

CASE REPORTS

Ultrasound-guided multiple peripheral nerve blocks, a way out for anesthesia in morbidly obese patients for bone marrow aspiration



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Abstract Morbid obesity is associated with various pathophysiological changes which affect the outcome of anaesthesia and surgery. So it's challenging to give anaesthesia to such patients. We present a 59-year-old adult morbidly obese, hypertensive, diabetic female with hypothyroidism operated for proximal humerus fracture and now presented with non-union of fracture, requiring percutaneous injection of bone marrow aspirate from the iliac crest to the site of non-union. The patient was extremely anxious and refused to undergo the procedure under local anaesthesia or sedation and demanded anaesthesia. Given her comorbidities general anaesthesia (GA) was avoided and the procedure was accomplished using Ultrasound (USG) guided Transversus abdominis plane (TAP) block and Lateral Femoral Cutaneous Nerve (LFCN) block for the bone marrow aspirate from the iliac crest and Intercostobrachial nerve block (T2) was given to prevent pain while injecting the aspirate into the non-union site. Dexmedetomidine and ketamine were given for deep level sedation and analgesia. TAP block and LFCN block is generally used for post-op analgesia but can be also used for surgical anaesthesia instead of General anaesthesia in specific scenarios. Its perioperative application and its potential use instead of GA have been discussed.

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Múltiplos bloqueios de nervos periféricos guiados por ultrassom, uma saída para anestesia em pacientes com obesidade mórbida para aspiração de medula óssea

Resumo A obesidade mórbida se associa a várias alterações fisiopatológicas que afetam o desfecho da anestesia e cirurgia. É, portanto um desafio anestésico tais pacientes. Apresentamos uma mulher adulta de 59 anos, obesa mórbida, hipertensa, diabética com hipotireoidismo, submetida à cirurgia devido a fratura proximal do úmero e que compareceu ao serviço com

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fratura não consolidada, e com indicação de injeção percutânea de aspirado de medula óssea da crista ilíaca na fratura não consolidada. A paciente estava extremamente ansiosa e recusou o procedimento sob anestesia local ou sedação e exigiu anestesia. Em função de suas comorbidades, Anestesia Geral (AG) foi evitada e o procedimento foi realizado usando bloqueio do Plano Transverso Abdominal (PTA) guiado por Ultrasonografia (USG) e bloqueio do Nervo Cutâneo Femoral Lateral (NCFL) para aspiração de medula óssea da crista ilíaca. O bloqueio do nervo Intercostobraqueal (T2) foi realizado para evitar dor durante a injeção do aspirado. Dexmedetomidina e ketamina foram dadas para sedação profunda e analgesia. O Bloqueio PTA e bloqueio NCFL geralmente são usados para analgesia pós-operatória, mas também podem ser usados para anestesia cirúrgica substituindo a anestesia geral em condições clínicas específicas. O emprego desses bloqueios no perioperatório e seu uso potencial no lugar de AG têm sido discutidos.

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Introduction

The World Health Organization estimates that, in 2016, there were 650 million obese (Body Mass Index – BMI > 30 kg.m⁻²) adults in the world. Anatomic and physiological alterations because of obesity cause limitations and problems in anesthesiology procedures. Bone marrow aspirate is used as a treatment for non-union of fractures. Bone marrow is a source of osteoprogenitor cells that are key elements in the process of bone formation and fracture healing. This method offers the advantage of treating a fracture with non-union without operative surgery. Despite the progress in medicine, the procedure remains painful for the majority of patients. There are no effective guidelines for the prevention of pain. General Anaesthesia (GA) may be required for such painful procedures but it has its limitations. For obese patients, Regional Anaesthesia (RA) is better than general anaesthesia, but neuraxial block has its challenges. It is difficult to palpate the spaces and give a proper position for the block with the risk of high spinal. For moderately painful and short procedure, sedation with the maintenance of spontaneous ventilation can be used, but using excess of propofol can lead to respiratory depression. The increase in the use of ultrasonography in recent years suppresses many limitations. Given these issues, we decided to give a regional block, Ultrasound (USG) Guided Transversus Abdominis Plane (TAP) block and Lateral Femoral Cutaneous Nerve (LFCN) block to this patient with sedation to have a pain-free procedure.

Case history

A 59 years old female weighing 102 kg (Ideal Body Weight – IBW = 46.4 kg) with alleged history of road traffic accident had been operated for proximal humerus fracture and is now presented with non-union of humerus for which bone marrow had to be aspirated from iliac crest and injected percutaneously at the non-union site. The patient had no complaints of pain at the site of non-union (Fig. 1). The preoperative airway examination revealed a Mallampati Class 3. Pre anaesthetic evaluation was carried out and the patient was categorised under ASA III because of hyper-



Figure 1 Humeral x-ray.

tension, diabetes mellitus, hypothyroidism, morbid obesity (BMI = 44.3 kg.m⁻²). Patient was on Tablet Amlodipine 5 mg, Tablet Metformin 500 mg, Tablet thyroxin 200ug. She was not on any antithrombotic medications. All routine investigations were normal. STOP-BANG score 5/8 (high risk). A fresh 2Decho was done showing concentric left ventricular hypertrophy, ejection fraction 60%, Grade I diastolic dysfunction and rest within normal limits. USG guided TAP block with LFCN block was planned for bone marrow aspiration from the iliac crest, and intercostobrachial block (T2) was planned to prevent pain while injecting the aspirate into the non-union site on the medial side of the arm. The procedure was explained and consent taken. Patient was kept nil by mouth for 8 hours before the procedure. Patient was given a ramped position (Fig. 2). Baseline Heart Rate 68 min⁻¹ and Blood Pressure 130/80 mmHg and saturation 94% was noted. Supplemental oxygen was given at 10 L.min⁻¹ via High flow nasal cannula and End-tidal carbon dioxide measured 32–34 mmHg. Since the patient was very anxious,



