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Exploring the Role of Anesthesia in total joint arthroplasty.

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Abstract.

Background Total joint arthroplasty surgery is a commonly performed elective orthopaedic procedure worldwide, which has been shown to improve quality of life.

Objective: We conducted a cross-sectional study to compare the efficacy of general anaesthesia versus neuraxial anaesthesia on patients undergoing total joint arthroplasty (knee and hip).

Patients and methods, We identified 126 patients who underwent total joint arthroplasty (knee and hip) between 15th June 2022 and 8th March 2023. Our study aimed to define the clinical and demographic characteristics of patients aged 50-70 years, both male and female. We presented the effects of pre-operative comorbidities on patients during and after surgery. Clinical examinations were conducted on patients who underwent left or right lateral surgeries. Anaesthesia types used during the surgeries were determined, including general and neuraxial anaesthetics. Pain scores (MME) were recorded post-surgery. A comparison was made between general anaesthesia (45 cases) and neuraxial anaesthesia (81 cases) during and after surgery. Our data was organized and analysed using the SPSS software.

Results and discussion, it was discovered that the majority of patients aged over 60 underwent knee and hip surgeries, with 64.3% of these patients being men and 35.7% women. Additionally, 105 patients were found to have suffered from obesity. Clinical outcomes indicated the types of surgeries performed on the knee and hip. Of the patients involved, 81 underwent knee surgery (64.3%) and 45

underwent hip surgery (35.7%). The study analysed the length of hospital stay for 126 patients and found that those under Neuraxial anaesthesia had a longer stay (177.64 ± 12.86) compared to patients under general anaesthesia (129.86 ± 8.56). Additionally, the study identified mortality rates after surgery, with four patients (5%) under Neuraxial anaesthesia and ten patients (22.22%) under general anaesthesia experiencing mortality.

Conclusion Neuraxial anesthesia was considered a perfect optional treatment to improve clinical patients' outcomes of total hip or knee joint arthroplasty surgery over than general anesthesia.

Keywords: Total joint arthroplasty (knee and hip), General anaesthesia, and Neuraxial anaesthesia

INTRODUCTION

Worldly, total joint arthroplasties are commonly performed as elective orthopedic procedures that can significantly enhance the quality of life. Historically, following a total joint arthroplasty, several days of hospitalization have been typical [1-3]. These days, these procedures are carried done as outpatient procedures or even with a brief hospital stay. There are several factors driving the transition to this new paradigm of shorter hospital stays. There is a financial motivation to shorten hospital stays following surgery due to the introduction in bundled reimbursements, the removal of total knee and hip arthroplasty of the Medicare inpatient-only treatment list, and a rise in the demand for these procedures. [4-5]

Most patients with hip fractures are elderly and are treated with surgery that requires anaesthesia. The fracture is usually the result of a minor fall, and a large proportion of these patients have other comorbidities associated with ageing that place them at a high risk of mortality during anaesthesia and in the postoperative period. The most common anaesthetic techniques are general anaesthesia (induced sleep) and neuraxial anaesthesia. [6-9]

There is a financial motivation to shorten hospital stays following surgery due to the introduction in bundled payments, the elimination of total knee and hip arthroplasty of the Medicare inpatient-only treatment list, and a rise in the demand for these procedures [10-11]. When compared to typical inpatient treatment, outpatient total joint arthroplasty was demonstrated to be safe and practical, with a comparable or perhaps lower risk of complications. The trend toward outpatient arthroplasty is likely to continue, given the steadily rising demand for total joint replacements and the goal of healthcare organizations to deliver value-based patient care. The kind of anesthetic used can have a significant impact on how well an outpatient total joint replacement program is run. [12-15]

neuraxial anaesthesia has been used extensively in hip replacement surgery, but it has some limitations: motor block is rarely complete, positional discomfort is rarely tolerated for more than 2 hours, and urinary retention is common. [16,17]

When neuraxial anesthesia is used instead of general anesthesia, studies on the effect of anesthetic type on postoperative results following total joint arthroplasty and other surgical types have consistently demonstrated a reduction of postoperative mortality, as well as healthcare expenditures. Nevertheless, considering the relatively healthier patient group having ambulatory surgery, it is uncertain if the advantages of neuraxial anesthesia also apply to outpatient total joint arthroplasty. [18-20]

Patients and methods

We identified 126 patients who performed total joint arthroplasty (knee and hip) that organized from 15th Jun 2022 to 8th March 2023. Our study was defined clinical and demographic characteristics where we included patients with ages 50-70 years in terms of women and men. We presented pre-operative comorbidities that effect patients during and after surgery.

