

## Effect of regional anesthesia in the knee arthroplasty surgery

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### ABSTRACT

The present study aims to evaluate the effect of regional anesthesia in the knee replacement surgery. This is a hospital-based prospective study. It was conducted at Al-Saffir hospital between April 2021 to October 2021. Six patients were enrolled in this study. They were divided into two groups, i.e. general anesthesia group (n=3) and regional anesthesia group (n=3). The patients were divided into two groups based on their oral consent, and complexity of the surgery. The patients operated with neuraxial anesthesia showed lower percentages of pulmonary compromise (respiratory distress, respiratory failure or respiratory arrest), acute renal failure, infections, prolong hospital stay, and health care cost parameters as compared to the patients operated with general anesthesia. The study can be concluded as the regional anesthesia was found to be effective over general anesthesia. To drive change in clinical practice, more robust clinical outcome studies will be required to define best practices for the use of general anaesthetic or regional anaesthetic.

**Keywords:** Total knee arthroplasty, General anesthesia, Regional anesthesia, Neuraxial anesthesia

### الخلاصة

تعد عملية تقويم مفصل الركبة الكلي (TKA) علاجاً فعالاً للغاية لحالات التهابات العظام الشديدة. تهدف الدراسة الحالية إلى تقييم تأثير التخدير الموضعي في جراحة استبدال الركبة. هذه دراسة مستقبلية قائمة على المستشفى تشمل ستة مشاركين. تم إجراؤه في مستشفى السفير في الفترة ما بين نيسان 2021 إلى تشرين الأول 2021. تم تقسيم المشاركين إلى مجموعة التخدير الموضعي و مجموعة التخدير العام. (n-3) مجموعة التخدير العام (n3) بناءً على موافقتهم الشفوية ، وتعقيد الجراحة أظهر المرضى الذين خضعوا للتخدير العصبي نسباً أقل من القصور الرئوي، والفشل الكلوي الحاد، والالتهابات ، وإطالة الإقامة في المستشفى ، كلفة الرعاية الصحية مقارنة بالمرضى الذين خضعوا للتخدير العام. يمكن استنتاج الدراسة حيث وجد أن التخدير الموضعي فعال على التخدير العام. لإحداث تغيير في الممارسة السريرية ، ستكون هناك حاجة لدراسات نتائج سريرية أكثر قوة لتحديد أفضل الممارسات لاستخدام التخدير العام أو التخدير الموضعي.

## 1. Introduction

Total knee arthroplasty (TKA) is more common orthopedic surgery nowadays. Many improvements were made in the surgical procedure till now [1]. Similarly, various new techniques are discovered and implemented in the field for these procedures, anaesthetic and analgesia were employed [2,3]. The general anesthesia is routinely used in the TKA surgery in the past. However, regional anesthesia techniques are now rising as a new hope. Total knee arthroplasty anaesthetic and analgesic treatments have changed over time in an effort to improve procedural outcomes, prevent risk, such as pain and nausea, and improve patient satisfaction [4].

In the regional anesthesia, the nerves of particular body part are blocked without affecting the brain or the breathing activity [5-7]. In joint replacement surgery, three forms of regional anaesthesia were used. These are epidural blocks, spinal blocks, and peripheral nerve blocks. The utilization of total knee arthroplasty (TKA) has risen crucially in recent years [8-10]. Factors such as rising obesity and accompanying osteoarthritis, in addition to an ageing population, have been highlighted as contributing to the growing demand for joint replacement surgery [11-12]. Due to sports-related injuries, there appears to be an increase in the demand for joint replacement in a youth patient group. This could be owing to an increase in the quality of prosthetics, making these surgeries more feasible as early treatments [13].

For severe osteoarthritis, total knee arthroplasty (TKA) is a very successful treatment [7]. TKA produces positive outcomes in terms of continuing daily activities, survival rates, and total functional improvement. Accomplishing the functional expectations of TKA patients is still a major surgical goal. Despite significant advances in surgical technique and postoperative care over time, up to 20% of TKA patients are still unsatisfied. Only 62 percent of 347 non-selected TKA patients utilize different implants were pain free during gait, 35 percent were free of pain while climbing or descending stairs, and 40 percent suffered of pain while jogging, according to a multicenter study. Only 48% of patients said they were "very satisfied" with the treatment, and only 68 percent said their operated knee felt "normal" for their age. With this background, the present study aim to evaluate the effect of regional anesthesia in the knee replacement surgery.

