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ADVERTISING FEATURE

Key Factors in Migration of Total Knee Arthroplasty to Outpatient Settings

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Landscape of Outpatient Knee Replacement Procedures

Total knee arthroplasty (TKA) is among the most common procedures performed in the United States, with incidence projected to increase over time from 429 to 725 per 100,000 population by 2050, a more than 100 percent increase in the number of procedures.[1] Alongside the increase in number of procedures, enhanced patient recovery pathways, and value-based care and bundled payment initiatives have allowed for the migration of TKA procedures from inpatient to outpatient settings.[2,3] Migration accelerated in 2018 when the Centers for Medicare & Medicaid Services (CMS) removed TKA from the inpatient-only list[4] and was expedited in 2020 when CMS provided provisions for TKA reimbursement in the ambulatory surgery center (ACS) setting. However, the COVID-19 pandemic has had a profound effect on all hip and knee arthroplasty practices, with over 70% of surgeons canceling elective procedures.[5] In the United States, an estimated 30,000 primary and 3,000 revision hip and knee arthroplasty cases were canceled each week of the COVID-19 restrictions.[6] This halt in elective surgeries has led to challenging times for patients and surgeons alike. A survey showed that, while over 90% of patients whose procedures had been canceled due to Covid-19 planned to reschedule the surgery as soon as possible, they had new found anxiety over the inpatient setting.[7]

Considering the backlog of cases and lack of availability in the inpatient setting, an outpatient center and/or ASC may be a viable option to perform a TKA in a safe and optimal manner. Several studies have shown similar or improved outcomes and expedited discharges in an ASC with cost savings compared to an inpatient setting.[8-11] Prospective trials have also demonstrated that the majority of complications associated with a TKA occur outside the procedural admission.[12] The American Association of Hip and Knee Surgeons (AAHKS) have concluded that outpatient joint replacements "can be appropriately performed in an outpatient setting with safe discharge the day of surgery" in the appropriately optimized patient and surgical setting.[13]

Pain Management as a Key Driver in Shifting to Outpatient Surgery

One of the chief concerns of both surgeons and patients, particularly in the outpatient setting, is the postsurgical pain associated with a TKA. Several studies have shown that inadequate pain control has led to higher readmission rates, time to discharge, and time to ambulation, which all have demonstrated cost implications.[14] In a large retrospective analysis of same-day surgeries (n = 20,817), Coley et al. observed that pain was the predominant reason for unexpected hospital admission or readmission post procedure. In addition, the mean cost per patient for follow-up management of inadequately controlled pain after outpatient surgery was estimated to be US $1,869 per visit.[15]

Therefore, opioids have become a mainstay for primary pain control for total joint arthroplasty; however, there are significant adverse events. In addition, the use of opioids preoperatively and intraoperatively has been associated with the requirement of paradoxically increased opioids postoperatively due to, so-called, opioid-induced hyperalgesia.[16] To further emphasize the negative consequences associated with the effects of opioids, Brummett et al. found that 6% of patients continued to use opioids 90 days after a minor surgery and concluded that prolonged opioid use is the most common complication after surgery.[17] To counter the effects of opiods, multimodal analgesia has been established as the optimal regimen for postsurgical pain management, as a means to provide superior pain relief.[18,19] The adverse events and economic impact associated with the over prescription of opioids when a multimodal is present has been well described.[19,20-29]

As detailed in the AAHKS position statement, successful outpatient surgery requires a carefully selected and medically optimized patient as well as attention to pain management through the surgical care. Multimodal enhanced recovery pathways have been shown to be successful in reducing the reliance on opioids as a monotherapy for controlling postsurgical pain.[13]

The potential for a patient to experience opioid-free analgesia and anesthesia, careful applications of regional anesthesia techniques and multimodal agents can be implemented to optimize a total knee procedure in an enhanced recovery pathway, which includes presurgical patient education, realistic expectations, and an individualized multimodal outpatient setting.[18, 30, 31] Van Horne et al. published an enhanced recovery pathway with a triple aim approach, which includes presurgical patient education, realistic expectations, and an

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individualized multimodal opioid-sparing pain management protocol.[32]

Regional Anesthesia Techniques as a Cornerstone of Opioid-minimized Pain Management

The scope of regional anesthesia includes spinal, epidural, and nerve blocks. Scholsser et al. found that high doses of opioids within the multimodal pain management pathway lead to compromised patient outcomes with the increased risks associated.[33] Additionally, with the increased risks for health care providers and patients associated with airway manipulation, the preferences for a combination of regional anesthesia has increased.[34]

