

## Advances in Orthopedics and Traumatology (Shoulder and Elbow Surgery) and Knowing the Optimal Type of Anesthesia Used in Surgery

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### ABSTRACT

*Background: Anesthesia techniques have played an important and effective role in the management of shoulder and elbow surgeries, which enhances the patient's health after the operation. Objective: This paper analysed and assessed the outcomes associated with the effect of anesthesia on patients undergoing orthopedics and traumatology in terms of shoulder and elbow Surgery. Patients and methods: In different hospitals in Iraq for a period between July 7, 2022, to March 24, 2023, a cross-sectional study was conducted for patients who underwent orthopedic and fracture surgery, and samples of 130 patients between the ages of 30 and 60 years were collected. This study distributed data related to both groups, which determined that the first group included patients who underwent surgery under general anesthesia with 70 patients, and the second group included patients who underwent surgery under local anesthesia with 60*

*patients. Our data identified the two surgeries that patients underwent, which included both shoulder surgery and elbow surgery, during and after surgery in terms of the time of the two surgeries, the estimated rate of blood loss, the number of cases that lost blood, and the mortality rate. Results: Our results found the operating time for shoulder surgery which was between 3 - 4 hours, and for elbow surgery, which was between (50 - 60) minutes, and the number of patients who lost blood was 11, with an amount of  $119.76 \pm 14.20$  ml in the first group with an amount of  $171.56 \pm 16.51$  ml in the second group. 51 ml in the second group, the length of hospital stay was between (2-3) days for patients who underwent general anaesthesia and (2-3) days for elbow surgery, and the mortality rate was three patients in the general anaesthesia group and five patients in the regional anaesthesia group, the recovery rate was 2-3 weeks for shoulder surgery and 5-6 weeks for regional anaesthesia. The complication rate was seven patients in the general anaesthesia group and ten patients in the regional anaesthesia group. The patient's quality of life scores for physical function were  $82.80 \pm 12.9$  under general anaesthesia and  $71.47 \pm 8.54$  under regional anaesthesia, and for a social function, were  $88.53 \pm 2.46$  under general anaesthesia and  $86.65 \pm 2.07$  under regional anaesthesia. Conclusion: Our study demonstrated that general anesthesia has a crucial role in improving patient outcomes, recovery rates, and patient complications compared to regional anesthesia after both shoulder and elbow surgery.*

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## **Introduction**

Orthopaedic and trauma surgery involves interventions on the upper and lower limbs as well as the spine. It is a subspecialty of anaesthesia that requires familiarity with a wide range of anaesthetic techniques [1,2,3]. To ensure better control, regional techniques or combined regional-general techniques can be used as an alternative to general anaesthesia. Experience in extremity blocks is necessary to provide correct anaesthesia and analgesia in orthopaedic surgery, in addition to knowledge of spinal and lumbar epidural anaesthesia [4,5,6].

The use of various types of regional anaesthesia is discussed in other chapters, particularly in relation to post-operative control and prevention of thromboembolic events or deep vein thrombosis [7,8]. Therefore, from a theoretical perspective, it is interesting to focus on the aspect that forms part of this chapter [10].

The field of shoulder surgery has experienced significant advancements in the past 70 years, mainly due to the progress made in biomedical technology. It is relevant to a diverse patient population, including physically active individuals with sports injuries and those with arthritis. Typical surgical procedures for the shoulder include hemiarthroplasty, complete shoulder arthroplasty, shoulder arthroscopy, subacromial decompression, and shoulder instability

procedures. Arthroscopy has become the primary therapeutic approach for shoulder diseases due to its smaller incisions, reduced risk of deltoid muscle injury, and faster recovery. [11]

The utilisation of dexmedetomidine-augmented inter-scalene brachial plexus block is a developing method in shoulder surgery that holds the capacity to transform the perioperative encounter for patients. Shoulder surgery is an essential aspect of orthopaedic practice as it plays a critical role in maintaining patient comfort, optimising surgical conditions, and minimising postoperative pain. [12,13,14]

Efficient anaesthesia is vital for secure and prosperous shoulder surgery, whereas active patient involvement is necessary for evaluating joint mobility. Effective management of pain after surgery is essential because of the complex structure of the shoulder. Regional anaesthesia procedures, such as the interscalene brachial plexus block, offer precise pain relief by targeting specific areas, all while keeping the patient awake and allowing for communication with the surgeon [15,16,17,18].