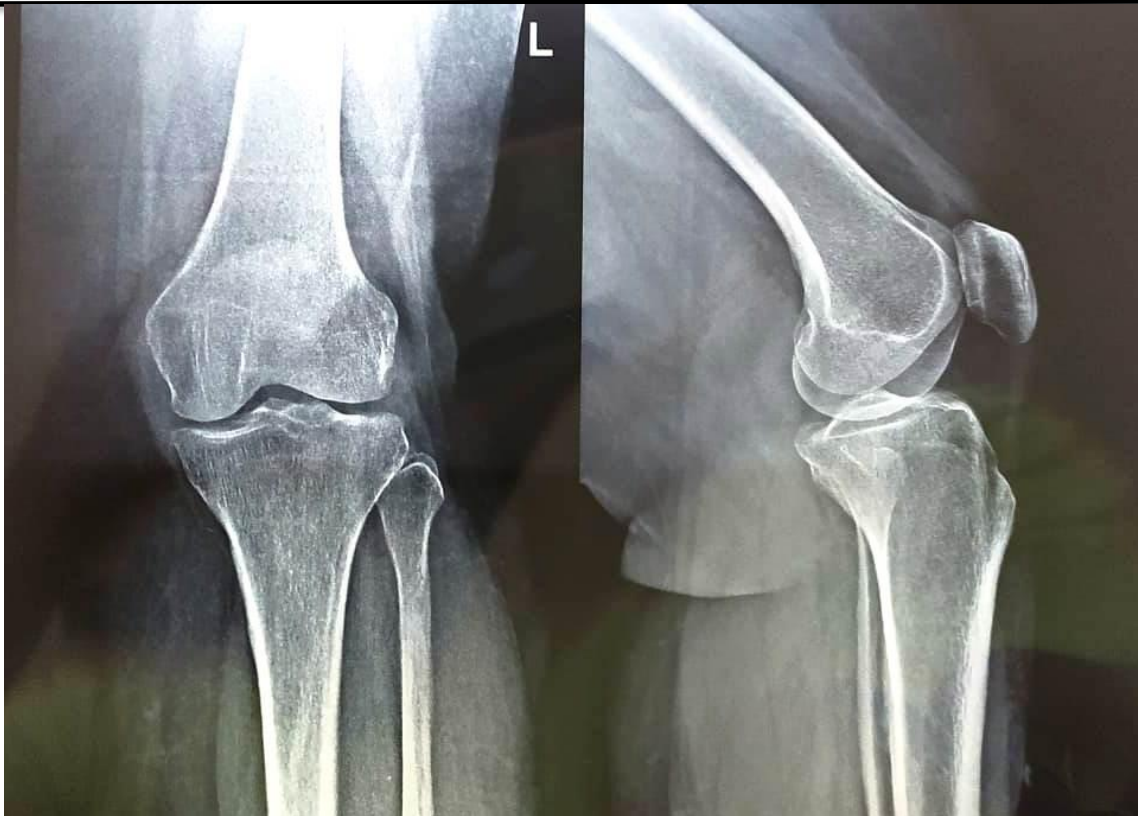
## 2. Materials and Methods

### Patient Enrollment

This is a hospital-based prospective study. It was conducted at Al-Saffir hospital between April 2021 to October 2021. The six patients were enrolled in this study. They were divided into two groups, i.e. general anesthesia group (n=3) and regional anesthesia group (n=3). The patients were divided into two groups based on their oral consent, and complexity of the surgery.

### Preoperative conditions

Total knee arthroplasty (TKA) is a major surgical procedure that can be both physically and psychologically stressful for patients. Before operation, each patient was aware about the operative procedure. Before the surgical procedure, the patients were fasted for eight hours.



**Figure 1: X-ray photograph of preoperative conditions showing damaged cartilage**

### **Knee Anatomy**

Ligaments, muscles, and tendons hold two long bones together at the knee. A layer of cartilage cushions each bone end, absorbing shock and protecting the knee. In the knee, there are two muscle groups that are involved. These are the quadriceps and hamstring muscles found on the front and back of the thighs, respectively. The quadriceps muscles are responsible in straighten the legs, while the hamstring muscles are engaged in knee folding. Tendons are tough connective tissue strands that pass among muscles and bones. Ligaments are elastomeric tissue bands that link bones. Some ligaments in the knee give joint stability and protection, while others restrict forward and backward movement of the tibia (shin bone).

### **Regional Anesthetic Techniques**

Peripheral regional anesthesia was used in this study. An injection of a local anesthetic was introduced into a nerve root via its sheath. Anatomical markers were used for localization of nerves to be anesthetized. Routine knee replacement surgery method was followed for both groups.

### **Study Parameters**

The preoperative and postoperative basal metabolic panel was assessed for both the groups. Postoperative parameters such as pulmonary compromise, acute renal failure, infections, and prolong hospital stay.

