

Use of Perineural Dexamethasone and Dexmedetomidine (Dex-Dex Combination) in Distal Radial and Median Nerve Blocks to Reduce Postoperative Pain in Hand Surgery: A Case Report

Po-Lai Ho¹, Anyon Chan¹, Gerund Yik-Nang Cheung¹

Abstract

Introduction: Regional anaesthesia is an attractive option for orthopaedic surgery as it offers benefits like improved analgesia, reduced opioid consumption and its associated adverse effects, along with decreased time spent in the post-anaesthetic care unit when compared to general anaesthesia. Nevertheless, its benefits are offset by the limited duration of action which may be solved by the use of adjunct.

Case presentation: The authors present a case of a 45-year-old Chinese who was a chronic smoker and suffered from malunion of right thumb and was scheduled for an elective right thumb osteotomy and fusion with bone graft from iliac crest. He received ultrasound guided distal radial and median nerve block with perineural dexamethasone and dexmedetomidine (dex-dex) as postoperative analgesia, which was not yet mentioned in current literature. His postoperative pain was well controlled, as he reported subjective numbness over territories of the corresponding nerve until 117 hours (approximately five days) after the nerve block. However, the motor block was also prolonged until 45 hours (approximately two days) after regional anaesthesia, and he made full neurological recovery later.

Conclusion: The dex-dex combination proves to be a valuable tool in managing post-operative pain, bearing in mind of the associated prolonged motor block.

Keyword: Dexmedetomidine, Dexamethasone, Nerve block, Analgesia, Case report

Introduction

Regional anaesthesia (RA) is an attractive option for orthopaedic surgery as it offers benefits like improved analgesia, reduced opioid consumption and its associated adverse effects [1]. It can also prevent chronic post surgical pain (CPSP), as suggested by Borghi et al in preventing post-amputation phantom limb pain [2]. However, single shot peripheral nerve block has a short duration and may not outlast the inflammatory process. Recently, use of perineural dexmedetomidine and dexamethasone (dex-dex) has been reported in the literature to lengthen the effect of nerve block [3]. However, its use in distal upper limb nerve block was not mentioned in the literature. Given the lack of information in this field, the authors would like to discuss a case with use of dex-dex in radial and median nerve block resulting in extended postoperative analgesia. Written consent was obtained from the patient for the case to be published, and ethics approval was waived by the New Territories West Cluster Research Ethics Committee. The case report was written according to the CARE (CAse REport) guideline [4].

Case Report

A 45-year-old Chinese man (body weight 71 kg) who enjoyed good past health and smoked ten cigarettes per day for 30 years, presented with malunion of right thumb and was scheduled for an elective right thumb osteotomy and fusion with bone graft from iliac crest. He

claimed to suffer from an injury on duty with near amputation of right thumb and underwent multiple surgeries under RA uneventfully. Preoperatively, he appeared anxious and reported pain over his right thumb with numeric rating scale (NRS) of 8/10, and there was no neurological deficit. Given multiple risk factors of chronic CPSP, the authors suggested to supplement general anaesthesia (GA) with peripheral nerve block (PNB) and adjuncts to prolong analgesia. Risks including peri-operative nerve injury (PNI) were explained, and the patient agreed to proceed.

RA was performed after GA because of patient anxiety. He was intubated after intravenous bolus of 100 mg propofol, 150 µg fentanyl and 35 mg atracurium. Afterward, RA was performed with Pajunk Sonoplex® A50 (5 cm) echogenic needle and ultrasound guidance to look for radial nerve at mid-arm level (Fig. 1) and median nerve at mid forearm level (Fig. 2). Eight mg dexamethasone and 40 µg dexmedetomidine (approximately 0.5 µg/kg) were added to ten mL of 0.5% levobupivacaine to make up a total of 12 ml, from which seven millilitre was injected around the radial nerve and five millilitre was injected around the median nerve. The patient did not complain of pain in the post-anaesthetic care unit (PACU), and was prescribed regular oral paracetamol and tramadol.

Upon follow-up 24 hours after RA, the patient reported weakness in right wrist and finger extension (Medical Research Council or MRC grade 2-3/5) and flexion (MRC grade 4/5). Overall picture suggested deficit in right radial and median nerve, and differential diagnoses included prolonged block due to dex-dex and PNI. An anti-wrist drop splint was applied and Neurobion (Vitamin B complex) was prescribed. Motor block improved upon follow-up at 32 hours after RA with residual weakness in wrist and finger extension (MRC 3/5), while wrist flexion remained mildly affected