Besides to that, we distributed clinical examination of patients in terms of laterality of surgery, both of left and right, where we determined the anaesthesia used, which involved of general and neuraxial anaesthetics. We distributed pain scores in (MME) after surgery. We conducted a comparison between general, with 45 cases, and neuraxial anaesthesia, with 81 cases during performed and after surgery.

Furthermore, we examined all baseline demographic characteristics of patients where preoperative classification of BMI in terms of normal, obese, and overweight, and defined patients who underwent hip and knee surgeries in association with intraoperative anaesthesia and comorbidities, ASA classification in terms of I, II, III, IV, and Laterality of surgery in both left and right.

In addition, we defined clinical post-operative outcomes as surgical outcomes in terms of time and length of stay in minutes. Also, we determined post-operative clinical outcomes followed with intraoperative blood loss transfusion (intraoperative and postoperative), where we determined PACU opioid usage (MME) for all patients who were under general and neuraxial anesthesia where our study was enrolled rate of post-operative complication.

Results

Table 1: *Clinical demographic characteristics of patients with total joint arthroplasty based on age.*

		Age
N	**Valid**	126
	Missing	0
Mean		60.0000
Std. Error of Mean		.54160
Median		60.0000
Std. Deviation		6.07947
Minimum		50.00
Maximum		70.00

Table 2: *Clinical demographic characteristics of patients with total joint arthroplasty based on sex.*

	F, 126	P (%)	VP (%)	CP (%)
Women	45	35.7	35.7	35.7
Men	81	64.3	64.3	100.0
T	126	100.0	100.0	

It was observed that knee and hip procedures were the primary medical interventions for patients aged over 60, with 64.3% being male and 35.7% being female.

Table 3: *Preoperative classification of BMI.*

	F, 126	P (%)	VP (%)	CP (%)
Normal	21	16.7	16.7	16.7
Obese	60	47.6	47.6	64.3
Overweight	45	35.7	35.7	100.0
T	**126**	**100.0**	**100.0**	

Our study classified BMI as normal, overweight, or obese. It was observed that 105 patients suffered from obesity.

Table 4*: Types of surgeries.*

	F, 126	P (%)	VP (%)	CP (%)
Hip	45	35.7	35.7	35.7
Knee	81	64.3	64.3	100.0
T	126	100.0	100.0	

Our study investigated the pre-operative outcomes associated with knee and hip surgeries. Our sample comprised of 81 patients (64.3%) who underwent knee surgery and 45 patients (35.7%) who underwent hip surgery.

Table 5: *Pre-operative of ASA classification.*

ASA	F, 126	P (%)	VP (%)	CP (%)
I	5	4.0	4.0	4.0
II	79	62.7	62.7	66.7
III	34	27.0	27.0	93.7
IV	8	6.3	6.3	100.0
T	**126**	**100.0**	**100.0**	

In terms of the ASA classification, the highest rate of patients was identified as ASA class II, which consisted of 79 individuals (62.7%).

Table 6: *Laterality of surgery.*

	F, 126	P (%)	VP (%)	CP (%)
Left	45	35.7	35.7	35.7
Right	81	64.3	64.3	100.0
T	**126**	**100.0**	**100.0**	

We enrolled ate of patients in related to Laterality of surgery. Where it has shown that almost all patients with underwent surgery in the right side had surgery, with 64.3% more than 35.7%.