### **Statistical Analysis**

The values were represented as the percentage of the patients.

### 3. Result

In the present, the role of the general and regional anesthesia (Neuraxial anesthesia) was evaluated in the knee replacement surgery. The enrolled patients were divided into two groups, *viz.* TKA with general anesthesia and TKA with regional anesthesia. Both the groups were received similar postoperative treatment. Before and after surgery, basic metabolic panel was assessed. The results of basic metabolic panel are depicted in the Table 1.

Table 1: Basic metabolic parameters

		General anesthesia		Regional anesthesia	
		Before	After	Before	After
1.	Glucose (mg/dl)	95±10	99±7	88±15	91±14
2.	Albumin (g/dl)	4.58±1.39	5.14±1.93	4.01±1.43	4.91±1.42
3.	Ca+ (mg/dl)	9.38±1.52	9.25±1.40	9.47±1.46	10.23±2.31

Table 2 represents pulmonary compromise, acute renal failure, infections, prolong hospital stay, and health care cost parameters after surgery. The patients operated with neuraxial anesthesia showed lower percentages of pulmonary compromise, acute renal failure, infections, prolong hospital stay, and health care cost parameters as compared to the patients operated with general anesthesia.

Table 2: Post-operative parameters of study group

	General anesthesia	Neuraxial anesthesia
Pulmonary compromise	0.72%	0.28%
Acute renal failure	1.47%	0.95%
Infections	3.92%	2.74%
Prolong hospital stay	34.71%	27.61%

### 4. Discussion

For many surgical operations, regional anaesthesia (RA) techniques have been demonstrated to reduce pain, nausea and vomiting, and delay to discharge, as well as cardiovascular and pulmonary problems [14,15]. Regional anaesthetic may have advantages such as decreased blood loss, nausea, drowsiness, and improved pain control following surgery, as well as a lower risk of catastrophic medical problems such as a heart attack or stroke, which can occur with general anaesthesia. Our results are accordance with this report.

Rodgers et al identified a link between neuraxial anaesthesia (NA) and a reduction in deep vein thrombosis, pulmonary embolism, transfusion need, pneumonia, and respiratory depression in a systematic review that comprised 141 trials and 9,559 patients. Patients who got NA had a one-third lower overall death rate (odds ratio 0.70) than those who received GA [16]. A 2009 meta-analysis of 28 randomized studies including 1,538 TKA patients found insufficient evidence that anaesthetic approach influenced mortality, cardiovascular morbidity, deep vein thrombosis, pulmonary embolism, blood loss, or surgery duration [17]. Headaches, urination problems, allergic responses, and nerve injury are all possible side effects of regional anaesthetic.

Various anaesthetic approaches have been employed to care for TKA patients throughout the previous decade. Kamenetsky et al. [18] found that regional and neuraxial approaches are frequently used to increase postoperative analgesia and reduce systemic opioid side effects. According to the American Society of Regional Anesthesia (ASRA), recommendations for neuraxial techniques should be applied similarly for patients undergoing deep plexus block to reduce the risk of hemorrhagic complications [18-22]. When compared to general anaesthesia, they discovered that neuraxial anaesthesia, a type of regional anaesthetic, lowered morbidity, mortality, length of hospital stay, and expenditures.

Due to concerns about pneumoperitoneum-related breathing alterations, laparoscopic procedures have typically been conducted under general anaesthesia. However, the use of RA in these laparoscopic surgeries has just lately been adopted. The evidence demonstrates that spinal, epidural, and combined spinal-epidural anesthesia can be used safely in laparoscopy with few side effects that can be effectively treated with existing pharmaceutical medicines. Lack of airway manipulation, maintenance of spontaneous respiration, efficient post-operative analgesia, minimal nausea and vomiting, and early recovery and ambulation may all be advantages of RA vs GA. However, more research is needed to confirm the safety of RA in laparoscopic surgeries in a variety of patient demographics. Furthermore, the technique of anaesthesia for laparoscopic surgeries is a heated topic that is largely dependent on the experience and ability of the anesthesiologist [23,24] showed that the surgical outcome is not affected by the types of anesthesia in the surgery. However, additional research with well-designed and large sample sizes are needed to be tailored to individual patient requirements to optimize.

## 5. Conclusion

The patients operated with neuraxial anesthesia showed lower percentages of pulmonary compromise, acute renal failure, infections, prolong hospital stay, and health care cost parameters as compared to the patients operated with general anesthesia. The study can be concluded as the regional anesthesia was found to be effective over general anesthesia.

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