



## CASE REPORT

# Evaluation of Oblique Subcostal Transversus Abdominis Plane Block Effectiveness in Amyotrophic Lateral Sclerosis Patients Undergoing Laparoscopic Cholecystectomy

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## Abstract

ALS is a rare motor neuron disease. Since surgical procedures exacerbate ALS, surgical procedures are not usually applied except in the necessary cases. Pulmonary complications are the main cause of mortality in ALS patients, because respiratory and swallowing muscles may be affected. Although opioids provide effective analgesia, they are not the best choice in ALS patients because they can cause nausea-vomiting and have negative effects on respiratory functions. Oblique Subcostal Transversus Abdominis Plane Block provides highly effective analgesia in laparoscopic cholecystectomy operations. In this case report, we evaluated the effectiveness of the OSTAP block in ALS patients, which is one of the rare diseases and rarely underwent Laparoscopic Cholecystectomy. As far as we know, this case report is the first and only in literature. Laparoscopic Cholecystectomy was performed under general anesthesia on a 56-year-old male patient. Unilateral OSTAP block (30 ml 0.25%) was applied. The patient's postoperative 10<sup>th</sup>-hour pain score was 4, and 75 mg diclofenac sodium i.m. administered. The patient did not need any other analgesics. In this case; we detected that the OSTAP block provides effective analgesia.

## Keywords

ALS, Laparoscopic Cholecystectomy, TAP Block

## Introduction

Amyotrophic Lateral Sclerosis (ALS) is a progressive motor neuron disease involving motor neurons in the spinal cord and cortex. ALS is frequently encountered in the fifth and sixth decades. It is a rare disease with

a rate of 1.5-2.5/100,000 per year. There is no definitive treatment method; only palliative treatments can be applied. It produces signs of denervation atrophy in striated muscles and thus causes strength loss. Strength loss begins insidiously in ALS patients. It involves all muscles, including respiratory and swallowing muscles, in an unpredictable period of time. When the respiratory muscles are involved, ALS patients need mechanical ventilator. ALS patients die due to reasons such as respiratory failure, aspiration pneumonia, and infections. Surgical procedures such as tracheostomy and gastrostomy can be applied to patients with ALS for palliation. However, surgical intervention may be required in comorbidities that have not medical treatment (such as breast cancer, laparoscopic diaphragmatic pacing, cesarean section, fractures, baclofen pump attachment). Applying anesthesia or surgical procedure to ALS patients may exacerbate the disease. Therefore, the surgical procedure should be avoided. Preferred anesthetic drugs in ALS patients should have minimal effect on respiratory and swallowing functions or provide rapid recovery of these functions. For this purpose, propofol, remifentanyl, desflurane, and sevoflurane; rocuronium from neuromuscular blockers, and sugammadex to terminate neuromuscular effects are can be used safely in ALS patients. Spinal and Epidural Anesthesia, which is performed by applying local anesthetic to the nerve roots, is relatively contraindicated because it may exacerbate ALS, but it has been used in various cases. Para-

vertebral Nerve Block, one of the peripheral nerve block methods, can be given as an example [1-12].

In cholecystectomy operations; Postoperative breathing difficulties, inability to cough, atelectasis, and related pneumonia can be observed. In order to reduce complications related to respiratory functions, laparoscopic intervention should be preferred in upper abdominal surgery procedures and effective postoperative analgesia should be provided. Opioid analgesics provide effective analgesia. However, sedation due to opioids may adversely affect respiratory functions such as superficial respiration and decreased coughing. In addition, opioids may cause nausea and vomiting. In ALS patients swallowing functions being impaired, thus vomiting may cause aspiration-induced pneumonia. For these reasons, the use of opioids should be avoided as much as possible in ALS. Central and peripheral nerve block methods, which reduce postoperative opioid need and sometimes eliminate it completely, are used for postoperative analgesia. OSTAP is one of these methods. OSTAP Block blocks the peripheral nerves (T6-L1) that travel between the internal oblique muscle fascia and transversus abdominis muscle in abdominal wall and provide sensory innervation of the anterior abdominal wall. OSTAP Block is performed by injecting local anesthetic between the transversus abdominis muscle and internal oblique muscle fascia by using a peripheral block needle. OSTAP Block is performed subcostally with a linear probe in plane. OSTAP Block is applied bilaterally in cases of abdominal midline incisions or surgical incisions involving both sides of the abdomen. However, unilateral right OSTAP block can be applied in surgical incisions where the incisions are predominantly on the right side, as in LC. Applying OSTAP Block before surgical incision will prevent pain due to surgical incision [13-18].

