CASE REPORT

DOI: 10.5336/caserep.2021-85435

Double Complication Developed in a Patient Related to Local Anesthetics

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ABSTRACT Local anesthetics (LA) are extensively used and usually thought to be relatively safe. However lack of information about their toxic doses, side effects and treatment management of toxicity cause complications related to LA. A 19 years old male patient scheduled for shoulder arthroscopy with interscalene block. After the patient described pain, surgeon used 40 mL 2% prilocaine for LA infiltration. In post-anesthesia care unit, patient's peripheral oxygen saturation began to decrease, respiratory distress, aphasia and unconsciousness developed. These symptoms were evaluated as LA systemic toxicity and 20% intravenous lipid emulsion treatment had been started. After the bolus dose of intravenous lipid emulsion, neurological symptoms regressed. The metHb level was 28%. Intravenous methylene blue infusion was administered for methemoglobinemia. It was emphasized that it is necessary to increase awareness and knowledge about side effects, toxic doses of LA and their treatments.

Keywords: Local anesthetics systemic toxicity; methemoglobinemia; peripheral nerve block

The primary mechanism of action of local anesthetics (LA) is to inhibit the conduction of action potential by blocking the influx of sodium through the neuronal cell membrane during the depolarization phase.[1] Using this mechanism of action, it is planned to obtain sensory and motor block in the administration site.

LA are frequently used in daily practice. Despite its wide use, the awareness of the side effects and LA systemic toxicity (LAST) and the level of knowledge on its management are not sufficient.[2,3] The side effects of LA are often temporary and minor; however, moderate and severe life-threatening central nervous system involvement and/or cardiotoxicity that may result in mortality or morbidity may also occur.[3] LAST is the most fatal complication among these side effects. In this case report, we aimed to share the double complication (LAST and methemoglobinemia) developed in a patient due to lack of knowledge of the LAST and treatment management.

CASE REPORT

A 19 years old, 60 kg, American Society of Anesthesiologists I male patient scheduled for shoulder arthroscopy. Interscalene block was planned for this operation. After informed consent of the patient had been obtained, the brachial plexus was visualized in the interscalene area under the guidance of ultrasound and a LA mixture of 15 mL 0.5% bupivacaine and 5 mL lidocaine 2% was administered. Sensory and motor block developed 10 minutes after the procedure. The surgical team stated that they would administer local anesthetic infiltration to the patient who described pain in the posterior trocar insertion site about 10 minutes after the operation had started. However, the agent to be used and the dose informa-

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Peer review under responsibility of Turkiye Klinikleri Journal of Case Reports.

Received: 17 Sep 2021 ***Received in revised form:*** 12 Nov 2021 ***Accepted:*** 20 Nov 2021 ***Available online:*** 25 Nov 2021

tion were not specified. Two mg midazolam was applied to the patient who developed agitation a few minutes later. After the operation which lasted about 1 hour, the patient was transferred to the post-anesthesia care unit (PACU).

The patient whose oxygen saturation (SpO_2) began to decrease and who developed clouding of consciousness in the PACU was evaluated. His $SpO_2$was 94% under 4 lt/min O_2 support, arterial blood pressure was 90/54 mmHg, heart rate was rhythmic and 58/min, he was conscious and appeared aphasic. When the operation process was reviewed and questioned, it was learned that 40 mL prilocaine were administered for LA infiltration. Ninety mL of intravenous lipid emulsion (bolus dose: 1.5 mL/kg) was administered within 2 minutes to the patient who was thought to have developed LAST. After the bolus dose, his neurological symptoms regressed and 15 mL/kg/h intravenous lipid emulsion infusion continued for 15 minutes. However, arterial blood gas (ABG) sample was collected and portable postero-anterior chest X-ray (PA CXR) was taken from the patient with persisting respiratory distress and low SpO_2 value. His PA CXR was evaluated and pneumothorax was excluded. When ABG values were checked, the metHb level was 28%. The patient whose respiratory distress was found to be due to methemoglobinemia was administered 1.5 mg/kg intravenous methylene blue infusion. The patient whose SpO_2 value and respiratory pattern improved was transferred to the intensive care unit for hemodynamic follow-up. The patient whose hemodynamics were stable and who did not have any additional problem during the follow-ups was transferred to the ward a day later and discharged.

DISCUSSION

The incidence of major LAST cases (cardiac arrest, convulsion, etc.) associated with regional anesthesia is very low. As a result of the increased awareness of LAST and the inclusion of preventive measures into routine clinical practice since the early 1980s, a significant reduction has been observed in major LAST cases.[4,5]

In 99% of LAST cases, the cause is the serum blood level of the drug. This occurs in administrations requiring high volume and concentration of LA, such as epidural block and peripheral nerve blocks.[6]

LAST usually presents with findings due to the excitation of the central nervous system such as irritation, agitation and tinnitus, and then non-specific findings such as metallic taste in the mouth and perioral numbness are observed. Cardiotoxicity usually develops later and presents with tachycardia, hypo-hypertension, conduction blocks, and may result in deep cardiovascular collapse and asystole, if not intervened.[7]

The treatment of LAST primarily involves obtaining airway control, suppressing convulsions and, if necessary, using 20% intravenous lipid emulsion with cardiopulmonary resuscitation.[8] In this case, agitation that developed in the intraoperative period was the possible first sign of LAST, but the sedation masked the early LAST clinic. LAST was recognized with the neurological symptoms that appeared in the PACU. Patients in similar case reports that had been published in recent years also presented with neurological symptoms (seizure, unconsciousness..) and responded well to intravenous lipid emulsion treatment.[9-11]

Another potential complication of LA is methemoglobinemia. Methemoglobinemia results from the oxidation of hemoglobin charged with Fe+2 to hemoglobin charged with Fe+3, in other words methemoglobin. The high oxygen affinity of the resulting oxidized hemoglobin causes a left shift in the oxygen-hemoglobin curve. This is reflected to the clinic as low saturation value, cyanosis, tachycardia, dyspnea, and fatigue in the early period and in the case of high methemoglobin levels, respiratory depression, convulsion and coma.[12,13] In asymptomatic patients and patients with a methemoglobinemia level less than 20%, the elimination of the active agent is usually sufficient in the treatment and no additional treatment is required. In symptomatic patients and patients with a methemoglobin level higher than 20%, close monitoring of respiration and circulation is required and specific treatments such as oxygen support, hyperbaric oxygen therapy, blood transfusion, ascorbic acid and methylene blue may be needed.[14]

Methemoglobinemia associated to LA, which is usually seen in children, is encountered in dental procedures, bone marrow aspiration and hair removal in adults. When similar case reports in the literature were reviewed, it was seen that intravenous methylene blue was mostly sufficient for treatment in symptomatic patients.[15]

Although LA are frequently used, the survey studies have revealed that there is a serious lack of knowledge on the mechanisms of action, toxic dose limits, side effects of LA and LAST awareness, and the management and treatment of potential complications. The awareness study by Sagir and Goyal showed that of the participants, 93% did not know the toxic dose of bupivacaine, 30% did not know that LA could be toxic, and only 2% knew that the lipid emulsion was part of the treatment.[3] The study by Collins showed that of the participants other than anesthetists, 25% knew the safe doses of LA and only 7% knew the dose of intravenous lipid emulsion.[2]

As a result, although LA are frequently used as safe pharmacological agents, it is necessary to increase awareness and knowledge about their side effects, toxic doses and treatments.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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