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ORIGINAL ARTICLE

Interscalene block applied by an experienced anesthesiologist has a good anesthetic effect, a long duration of action, and less postoperative pain after arthroscopic shoulder procedures independent of surgery type and operation duration

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Postoperative pain decreases patient comfort, increases analgesic consumption, and hinders the rehabilitation process. Commonly accepted benefits of arthroscopy over open surgery are less pain, shorter length of hosp italization, and early rehabilitation.[1,2] However, severe postoperative pain is still a problem following arthroscopic shoulder procedures mostly due to soft tissue debridement, mechanical irritation

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ABSTRACT

Objectives: This study aims to evaluate the severity of postoperative pain and the time to the onset of pain after arthroscopic surgical treatment of rotator cuff tear or instability under interscalene block.

Patients and methods: Between October 2015 and June 2016, a total of 172 patients (82 males, 90 females; mean age: 47.9±16.9 years; range, 15 to 83 years) who underwent shoulder arthroscopy under interscalene block by a single surgeon were retrospectively analyzed. The relationship between the postoperative 24-h Visual Analog Scale (VAS), the time to the onset of pain with the type of surgical procedure (rotator cuff repair, n=101 or instability surgery, n=71), and the duration of surgery (<30 min n=92; ≥30 min n=80) was examined.

Results: No significant relationship was found between the type of surgical procedure, VAS scores, and the onset of pain after the block (p=0.577 and p=0.780, respectively). No significant relationship was found between the operation duration, and VAS, and the onset of pain after the block (p=0.570 and p=0.408, respectively). The mean duration until the start of postoperative pain was 734±313 (range, 60 to 1,440) min. There was no statistically significant difference in the need for rescue analgesics at the postoperative 24th h and the duration of surgery between the two groups (p=0.393 and p=0.675, respectively).

Conclusion: Our study results show no significant difference in the time for the onset of postoperative pain and the VAS scores according to the characteristics of the surgical procedure, operation duration, or age and sex of the patient. Shoulder arthroscopy performed by experienced surgeons under interscalene block eliminates the need for analgesics within the first 12 h postoperatively.

Keywords: Interscalene block, pain, postoperative pain, shoulder arthroscopy.

caused by surgical instruments, and irrigation fluid leakage into soft tissue.[3,4]

In recent years, interscalene block or superficial cervical block used during arthroscopic shoulder surgeries has become increasingly popular among orthopedists, anesthesiologists, and patients. The reason behind this is the success of regional procedures in relieving acute postoperative pain, reducing the need for postoperative narcotic analgesics, low complication rates, and short hospitalization time.[5-7]

Previous studies have reported pain levels, complications and time to postoperative pain onset after interscalene block used during elective shoulder surgery;[7,8] however, very few studies have extensively explained the relationship between arthroscopic treatment method or operation duration and pain.[9]

In the present study, we aimed to evaluate the severity of postoperative pain and the time to the onset of pain after arthroscopic surgical treatment of rotator cuff tear or instability under interscalene block.

PATIENTS AND METHODS

This single-center, retrospective study was conducted at Gazi University Faculty of Medicine, Department of Orthopedics and Traumatology between October 2015 and June 2016. Medical data of patients who underwent interscalene block before arthroscopic shoulder surgery due to rotator cuff repair or instability were reviewed. A total of 191 patients met the inclusion criteria. Eight patients underwent general anesthesia after the block, and 11 underwent rotator cuff repair and instability surgery and they were excluded from the study. Patients who underwent general anesthesia following an interscalene block failure (n=8), isolated subacromial debridement, tendon transfer, isolated acromioplasty, isolated biceps tenotomy or tenodesis, rotator cuff and instability surgery simultaneously and with history of previous shoulder surgery were also excluded. Finally, 172 patients (82 males, 90 females; mean age: 47.9±16.9 years; range, 15 to 83 years) were included in the study. Age, sex, operation duration, type of surgery, the intensity of postoperative pain at 24 h measured by Visual Analog Scale (VAS), and duration until the start of postoperative pain were recorded.

