Editorial
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Ultrasound Guided Regional Anaesthesia for the Lower Limb

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1. Introduction

Over the last decade the practice of regional anaesthesia has moved leaps and bounds with renewed interest in the practice of regional anaesthesia techniques amongst both trainees and experienced anaesthetists. This resurgence can be attributed to the availability of portable high resolution ultrasound machines. Ultrasound allows the practitioner to actually visualise the target nerve and the surrounding structures real time while giving the local anaesthetic. This real time guidance results in better success rates, helps in reducing the drug requirement and also reduces failures and complications. This gives the anaesthetist confidence in practicing blocks which established techniques like peripheral nerve stimulation, paresthesia and anatomical techniques do not give. This widespread use of ultrasound has also stimulated increasing number of publications in the use of ultrasound for regional anaesthesia techniques. The need is to look at practices which make regional anaesthesia consistent and safer to novices and expert users alike.

Lower limb blocks traditionally had limited use compared to Upper limb block because a single plexus bock fails to cover all the innervations for most commonly performed surgeries. Multiple blocks have to be performed and this results in more patient discomfort and incomplete anaesthesia. Comparatively central neuro-axial block are easy to perform and result in complete anaesthesia required for the surgery with faster onset times. The advancement in ultrasound has made these lower limb blocks easier and more accurate with faster onset times. This has lead to wider adaptation of these for postoperative analgesia and in some instances anaesthesia for high risk patients and patients who have contraindications for central neuro-axis blocks.

Lower limb anaesthesia and analgesia need coverage of both the lumbar plexus and its distribution as well as the sacral plexus and branches. Often the nerves are deep and the anatomy is variable in comparison to the upper limb. Along with covering the plexus newer lower limb blocks are area specific like the Pericapsular Nerve Group (PENG) and Infiltration between Popletial artery and capsule of the knee (IPack) for hip and knee replacement respectively.

The lumbar plexus comprises of Ventral rami from L1 to L4 and its branches and these cover the anterior aspect from the lower abdomen, thigh and going upto the ankle with underlying myotomes and osteotomes. Depending on the area of anaesthesia or analgesia required, the nerves can be blocked at the Lumbar Plexus or individually at Femoral nerve, Adductor canal block, Saphenous nerve at the leg and in the ankle. Along with this the other individual blocks include Lateral cutaneous nerve of the thigh, obturator nerve and its anterior and posterior divisions in the thigh. All these three components of the lumbar plexus can also be targeted by a large volume Fascia Iliac Block in the thigh but as expected with large fascial plane block some components, especially the obturator nerve here, do not get blocked every time resulting in a patchy block[1].

The sacral plexus is formed by the Ventral rami of the S1, S2, S3 and S4 with some contributions from L4 and L5. The sacral plexus can be accessed at the pre sacral area but being deep in the pelvis it has not been a popular location for a block due to possible complications like vascular puncture and bowel injury. For lower limb analgesia

the only component of the sacral plexus to be blocked is the Sciatic nerve. Other components like the Superior and Inferior Gluteal nerve and the Pudendal nerve have limited lower limb innervation. The sciatic nerve can be blocked at the gluteal region (classical approach) between the ischial tuberosity and the greater trochanter deep to the gluteal muscles and just sub gluteal high up in the posterior aspect of the thigh. Further down it can be blocked in the popliteal fossa around 5-6 cms above the knee joint. Further down the leg its divisions the peroneal and tibial nerves can be blocked individually in the posterior aspect of the knee. As the sciatic nerve courses in the posterior aspect of the thigh all these block need the patient prone or lateral. Using ultrasound it is possible to block the sciatic nerve with an anterior approach in the supine position as it course through the thigh adductors and is just posterior to the lesser trochanter on the medial aspect[2]. This gives an option for patients with fractures who find it difficult to turn.

Anaesthesia and analgesia in the lower limb needs a combination of these two plexus or their components being blocked based on the surgery. As ambulation after surgery and day care procedure get popular motor blockade in lower limb is losing favour. This is resulting in need for selective block which spares the motor component especially to the quadriceps and the adductor muscles of the lower limb.

Hip surgeries predominantly need the lumbar plexus with a small component from the sciatic which are mainly periarticular. As a result the PENG block has come into favour for the hip as it involves depositing local anaesthetic in the plane in between the iliopsoas and insertion of the anterior hip capsule next to the acetabulum covering the articular branches from the lumbar plexus[3]. Knee surgeries need components from both the lumbar and sacral plexus. Traditional blocks of the femoral nerve and the sciatic nerve lead to significant motor weakness and resultant immobility. These are now getting replaced with a combination of Adductor canal block and IPack[4,5]. Adductor canal block covers the distal sensory branches from the femoral nerve but spares the motor components from the femoral nerve going to the adductors and quadriceps[6]. Similarly the IPack block which involves infiltration of local anaesthetic between the popliteal artery and the posterior capsule of the knee under ultrasound is a muscle sparing alternative for the sciatic components.

Soft tissue surgery in the foot is well covered by the Ankle block which involves blocking the Sciatic components - Tibial Nerve (behind the medial malleolus), Deep peroneal nerve (next to the anterior tibial artery), Superficial Peroneal Nerve (Along the fibula) and the Sural nerve (behind the lateral malleolus) along with the Femoral component - Saphenous nerve (Along the saphenous vein)[7]. They have been done by landmark, nerve stimulator or ultrasound guided resulting in very little motor blockade. Bony surgery in the foot and ankle still needs a Sciatic block in the popliteal region as most of the supply to the osteotomes leaves well above the ankle.

The advent of Ultrasound in regional anaesthesia has resulted in a dramatic change in the indications for blocks for intraoperative anaesthesia and postoperative analgesia. This is especially profound in procedures for the lower limb where block have become more reliable, consistent and easier to perform. Along with this newer options have resulted in reduced motor blockade and earlier mobility making them suitable for use in day care and ERAS programs. Now good quality studies should be able to justify their incorporation into routine use and analgesia protocols.

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