

Triple Regional Block for Clavicle Surgery in a Pregnancy: A Combination of Interscalene, Superficial Cervical Plexus, and Clavipectoral Fascial Plane Blocks

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ABSTRACT

Background: Clavicle surgery is commonly performed under general anesthesia; however, this approach may pose additional risks in pregnant patients because of physiological airway changes and potential fetal exposure to anesthetic agents. Regional anesthesia may offer a safer alternative in selected cases.

Case: A 32-year-old woman at 28 weeks and 5 days of gestation presented with a closed midshaft fracture of the left clavicle following a motorcycle accident. Radiographic evaluation confirmed a comminuted midshaft clavicle fracture (Allman type I). The patient underwent open reduction and internal fixation under ultrasound- and nerve stimulator-guided triple regional anesthesia consisting of an interscalene block with 25 mL of 0.5% bupivacaine, a superficial cervical plexus block with 5 mL of 0.5% bupivacaine, and a clavipectoral fascial plane block with 5 mL of 2% lidocaine. Adequate surgical anesthesia was achieved with stable maternal hemodynamics and fetal heart rate, without conversion to general anesthesia.

Discussion: Clavicle surgery presents a challenge for regional anesthesia because of its complex innervation from both the cervical and brachial plexuses. In this pregnant patient, combining interscalene, superficial cervical plexus, and clavipectoral fascial plane block provided complementary sensory coverage and adequate surgical anesthesia without additional sedation or conversion to general anesthesia. This approach minimized airway manipulation and systemic anesthetic exposure, which are important.

considerations during pregnancy, while maintaining stable maternal hemodynamics and fetal heart rate throughout the procedure.

Conclusion: This case demonstrates that a triple regional block technique can provide adequate surgical anesthesia for clavicle fixation in pregnancy, with stable maternal and fetal well-being.

Keywords: Clavipectoral fascial plane block, clavicle surgery, interscalene block, superficial cervical plexus block, pregnancy.

INTRODUCTION

Trauma during pregnancy is reported in approximately 6–7% of pregnancies and represents a leading cause of non-obstetric maternal morbidity and mortality.^{1–4} Management of anesthesia in pregnant women undergoing non-obstetric surgery requires special considerations to ensure the safety of both the mother and the fetus. Pregnant women are at increased risk of trauma due to the anatomical and physiological changes that occur during pregnancy.³ Clavicle fractures are common injuries, accounting for approximately 2.6–12% of all fractures in adults and nearly one-third of all shoulder girdle injuries.⁵

The complex innervation of the clavicular region presents a challenge for anesthetic management, particularly in patients at high risk for general anesthesia, such as pregnant women.⁴ Regional anesthesia is generally preferred over general anesthesia because it reduces the risk of aspiration, avoids airway manipulation, and minimizes exposure to systemic anesthetic agents that may potentially affect the fetus.⁶ Furthermore, regional anesthesia allows the patient to remain awake, enabling optimal monitoring of neurological and respiratory status throughout the surgical procedure. A case report demonstrated that a combination of selective supraclavicular and interscalene nerve blocks may provide a safer alternative for pregnant patients.⁴

This report describes the successful use of a triple regional block technique consisting of an interscalene block, superficial cervical plexus block, and clavipectoral fascial plane block as the primary anesthetic approach for clavicle surgery in a pregnant patient.

CASE

A 32-year-old woman at 28 weeks and 5 days of gestation presented with a closed fracture of the left clavicle following a motorcycle accident that occurred six days prior to hospital admission. The patient complained of pain in the left shoulder and pain when raising her arm. She reported that she was struck from the right side while riding a motorcycle and fell onto the

pavement, impacting her left shoulder. She denied any head injury or abdominal trauma. The patient also denied symptoms of dizziness, vomiting, or abdominal pain. There was no significant past medical history, with no history of hypertension, diabetes, asthma, cardiac disease, or allergies.

On physical examination, the patient was fully conscious and hemodynamically stable, with a blood pressure of 112/78 mmHg, heart rate of 71 beats/minute, respiratory rate of 20 breaths/minute, and oxygen saturation of 99% on room air. Her pre-pregnancy weight was 70 kg, current weight was 74 kg, and height was 142 cm, resulting in a body mass index (BMI) of 36.7 kg/m², consistent with Grade II obesity.