Dexmedetomidine, a specific alpha-2 adrenergic agonist, is being contemplated as an additional treatment to the conventional interscalene brachial plexus block in shoulder surgery because of its calming and pain-relieving characteristics. This review examines the present condition, modes of operation, methods of administration, clinical uses, safety characteristics, and potential future advancements in this developing domain. Its objective is to improve the anaesthesia used in shoulder surgery [19,20].

Shoulder surgery was mainly performed under general anaesthesia before the 1970s. In the latter half of the century, interscalene brachial plexus block (ISB) was introduced as a legitimate anaesthetic technique. Several techniques have been developed to access the plexus, including paraneesthesia, peripheral nerve stimulators, and ultrasound imaging. Local anaesthetic procedures can effectively manage pain, reduce muscle spasms, facilitate early mobility, and enhance patient recovery and success. This paper examines the progression of various anaesthetic methods used in shoulder surgery. [21,22]

### **Patients and methods**

A cross-sectional study was conducted for patients who underwent orthopedic and fracture surgery, and samples of 130 patients were collected from different hospitals in Iraq for a period between July 7, 2022, and March 24, 2023. This study identified demographic and clinical data for patients between the ages of 30 and 60 years. Characteristics included age, sex, body mass index, surgery used, smoking status, marital status, income level, employment status, and opioids used before surgery. Also, this study demonstrated the main causes and diagnoses of patients with shoulder and elbow injuries and also identified the most common comorbidities associated with the patients. Furthermore, the biochemical data of the patients were measured before they underwent surgery.

This determined the surgical data used distributed among the patients for both groups, which identified the first group that included patients who underwent surgery under general anesthesia with 70 patients and the second group that included patients that underwent surgery under local anesthesia with 60 patients. Our data identified the two surgeries that patients underwent, which included both shoulder surgery and elbow surgery, during and after surgery in terms of the time of the two surgeries, the estimated rate of blood loss, the number of cases that lost blood, the mortality rate while undergoing both surgeries under general anesthesia or local anesthesia, and the rate of

patients who were admitted to care, and recovery time of patients.

In addition, our study recorded the rate and prevalence of complications among patients after both surgeries. Also, our results determined the satisfaction rate of patients with surgery and special care in the hospital in terms of criteria: excellent, good, satisfactory, and poor.

Our study determined the rate of pain during the first three days after surgery for both groups using the VAS scale. To further compare the results between the two groups, our study evaluated the patient's quality of life before surgery and after surgery within the parameters of physical function, psychological function, social function, and daily activities.

## Results

Table 1: Demographic and preoperative data of patients in this study.		
Characteristics	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]
Age		
30 – 39	16 [22.86%]	12 [20%]
40 – 49	24 [34.29%]	17 [24.29%]
50 – 60	30 [42.86%]	31 [44.29%]
Sex		
Males	49 [70%]	36 [60%]
Females	21 [30%]	24 [40%]
BMI, [Kg/m <sup>2</sup> ]		
18.5 – 24.9	14 [20%]	15 [25%]
25 – 29.9	21 [30%]	21 [35%]
> 30.0	35 [50%]	24 [40%]
ASA		
I	18 [25.71%]	9 [15%]
II	24 [34.29%]	15 [25%]
III	28 [40%]	36 [60%]
Surgery used		
Shoulder surgery	42 [60%]	30 [50%]
Elbow surgery	28 [40%]	30 [50%]
Smoking status		
Yes	7 [10%]	12 [20%]
No	63 [90%]	48 [48%]

Marital status		
Single	4 [5.71%]	3 [5%]
Married	45 [64.29%]	39 [65%]
Divorced	14 [20%]	12 [20%]
Widow	7 [10%]	6 [10%]
Income level, \$		
Less than 800 \$	47 [67.14%]	42 [70%]
More than 800 \$	13 [18.57%]	18 [30%]
Employment status		
Employed	42 [60%]	46 [65.71%]
Unemployed	20 [40%]	24 [34.29%]
Preoperative opioid use		
Yes	56 [80%]	42 [70%]
No	14 [20%]	18 [30%]