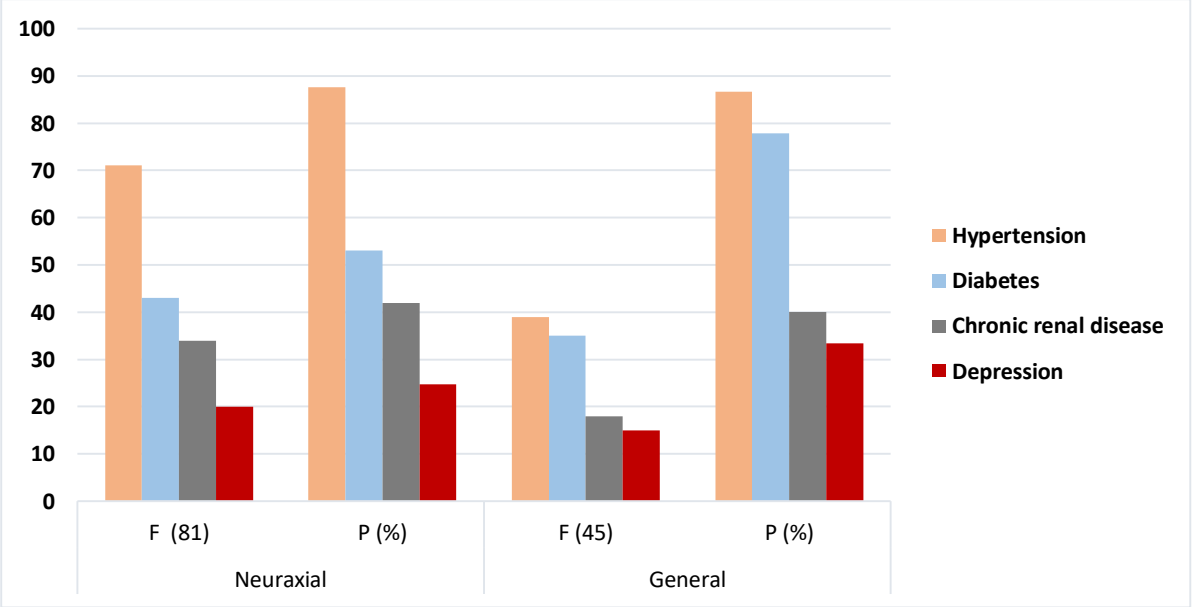

Figure 1: *Distribution of comorbidities on all patients who underwent surgery by general or neuraxial anaesthesia.*

Our research involved participants who had preoperative comorbidities, including hypertension, diabetes, chronic renal disease, and depression. Hypertension had the highest prevalence at 87%, followed by diabetes at 54%. These factors were identified as the most significant.

Table 7*: Distribution of patients who underwent hip and knee surgeries in association with intraoperative anaesthesia.*