Since it is a rare disease, surgical methods applied in ALS patients are included only as case reports in the literature. In our literature review, we could not find TAP block application in ALS patients who underwent LC. Therefore, this case can be accepted as the first and only case in the literature.

In this case report; we aimed to evaluate the effectiveness of OSTAP Block procedure applied in Laparoscopic Cholecystectomy (LC) surgery on postoperative analgesia in a patient with amyotrophic lateral sclerosis.

## Methods and Results

A 56-year-old male patient, scheduled for LC due to calculous cholecystitis, was evaluated in the anesthesia clinic. It was found that the patient was in the early stage of ALS disease, and had two attacks previously; had no involvement of respiratory muscles but strength loss in the lower extremities, and gait disorder was detected. Laparoscopic Cholecystectomy was planned with ASA III according to the risk scoring system of the American

Society of Anesthesiologists.

The patient was taken to the operating room and monitored. The induction of general anesthesia was made via 2 mg/kg propofol, neuromuscular blockade was made via 0.4 mg/kg rocuronium iv, which facilitates intubation by eliminating the spontaneous breathing by preventing nerve-muscle transmission [5,12]. When the TOF Count response dropped to 1, the patient was intubated. Maintenance of anesthesia was provided with remifentanyl at a rate of 2 mcg/kg/min, 50% oxygen-50% air, and Sevoflurane (2.5-3%). Train of Four (TOF) was used for the evaluation of neuromuscular transmission, and Entropy was used for determining the depth of anesthesia. Following the application of general anesthesia, the right unilateral OSTAP Block was performed with 30 ml of 0.25% bupivacaine under USG before the surgical procedure was started. The surgical procedure was completed laparoscopically in 35 minutes. Tramadol (100 mg, i.v.) was preferred for postoperative analgesia. I.v. Sugammadex 2 mg/kg was administered to eliminate neuromuscular block [5,19]. When the TOF count response in the 3<sup>rd</sup> minute increased to 4 and the TOF value was found to be 112%, the patient was extubated. The patient was taken to the recovery unit. Since there was no additional problem in the recovery unit, the patient was transferred to the service.

Analgesic treatment was planned in case of the patient's pain score was found 4 and above. It was decided to use nonsteroidal anti-inflammatory drugs as the primary choice, and if the pain score persisted as 4 and above, tramadol (weak opioid) was decided as the second choice. In the pain follow-up of the patient in the service, the postoperative 1<sup>st</sup>, 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, 16<sup>th</sup>, and 24<sup>th</sup> hours pain scores were below 4. Only the postoperative 10<sup>th</sup>-hour pain score was found as 4, and 75 mg of diclofenac sodium I.M. was administered to the patient. The patient did not need opioid and other analgesic drug for 24 hours. No respiratory complications were observed during the service follow-up. The patient was discharged with recovery on the 3<sup>rd</sup> postoperative day.

## Conclusion and Discussion

Amyotrophic Lateral Sclerosis is a motor neuron disease that causes muscle atrophy due to motor neuron loss. Respiratory failure and swallowing difficulties occur due to the involvement of the respiratory and swallowing muscles. The treatment of Amyotrophic Lateral Sclerosis is palliative. Tracheostomy and gastrostomy are surgical procedures performed for palliative care in these patients. However, these patients rarely need surgery due to other diseases. Surgical procedures, spinal and epidural anesthesia applications can exacerbate the disease in ALS patients. However, there are case reports in literature about surgical procedures and nerve block applications to these patients [2-4,7-9].

