Use of a Nanotechnology Analgesic Patch to Improve Clinical Outcomes in Ambulatory Total Knee Arthroplasty

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BACKGROUND

- It is well established that a multimodal analgesia including regional anesthesia facilitates recovery in surgical patients[1] and that pain, opioid and PONV prolong hospital length of stay following total unilateral primary knee arthroplasty (TKA).[2]
- Recent advancement in nanotechnology-based device (NBD) suggested that NBD compared to standard of care may be interesting to control pain following TKA. [3] This prospective study was conducted to assess the role of an active NBD compared to sham device in patients undergoing ambulatory TKA.

METHODS

- **Study Design**: Randomized placebo design comparing the safety and effectiveness of a nanotechnology-based device (NBD) versus a placebo device (same device without capacitors) placed in the recovery room after ambulatory TKA perform by 2 surgeons using the same standardized peri-operative protocol at 2 UPMC hospitals.
- This prospective, randomized, sham-controlled clinical trial evaluated the efficacy of the postoperative application of an active NBD or placebo (sham), in opioid-naive patients receiving regional analgesia for ambulatory total TKA.
- A standardized multimodal analgesia protocol, including an adductor canal block administered preoperatively was used and surgery was performed under spinal anesthesia and sedation
- Patients were randomized in 2 groups: an active NBD or a sham group according to the type of device placed immediately after surgery in the recovery room. (Figure 1)
- The patients were asked to wear NBD for 12 hours per day for 2 weeks.
- Outcomes included pain at rest and with movement, opioid consumption, postoperative nausea and vomiting (PONV), and length of stay in the hospital (LSH).

RESULTS

- A total of 156 patients scheduled for primary, unilateral TKA were enrolled
- The use of active NBD was associated with statistically significant outcomes (Figures 2 & 3)
  - **26% reduction** in opioid consumption
  - **14% reduction** in average pain-at-rest scores on postoperative week 1
  - **13% reduction** in pain scores at 24-hours postoperatively
  - **30% reduction** in PONV
  - **41% fewer** antiemetic use
  - **19% reduction** in length of hospital stay

Figure 1: Application of active or sham NBD

Figure 2. Timeline of Primary and Secondary Endpoints by Treatment Group

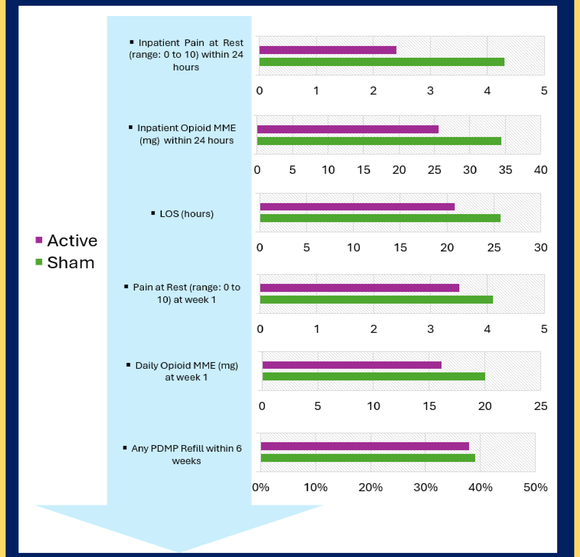
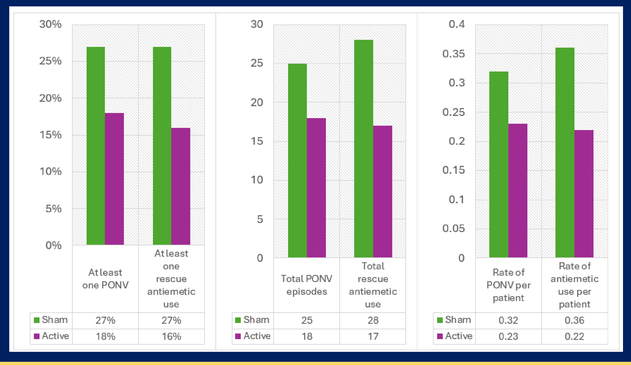


Figure 3. Postoperative nausea and vomiting (PONV) and rescue antiemetic use



DISCUSSION

- More TKA are being performed are scheduled as ambulatory surgery . [2]
- This clinical trial indicates that the NBD reduces pain, opioid requirement, PONV and antiemetic use. and the length of stay following primary, unilateral ambulatory TKA PONV and antiemetic use.
- There is an increase interest in non-pharmacological analgesics therapies In the current opioid crisis .
- Future larger clinical trials investigating the role of the NBD as a scalable tool to reduce opioid use and improve surgical outcomes are required.

REFERENCES

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