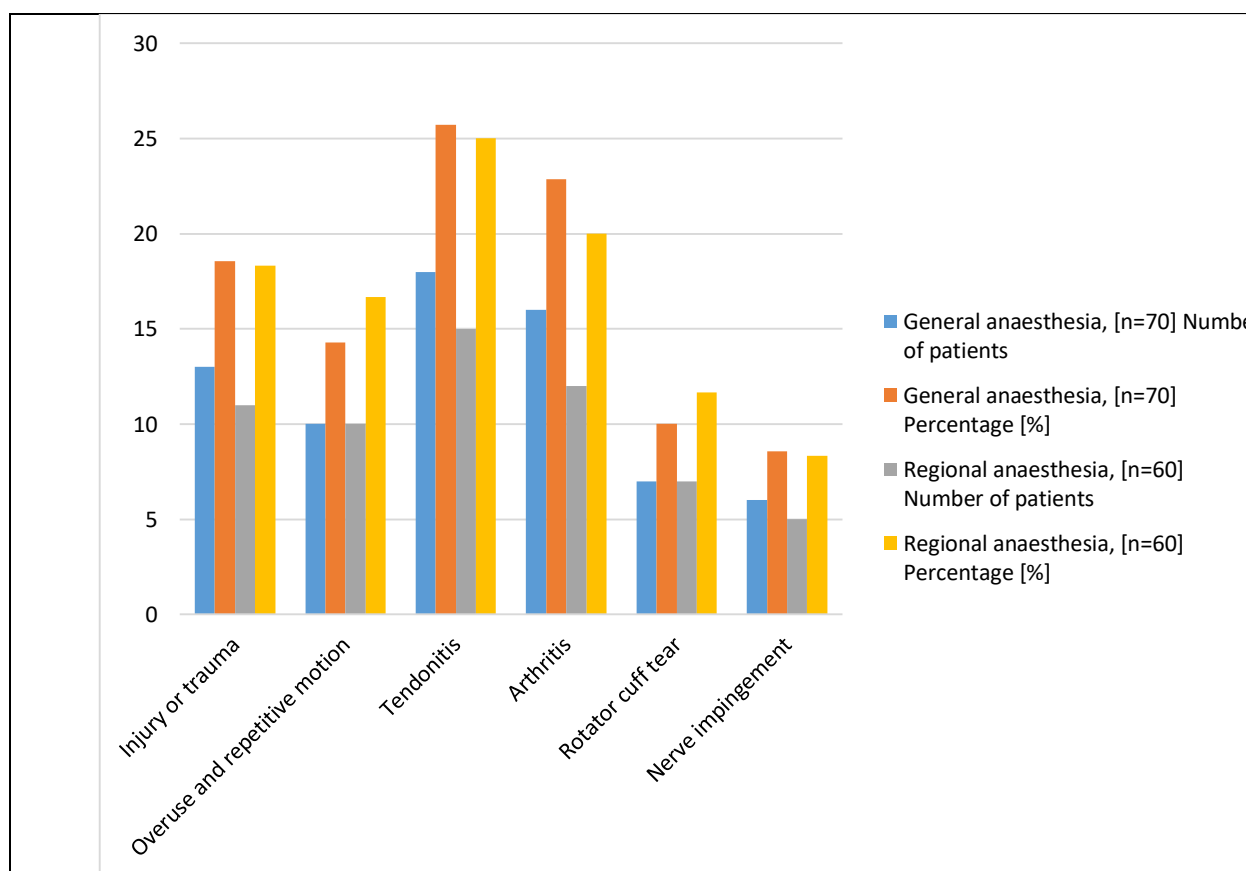


Figure 1: The main causes and diagnoses for patients with shoulder and elbow injuries.