All procedures were performed by a single senior surgeon (U.K.) who has 20 years of experience with shoulder arthroscopy. In order not to be affected by possible delays caused by the anesthesia procedure, patient positioning and draping, the recording of operation duration was initiated at the initial visualization of the joint and concluded with the end of the arthroscopic visualization. Time between the nerve block and the "first rescue analgesic" injection was also recorded and determined as the duration of analgesia. Postoperatively, patients only received analgesic agents, if the VAS score was above 4; the first rescue analgesic was paracetamol 500 mg via intravenous route. The other rescue analgesic was diclofenac sodium 75 mg via intramuscular route. In patients who received three or more analgesics, paracetamol, diclofenac sodium, and paracetamol were applied in the dose mentioned above, respectively. The number of rescue analgesic injection(s) the patient received within 24 h was noted.

Anesthesia procedure

The patients who underwent interscalene block due to shoulder arthroscopy were given 1 mg of midazolam and 50 μg of fentanyl for sedo-analgesia by the Anesthesia Department. While the patient was in the supine position, and the head was turned to the opposite side, the interscalene block procedure was performed under the guidance of ultrasonography (USG) and a peripheral nerve stimulator. Scanning was started from the cricoid cartilage level with an 8 to 13 mHz linear USG probe. After the internal jugular vein and carotid artery were identified, the probe was moved laterally, C5 and C6 nerve roots belonging to the brachial plexus were seen under the sternocleidomastoid muscle between the anterior and middle scalene muscles. Then, the procedure started with a peripheral block needle with a 5-cm tip isolated and a nerve stimulator attached. It was confirmed that the needle tip was around the C5-C6 nerve roots in the USG image, with contraction in the deltoid muscle group at 0.3 to 0.5 mA on the nerve stimulator. A total of 30 mL of 0.375% bupivacaine was administered by multi-injection by aspirating every 5 mL. Interscalene nerve block was applied as a single-shot. Then, a superficial cervical plexus block was performed by administering 5 mL of 0.2% bupivacaine under the transverse fascia of the sternocleidomastoid muscle, again with the help of USG, to provide skin analgesia of the port entrances. The patient was followed for 30 min in terms of both complete settlings of the blockage and side effects and complications. After controlling the motor and sensory block levels, the patients underwent surgery. During the surgical procedure, no additional anesthetic and analgesic agents were used other than 1 mg of midazolam and 50 μg of fentanyl.

Arthroscopy was performed in semi-lateral decubitus position, and a video recording system recorded the operation duration. Anchor was used in all procedures. Immediately after the operation, all shoulders were immobilized using a Velpeau bandage.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 21.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean ± standard deviation (SD) or number and frequency, where applicable. The Shapiro-Wilk test was used to evaluate data for compliance with normal distribution. Independent variables were sex, age, type of surgery and duration of surgery, while dependent variables were administration of rescue analgesics, pain level, and time to pain onset. The chi-square test was used for data that did not comply with the normal distribution, and the independent samples t-test was used normally distributed data. A p value of <0.05 was considered statistically significant.

RESULTS

A total of 172 patients were included in this study, of whom 101 received rotator cuff repair and 71 instability surgery. The mean postoperative 24th-h VAS score was 4.4±2.4, and the mean duration until the start of postoperative pain was 734±313 (range, 60 to 1,440) min. The mean operation duration was 30±10.5 (range, 9 to 60) min. The mean operation duration was 33.2±10.1 min in patients with rotator cuff repair and 25.5±9.3 min in patients undergoing instability surgery. The mean operation duration was shorter than 30 min in 53.5% of the patients. Age, sex, type of surgery, and operation duration had no statistically significant effect on postoperative pain intensity and time to postoperative pain onset (p>0.05) (Table I).

