

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

Ahmed A Khalifa FRCS*

Department of orthopaedic and traumatology, Qena faculty of medicine and its university hospital, Egypt

*Corresponding author: Ahmed A Khalifa, Assistant lecturer and specialist of orthopaedic and traumatology, Qena faculty of medicine and its university hospital, Egypt

Received: 📅 May 23, 2019

Published: 📅 June 03, 2019

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.

References

- Lubowitz JH, Appleby D (2011) Cost-effectiveness analysis of the most common orthopedic surgery procedures: knee arthroscopy and knee anterior cruciate ligament reconstruction. *Arthroscopy: The journal of arthroscopic & related surgery* 27(10): 1317-1322.
- Mehrotra C, Remington PL, Naimi TS, Washington W, Miller R (2005) Trends in total knee replacement surgeries and implications for public health, 1990–2000. *Public Health Reports* 120(3): 278-282.
- Ethgen O, Bruyere O, Richey F, Dardennes C, Reginster J (2004) Health-related quality of life in total hip and total knee arthroplasty: a qualitative and systematic review of the literature. *JBJS* 86(5): 963-974.
- Harris WH, Sledge CB (1990) Total hip and total knee replacement. *New England Journal of Medicine* 323(11): 725-31.
- Macario A, Weinger M, Carney S, Kim A (1999) Which clinical anesthesia outcomes are important to avoid? The perspective of patients. *Anesthesia & Analgesia* 89(3): 652.
- Turnbull ZA, Sastow D, Giambrone GP, Tedore T (2017) Anesthesia for the patient undergoing total knee replacement: current status and future prospects. *Local and regional anesthesia* 10: 1.
- Turnbull ZA, Sastow D, Giambrone GP, Tedore T (2017) Anesthesia for the patient undergoing total knee replacement: current status and future prospects. *Local and regional anesthesia* 10: 1-7.
- Treschan TA, Taguchi A, Ali SZ, Sharma N, Kabon B, et al. (2003) The effects of epidural and general anesthesia on tissue oxygenation. *Anesthesia & Analgesia* 96(6): 1553-1557.
- Horlocker TT (2011) Complications of Regional Anesthesia and Acute Pain Management. *Anesthesiology Clinics* 29(2): 257-278.
- Fettes P, Jansson JR, Wildsmith J (2009) Failed spinal anesthesia: mechanisms, management, and prevention. *British journal of anaesthesia* 102(6): 739-748.
- Hadzic A, Williams BA, Karaca PE, Hobeika P, Unis G, et al. (2005) For outpatient rotator cuff surgery, nerve block anesthesia provides superior same-day recovery over general anesthesia. *Anesthesiology: The Journal of the American Society of Anesthesiologists* 102(5): 1001-1007.
- Ilfeld BM, Vandenborne K, Duncan PW, Sessler DI, Enneking FK, et al. (2006) Ambulatory continuous interscalene nerve blocks decrease the time to discharge readiness after total shoulder arthroplasty randomized, triple-masked, placebo-controlled study. *Anesthesiology: The Journal of the American Society of Anesthesiologists* 105(5): 999-1007.
- Helwani MA, Avidan MS, Abdallah AB, Kaiser DJ, Clohisey JC, et al. (2015) Effects of regional versus general anesthesia on outcomes after total hip arthroplasty: a retrospective propensity-matched cohort study. *JBJS* 97(3): 186-193.
- Memsoudis SG, Sun X, Chiu YL, Stundner O, Liu SS, et al. (2013) Perioperative comparative effectiveness of anesthetic technique in orthopedic patients. *The Journal of the American Society of Anesthesiologists* 118(5): 1046-1058.
- Macfarlane AJR, Arun Prasad G, Chan VWS, Brull R (2009) Does Regional Anesthesia Improve Outcome After Total Knee Arthroplasty? *Clinical Orthopaedics and Related Research* 467(9): 2379.
- Memsoudis SG, Rasul R, Suzuki S, Poeran J, Danninger T, et al. 2014; Does the Impact of the Type of Anesthesia on Outcomes Differ by Patient Age and Comorbidity Burden? *Regional Anesthesia & Pain Medicine* 39(2): 112.

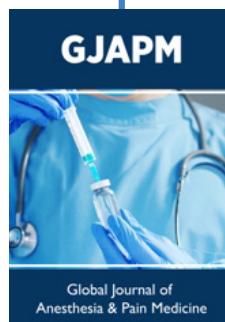
17. Basques BA, Toy JO, Bohl DD, Golinvaux NS, Grauer JN (2015) General compared with spinal anesthesia for total hip arthroplasty. *The Journal of bone and joint surgery American* 97(6): 455-461.
18. Pugely AJ, Martin CT, Gao Y, Mendoza-Lattes S, Callaghan JJ (2013) Differences in Short-Term Complications Between Spinal and General Anesthesia for Primary Total Knee Arthroplasty. *JBJS* 95(3): 193-199.
19. Rodgers A, Walker N, Schug S, McKee A, Kehlet H, et al. (2000) Reduction of postoperative mortality and morbidity with epidural or spinal anesthesia: results from overview of randomised trials. *Bmj* 321(7275): 1493.
20. Stundner O, Chiu YL, Sun X, Mazumdar M, Fleischut P, et al. (2012) Comparative perioperative outcomes associated with neuraxial versus general anesthesia for simultaneous bilateral total knee arthroplasty. *Regional anesthesia and pain medicine* 37(6): 638-644.
21. Johnson R, Kopp S, Burkle C, Duncan C, Jacob A, et al. (2016) Neuraxial vs general anesthesia for total hip and total knee arthroplasty: a systematic review of comparative-effectiveness research. *BJA: British Journal of Anesthesia* 116(2): 163-176.
22. Perlas A, Chan VWS, Beattie S (2016) Anesthesia Technique and Mortality after Total Hip or Knee Arthroplasty: A Retrospective, Propensity Score-matched Cohort Study. *Anesthesiology: The Journal of the American Society of Anesthesiologists* 125(4): 724-731.
23. Weavind LM, Pandharipande PP, Saied NN, Shotwell MS, Shi Y, et al. (2016) Effect of anesthesia type on postoperative mortality and morbidities: a matched analysis of the NSQIP database. *BJA: British Journal of Anesthesia* 118(1): 105-111.
24. SH, ZY Z, YQ H, JL, ZD C (2009) A comparison of regional and general anesthesia for total replacement of the hip or knee. *The Journal of Bone and Joint Surgery British* 91 B (7): 935-942.
25. Fowler SJ, Symons J, Sabato S, Myles PS (2008) Epidural analgesia compared with peripheral nerve blockade after major knee surgery: a systematic review and meta-analysis of randomized trials. *BJA: British Journal of Anesthesia* 100(2): 154-164.



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DOI: [10.32474/GJAPM.2019.01.000116](https://doi.org/10.32474/GJAPM.2019.01.000116)



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