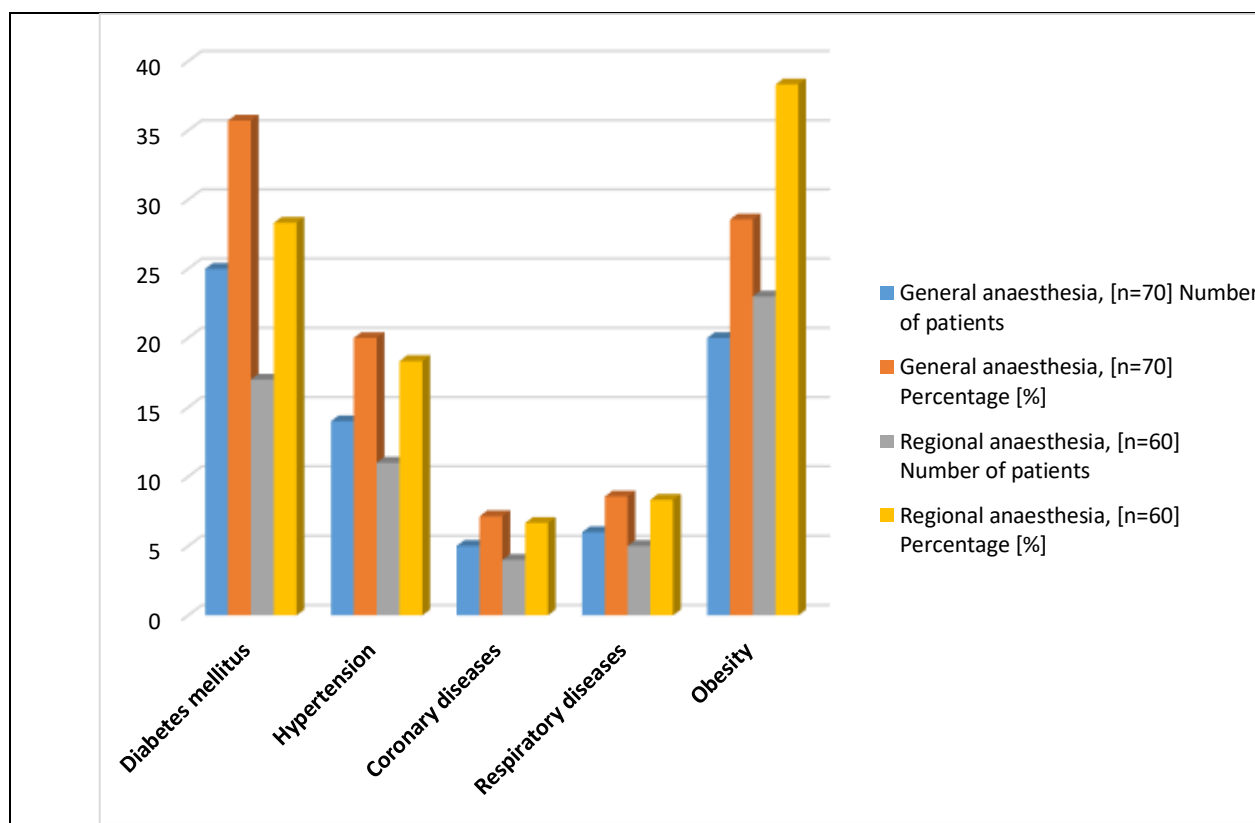


Figure 2: Identify the most common comorbidities associated with patients.

Table 2: Preoperative quality of life for patients who undergoing into shoulder and elbow surgeries.

QoL domains	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]	P – value
Physical function	20.60 ± 4.52	23.16 ± 2.5	0.0471
Social function	41.81 ± 1.8	34.83 ± 4.8	0.0180
Psychological function	16.82 ± 3.7	24.8 ± 5.2	0.0001
Daily activates	17.40 ± 2.55	19.22 ± 3.18	0.0468

