Characterization of rebound pain following peripheral nerve block.

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Background

Peripheral nerve blockade is routinely performed for perioperative analgesia/anaesthesia in patients undergoing surgery. When the block has resolved, patients can experience "rebound" pain which has been quantified as the difference in pain score reported by a patient when the block is effective vs that reported when the block has resolved.[1] Such pain has been attributed simply to nociceptive input associated with surgical trauma/ inflammation which is "revealed" once the neural blockade has resolved.[2] The etiology of this "rebound pain" may be more complex; the perineural injection of neurotoxic anesthetics on heat-specific pain fibers is a possible mechanism.[3] Bupivacaine up-regulation of cyclooxygenase 2 gene expression and resultant increased prostaglandin E2 production at the surgical site may also contribute to the phenomenon of rebound pain after effects of the LA have dissipated.[4]

Rebound pain (RP) after peripheral nerve block (PNB) may represent a manifestation of hypersensitivity and offer an accessible clinical model suitable for examining sensitized states such as occur with pain persistence after surgery.

The objectives of this study were to quantitatively charaterise post-PNB rebound pain in patients undergoing upper limb surgery for orthopaedic injury and, in particular, its associations with patient factors, preoperative stress (estimated using salivary cortisol concentration) and gut microbiome diversity (the latter to be reported separately).

Methods:

With institutional ethical approval and having obtained written informed consent from each, 20 ASA 1-3 patients (age 18-80) undergoing surgical fixation of distal radius fracture under axillary brachial plexus block (ABPB) were enrolled into this prospective observational study. Patient self-report of pain and analgesic consumption was elicited [preoperative pain diary; Short Form McGill Pain Questionnaire (SF-MPQ, first 24 hours postoperatively); pain diary (for 1 week postoperatively) and one month follow up telephone call)]. Neurophysiological measurements were made pre- and postoperatively, namely pain perception (PPT) and tolerance thresholds (PTT). Preoperative salivary cortisol level was measured. Food Frequency Questionnaire (FFQ) was completed by each participant and faecal samples were collected for GMB phylogenetic tree generation and alpha and beta diversity analysis.

	Mean (SD) / n
Age	50,80 (13,34)
Gender F/M	13 / 7
ASA I/II	11 / 9
Weight (kg)	75,44 (15,86)
Surgery PL/KW	16 / 4
Block failure	0

Table 1. Demographic data. PL distal radius plate; KW K-wiring

Results:

Twenty patients were enrolled (**Table 1**). The mean (SD) Numeric Rating Scale score (NRS, 0-10) was 4.5 (2.59) preoperatively (the day before surgery). Seventeen out of 20 patients experienced RP after ABPB resolution with a mean (SD) Rebound Pain Score of 5.4 (3.11). Patients' median daily pain scores for the 1st postoperative week are shown in **table 2**. Mean (SD) analgesic consumption (opioid equivalent, **table 3.**) for the first postoperative week was 253.69 mg (107.04). Pre- and postoperative PPT and PTT were not different amongst patients with or without RP, nor was the adherence to analgesia protocol. Also there was no correlation between Rebound Pain Score and morning salivary cortisol levels (Correlation Coefficient -0.11). According to SF-MPQ RP is primarily nociceptive but hypersensitivity due to neuronal changes may contribute. FFQ evaluation, and faecal sample analysis are under progress.