By evaluating the previous literature, we adminis-

tered propofol and remifentanyl, which are short-acting intravenous anesthetics; sevoflurane, which is an inhalation agent that provides rapid recovery; rocuronium for neuromuscular blocking, and sugammadex for termination of neuromuscular block to our patient. TOF was used to monitor the level of entropy and neuromuscular blockade in order to assess the depth of anesthesia. Intravenous tramadol was used for postoperative analgesia. OSTAP Block was applied under general anesthesia, just before the surgical incision, in order to reduce the response to the surgical procedure [1,5,7,10-14,17].

Although there are studies using TIVA, Kelsaka, et al. showed that it is sevoflurane, Yoo JH, et al. desflurane can be used safely in ALS patients. In this context, we successfully used sevoflurane in our patient [12].

In the Kelsaka, et al. study, a total of 30 mg (30 mg/70 kg: 0.42 mg/kg), Yoo JH, et al. they used rocuronium bromide at a dose of 0.42 mg/kg [5,12]. Using these data, we administered 0.4 mg/kg rocuronium bromide to our patient and did not use additional doses. Intubation was successfully achieved when the TOF Count response was measured as 1 after 0.4 mg/kg rocuronium bromide administration. In this patient, 0.4 mg/kg rocuronium dose was sufficient for intubation.

Sugammadex is a drug designed to surround rocuronium and vecuronium, the amino-steroid neuromuscular blockers commonly used in general anesthesia. As a result of this binding, the amount of rocuronium and vecuronium that bind to nicotinic receptors at the neuromuscular junction is reduced. The block that occurs at the neuromuscular junction is reversed [19]. Kelsaka, et al. Using a sugammadex dose of 2 mg/kg was successful, and Mayuko, et al. Using a dose of 2.1 mg/kg sugammadex [5,12]. We administered 2 mg/kg sugammadex to our patient and when the TOF Count value was 4 and the TOF% equivalent was 112%, the patient was successfully extubated.

Iwata, et al. applied TAP block to assist general anesthesia during Open Cholecystectomy performed on a patient with Becker Muscular Dystrophy. In our study, we applied TAP block to ALS patients who underwent LK. Although the two diseases are different from each other, they are similar because both are neuromuscular diseases. There are differences between the surgical procedures of the two patients because one of them is a closed (laparoscopic) surgery and the other is open surgery. Both TAP block applications were performed unilaterally on the oblique subcostal area, but the drugs used (bupivacaine vs. ropivacaine) and amounts (30 ml vs. 40 ml) are included in the knowledge. In addition, Iwata, et al. Applied Rectus Sheath Block to the same patient simultaneously in addition to the TAP block [17].

Hadaya, et al. performed Baclofen Pump Placement on ALS patients with the anesthesia provided by TAP block application alone without other anesthesia and

sedation method. Hadaya, et al. Used 40 ml of 0.375% concentrated ropivacaine in the Left Lateral Tap block application [19]. TAP block is used only for analgesia in laparoscopic cholecystectomy operations. Therefore, we were able to apply TAP block to ALS patients for postoperative analgesia.

Respiratory functions are more affected after upper abdominal surgery. In this respect, ALS patient undergoing upper abdominal surgery (Laparoscopic Cholecystectomy) puts the patient at higher risk in terms of respiratory complications. Effective analgesia should be provided to reduce respiratory complications such as atelectasis. Opioid group analgesic drugs cause respiratory depression through the central nervous system and do not have a significant effect on muscle functions. In this context, the use of opioids, which have negative effects on respiration after surgical procedures, is limited in all patients, especially in the postoperative period. Therefore, we applied TAP block, which is one of the peripheral regional anesthesia methods, which is safer than central regional block methods in ALS patients. In this way, we aimed to reduce the need for opioids and even to prevent the use of opioids in ALS patients undergoing upper abdominal surgery, who are more likely to have respiratory problems.

In the postoperative follow-up of the patient, we did not detect high pain scores and the patient did not need any opioids. No complications related to respiratory tract and functions were observed. No newly developed neurological deficit was detected in the early postoperative period. The patient was discharged on the third day without any complications.

In conclusion, we determined that right unilateral Oblique Subcostal TAP block application provided effective analgesia in ALS patient underwent Laparoscopic Cholecystectomy surgery and the patient did not need opiates.

With this experience, we think that in ALS patients, Transversus abdominis Plane Block methods can be used for analgesia or anesthesia for various surgical procedures.

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