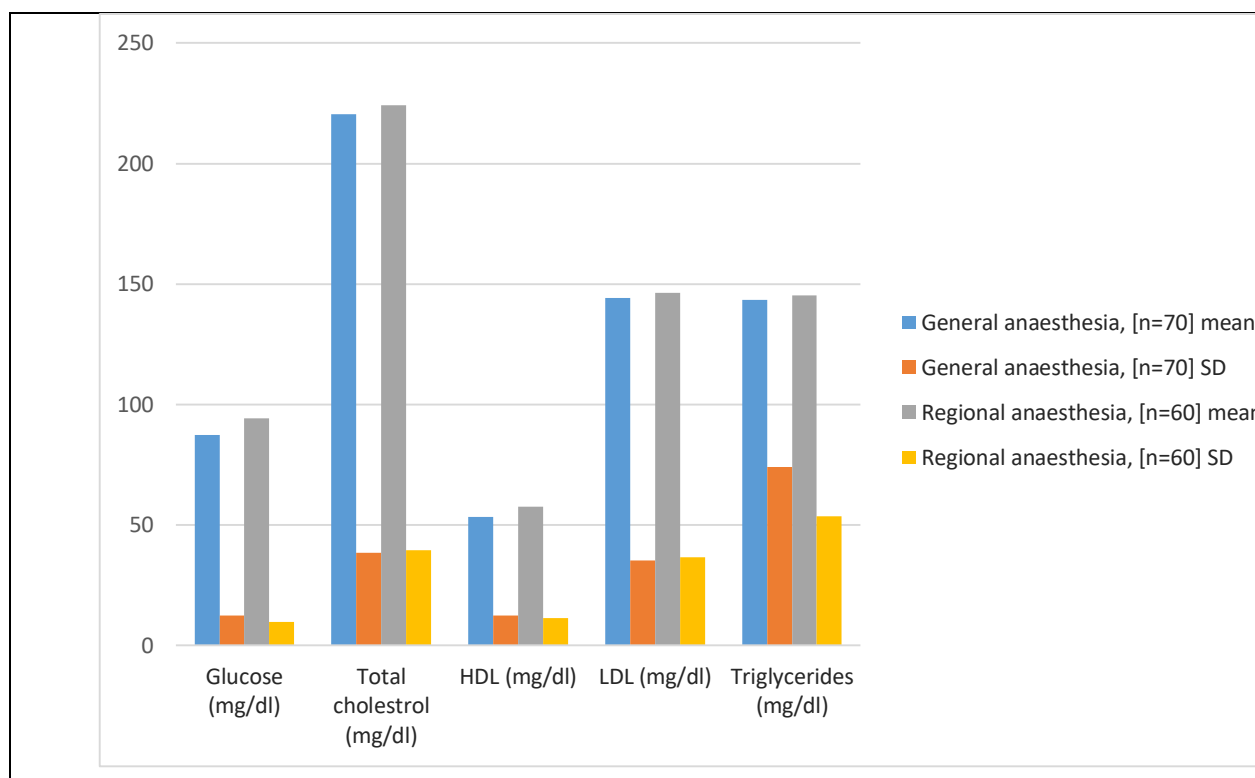


Figure 3: Preoperative outcomes of the biochemical test.

Table 3: Intraoperative and postoperative findings.

Characteristics	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]	P – value
Operative time			0.021
Shoulder surgery hours	3.1 ± 0.2	3.7 ± 5.2	
Elbow surgery min	50.21 ± 4.5	56.76 ± 7.8	
Estimated blood loss, mL	119.76 ± 14.20	171.56 ± 16.51	< 0.001
Bleeding N [%]	11 [15.71%]	15 [25%]	0.0064
Length of stay, days			0.0265
Shoulder surgery	2.1 ± 0.2	2.6 ± 0.3	
Elbow surgery	2.4 ± 0.8	2.6 ± 1.2	
Mortality rate N [%]			0.0642
Shoulder surgery	2 [2.86%]	3 [5%]	
Elbow surgery	1 [1.43%]	2 [3.33%]	
ICU Admission	7 [10%]	12 [20%]	0.0011

Recovery time, weeks			0.048
Shoulder surgery	2.21 ± 0.11	2.45 ± 0.34	
Elbow surgery	5.1 ± 0.6	5.3 ± 0.71	

Table 4: Post-operative complications.