		General	Neuraxial	Total
	Hip	16	29	45
	Knee	29	52	81
		45	**81**	**126**

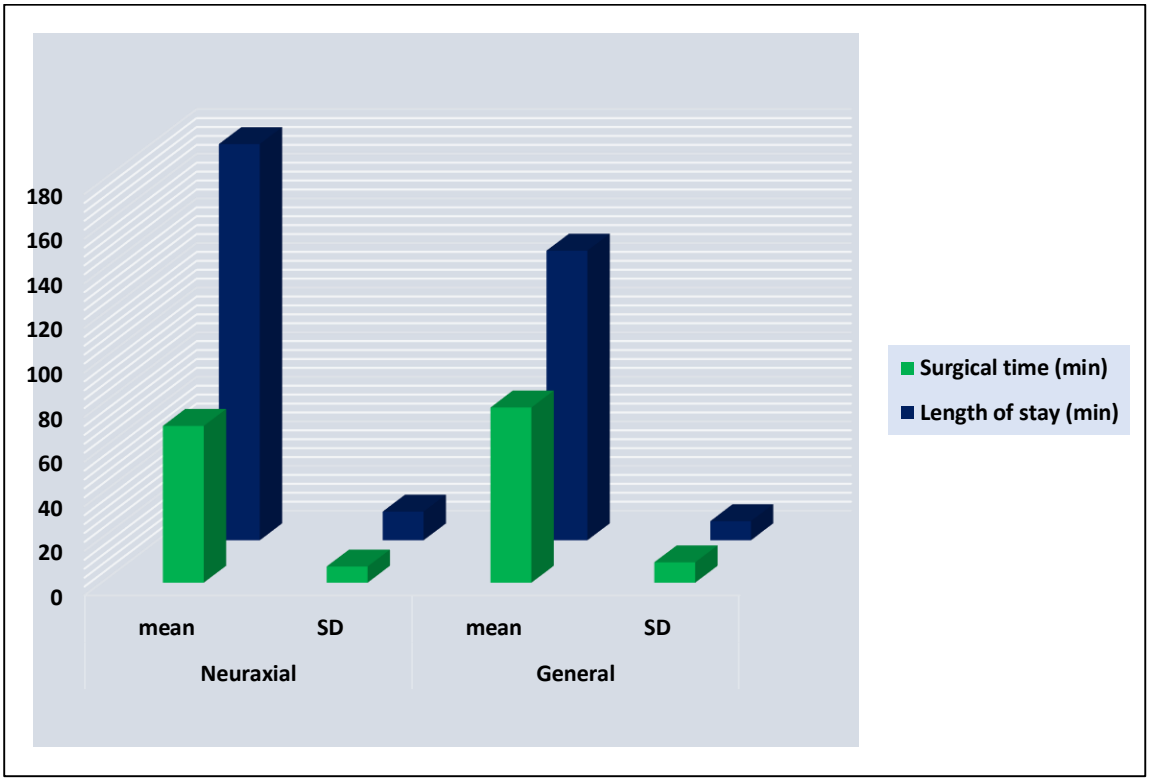

Figure 2: *Determine post-operative outcomes in terms of surgical time and length of stay.*

In terms of surgical time in the hospital, our study examined the duration of operations for hip and knee surgeries. Patients receiving Neuraxial anaesthesia had an average surgical time of (70.3 ± 7.24) while those receiving general anaesthesia had an average surgical time of (78.55 ± 9.13). Length of hospital stay was also assessed in our clinical findings involving 126 patients. We observed that patients undergoing Neuraxial anaesthesia had a comparatively longer length of

stay, with an average of (177.64 ± 12.86), than those under general anaesthesia, with an average of (129.86 ± 8.56).

