The Impact of Peripheral Nerve Blocks on the Quality of Care Following Ankle Fracture Surgery

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INTRODUCTION:

Ankle fractures are common orthopaedic injuries, often requiring operative intervention to restore joint stability, improve alignment, and reduce the risk of post-traumatic ankle arthritis. However, ankle fracture surgeries (AFS) are associated with significant postoperative pain, typically requiring postoperative opioid analgesics. In addition to putting patients at risk of opioid dependence, the adverse effects of opioids include nausea, vomiting, and altered mental status which may delay recovery. Peripheral nerve blocks (PNB) offer notable benefits to the postoperative pain profile when compared to general anaesthesia (GA) or spinal anaesthesia (SA) alone and may help improve recovery. For AFS, commonly used blocks include the popliteal (Figure 1) and saphenous nerve blocks. The primary objective of this quality improvement (QI) study was to increase PNB administration for AFS at our institution to above 50% by January 2021.

Figure 1. Popliteal block with local anaesthetic (LA) already injected.

METHODS:

A root cause analysis was performed by a multidisciplinary team to identify barriers for PNB administration. Four interventions were chosen & implemented: recruitment and training of expert anesthesiologists in regional anesthesia techniques, procurement of additional ultrasound machines, implementation of a dedicated block room with training to create an enhanced learning environment, and the development of an educational pamphlet for patients outlining strategies to manage rebound pain, instructions around the use of oral multimodal analgesia, and the potential for transient motor block of the leg.

The primary outcome was the percentage of patients who received PNB for AFS. Secondary outcome measures included total hospitalization length of stay (LOS), post-anesthesia care unit (PACU) and 24-hour postoperative opioid consumption (mean oral morphine equivalent [OME]), proportion of patients requiring opioid analgesic in PACU, and proportion of patients experiencing post-operative nausea and/or vomiting (PONV) requiring antiemetic in the PACU. Thirty-day post-operative emergency department (ED) visits were collected as a balance measure.

RESULTS:

The groups receiving PNB and not receiving PNB included 78 & 157 patients, respectively, with no significant differences in age, gender, or ASA class between groups. PNB administration increased from less than 10% to 53% following implementation of the improvement bundle (Figure 2). Mean total hospital LOS did not vary significantly across the PNB and no PNB groups (1.04 days vs. 1.42 days, $P = 0.410$). Both mean PACU and mean 24-hour postoperative opioid analgesic consumption was significantly lower in the PNB group compared to the no PNB group (OME in PACU 38.96mg vs. 55.42mg [$P = 0.001$]; 24-hour OME 44.74mg vs. 37.71mg [$P = .008$]). A greater proportion of patients in the PNB group did not require any PACU opioid analgesics compared to those in the no PNB group (62.8% vs. 27.4%, $P < 0.001$). The proportion of patients experiencing PONV and requiring antiemetic in the PACU did not vary significantly across groups. Thirty-day postoperative ED visits did not vary significantly across groups.

Figure 2. Statistical process control chart for rate of PNB performed for AFS from April 2016 to January 2021. Rate of PNB is indicated on the y-axis, and the time point of data collection on the x-axis. The average rate of PNB administration was measured monthly (indicated by the dotted line), as well as during the first, middle, and last third of the study period (indicated by the solid line). The upper and lower control limits are indicated by the dashed lines. Interventions were implemented in a stepwise manner throughout the study period as resources became available, as indicated with arrows.

DISCUSSION AND CONCLUSION:

Reduced need for postoperative opioid analgesics following AFS can be attributed to the benefits offered by PNBs when compared to GA or SA alone. By performing a root cause analysis and implementing a multidisciplinary, patient-centered QI bundle, we achieved significant increases in PNB administration for AFS. As a result, there were significant improvements in the recovery of patients following AFS, specifically reduced use of postoperative opioid analgesia. This multi-faceted approach provides a framework for an individualized QI approach to increase PNB administration and achieve improved patient outcomes following AFS.

The use of PNB led to a significant reduction in opioid consumption, as reflected in the smaller proportion of patients requiring any opioid analgesia, as well as the mean oral morphine equivalent dose of opioid analgesics consumed. Given the reduced need for post-operative opioids following AFS with PNB, decreased LOS was expected with patients able to

ambulate and begin rehabilitation sooner following their operation. The LOS was found to be on average 0.40 days shorter in the PNB group compared to the no PNB group, however, this finding was not statistically significant. A larger sample size may be required to elucidate any significant differences in LOS following AFS with and without PNB. Regardless, the reduced need for postoperative opioid analgesics following AFS with PNB highlights the benefits offered by PNB, especially from a patient safety perspective.