A value of $p<0.05$ was evaluated statistically significant.

RESULTS

There were no differences in terms of demographic characteristics and duration of operation in both groups (SAPB + PCA group and only PCA group). (Table 1) VAS scores at 1st, 6th, 12th, 24th hours and 24 hours total analgesic doses lower SAPB with PCA group than only PCA group (Table 2) 10 patients were performed bilateral VATS due to bilateral sympathectomy in the SAPB+PCA group. 14 patients were performed unilateral VATS who underwent due to decortication and wedge resection. Additionally 10 patients who had undergone VATS operation were excluded due to sympathectomy and than the remaining 24 patients were divided into two groups according to whether SAPB was performed or not. VAS scores at 6th, 12th and 24th hours and 24 hours total analgesic consumption in SAPB + PCA patients were significantly lower than only PCA group (Table 3). None of the patients had any complications.

Table 1. Demographic and clinical data.

	SABP group (n=24)	NSABP grup (n=10)	P
Age, year	41.08±18,21	50.6±19.5	0.304
Sex, M/F	12/12	6/4	0.669
Operation type (D/S/W)	10/10/4	7/0/3	0.491
Operation time	102.70±25.7	116±23.6	0.61

ASA: American Society of Anesthesiologist Clasification, SAPB group: Serratus anterior
Plane Block NSAPB grup: No Serratus anterior Plane Block
M: Male, F: Female, D: Decortication, S: Sympathectomy
W: Wedge Resection

Table 2. VAS scores across postoperative time points and total analgesic consumption.

	SABP group (n=24)	NSABP grup (n=10)	P
1h	3.08±0.97	4.1±0.56	0.009*
6h	1,83±0.63	2.9±0.56	0.001*
12h	1.33±0.63	2.2±0.63	0.002*
24h	1.04±0.2	1.9±0.56	0.001*
Total analgesic (mg)	120.4±60.6	213.0±26.2	0.001*

Data are presented as mean±SD: Standart Deviation
SAPB: Serratus Anterior Plane Block,
NSAPB: No Serratus Anterior Plane Block
VAS: Visual Analog Scale
**Indicate p<0.05 when comparing SAPB and NSAPB groups*

Table 3. VAS scores across postoperative time points and total analgesic consumption.

	USAPB group (n=14)	NSAPB group (n=10)	P
1h	3.06±0.84	4.1±0.56	0.259
6h	2.14±0.53	2.9±0.56	0.009*
12h	1.5±0.75	2.2±0.63	0.031*
24h	1.07±0.26	1.9±0.56	0.001*
Total analgesic (mg)	156.42±47.16	213.0±26.26	0.001*

Data are presented as mean ± SD: Standart Deviation
USAPB: Unilateral Serratus Anterior Plane Block,
NSAPB: No Serratus Anterior Plane Block VAS: Visual Analog Scale
**Indicate p<0.05 when comparing USAPB and NSAPB groups TA: Total Analgesic Consumption*

DISCUSSION

The results of the study showed that the postoperative 1st, 6th, 12th 24th VAS scores and 24-hour analgesia use were lower in the patients performed SABP underwent VATS. In the current study SAPB was effective postoperative analgesia in VATS operations. In a randomized, prospective study by Okmen et al [13] of 40 patients who had undergone VATS, PCA was attached to patients in one group and in the other group SAPB was applied in addition to the PCA. When the postoperative analgesia consumption and pain scores were compared, it was reported that SAPB provided effective analgesia for VATS operations. In a case report by Shariat et al [14] in which SAPB was implemented to a patient and a successful VATS operation under sedation was reported, it was stated that SAPB could be an alternative to paravertebral or thoracic epidural block.

Segura-Grau et al [15] reported SAPB for pain management in a sympathectomy operation in 4 cases and noticed that rescue analgesia was not required by any of the patients postoperatively.

In this study bilaterally SAPB was performed in 10 patient underwent bilaterally VATS for sympathectomy. As no chest tube is usually required by patients undergoing sympathectomy operation, patients felt less pain. For this reason, patients with sympathectomy operations were removed and than remaining 24 patients were divided with and without unilateral SAPB due to unilateral VATS. When comparing VAS scores at 6th, 12th, 24th hours and 24 hour analgesic consumption SAPB group who underwent unilateral VATS operation due to decortication and wedge resection, significantly lower than only PCA group. In VATS operations, intercostal block, paravertebral block or thoracic epidural block may be performed for postoperative analgesia. In the management of pain in VATS operations, we did not find a study comparing these blocks with SAPB in the literature.

In a prospective study comparing SAPB in thoracotomy operations and epidural block, it was noticed that SAPB provided analgesia at a level close to that of epidural block and was a more reliable block in respect of complications, with lower rates of postoperative hypotension and bradycardia [16]. In the current study, no complications were seen in any patient of either the single or bilateral block groups. All the patients underwent sympathectomy were discharged on postoperative day 1.

SAPB, which was first described by Blanco et al [10] was reported to provide sufficient and effective analgesia for thoracic surgery and two separate techniques were stated in which local anaesthesia was

administered above and below the serratus. The authors advised that the administration of local anaesthetic over the serratus was more effective and with MR (Magnetic Resonance) examination, the local anaesthestic was shown to have spread more to the posterior. It was described that this block is a fascial plane block and a high volume (30 ml) is required.

Kunigo et al [17] compared 20 ml and 40 ml 0.375% ropivacaine to 42 breast surgery patients were used SAPB and noticed that it was significantly more effective in respect of the dermatome level in the group in 40 ml. In the current study, in all the blocks, whether unilateral or bilateral, local anaesthetic of 30 ml was applied above the serratus anterior muscle. There is a need for further studies to clarify which technique is superior in the application of SAPB.

To our knowledge, there were no complications in the literature but there is a still risk of local anesthetic systemic toxicity. When the bilateral administration is required because of high volume application is required in this block the concentration of local anesthetics should be reduced. Additionally possible complications of the serratus plane block include pneumothorax, hematoma and failed or inadequate block.

The limitations of our study are a retrospective study and it is not known whether the VAS scores are measured on the move or during rest, there is no hourly follow-up of analgesic consumption.

CONCLUSION

SAPB is an effective and preferable analgesia method and can be one of the multimodal analgesia components for postoperative pain management in VATS operations.

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