Within 24 h, 52 (30.2%) patients did not need additional analgesics. Rescue analgesia was administered to 65 (37.8%) patients only once, twice to 38 (22.1%) patients, and three or more additional analgesia to 17 (9.9%) patients. None of the patients needed narcotic analgesics. There was no significant difference in rescue analgesic dose between the two surgical groups (Table II). There was no statistically significant difference between the two groups regarding the need for rescue analgesics within 24 h postoperatively (p=0.675). In addition, there was no statistically significant relationship between the need for rescue analgesics at the postoperative 24th h and the duration of surgery (p=0.393).

None of the patients developed a major complication, such as cardiac arrest or pneumothorax. However, diaphragm elevation developed in one, hypertension in two, Horner's syndrome in three, hoarseness in one, and vagal presyncope in seven patients. An X-ray of the shoulder was suspected after surgery, and a chest X-ray was taken. Diaphragm elevation was detected on chest X-ray. The patient with diaphragmatic elevation had no low saturation,

TABLE I
Relationship between postoperative 24th-h VAS and duration until the start of pain with demographic data

		Postoperative 24th h VAS		Duration until the start of pain (min)	
	n	Mean±SD	*p*	Mean±SD	*p*
Age (year)			0.270		0.879
<50	79	4.6±2.4		738.4±303.3	
≥50	93	4.2±2.4		731.1±323.6	
Sex			0.492		0.903
Female	90	4.5±2.3		737.3±306.1	
Male	82	4.3±2.5		731.4±323.3	
Type of surgery			0.577		0.780
Rotator cuff repair	101	4.3±2.4		740.1±318.6	
Instability	71	4.5±2.4		726.5±308.2	
Operation time			0.570		0.408
<30 min	92	4.3±2.5		753.0±323.1	
≥30 min	80	4.5±2.3		713.2±302.9	

VAS: Visual Analog Scale; SD: Standard deviation.

TABLE II
Comparison of rescue analgesia dose according to the type of surgery

	Rotator cuff repair	Instability	*p*
None analgesic	33	19	0.052
Once analgesic	32	33	0.901
2 analgesic	25	13	0.052
3 or more analgesic	11	6	0.225

dyspnea, or clinical findings and did not require treatment.

DISCUSSION

In the present study, we evaluated the severity of postoperative pain and the time to the onset of pain after arthroscopic surgical treatment of rotator cuff tear or instability under interscalene block. Our study results showed that the duration of surgery and the type of surgery were not associated with postoperative pain. In addition, sufficient pain relief could be achieved with interscalene block within the first 24 h after shoulder arthroscopy. Using this technique, interscalene block decreased the need for analgesics within the first 12 h (mean time to pain onset: 734 min). Clinical experience shows that interscalene brachial plexus block is effective to relieve early postoperative pain, up to 12 h, and is associated with low rates of complication.[8,9]

Shoulder pain is a common complaint in the daily practice of orthopedics, and the most common shoulder pathologies are biceps tendinopathy, subacromial impingement, rotator cuff tears, and acromioclavicular joint disorders. Although there are several studies evaluating shoulder disorders with various pain scoring systems in the literature,[10-13] there is a limited number of studies comparing the pain and type of surgical procedure in patients undergoing shoulder arthroscopy under interscalene block. Postoperative pain at 24 h was previously found to be more severe in patients undergoing shoulder arthroscopy for rotator cuff repair compared to instability (2.6 times higher) and subacromial decompression (2.4 times higher).[13] In the study of Calvo et al.,[13] the mean operation duration (instability: 63±18.5, rotator cuff repair: 73.6±27.5) was longer than in our study; therefore, the volume of irrigation fluid used during surgery was probably higher. Stiglitz et al.[14] also reported the mean postoperative first-day VAS score of 3.4 in patients undergoing arthroscopic repair and 2.2 in instability patients. In our study, the mean first-day VAS score of patients who underwent rotator cuff repair was 4.3, while this score was 4.5 in those who underwent instability surgery. This difference may be due to the application of complementary analgesic methods (single-dose ropivacaine, glenohumeral catheter, or subacromial catheter) in addition to the anesthesia technique applied and the different pain experiences of the patients.