Local infiltration anesthesia (LIA) has become a standard practice of total hip and total knee arthroplasty. In a recent survey of the AAHKS members, periarticular injections were used by 80.3%.[35] In a prospective randomized trial, liposomal bupivacaine showed significant reduction of pain and opioid use, with 10% of patients remaining opioid free through 72 hours after the surgical procedure.[36] Additionally, Dysart et al. showed patients who received liposomal bupivacaine were 16% less likely to require opioid rescue within the first 24 hours of a TKA and were found to be ready for earlier discharge.[31]

In addition to LIA, peripheral nerve blocks have improved enhanced recovery pathways as well. Hebl et al. found a perioperative analgesic regimen emphasizing peripheral nerve blocks for patients undergoing total hip and knee arthroplasty had significant improvements in perioperative outcomes and fewer adverse events.[37]

Advances in Regional Anesthesia Techniques

The adductor canal block (ACB) has been an effective adjunct for pain relief after TKA, particularly in the same-day setting after TKA due to its motor sparing advantage over femoral nerve block. Greenky et al. found that intraoperative surgeon administered adductor canal blockade is equivalent to an anesthesiologist administered adductor canal block with respect to pain, opioid consumption, range of motion, patient satisfaction, or short-term functional outcomes.[38] The study highlights an opportunity for surgeons to provide adequate pain relief where a regional anesthesiologist may not be available. Although this may represent a new, safe, and cost-effective approach for surgeons who lack regional anesthesiologist services, larger studies must be done to demonstrate safety and efficiency of the technique. Several studies have shown a potential synergistic effect of the block in addition to a pericapsular injection.[39] Zhou et al. compared patients with an ACB to patients with an ACB and LIA and found patient satisfaction and pain relief was higher in the combined approach.[40] To highlight the benefits, a meta-analysis of studies found an improvement in analgesia and faster functional rehabilitation in patients who underwent a TKA with an ACB combined with an LIA compared to an ACB alone.[41] Regional techniques for the knee can also be translated to the shoulder using LIA and interscalene nerve blocks.

Arthroscopic rotator cuff repair and shoulder arthroplasty have been associated with excellent clinical outcomes; however, clinically significant postsurgical pain continues to be a challenge. With the advent of a multimodal approach to shoulder surgery and with the addition of a long-acting interscalene block, the postoperative burden of clinically significant pain has been diminished. A randomized, controlled trial by Sethi et al. demonstrated that liposomal bupivacaine infiltrated into the surgical site as a field block in addition to a standard interscalene block reduced total narcotic consumption of a five-day period by 64%.[42] Similarly, a randomized, controlled trial by Sabesan et al. demonstrated that patients who received liposomal bupivacaine LIA had comparable narcotic use, pain scores, fewer complications, and lower cost when compared to a continuous interscalene block.[43] Patel et al. showed a liposomal bupivacaine interscalene nerve block demonstrated significant improvement in pain scores, opioid consumption, and percentage of opioid-free patients over 48 hours after surgery versus placebo.[44]

More recently attention has turned to the use of preemptive, presurgical techniques to reduce pain and opioid use associated with knee arthroplasty. Novel platforms, such as cryoneurolysis, have been applied to TKA to reduce pain and opioid use. Dasa et al. found that patients undergoing cyroneurolysis of the infrapatellar branch of the saphenous nerve in addition to a multimodal pathway including regional anesthesia preoperatively had a reduced length of stay (LOS) versus control and also required 45% less opioids during the first 12 weeks after surgery. This intervention group also demonstrated significantly less pain and pain interference in follow-up.[45]

Percutaneous freezing of sensory nerves prior to surgery is another step towards the opioid-minimization pathway. In a motor-sparing approach, the sensory nerves undergo Wallerian degeneration with application of the cooling element and return to function over a period of time as the nerves regenerate to the original locations. Further clinical trials are ongoing with the combination of cryoneurolysis and multimodal pathway, including regional anesthesia techniques, with the hope of further advancing enhanced recovery pathways. The ability to apply the longest lasting sensory block with cryoneurolysis of sensory nerves for TKA pain management may significantly alter the recovery landscape postoperatively and further facilitate the migration of TKA to an outpatient setting.

FIGURE 1. iovera° device.

The potential for opioid-free analgesia and opioid-free anesthesia in many surgical procedures holds the promise of improved care for our patients, the common goal of surgeons and anesthesiologists alike.

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