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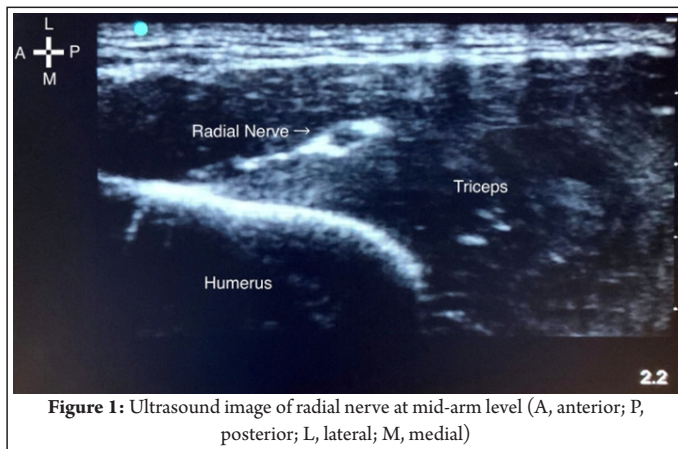


Figure 1: Ultrasound image of radial nerve at mid-arm level (A, anterior; P, posterior; L, lateral; M, medial)

(MRC 4/5). All motor function returned to normal 45 hours after RA.

In terms of sensation, the patient reported subjective numbness over posterior aspect of right forearm and radial half of dorsum and palm, along with radial three and half fingers. This was associated with reduced pinprick and cold sensation, which persisted until 70 hours post-RA. At 95 hours post-RA, subjective numbness receded to dorsal aspect of the thumb and the anatomical snuffbox, which altogether resolved 117 hours after RA. Pain control was excellent, as the patient did not feel pain until the fourth day post-operatively with NRS of 5/10, which was treated with regular pregabalin. Since the patient was informed preoperatively about the expected postoperative course, he did not find the numbness particularly uncomfortable, and he was thankful of the good pain control. In view of the slightly prolonged motor block, nerve conduction study and electromyography were arranged by neurologist to look for subclinical neuropathy (Fig. 3).

Discussion

Perineural dexmedetomidine or dexamethasone were well supported by evidence as means of prolonging RA. Systemic review by Sehmbi et al showed that perineural dexmedetomidine and dexamethasone prolonged sensory blockade of supraclavicular block by 411 and 284 minutes respectively [5]. Still, the duration of single shot nerve block with only one perineural adjunct cannot cover the whole course of postoperative pain which lasts for days. The combined use of both agents were not studied until a randomised control trial from Zhang et al in 2018 which demonstrated a more

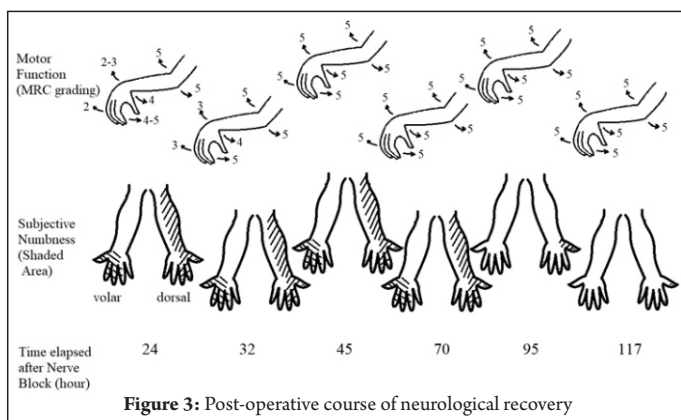


Figure 3: Post-operative course of neurological recovery

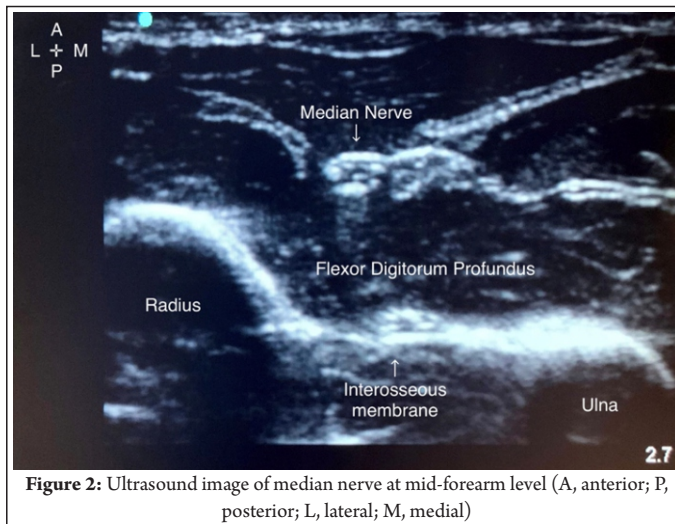


Figure 2: Ultrasound image of median nerve at mid-forearm level (A, anterior; P, posterior; L, lateral; M, medial)

extended analgesia duration and reduced use of postoperative opioid with dex-dex compared to use of either one of the adjuncts [3]. Since then, dex-dex became widely popular among various kinds of surgery like mastectomy (PEC 1 and 2 block) [6], total hip replacement (fascia iliaca block) [7], total knee replacement (adductor canal block and iPACK block) [8], shoulder surgery (interscalene block) [9] and hernia repair (transversus abdominis plane block) [10]. However, the evidence was mainly from case reports with none of them studying how dex-dex affect motor block in detail. In this case report, the patient was followed up in a comprehensive manner with clinical outcomes like motor and sensory block, along with pain score being documented clearly in chronological sequence. Furthermore, this is the first case report mentioning use of dex-dex in distal upper limb nerve block in a patient at risk of CPSP.

