



# Which Anesthesia Should Be Used for Total Knee Arthroplasty (TKA), General or Neuraxial?

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## Abstract

Total knee arthroplasty (TKA) considered to be one of the most common orthopedic surgical procedures performed worldwide. Anesthesia techniques had been developed as part of the development of the TKA surgical techniques over the past decades. Regional anesthesia started to take the upper hand as the dominant form of anesthesia from the general anesthesia which was considered as the standard practice in the past. It had been shown in many studies the probability of reducing intra-operative blood loss, length of hospital stays, patient outcomes and mortality rates when regional anesthesia was used instead of general anesthesia.

**Keywords:** TKA; General; Neuraxial; Anesthesia

## Introduction

Total knee arthroplasty (TKA) became one of the most commonly performed orthopedic surgical procedures in the United States, with an expecting rise in TKA utilization to continue in the future [1,2]. TKA for treating end-stage knee osteoarthritis, considered to be a safe and highly effective procedure for improving patient's mobility and overall life quality [3,4]. To improve patients' satisfaction, the anesthetic techniques for TKA have advanced over time for the sake of improving procedure outcomes as well as to reduce complications and in hospital length of stay [5]. Total knee arthroplasty is amenable to various anesthesia techniques, the choice of anesthetic technique for TKA depends on several factors, including anticoagulation status, preoperative cardiopulmonary health, patient preferences, and institutional workflow factors [6].

### General anesthesia (GA)

GA has been the dominant form of anesthesia utilized for TKA in the United States [7], however, in general, postoperative nausea, vomiting, and delirium were reported more frequently with GA [7] it is also associated with reduced perioperative tissue oxygen tension as well. [8]

### Neuraxial anesthesia (NA)

While avoiding the common complications reported with GA, either spinal or epidural anesthesia, may be prone to rare but devastating complications such as spinal hematoma, epidural

abscess, and nerve injury [9], its administration may require technical procedural skill and it is associated with a failure rate of approximately 4%, necessitating conversion to general anesthesia [10]. On the other hand, NA has less incidence of postoperative pain, nausea, and vomiting as well as decreasing time to discharge, pulmonary and cardiovascular-related complications as reported in many studies [11,12].

### Which to use, general or neuraxial anesthesia?

Unlike major abdominal or cardiac surgeries, where GA considered the gold standard practice, major lower extremity orthopedic surgeries like TKA can be performed with either NA or GA, where many studies examining the possible differences in perioperative morbidity and mortality between both techniques for total joint arthroplasty suggest largely equivalent results [13,14]. There is also a lack of agreement among the anesthesia community as to the superiority of NA versus GA, as older data have tended to be contradictory [15]. However, more recent data, particularly from analyses of large patient databases and systematic reviews, may lean toward a preference for spinal anesthesia. Memtsoudis et al. [16] performed an analysis of more than 380,000 total knee and hip arthroplasty procedures and verified that general anesthesia was associated with an almost twofold increase in 30-day mortality. Basques et al. [17] performed a similar study using the American College of Surgeons database and found that GA was associated

with a 25% increase in adverse events compared with spinal anesthesia in the studied population. Pugely et al. in a retrospective study including 6,030 patients received spinal anesthesia and 8,022 patients received GA. They reported a lower rate of wound infection, blood transfusions, and overall complications as well as a decrease in the length of surgery and hospital LOS in the spinal anesthesia group compared to the GA group [18]. An association between NA and a decrease in deep vein thrombosis, pulmonary embolism, transfusion requirement, pneumonia, and respiratory depression were found in a systematic review by Rodgers et al included 141 trials and 9,559 patients, they also reported that the overall mortality of patients with NA was about one-third of those who received GA [19]. In a study by Stundner et al. comparing GA and NA for bilateral TKA, improved outcomes were identified in the neuraxial group, they also reported that Patients in the NA group required fewer blood transfusions and showed lower, but nonsignificant, the incidence of in-hospital mortality, 30-day mortality, and overall complications [20]. In a Systematic review by Johnson et al comparing GA to NA as regards the incidence of deep vein thromboses, they found that neuraxial anesthesia was associated with lower risk of deep vein thrombosis (RR 0.51; 95% CI 0.41–0.62, nine studies) and pulmonary embolism (RR 0.36; 95% CI 0.22–0.60, seven studies), this was found in patients who did not receive chemical antithrombotic prophylaxis, However, there were no statistically significant differences in venous thromboembolic events rates in those studies that included chemical antithrombotic prophylaxis in patient-care protocols [21]. Other large database studies support the valuable effect of spinal anesthesia on morbidity, mortality, and length of stay (LOS) [22,23].

### However, on the contrary

No evidence regarding the effect of anesthetic technique on mortality, cardiovascular morbidity, or the occurrence of deep vein thrombosis, pulmonary embolism, blood loss, or duration of surgery found in a meta-analysis by Macfarlane et al. of 28 randomized trials involving 1,538 patients undergoing TKA, However, RA was found to reduce post-operative pain and LOS [15]. A meta-analysis including literature from 1966 to 2008, involving 21 randomized control trials of both THA and TKA patients, no reduction in operating time, intraoperative blood loss, mortality, or LOS was found when comparing RA to GA specifically in the TKA patients [24]. Regarding the use of epidural anesthesia for postoperative pain control, it was found to have equivalent pain scores and morphine consumption up to 48 hours postoperatively as compared to peripheral nerve block (PNB) when examined in a meta-analysis of eight RCTs comparing epidural anesthesia with (PNB) in 510 patients, 464 of whom underwent TKA. However, the use of epidural anesthesia was associated with a higher incidence of hypotension and urinary retention, they concluded that PNB provides comparable pain relief with a more satisfactory adverse-effect profile [25].

### Conclusion

Utilizing neuraxial anesthesia in total knee arthroplasty seems to be equally effective without increased morbidity risk when compared with general anesthesia with the advantage of

less post-operative pain, nausea, vomiting, and length of hospital stay. However, there is limited evidence to suggest that neuraxial anesthesia is associated with better intermediate and long-term outcomes. The need for stronger clinical outcomes related studies is mandatory to drive a change in TKA anesthesia practice.

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