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Effectiveness Of Peripheral Nerve Blocks In Split Skin Grafts. Do They Offer Complete Deafferentation And Antinociception?: A Case Series.

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ABSTRACT

Split-thickness skin grafting (SSG) is the current treatment standard for non-healing wounds. Donor-site pain is most likely the disconcerting challenge in both the intraoperative and the immediate postoperative period. We report a series of three cases where we administered a combined femoral and lateral femoral cutaneous nerve blocks under ultrasound guidance with appropriate drug and concentration. After fifteen minutes there was complete loss of all the sensation; still grafting caused pain. The pain was mild in all the cases and managed with minimal doses of narcotics and ketamine. As the nerve exits the spinal cord, the mass of an epineurium (composed of stroma and connective tissue) decreases while the overall volume increases. Thus, in proximal plexuses, the ratio of nonneural to neural tissue is approximately 1:1, whereas in distal plexuses, the ratio is 2:1. A peripheral nerve can have up to 70% connective tissue. Hence, possibly, the effectiveness of peripheral nerve blockade in relieving severe pain during SSG harvesting appears to be diminished. An obturator overlap problem was negated by the graft site more than 2 cm within the blocked area. We hypothesise that the intense noxious stimulus will overcome the block characteristics and cause some breakthrough pain. This pain is usually manageable with intravenous narcotics and a low dose of ketamine. This failure is unlikely in intrathecal blocks with strong conduction blockade. We believe that blocks at two levels could help to alleviate the aforementioned issue.

Keywords: surgery: Skin graft: Anaesthesia, Nerve block; pain

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INTRODUCTION

Split-thickness skin grafting (SSG) is the present treatment standard for wound management in non-healing wounds. SSG entails the removal of the epidermis and a portion of the dermis, leaving only the reticular dermis in the donor area, possibly allowing the skin to regenerate and heal by secondary intention. The most distressing challenge in the initial postoperative period is most likely donor-site pain. The administration of nerve blocks has evolved as an optimal anaesthetic technique in many surgical procedures. Many patients report that their pain, itchiness, and discomfort are worse at the donor site than at the graft-treated location. Moreover, infection, dyspigmentation, and emergence of hypertrophic scar tissue can impede donor site healing [1, 2]. Peripheral nerve block has replaced central neuraxial blockade and general anaesthesia in a few upper limb and lower limb surgeries. It has been reported that combination of femoral and sciatic nerve block is reportedly an effective anaesthetic technique for knee surgeries and other soft tissue procedures [3, 4]. Regional anaesthesia at skin graft donor sites significantly reduces narcotic consumption in burns significantly. Regional anaesthesia is less expensive, has fewer side effects, or might lead in shorter hospital stays due to better pain control [5]. The administration of nerve blocks has been used with success for analgesic and anaesthesia purposes in wide range of surgeries with established safety [6-9]. Even though there is a lot of potential and proved uses of nerve blocks in SSG, the preference of centrineuraxial blockade in relation to the depth of blockade and the intensity of nociception is not discussed. We present three cases in which peripheral nerve blocks were performed for harvesting split thickness Skin Graft (SSG).

CASE SERIES

Case-1

A 45-year-old male patient (154 cm; 59 kg; American Society of Anaesthesiologists physical status II) was admitted with alleged history of RTA and sustained injury in the left distal part of Ulna with exposed raw area (Figure – 1).

Figure: 1 The Exposed Raw Area Of The Wound Site

The baseline investigations were normal. We decided to perform the operation under ultrasound-guided peripheral nerve block rather than general or central neuraxial anaesthesia. In order to achieve sufficient anaesthesia for repairing fracture of ulna, we planned to block the brachial plexus and for SSG from left thigh, the femoral and lateral femoral cutaneous nerve (LFCN) blocks were planned.

The patient was shifted to operating room and standard monitors were connected (electrocardiography, pulse oximetry, and non-invasive blood pressure) and 4 L/min oxygen was delivered through facial mask. The patient presented with an initial blood pressure of 110/86 mmHg, heart rate of 76 beats/min, and 100 % oxygen saturation. The patient was sedated with 1 mg of Inj.Midazolam. The patient was placed in the supine position and the thigh was slightly abducted and externally rotated. Ultrasound was used to trace the femoral and lateral cutaneous nerves. Using real-time ultrasound guidance(Sonosite X porte) , a 23 -gauge needle was introduced after infiltrating the skin with local anaesthesia. 15 ml of 0.5% Bupivacaine was slowly injected around femoral nerve and 2 ml of 0.5% Bupivacaine was administered around lateral cutaneous femoral nerve. After injection, lateral thigh sensation was tested using a pin prick test. Absence of nociceptive sensation in response to a prick was observed.