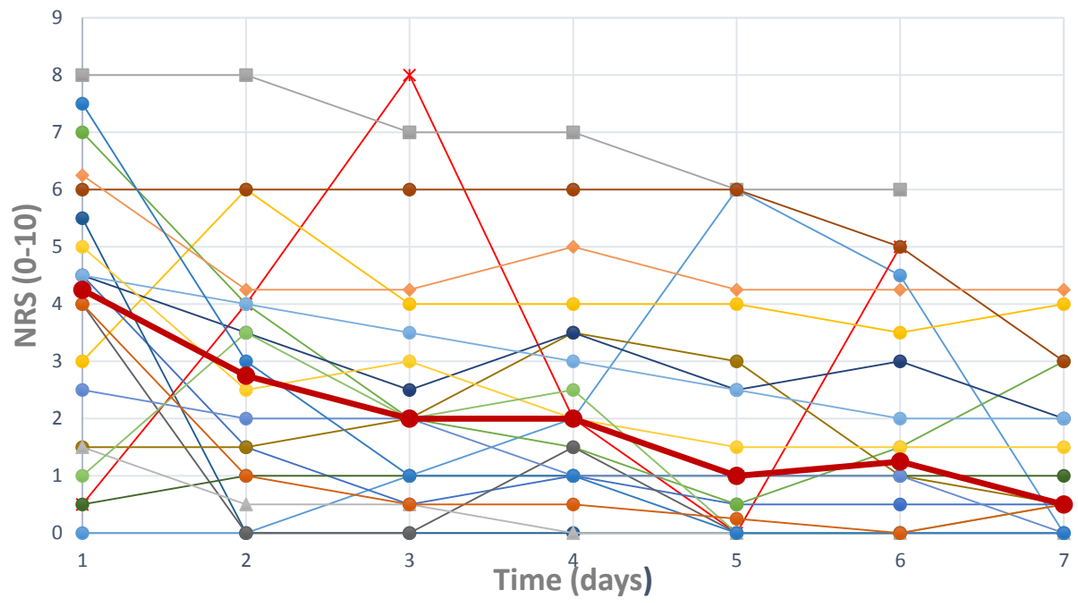

Table 2. Patients' median daily pain scores. Thick line: median pain score of patient 1-20. Day 1: day of surgery.

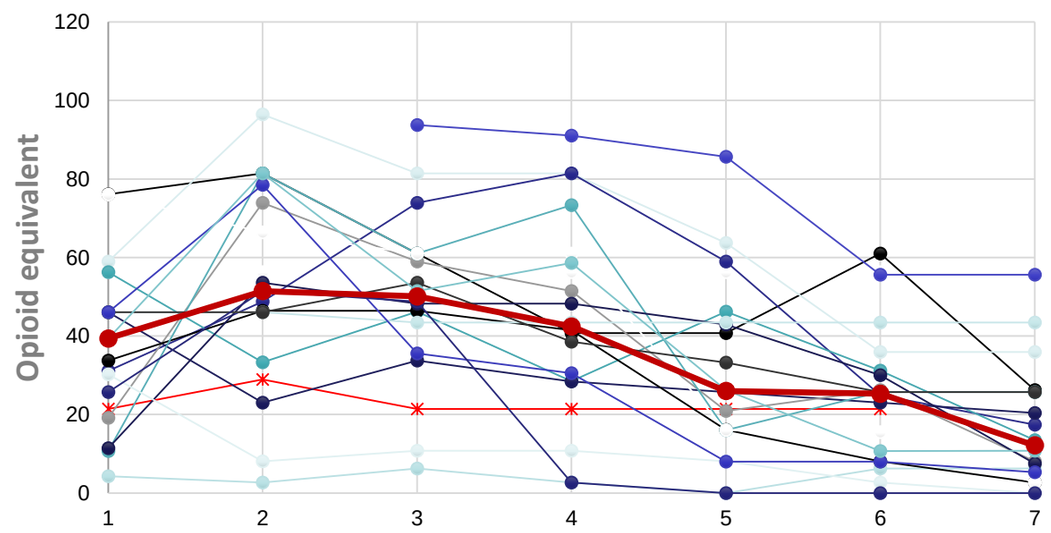

Table 3. Patients' daily analgesic consumption. Thick line: median analgesic consumption of patient 1-20. Day 1: day of surgery.

Conclusion

Rebound pain is mainly nociceptive in origin but affective and neuronal components cannot be excluded. The magnitude of post-PNB rebound pain varies greatly amongst patients after upper limb surgery. Preoperative selection of high risk patients and postoperative treatment of severe rebound pain can be challenging.

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