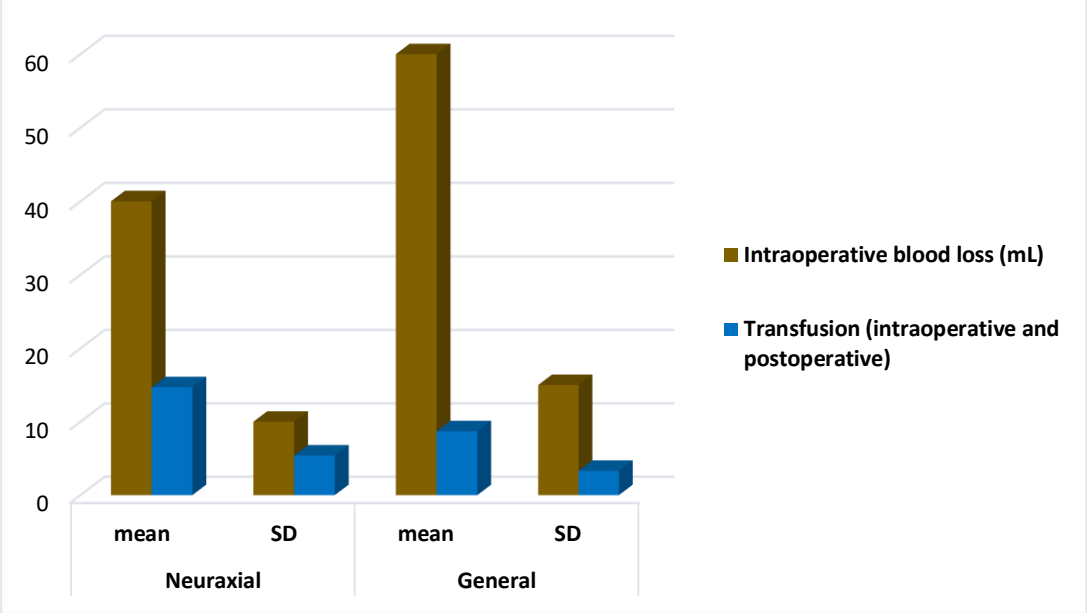

Figure 3: *Post-operative outcomes of patients with total joint arthroplasty.*

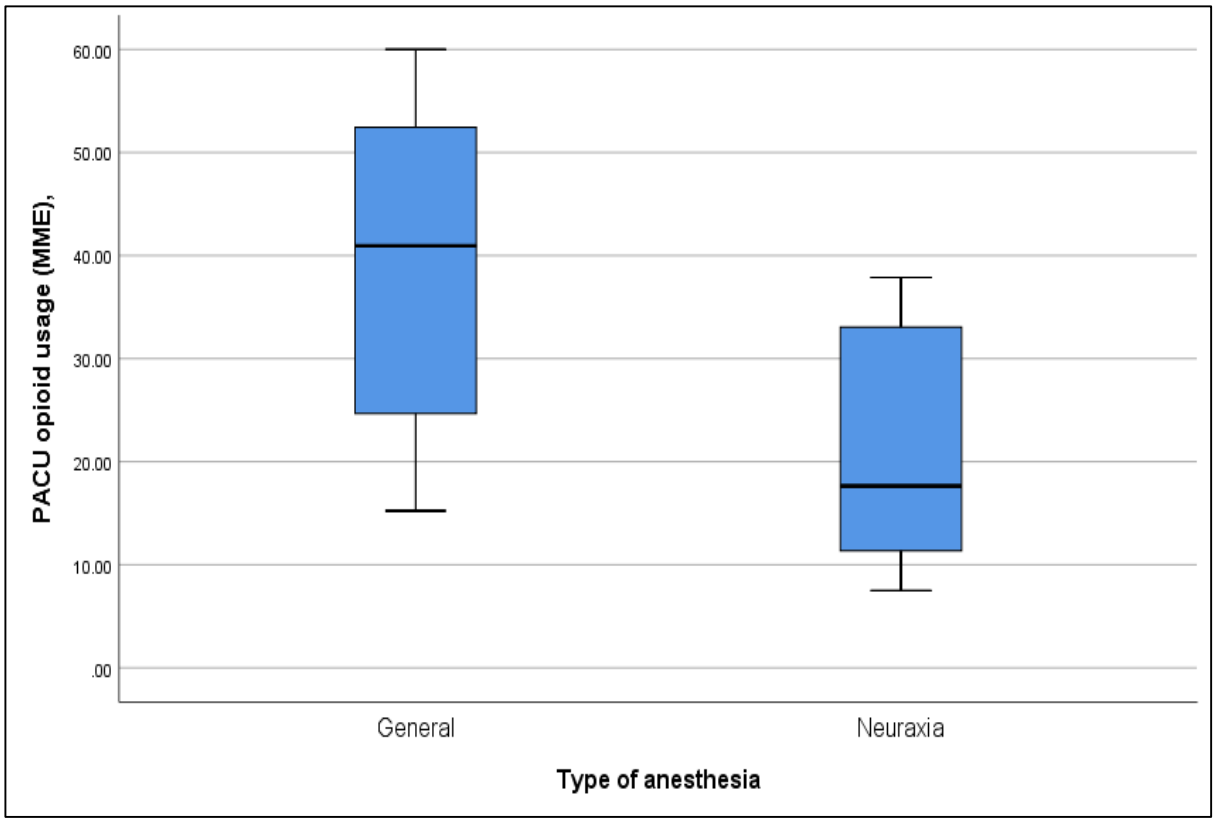

Figure 4*: PACU opioid usage (MME).*

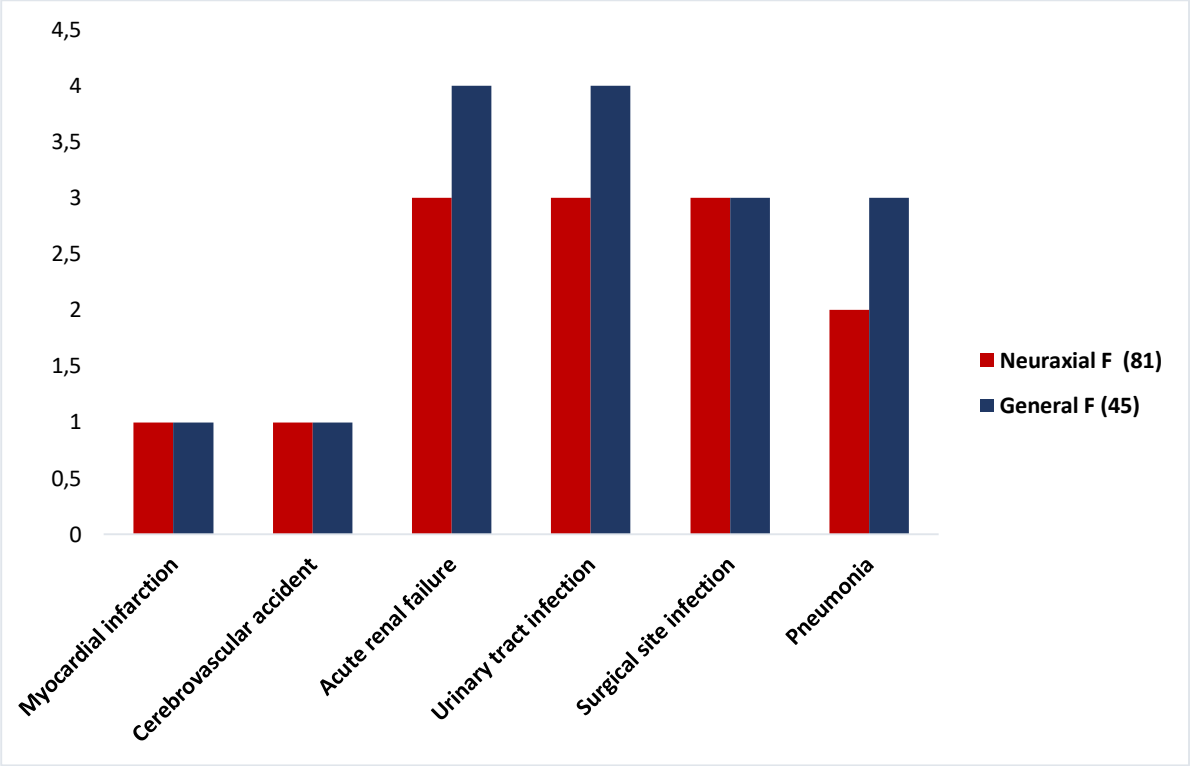

Figure 5: *Post-operative complications outcomes.*

Our study was conducted post-operative complications outcomes where the complication rate of patients under