Figure 2 Patient in a ramped position.

sedation was given to the patient. Dexmedetomidine infusion was started at a maintenance dose of $0.5 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{hr}^{-1}$ and continued throughout the procedure. Aliquots of Injection Ketamine were given at a dose of $1 \text{ mg}\cdot\text{kg}^{-1}$ before starting the procedure. A total of 40 mg ketamine and 30 μg of Dexmedetomidine was given. With the patient in supine position and abdomen exposed, the pannus was taped cephalad as the fatty tissue hanging from the abdomen made it difficult to access the inguinal region. Under all aseptic precautions, the patient was scanned with a curvilinear probe of USG machine; the probe was located over the right side moving from medial to lateral until the three muscle planes were recognised midway between the costal margin and iliac crest. A spinal needle 23G was advanced in the plane under the guidance of USG until it reached the transversus abdominis plane. 10 mL of 0.5% bupivacaine and 10 mL of 2% lignoadrenaline was injected in real time and the hypoechoic shades of Local Anaesthesia (LA) spread were followed and confirmed. Anterior superior iliac spine was identified with USG and the probe was moved down to confirm LFCN and the area was infiltrated with LA, then 5 mL 0.5% bupivacaine and 5 mL 2% lignoadrenaline was given in plane, hypoechoic shades of LA spread was seen. After 15 minutes the area covered by block was checked and it was found to be anaesthetised. Intercostobrachial nerve (T2) block was given by depositing 5 mL of 2% lignocaine (plain) subcutaneously superiorly and inferiorly along the axillary crease via a 1.5 inch 22 gauge needle to anaesthetize the entire width of the medial aspect of the arm. Patient's vital signs were within normal limits throughout the operation. In the Post Anaesthesia Care Unit (PACU) the patient was completely awake, oriented and satisfied. Pain was evaluated using a Visual Analogue Scale (VAS) with 0 minimum and 10 maximum. Patients VAS score immediately post-procedure was 1 after arriving in the PACU. Patient was shifted to the ward after an observation period of 2 hours. Discharge was given to the patient after 24 hours.

Discussion

Morbid obesity is associated with various pathophysiological changes related to airway, cardiovascular, respiratory systems. Our patient was morbidly obese (IBW = 46.4 kg, BMI = $44.3 \text{ kg}\cdot\text{m}^{-2}$, neck circumference 40 cm and abdominal girth 155 cm). Maintaining airway, difficult intubation, acid aspiration, decreased functional residual capac-

ity, increased ventilation-perfusion mismatch, pulmonary hypertension, obstructive sleep apnoea, increased ventricular workload, arrhythmias, ischemic heart disease are the challenges faced while giving GA in these patients. RA does not interfere with cardiovascular status and respiratory issues. RA offers several advantages when treating obese patients, minimal airway intervention, improved postoperative analgesia, decreased opioid consumption, decreased postoperative nausea vomiting, reduced hospital length of stay.¹ But Neuraxial blocks can be difficult because of impalpable spaces and patient positioning. The risk of cardiopulmonary collapse and respiratory problems associated with increased block levels is higher in obese patients. Giving only local anaesthesia infiltration was not a good option because of too much of adipose tissue and the use of the trephine needle for bone marrow aspiration could be painful. Peripheral nerve blocks may help in such situations. Peripheral nerves are under dense adipose tissues and located more deeply in obese patients. So the blind technique is not possible and USG is required. The target tissue is deeply located, thus the visualization of the needle tip is more difficult. Therefore, more experience and expertise is required for the use of ultrasonography in obese patients. The curvilinear probe is an appropriate option for obese patients because it uses lower frequencies and has improved penetration.

TAP block is widely used as an analgesic technique but not as anaesthetic technique. Thoracolumbar nerve roots T8–L1 are blocked, which course in a plane between the transversus abdominis and internal oblique muscle and provide sensory innervation to the skin, muscles and parietal peritoneum of the anterior abdominal wall. When compared with neuraxial block, TAP block does not provide effective surgical anaesthesia. However, it can be used in patients with intracranial hypertension, who cannot tolerate positioning for neuraxial blockade and who may not tolerate the hemodynamic consequences of sympathectomy. Ultrasonography enables direct visualization of the nerves and reduction in the local anaesthetic doses and complications, thus allowing multiple nerve blockades. USG guided TAP block has been used for open appendectomy in a patient with comorbidities where GA was not possible and the patient denied spinal anaesthesia.² LFCN supplies the iliac crest.

Dexmedetomidine is generally effective for non-invasive procedures and has not been successful for an invasive procedure. Therefore, ketamine was given along with dexmedetomidine to achieve Richmond agitation sedation scale of -5 where the patient becomes unresponsive to verbal and painful stimulus.³ Individual case reports have demonstrated the utility of dexmedetomidine and ketamine to get the desired deep level of sedation maintaining spontaneous respiration and without significant changes in hemodynamic parameters. Dexmedetomidine can be expected to prevent tachycardia, hypertension, salivation and emergence phenomena associated with ketamine. While ketamine may prevent the bradycardia and hypotension which has been reported with dexmedetomidine.⁴

Conclusion

In the case of this morbidly obese patient with difficult airway and comorbidities, ultrasound-guided multiple

peripheral nerve blocks were successfully performed for superficial invasive procedure. It is a good alternative to general anaesthesia and neuraxial blocks, despite their technical difficulties.

Conflicts of interest

The authors declare no conflicts of interest.

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