Head-to-toe examination revealed edema of the left shoulder accompanied by limited range of motion. The remainder of the physical examination was unremarkable. Obstetric examination demonstrated a singleton pregnancy in cephalic presentation, with a fetal heart rate of 148 beats/minute and no uterine contractions.

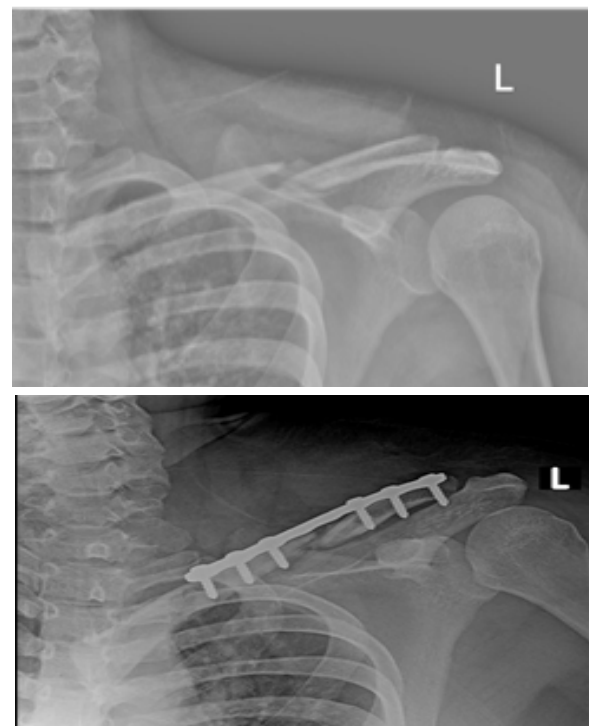


Figure 1. Preoperative and Postoperative Radiographs of the Left Clavicle Demonstrating Fracture Fixation

Laboratory investigations showed a hemoglobin level of 11.3 g/dL, hematocrit of 37.4%, leukocyte count of $8.5 \times 10^3/\mu\text{L}$, and platelet count of $183,000/\mu\text{L}$. Other laboratory parameters were within normal limits. Radiographic examination revealed a comminuted midshaft fracture of the left clavicle with poor apposition and alignment, consistent with an Allman Type I fracture. No pulmonary abnormalities were identified, and the cardiac silhouette was within normal limits.

The patient was diagnosed with a closed fracture of the middle third of the left clavicle and a singleton pregnancy at 28 weeks and 5 days of gestation (G1PoAo). She was classified as ASA Physical Status II because of pregnancy and obesity (BMI 36.7 kg/m^2). The patient was scheduled for open reduction and internal fixation (ORIF) of the left clavicle. The patient and her family were counseled regarding her condition, the planned pain management strategy, and the potential risks associated with the procedure, particularly those related to pregnancy. Patient care was provided through a multidisciplinary approach involving the obstetrics, anesthesiology, and orthopedic teams.

Anesthetic management was performed using a combination of regional anesthesia techniques, including an interscalene block, superficial cervical plexus block, and clavipectoral fascia plane block under ultrasound and nerve stimulator guidance. Upon arrival in the operating room, standard monitoring was applied, including electrocardiography (ECG), noninvasive blood pressure monitoring, and pulse oximetry. Ultrasound was used to identify the C5, C6, and C7 cervical nerve roots. The maximum dose of bupivacaine was calculated based on the patient's actual body weight at 2.5 mg/kg without epinephrine. With a body weight of 74 kg, the maximum allowable dose was approximately 185 mg. The maximum dose of lidocaine without epinephrine was calculated at 4.5 mg/kg, corresponding to approximately 333 mg. Actual body weight-based dosing remains a commonly used clinical approach for determining local anesthetic dosage, while taking into account patient-specific factors and