There are some unique observations that worth discussion. This patient experienced unexpectedly prolonged motor block after nerve block until the second day. Kassem et al reported a case of Achilles tendon repair who received adductor canal block and popliteal sciatic nerve block, whose motor block lasted for around 24 hours [11]. There are two possible explanations. Firstly, nerves of the distal upper limb were exposed to relatively higher dose of local anaesthetic and adjunct given their lower cross sectional areas. Another possible mechanism could be due to underlying subclinical neuropathy due to microvascular dysfunction from smoking. Indeed, a systemic review from Clair et al suggested that smoking may be associated with a higher risk of diabetic neuropathy in diabetics [12]. Therefore, case

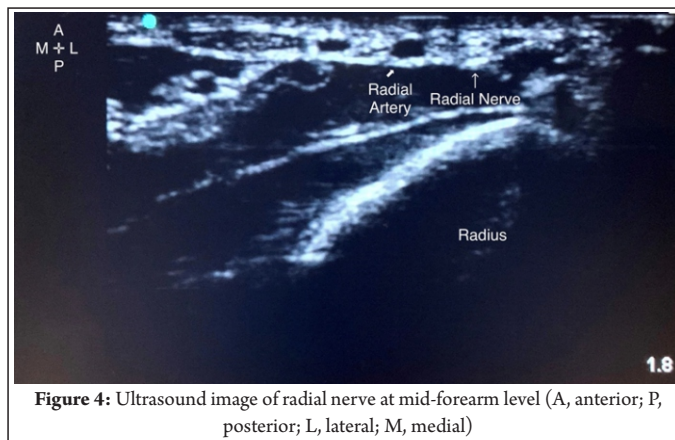


Figure 4: Ultrasound image of radial nerve at mid-forearm level (A, anterior; P, posterior; L, lateral; M, medial)

selection is important in order not to complicate the clinical picture in those who are vulnerable to PNI, although the chance of PNI is relatively low in this case as distal nerve contains less neural tissues and more connective tissue compared to proximal nerve [13]. Another lesson to learn is that nerve with less motor innervation should be chosen when dex-dex is considered, as in this case a mid-forearm approach is more advisable (Fig. 4) in order to facilitate early mobilisation.

Dex-dex prolonged analgesic duration till the fifth day post-operatively, which is closer to experience from other centres. This offers several potential benefits. Multiple review articles have been published regarding risk factors of CPSP, which includes pre-operative pain and anxiety, orthopaedic surgery and poorly controlled post-operative pain [14-16]. At the same time, smoking was noted to be associated with more severe post-operative pain [17]. All of these place the patient at high risk of difficult post-operative pain control which impedes postoperative rehabilitation. In a case series from Otsuka et al, continuous median (or ulnar) nerve blockade for five to 12 days by means of a perineural catheter at the forearm achieved good postoperative pain control and range of movement in four patients undergoing hand surgery [18]. With the extended duration of action of dex-dex combination, it may eventually obviate the use of perineural catheter in continuous nerve block, along with its attendant risks like infection, local anaesthetic toxicity and catheter dislodgement.

The generalisability of this case report is limited by the fact that only one patient was included, and there was no control case to compare the duration of regional block without using dex-dex. Furthermore, the optimal doses of perineural dexamethasone and dexmedetomidine are yet to be defined, requiring additional research.

Conclusion

Combined use of perineural dexmedetomidine and dexamethasone is shown to prolong the analgesic duration of distal upper limb nerve block up to five days. This case report sheds light on the potential of dex-dex combination as an alternative to perineural catheter in postoperative pain management given its shortcomings. Nevertheless, one should be cautious about its side effects, especially protracted motor block. Further clinical trials may provide better understanding of dex-dex combination as adjuvants in regional anaesthesia which will likely serve as an effective component of Enhanced Recovery After Surgery (ERAS) strategies in a diversity of surgical procedures.

