



## Comparison of Efficacy of Spinal Anaesthesia and General Anaesthesia for Total Knee Arthroplasty (TKA).

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### KEYWORDS

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### ABSTRACT:

**Background:** The purpose of this study was to compare the use of spinal anaesthesia with general anaesthesia for Total Knee Arthroplasty (TKA).

**Material and methods:** For this study, a total of 100 participants who had undergone total knee arthroplasty (TKA) were included. The process was explained to the subjects and they were requested to provide consent. The subjects who declined to participate in the study and refused to grant consent were excluded from the study. In addition, those who needed blood transfusion were not included in the study. Out of a total of 100 participants, 40 individuals received bilateral staggered procedures for the first time, while the remaining 60 individuals underwent unilateral total knee arthroplasties (TKAs). Patients undergoing total knee arthroplasty (TKA) under general anesthesia were administered intravenous propofol at a dosage of 2-3 mg/kg for induction. This was done either with or without the addition of rocuronium at a dosage of 0.6-1.0 mg/kg. Sevoflurane and desflurane, which are inhalational anesthetics, were employed to ventilate the patients' lungs while ensuring an oxygen saturation level of 80%. Subsequently, the air passage and breathing were upheld by introducing an appropriately sized i-gel. The minimum alveolar concentration of the inhalational drug was reduced to a range of 1-2.5, while the oxygen concentration was dropped to a range of 40-50%.

**Results:** There existed 55 patients in the general anaesthesia group while there existed 45 patients in the spinal anaesthesia group. The duration of hospitalization was 4 days for patients in the general anesthesia group and 2 days for patients in the spinal anesthesia group. Acute renal injury occurred in 6 individuals from the general anesthesia group and 3 individuals from the spinal anesthesia group. Out of the 9 participants in the general anesthesia group and the 4 subjects in the spinal anesthesia group, there were cases of cardiovascular problems. Pulmonary problems were observed in 6 individuals from the general anesthesia (GA) group and 8 individuals from the spinal anesthesia (SA) group. Neurologic problems were observed in 5 participants from the general anesthesia (GA) group and 1 participant from the spinal anesthesia (SA) group. Two participants in the GA group experienced surgical site infections, while no subjects in the SA group did. A total of 32 complications were observed in the general anesthesia (GA) group, while 18 complications were observed in the spinal anesthesia (SA) group. Therefore, the spinal anesthesia group experienced less issues compared to the general anesthesia group.



**Conclusion:** According to the findings of this study, the spinal anesthesia group had less problems compared to the general anesthesia group. There was no substantial difference in the effectiveness of these types of anesthesia.

## Introduction

Total knee arthroplasty (TKA) utilizes an artificial prosthesis to replace a severely injured knee that has lost its normal function, eliminate pain, restore knee stability, and improve quality of life<sup>1</sup>. TKA is mainly used for non-suppurative arthritis (such as rheumatoid arthritis and osteoarthritis), traumatic arthritis, and so on, which can cause severe knee pain, instability, and serious daily life disorders in those for whom conservative treatment has been ineffective or treatment failure cases<sup>2</sup>. As the population ages, the prevalence of knee osteoarthritis is increasing<sup>3, 4</sup>. A large number of clinical applications indicate that TKA is the best treatment for advanced osteoarthritis<sup>2, 5</sup>. Relevant studies have shown that approximately 90% of patients experience excellent or good TKA results, and the 10-year survival of the prosthesis may reach 96%, significantly improving the quality of life of patients<sup>6, 7</sup>. Orthopedic surgery is a surgical specialty that focuses on preventing, diagnosing, and treating disorders and injuries of the musculoskeletal system in people of all ages.<sup>8</sup> End-stage knee osteoarthritis patients can opt for total knee arthroplasty (TKA) as the most effective treatment. With the continuous increase in both life expectancy and the prevalence of obesity, the burden of total knee arthroplasty (TKA) has also expanded and is projected to further increase in the future.<sup>9, 10</sup> Although it was reported that postoperative morbidity and mortality have declined with improved surgical and anaesthetic management, there still exists the risk of morbidity after TKA, which depends on the age and comorbidities of the patient.<sup>11, 12</sup> Moreover, pneumatic tourniquets, commonly used in TKA, are already known to induce an enhanced inflammatory response.<sup>13</sup> The purpose of this study was to compare the use of spinal anaesthesia with general anaesthesia for Total Knee Arthroplasty (TKA).