the principle of using the lowest effective dose. After skin sterilization, an interscalene block was performed at the C6 level using an in-plane lateral-to-medial approach with a 22-gauge, 50-mm needle under ultrasound guidance. A nerve stimulator was utilized, targeting motor responses such as deltoid or biceps muscle contraction as indicators of proximity to the brachial plexus (C5–C6), with a stimulation current of less than 0.5 mA. The anterior and middle scalene muscles were identified to locate the brachial plexus, while the phrenic nerve was also identified and carefully avoided. Local anesthetic administration consisted of 25 mL of 0.5% bupivacaine (125 mg). A superficial cervical plexus block was subsequently performed at the posterior border of the sternocleidomastoid muscle using 5 mL of 0.5% bupivacaine. Additional anesthesia was provided through a clavipectoral fascial plane block using 5 mL of 2% lidocaine. The total dose of bupivacaine administered was 150 mg, while the total lidocaine dose was 100 mg, both remaining within accepted safety limits. Following block placement, sensory blockade was assessed and deemed adequate for surgical intervention. Intraoperative hemodynamic parameters remained stable throughout the procedure, without the need for conversion to general

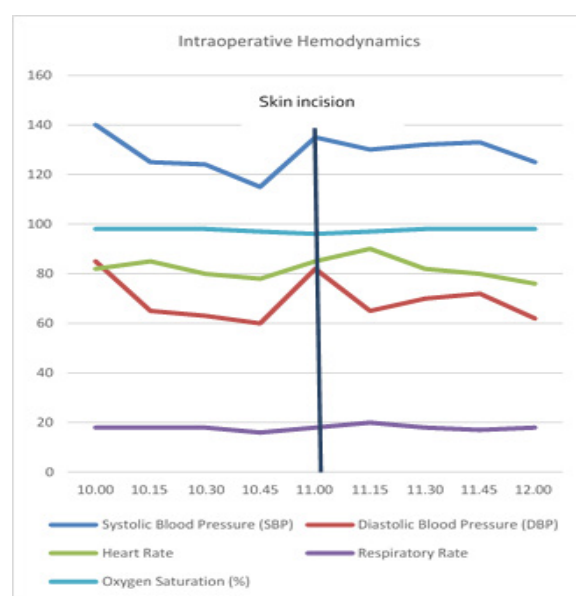


Figure 2. Intraoperative Hemodynamics

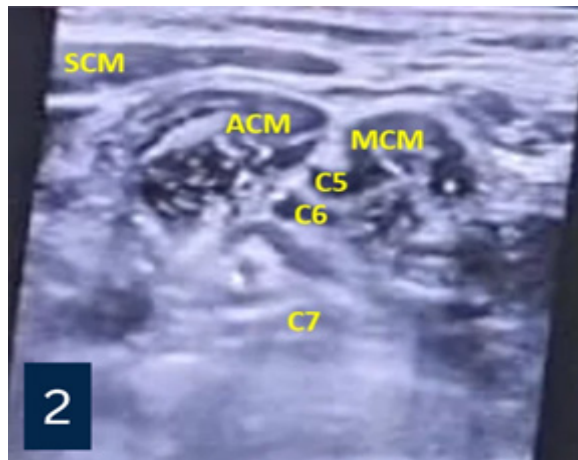


Figure 3. Ultrasound image of the cervical plexus region demonstrating the sternocleidomastoid muscle (SCM), anterior scalene muscle (ASM), and middle scalene muscle (MSM) in the patient described in this case report.

anesthesia or administration of additional sedative agents. Fetal heart rate was monitored intermittently every 15 minutes using obstetric Doppler by the obstetric team.

At 18 hours postoperatively, the sensory block had largely resolved, with only mild residual numbness over the clavicular region. Motor function had completely recovered. Pain was adequately controlled with paracetamol 1 g every 8 hours, and the patient reported a VAS pain score of 2–3.

DISCUSSION

Clavicle fractures are classified into three categories according to the anatomical location of the fracture. Fractures most commonly occur in the middle third of the clavicle (approximately 80%), followed by the distal third (approximately 15%) and the medial third (approximately 5%). Non-displaced clavicle fractures can generally be managed conservatively with nonoperative treatment, such as immobilization using a sling. In contrast, more complex fractures, including open fractures or displaced fractures, usually require surgical intervention.⁷

The sensory innervation of the clavicle remains controversial. It is thought to originate from both the cervical and brachial plexuses. The cervical plexus is composed of the C1–C4 nerve roots and gives rise to the greater auricular,

lesser occipital, supraclavicular, and transverse cervical nerves. Among these branches, the supraclavicular nerve is believed to provide the principal sensory innervation of the clavicle. The supraclavicular nerve arises from the C3–C4 nerve roots and divides into several branches. The medial branch supplies the skin and clavicle from the sternoclavicular joint to the medial clavicle. The intermediate branch innervates the clavicle and the skin extending from the superior aspect of the pectoralis major muscle to the anterior deltoid region. The lateral branch provides sensory innervation to the distal clavicle and the skin overlying the superior and posterior aspects of the deltoid muscle.⁷