Open reduction and internal fixation were initially performed and the patient obtained sufficient sensory block at the surgical area without further need for analgesia. After fixation of the bone, SSG was planned to be taken from left thigh (Figure – 2). When checked there was complete sensory blockade, patient couldn't sense any pain during incision but developed little pain during the scraping of the skin at the lateral thigh and was managed using adjuvant IV opioids (2micg/kg fentanyl). The surgery lasted 1 more hour and vital signs were stable throughout the operation. A separate block of the upper extremity was effective as the graft area.

Figure 2: Split Skin Graft (Red Triangle) Taken From Left Thigh

Case 2

A 28 year old female with multiple injuries of arms and legs treated with surgical and medical management came with raw area of the right elbow of 7*6 cm size. The patient had a difficult airway with no comorbid illnesses. She was posted for SSG from the left thigh. After a routine premedication of minimal doses of fentanyl and midazolam, the patient was administered a combined femoral and LFCN block as described in the earlier case. A complete analgesia as checked with pinprick was established in the donor site. During the procedure of actual grafting, the patient complained of pain and supplemented with top up doses of 25 mg of ketamine. The grafting later was uneventful and the postoperative period was normal.

Case 3

A 45-year-old male with a history a recent road traffic accident (RTA) was posted for SSG. The patient had a complicated airway with healed tracheostomy scar and no other medical conditions. He was posted from the left thigh for SSG. The graft needed was approximately around 5 * 5 cm. Following a routine premedication with adequate doses of fentanyl and midazolam, the patient was given a combined femoral and LFCN block, as described in the previous case. In the donor site, complete analgesia was established using a pinprick test. There is a complete loss of all modes of sensation including temperature, pain and

touch in the areas During the actual grafting procedure in the thigh, the patient complained of pain and was given top-up doses of 25 mg of ketamine and an additional 25micg of fentanyl. Later, the grafting went smoothly, and the postoperative period was normal.

DISCUSSION

Even though nerve conduction is not completely blocked, the block can be effective in terms of clinical success. This brings up the issue of whether all conducted impulses are perceived. When conduction continues to remain in C-nociceptors, which are only stimulated by more severe nociceptive, pinprick sensation carried by A-nociceptors may be completely absent. Furthermore, repeated activation of C-nociceptors "sensitises the receiving neurons in the dorsal horn, establishing a situation in which a partial block, which initially reduces impulse activity below the perceived minimal" level, later becomes ineffective as the dorsal horn neurons become sensitised. Clinical blocks show that afferent activity still reaches the central nervous system during local anaesthesia in patients who are completely pain-free; that is, all sensation can be lost acutely without blocking [11]**.** Benzon et al [12] have proved that even ibn epidural anaesthesia, there are some missed fibres so that if the intensity of nociception increases, there may be breakthrough pain. The mass of an epineurium (composed of stroma and connective tissue) declines as the nerve exits the spinal cord, but the overall volume raises. Thus, the ratio of nonneural to neural tissue in proximal plexuses is approximately 1:1, 2:1 than in distal plexuses. A peripheral nerve may even contain up to 70% connective tissue [13]. It is possible to do many surgeries with peripheral nerve blocks. But in case of SSG, the possible cutting of nerve fires is likely to produce extensive nociception. This is likely to break through the blocks and cause pain. This is unlikely in intrathecal blocks where the uncovered nerve bundles are soaked in local anaesthetic drug. The most important limitation of the case series is the number of cases which is small and there are no controlled comparisons. The pectineus, the three adductor muscles , gracilis, and the external obturator muscles are all supplied by the obturator nerve (L2-L4). This nerve [14] governs thigh adduction and rotation. Sensory fibres supply a small cutaneous area on the medial thigh. The overlap of obturator nerve supply is theoretically possible. We ensured that the grafting was taken at least 2 cm well within the area of complete loss of sensation in the mid-thigh. There was no difference between the strength of adductor muscles pre and post block which possibly rules out a possible obturator nerve block.All the three cases did not need extensive grafting. The discomfort was wholesome and not in the edges of the incision which confirmed our findings.

CONCLUSION

The effectiveness of peripheral nerve blockade in relieving severe pain during SSG harvesting appears to be diminished. We hypothesise that the intense noxious stimulus will overcome the block characteristics and cause some breakthrough pain. This pain is usually manageable with intravenous narcotics and a low dose of ketamine. This failure is unlikely in intrathecal blocks with strong conduction blockade. We believe that blocks at two levels could help to alleviate the aforementioned issue.

Concept and design: Dr SPS , write up YVK, data collection and case proceedings -SN

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