## Material and methods

For this study, a total of 100 participants who had undergone total knee arthroplasty (TKA) were included. The process was explained to the subjects and they were requested to provide consent. The subjects who declined

to participate in the study and refused to grant consent were excluded from the study. In addition, those who needed blood transfusion were not included in the study. Out of a total of 100 participants, 40 individuals received bilateral staggered procedures for the first time, while the remaining 60 individuals underwent unilateral total knee arthroplasties (TKAs). Patients undergoing total knee arthroplasty (TKA) under general anesthesia were administered intravenous propofol at a dosage of 2-3 mg/kg for induction. This was done either with or without the addition of rocuronium at a dosage of 0.6-1.0 mg/kg. Sevoflurane and desflurane, which are inhalational anesthetics, were employed to ventilate the patients' lungs while ensuring an oxygen saturation level of 80%. Subsequently, the air passage and breathing were upheld by introducing an appropriately sized i-gel. The minimum alveolar concentration of the inhalational drug was reduced to a range of 1-2.5, while the oxygen concentration was dropped to a range of 40-50%.

## Results

**Table 1: Distribution of subjects in the two groups.**

Groups	Number of subjects	Percentage
Group 1 (General Anaesthesia)	55	55%
Group 2 (Spinal Anaesthesia)	45	45%
Total	100	100%

There existed 55 patients in the general anaesthesia group while there existed 45 patients in the spinal anaesthesia group.

**Table 2: Comparison between the two groups.**

Postoperative outcomes	GA group	SA group
Number of ICU stays (Days)	4	2
Acute kidney injury	6	3



Cardiovascular complication	9	4
Pulmonary complication	6	8
Neurologic complication	5	1
Surgical site infection	2	0

The duration of hospitalization was 4 days for patients in the general anesthesia group and 2 days for patients in the spinal anesthesia group. Acute renal injury occurred in 6 individuals from the general anesthesia group and 3 individuals from the spinal anesthesia group. Out of the 9 participants in the general anesthesia group and the 4 subjects in the spinal anesthesia group, there were cases of cardiovascular problems. Pulmonary problems were observed in 6 individuals from the general anesthesia (GA) group and 8 individuals from the spinal anesthesia (SA) group. Neurologic problems were observed in 5 participants from the general anesthesia (GA) group and 1 participant from the spinal anesthesia (SA) group. Two participants in the GA group experienced surgical site infections, while no subjects in the SA group did. A total of 32 complications were observed in the general anesthesia (GA) group, while 18 complications were observed in the spinal anesthesia (SA) group. Therefore, the spinal anesthesia group experienced less issues compared to the general anesthesia group.

### Discussion

The majority of patients who are set to undergo a total knee arthroplasty (TKA), a frequently performed but painful surgical operation, are already experiencing inflammation as a result of the underlying osteoarthritis pathogenesis.<sup>14</sup> Preoperative inflammation in patients undergoing total knee arthroplasty (TKA) is intensified by the surgical procedure's induction of an inflammatory response.<sup>15</sup> Surgery is a technique that involves entering the body and is typically followed by a physiological response to stress. The magnitude of the stress reaction to surgery is recognized to be linked to the nature of the surgical procedure, and significant joint arthroplasties can elicit a substantial stress response.<sup>16</sup>

In addition, tourniquet use causes skeletal muscle ischemia-reperfusion injury and results in increased

adhesiveness, trapping and activation of leukocytes, increased inflammatory response, coagulation activity, and endothelial damage, thereby increasing the SIR to surgery.<sup>17</sup> The degree of inflammation in TKA patients is considered “the predicting factor” for recovery after the surgery.<sup>18</sup> Therefore, the identification of modifiable factors to reduce the SIR is vital in improving the clinical course after TKA.