Complications	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]	P – value
Infection	3 [4.29%]	3 [5%]	< 0.01
Stiffness	1 [1.43%]	2 [3.33%]	< 0.001
Blood Clots	1 [1.43%]	2 [3.33%]	< 0.001
Nerve or Blood Vessel injury	2 [2.86%]	3 [5%]	< 0.001

Table 5: Determine the satisfaction level of patients for both groups

Satisfaction level	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]	P – value
Excellent	29 [41.43%]	19 [31.67%]	0.0028
Good	20 [28.57%]	16 [26.67%]	0.0437
Satisfied	13 [18.57%]	14 [23.33%]	0.0318
Poor	8 [11.43%]	11 [18.33%]	0.0042

Table 6: Post-operative pain related to both groups by VAS score.

Time [Days]	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]	P – value
Day 1	5.5 ± 1.2	6.3 ± 1.5	> 0.01
Day 2	3.3 ± 0.3	3.8 ± 0.7	> 0.01
Day 3	0.4 ± 0.1	1.5 ± 0.02	< 0.01

QoL domains	General anaesthesia, [n=70]	Regional anaesthesia, [n=60]	P – value
Physical function	82.80 ± 12.9	71.47 ± 8.54	0.0073
Social function	88.53 ± 2.46	86.65 ± 2.07	0.0486
Psychological function	80.23 ± 5.68	76.10 ± 6.80	0.0286
Daily activates	87.10 ± 3.79	83.58 ± 2.79	0.0433

### Discussion

Our demographic results showed that patients aged 50–60 had the highest infection rate, as the general anesthesia group included 30 patients and 31 patients, with the male rate being higher with 49 compared to females with 21 patients. The BMI rate > 30.0 was the highest in 35 patients and ASA III. There were 28 patients, and our data recorded seven patients who were smokers and 63 non-smokers. The majority of patients were married, 64.29%. The employment rate was 60% employees, and 40% were non-employees. The use of opiates included 56 patients. Regarding the demographic results of the local anesthesia group, patients aged 50–60 years had the highest infection rate, which included 31 male patients and 31 male patients, and the rate of males was higher with 36 compared to females with 24 patients. The rate of BMI > 30.0 was the highest in 24 patients, and the ASA III was 36 patients, and our data recorded 12 patients who were smokers and 48 non-smokers. The majority of patients were married, 65%. The employment rate was 65.71% for employees, and 34.29% were non-employees. The use of opiates included 42 patients.

According to shoulder and elbow surgeries that were enrolled, our results showed that in the group that underwent both surgeries under general anesthesia, 70 patients underwent both surgeries, which included 42 patients who underwent shoulder surgery and 28 patients who underwent elbow surgery, while in the regional anesthesia group, which included 30 patients who underwent shoulder surgery and 30 patients who underwent elbow surgery, This study revealed that most of the causes of shoulder and elbow injuries were caused by tendonitis, with 18 patients in the general anesthesia group and 15 patients in the regional anesthesia group, while the second cause was arthritis, which included 16 patients in the general anesthesia group and 12 patients in the regional anesthesia group. Moreover, the most common comorbidities among patients were diabetes and hypertension, where the first group recorded hypertension at a rate of 14 cases and diabetes at 25 cases, while in the second group, our results recorded the presence of hypertension at a rate of 11 cases, and diabetes included 17 patients.

This study recorded the results during surgery, including the operating time for shoulder surgery, which ranged between 3 - 4 hours, and for elbow surgery, which ranged from (50 - 60) minutes, and the number of patients who lost blood included 11, with an amount of 119.76 ± 14.20 ml in the first group with an amount of 171.56 ± 16.51 ml in the second group, the duration of stay

in the hospital was between (2 - 3) days for patients who underwent general anesthesia and (2 - 3) days for elbow surgery, and the mortality rate was three patients in the general anesthesia group and five patients in In the regional anesthesia group, the recovery rate was 2-3 weeks under shoulder surgery and 5–6 weeks under regional anesthesia. The complication rate included seven patients in the general anesthesia group and ten patients in the regional anesthesia group. The most common post-operative complications were infection and nerve or blood vessel injury. The satisfaction rate was high among patients, as 29 patients were found to have excellent acceptance in the general anesthesia group, and 19 patients were in the regional anesthesia group. The pain rate was low in the surgical group under general anesthesia, especially on the third day,  $0.4 \pm 0.1$ , compared to regional anesthesia,  $1.5 \pm 0.02$ . Patient's quality of life scores with physical function were  $82.80 \pm 12.9$  under general anesthesia and  $71.47 \pm 8.54$  under regional anesthesia, as well as social function, was  $88.53 \pm 2.46$  under general anesthesia and  $86.65 \pm 2.07$  under regional anesthesia.