The brachial plexus provides motor and sensory innervation to most of the upper extremity, including the shoulder region and tissues surrounding the clavicle.⁷ An interscalene block alone is effective in blocking the upper portion of the brachial plexus and is commonly used for shoulder surgery as well as procedures involving the lateral two-thirds of the clavicle.⁸

An interscalene block does not completely cover the cutaneous innervation of the supraclavicular region and may therefore result in residual pain at the surgical incision site. Previous studies compared superficial cervical plexus block combined with clavipectoral fascial plane block with superficial cervical plexus block combined with interscalene brachial plexus block. Both approaches provided effective analgesia, while the clavipectoral block combination was associated with longer analgesia, better preservation of motor function, and a lower incidence of hemidiaphragmatic paresis.⁹ The superficial cervical plexus block provides sensory anesthesia to the skin of the anterolateral neck, preauricular and retroauricular regions, and the supraclavicular area, thereby contributing to analgesia for clavicular surgery.¹⁰

The clavipectoral fascial plane block (CPB) is a relatively novel regional anesthesia technique that targets the fascial plane between the pectoralis major and pectoralis minor muscles in the clavicular region. This technique has been reported to provide effective analgesia for clavicular surgery, either as a standalone technique or as part of a multimodal analgesic

approach.¹¹ CPB has been shown to provide effective surgical anesthesia and analgesia for midshaft clavicle surgery; however, its efficacy may be limited when the surgical incision is located near the shoulder or the distal clavicular region.¹² The combination of CPB and a superficial cervical plexus block offers more comprehensive analgesic coverage of the clavicular region and surrounding tissues.¹¹

In pregnant patients, regional anesthesia offers several advantages over general anesthesia, including avoidance of airway manipulation, reduction of aspiration risk, and minimization of fetal exposure to systemic anesthetic agents.⁶ Furthermore, the use of ultrasound guidance improves the accuracy of local anesthetic injection and enables the administration of lower volumes of anesthetic agents, thereby reducing the risk of local anesthetic systemic toxicity.

Ultrasound-guided interscalene block is generally considered superior to nerve stimulator-based techniques because it allows the use of lower volumes of local anesthetic, often as little as 5–10 mL, through real-time visualization of anesthetic spread.¹³ The use of ultrasound has been associated with a faster onset of anesthesia, higher success rates, and fewer needle passes, while simultaneously reducing the risk of complications compared with nerve stimulator-guided techniques.¹⁴

Local anesthetic dosing should be individualized according to the agent, injection site, patient characteristics, body composition, and cumulative exposure, while using the lowest effective dose. However, special caution is required in conditions such as pregnancy and obesity because physiological and pharmacokinetic changes may increase sensitivity to local anesthetic agents and potentially increase the risk of toxicity. To date, no specific recommendations exist regarding local anesthetic dose calculation in pregnant patients. Dosing remains based on standard mg/kg body weight calculations, with clinical adjustments according to individual patient characteristics. Therefore, local anesthetics should be administered cautiously, following the principle of using the lowest effective dose

while ensuring adequate surgical anesthesia.

In the present case, the combination of the three regional block techniques performed under ultrasound and nerve stimulator guidance provided stable intraoperative conditions, adequate analgesia, and eliminated the need for conversion to general anesthesia. Ultrasound guidance played a crucial role in improving injection accuracy, reducing local anesthetic requirements, and minimizing the risk of complications, all of which are particularly important in pregnant patients. No neurological complications or obstetric adverse events were observed, and fetal status remained stable throughout the perioperative and postoperative periods.

CONCLUSION

The combination of an interscalene block, superficial cervical plexus block, and clavipectoral fascial plane block may represent a feasible and effective anesthetic option for pregnant patients undergoing clavicular fracture fixation. This approach provided adequate surgical anesthesia, preserved maternal hemodynamic stability, and avoided the need for general anesthesia in the present case.

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