Neuraxial anethesia were 13 (16.05%) while patients under general anethesia were 16 (35.56%).

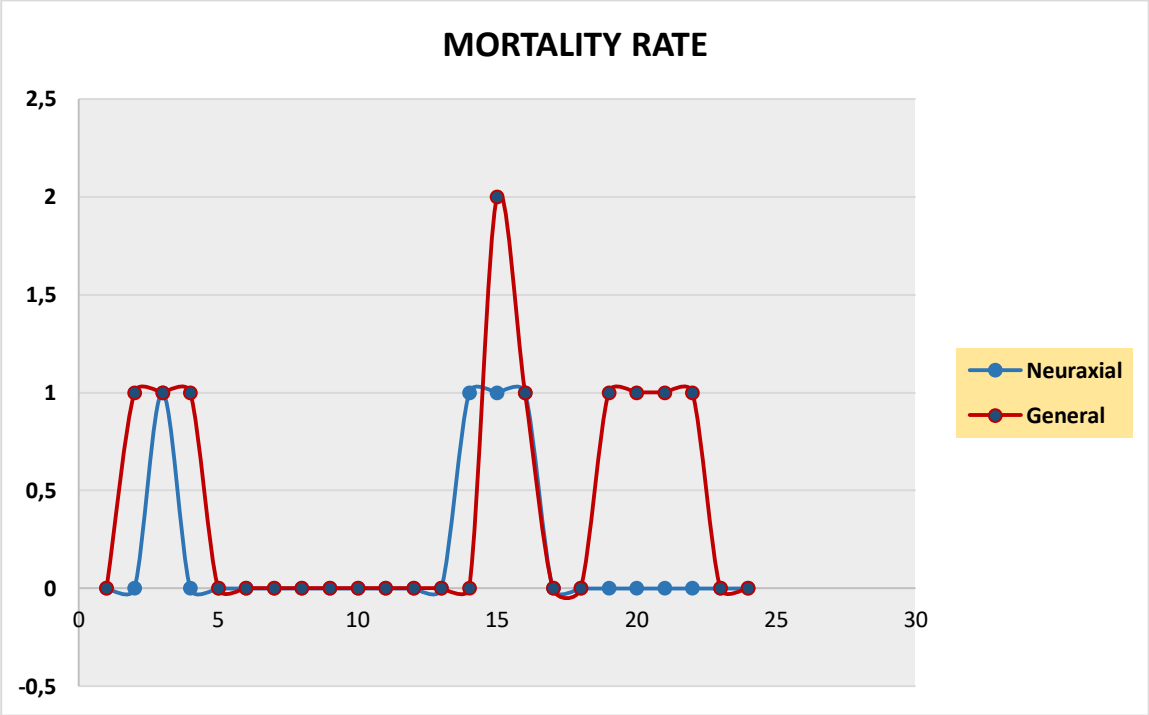

Figure 6: *Identify the mortality rate of patients after surgery.*

Our results were enrolled mortality rate of patients after surgery, which found the rate of patients under Neuraxial anethesia was 4 (5%) while patients under general anesthesia were 10 (22.22%).