Duration of pain relief after interscalene shoulder block has been reported to be between 4 and 14 h.[15] In the current study, patients, on average, started to feel pain at 12 h and the mean VAS score was 4.4 at the postoperative 24th h. Drosos et al.[16] reported that a VAS score of 6 or less was acceptable after arthroscopic surgery. Achieving acceptable pain levels regardless of type of arthroscopic procedure and duration of surgery, even at the postoperative 24th hand beyond allows easier and more effective rehabilitation, thereby reducing the duration of hospital stay. All patients in our study started an exercise program on the first postoperative day and were discharged subsequently.

Bishop et al.[7] reported that the success of the interscalene block would not be as successful, when the arthroscopic procedure was performed in the lateral decubitus position, compared to the beach-chair position due to positional discomfort or anxiety. On the contrary, all patients underwent surgery in the lateral decubitus position in our study, and interscalene block was found to be effective. We believe that interscalene block is effective when performed by an experienced team, regardless of the position during surgery. However, this should be investigated in further studies.

Furthermore, men have been reported to have a higher VAS score than women on the first postoperative day following shoulder arthroscopy.[13] However, in another study similar to our results, no difference was found between the sexes.[14] This may be due to lack of standardized anesthetic technique or ethnic differences.

Complications may occur after the local anesthetic drug spreads to the surrounding anatomical tissues (i.e., recurrent laryngeal nerve, stellate ganglion, carotid body baroreceptors, or phrenic nerve) following the interscalene block. Different clinical symptoms are seen according to the affected anatomical structure.[17] Hoarseness (0.6 to 22%) and Horner's syndrome (0.7 to 29%) were common complications reported in the literature.[18,19] In our series, similar to the literature, hoarseness developed in 0.58% (n=1) and Horner's syndrome in 1.7% (n=3). Another common complication was vasovagal syncope. Vasovagal syncope has multiple triggers: fear of injury, painful stimulus, prolonged standing, effort, venipuncture heat exposure, coughing, swallowing, or straining.[20] In our series, vasovagal presyncope was developed in seven patients. Triggering one or more of the aforementioned mechanisms may have led to the development of presyncope. Another complication is diaphragmatic elevation caused by hemi-diaphragmatic paralysis. While the incidence of hemi-diaphragmatic paralysis varies from 1 to 85%,[21,22] diaphragmatic elevation developed in only one (0.58%) patient in our series due to hemi-diaphragmatic paralysis. This difference can be attributed to the fact that cases that do not cause any clinical symptoms or have significant elevation on X-ray could not be detected in our study. Another reason may be the type, volume, or concentration difference of the anesthetic drug administered during the interscalene nerve block. Hypertension is a rare complication after the interscalene nerve block.[17] Hypertension without tachycardia was detected in two patients in our study. The patients had no previous diagnosis of hypertension.

Nonetheless, there are some limitations to our study. First, we only reported the results within the first 24 h when the pain was most severe, although pain typically persists for the first few weeks. However, it is plausible to expect the first 24 h to be an indicator for a longer period. Second, the study has a retrospective design. Moreover, comorbidities that may have affected postoperative pain, such as the amount of irrigation fluid, the number of implants, the presence of synovitis, and diabetes mellitus were not considered. Finally, we acknowledge the lack of demographic information such as education status, sociocultural differences, anxiety levels, and preoperative pain as limitations of this study.

In conclusion, our study results show no significant difference in the time for the onset of postoperative pain and the VAS scores according to the characteristics of the surgical procedure, operation duration, or age and sex of the patient. Shoulder arthroscopy performed by experienced surgeons under interscalene block eliminates the need for analgesics within the first 12 h postoperatively. Further studies are needed to confirm these findings.

Ethics Committee Approval: The study protocol was approved by the Gazi University Clinical Research Ethics Committee (date: 08.05.2017, no: 233). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from the parents and/or legal guardians of the patients.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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