The purpose of this study was to compare the use of spinal anaesthesia with general anaesthesia for Total Knee Arthroplasty (TKA).

In this study, there existed 55 patients in the general anaesthesia group while there existed 45 patients in the spinal anaesthesia group. The duration of hospitalization was 4 days for patients in the general anesthesia group and 2 days for patients in the spinal anesthesia group. Acute renal injury occurred in 6 individuals from the general anesthesia group and 3 individuals from the spinal anesthesia group. Out of the 9 participants in the general anesthesia group and the 4 subjects in the spinal anesthesia group, there were cases of cardiovascular problems. Pulmonary problems were observed in 6 individuals from the general anesthesia (GA) group and 8 individuals from the spinal anesthesia (SA) group. Neurologic problems were observed in 5 participants from the general anesthesia (GA) group and 1 participant from the spinal anesthesia (SA) group. Two participants in the GA group experienced surgical site infections, while no subjects in the SA group did. A total of 32 complications were observed in the general anesthesia (GA) group, while 18 complications were observed in the spinal anesthesia (SA) group. Therefore, the spinal anesthesia group experienced less issues compared to the general anesthesia group.

**Kim HJ et al (2021)**<sup>19</sup> compared the effects of general and spinal anaesthesia on the SIR after total knee arthroplasty (TKA), based on C-reactive protein (CRP) levels, the platelet-lymphocyte ratio (PLR), and the neutrophil-lymphocyte ratio (NLR). Patients who underwent TKA between January 2014 and December 2018 were included. Electronic medical records of the patients were retrospectively reviewed and analysed. To reduce the impact of potential confounding factors, they performed propensity score matching according to the anaesthetic technique. A total of 1311 TKA cases were analysed. After propensity score matching, the maximal



CRP value and changes in CRP levels in the general anaesthesia group were higher than those in the spinal anaesthesia group. However, the maximal NLR and PLR and the changes in NLR and PLR were not different between the two groups. There were no differences in postoperative clinical outcomes. Spinal anaesthesia tended to induce a lower inflammatory response than general anaesthesia when considering CRP levels in patients undergoing TKA. However, the effects of anaesthetic techniques on the overall outcomes were not significant.

**Owen AR et al (2022)<sup>20</sup>** This study aimed to investigate the pain control, length of stay (LOS), and complications associated with spinal versus general anaesthesia in primary TKAs from a single, high-volume academic centre. We retrospectively identified 17,690 primary TKAs (13,297 patients) from 2001 to 2016 using our institutional total joint registry, where 52% had general anaesthesia and 48% had spinal anaesthesia. Baseline characteristics were similar between cohorts with a mean age of 68 years (SD 10), 58% female (n = 7,669), and mean BMI of 32 kg/m<sup>2</sup> (SD 7). Pain was evaluated using oral morphine equivalents (OMEs) and numerical pain rating scale (NPRS) data. Complications including 30- and 90-day readmissions were studied. Data were analyzed using an inverse probability of treatment weighted model based on propensity score that included many patient and surgical factors. Mean follow-up was seven years (2 to 18). Patients treated with spinal anaesthesia required fewer postoperative OMEs (p < 0.001) and had lower NPRS scores (p < 0.001). Spinal anaesthesia also had fewer cases of altered mental status (AMS; odds ratio (OR) 1.3; p = 0.044), as well as 30-day (OR 1.4; p < 0.001) and 90-day readmissions (OR 1.5; p < 0.001). General anaesthesia was associated with increased risk of any revision (OR 1.2; p = 0.021) and any reoperation (1.3; p < 0.001). In the largest single institutional report to date, we found that spinal anaesthesia was associated with significantly lower OME use, lower risk of AMS, and lower overall 30- and 90-day readmissions following primary TKAs. Additionally, spinal anaesthesia was associated with reduced risk of any revision and any reoperation after accounting for numerous patient and operative factors. When possible and safe, spinal anaesthesia should be considered in primary TKAs.

## Conclusion

According to the findings of this study, the spinal anaesthesia group had less problems compared to the general anaesthesia group. There was no substantial difference in the effectiveness of these types of anaesthesia.

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