Clinical Message

Perineural dex-dex can prolong the analgesic duration of distal upper limb nerve block up to five days, but one should beware of prolonged motor block.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

- Kettner, S.C.; Willschke, H.; Marhofer, P. Does regional anaesthesia really improve outcome? *Br. J. Anaesth.* 2011, 107, i90–i95.
- Borghi B, D'Addabbo M, White P. The use of prolonged peripheral neural blockade after lower extremity amputation: the effect on symptoms associated with phantom limb syndrome. *Anesth Analges* 2010; 111: 1308–15.
- Zhang P, Liu S, Zhu J, Rao Z, Liu C: Dexamethasone and dexmedetomidine as adjuvants to local anesthetic mixture in intercostal nerve block for thoracoscopic pneumonectomy: a prospective randomized study. *Reg Anesth Pain Med.* 2019, 44:10.
- Riley DS, Barber MS, Kienle GS, Aronson JK et al. CARE guidelines for case reports: explanation and elaboration document. *J Clin Epidemiol.* 2017 Sep;89:218-235.
- Sehmbi H, Brull R, Ceballos KR, Shah UJ, Martin J, Tobias A, Solo K, Abdallah FW. Perineural and intravenous dexamethasone and dexmedetomidine: network meta-analysis of adjunctive effects on supraclavicular brachial plexus block. *Anaesthesia.* 2021 Jul;76(7):974-990.
- Chitneni A, Hasoon J, Urits I, Viswanath O, Kaye AD, Eskander J. Synergistic Effects of Dexamethasone and Dexmedetomidine in Extending the Effects of Pectoral I and Pectoral II Blocks for Postoperative Analgesia Following Total Mastectomy with Lymph Node Dissection. *Clin Pract.* 2021 Mar 30;11(2):190-192.
- Noor NA, Urits I, Viswanath O, Kaye AD, Eskander J. Fascia Iliaca Block Successfully Prolonged With Dexmedetomidine and Dexamethasone for Pain Control in a Patient Undergoing Total Hip Arthroplasty. *Cureus.* 2020 Oct 11;12(10):e10897.
- Herman J, Urits I, Eskander J, Kaye A, Viswanath O. Adductor Canal Block Duration of Analgesia Successfully Prolonged With Perineural Dexmedetomidine and Dexamethasone in Addition to IPACK Block for Total Knee Arthroplasty. *Cureus.* 2020 Sep 21;12(9):e10566.
- Noor N, Urits I, Viswanath O, Kaye A, Eskander J: Synergistic effect of perineural dexamethasone and dexmedetomidine (Dex-Dex) prolong Analgesic effect of a preoperative interscalene block. *Cureus.* 2020, 12:9473.
- Herman J, Urits I, Hasoon J, Viswanath O, Kaye AD, Urman RD, Eskander JP: Synergistic effect of local dexamethasone and dexmedetomidine (Dex-Dex) in extending the analgesic effect of a transversus abdominis plane block prior to inguinal hernia repair. *J Clin Anesth.* 2020, 62:109703.
- Kassem H, Urits I, Viswanath O, Kaye AD, Eskander JP. Use of Dexmedetomidine With Dexamethasone for Extended Pain Relief in Adductor Canal/Popliteal Nerve Block During Achilles Tendon Repair. *Cureus.* 2020;12(12):e11917.

12. Clair C, Cohen MJ, Eichler F, Selby KJ, Rigotti NA. The Effect of Cigarette Smoking on Diabetic Peripheral Neuropathy: A Systematic Review and Meta-Analysis. *J Gen Intern Med.* 2015;30(8):1193-1203.
13. Moayeri N, Bigeleisen PE, Groe GJ. Quantitative architecture of the brachial plexus and surrounding compartments, and their possible significance for plexus blocks. *Anesthesiology.* 2008;108:299–304.
14. Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: risk factors and prevention. *Lancet.* 2006 May 13;367(9522):1618-25.
15. Fregoso G, Wang A, Tseng K, Wang J. Transition from Acute to Chronic Pain: Evaluating Risk for Chronic Postsurgical Pain. *Pain Physician.* 2019 Sep;22(5):479-488.
16. Fletcher D, Stamer UM, Pogatzki-Zahn E, Zaslansky R, Tanase NV, Perruchoud C, Kranke P, Komann M, Lehman T, Meissner W; euCPSP group for the Clinical Trial Network group of the European Society of Anaesthesiology. Chronic postsurgical pain in Europe: An observational study. *Eur J Anaesthesiol.* 2015 Oct;32(10):725-34.
17. Armstrong AD, Hassenbein SE, Black S, Hollenbeak CS; Interdisciplinary Pain Team. Risk Factors for Increased Postoperative Pain and Recommended Order set for Postoperative Analgesic Usage. *Clin J Pain.* 2020 Nov;36(11):845-851.
18. Otsuka T, Okamoto H, Mizutani J, Goto H, Sekiya I. Continuous Peripheral Nerve Blocks for Early Active Mobilization after Hand Surgery: Four Case Reports. *J Hand Surg Asian Pac Vol.* 2018 Sep;23(3):419-423. doi: 10.1142/S2424835518720281. PMID: 30282533.

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