Discussion

Our study was identified clinical, demographic outcomes related to anesthesia effect on patients with total joint arthroplasty. We found that almost of patients with ages older than 60 years have performed with knee and hip surgeries, where the rate of men patients was 64.3% while women were 35.7%, as well as found that 105 patients have suffered of obesity. Clinical outcomes were showed types of surgeries performed into patients involved in knee and hip, where patients with knee surgery were 81 (64.3%) while patients with hip surgery were 45 (35.7%).

The ASA classification side, our results noticed that patients of ASA II have a high percentage of cases with 62.7%. Which secondary outcomes, we defined laterality of surgery where the right side had surgery with 64.3% more than 35.7%. Also, comorbidities results were shown that hypertension and with 87%, and diabetes at 54%.

In terms of surgical time in the hospital, our results enrolled surgical time of patients who underwent hip and knee surgeries where (70.3 ± 7.24) for patients under Neuraxial anethesia while (78.55 ± 9.13) for patients under general anesthesia.

To Length of stay in the hospital, our clinical findings were determined length of stay for 126 patients where we found that patients with Neuraxial anethesia have stayed with (177.64 ± 12.86) longer than patients with general anethesia with (129.86 ± 8.56). Due to that, we determined PACU opioid usage (MME) where general anethesia from 32 (15-60) but Neuraxial anethesia 13 (6.8-38).

Our results were defined post-operative complications outcomes, and we have resulted in that the complication rate of patients under Neuraxial anethesia were 13 (16.05%) while patients under general anethesia were 16 (35.56%). We identify the mortality rate of patients after surgery where we got that rate of patients under Neuraxial anethesia were 4 (5%) while patients under general anesthesia were 10 (22.22%).

Our study was discussed the effect of neuraxial anaesthesia is considered a recommended method for treating hip or knee fractures, as the targeted area can be anaesthetised without impacting the patient's overall consciousness. In contrast, general anaesthesia is a surgical technique that places the patient into a deep, temporary coma with the use of general anaesthetics. While general anaesthesia is crucial for surgical procedures and provides the medical team with full control and ease while performing the operation, it may have side effects and complications.

According to British studies, which conducted a comparative analysis between Neuraxial anaesthesia and general anaesthesia during hip or knee fracture surgeries, Neuraxial anaesthesia provides better results regarding pain and complications such as blood clotting, inflammation, and aneurysms. [20-22]

The research additionally found that Neuraxial anaesthesia is regarded as safe and efficient, enhances the recuperation phase, and diminishes significant discomfort in contrast with general anaesthesia. In addition, a study from 2000 to 2015 contrasted neuraxial anaesthesia and general anaesthesia in patients with knee fractures. The study indicated that the use of neuraxial anesthesia improves patient outcomes by lowering the incidence of common complications like high blood pressure and blood

clots. The study found that neuraxial anesthesia is a favourable option in treating patients with hip or knee fractures. [23-24]

Furthermore, these studies have shown that neuraxial anesthesia results in lower post-operative pain scores and less opioid usage compared to general anesthesia. Conversely, general anesthesia has been found to cause decreased blood loss compared to neuraxial anesthesia, that is associated with increased postoperative mortality [25,26].

Conclusion

Our study indicates that the treatment of patients undergoing hip or knee fracture surgery with neuraxial anesthesia is superior to general anesthesia due to its lower complication rate. Additionally, it shows that patients receiving general anesthesia have a higher mortality rate compared to those receiving neuraxial anesthesia. The study compared the length of hospital stay between patients under neuraxial anesthesia and those under general anesthesia. It found that patients under neuraxial anesthesia had a longer stay, but this was associated with improved post-operative outcomes. These findings suggest that using neuraxial anesthesia may enhance the success rate during the same period.

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