Despite the differences and changes in anesthesia techniques to improve patient outcomes, most studies show that the general anesthesia technique has an advantage as an effective anesthesia technique compared to local anesthesia in terms of the safety and comfort of patients during and after the pain-free operation, which enhances the pain rate significantly, as well as enhancing the rate of pain. Better and faster recovery after the operation, which reduces side effects for patients and effectively improves bone function in the long term.

### Conclusion

Our results showed that anesthesia techniques play an effective role in the safety and comfort of patients and the success of shoulder and elbow surgeries in post-operative pain management. Our study recorded the superiority of general anesthesia compared to local anesthesia because of its advantages: lower pain rate, faster recovery, higher satisfaction rate, lower complication rate, as well as relaxation of all the muscles of the body, which contributes to the surgeon managing the operation in an easier and more accurate way compared to regional anesthesia, which improves the results of patients after the operation.

### References

1. Arthroscopic shoulder surgery for the treatment of rotator cuff tears. [ Sep; 2023]. 2023. <https://orthop.washington.edu/patient-care/articles/sports/arthroscopic-shoulder-surgery-for-the-treatment-of-rotator-cuff-tears>
2. Anterior shoulder dislocation. Cutts S, Prempeh M, Drew S. *Ann R Coll Surg Engl*. 2009;91:2–7. [PMC free article] [PubMed] [Google Scholar]
3. Perioperative anaesthetic considerations for rotator cuff repair surgeries: A current concept review. Maurya I, Garg R, Jain VK, Iyengar KP, Vaishya R. *J Clin Orthop Trauma*. 2021; 17:65–71. [PMC free article] [PubMed] [Google Scholar]
4. Regional anaesthesia for shoulder surgery. Hewson DW, Oldman M, Bedfordth NM. *BJA Educ*. 2019; 19:98–104. [PMC free article] [PubMed] [Google Scholar]
5. Anesthesiological considerations in shoulder surgery. Lanna M, Pastore A, Policastro C, Iacovazzo C. <https://pubmed.ncbi.nlm.nih.gov/23905051/> *Transl Med UniSa*. 2012; 3:42–48. [PMC free article] [PubMed] [Google Scholar]

6. Post-operative pain management in shoulder surgery: suprascapular and axillary nerve block by arthroscope assisted catheter placement. Basat HÇ, Uçar DH, Armangil M, Güçlü B, Demirtaş M. *Indian J Orthop.* 2016; 50:584–589. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
7. Regional anesthesia techniques for shoulder surgery in high-risk pulmonary patients. Lee BH, Qiao WP, McCracken S, Singleton MN, Goman M. *J Clin Med.* 2023;12 [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
8. Waheeb A, Zywił MG, Palaganas M, Venkataramanan V, Davis AM. The influence of patient factors on patient-reported outcomes of orthopedic surgery involving implantable devices: a systematic review. *Seminars in Arthritis & Rheumatism.* 2015; **44:461–471.** doi: 10.1016/j.semarthrit.2014.08.002. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
9. Huang F, Wu D, Ma G, Yin Z, Wang Q. The use of tranexamic acid to reduce blood loss and transfusion in major orthopedic surgery: a meta-analysis. *Transfusion & Apheresis Science.* 2014; **186:318–327.** [[PubMed](#)] [[Google Scholar](#)]
10. Andrade N, Schmiedt CW, Cornell K, Radlinsky MG, Heidingsfelder L, Clarke K, et al. Survey of intraoperative bacterial contamination in dogs undergoing elective orthopedic surgery. *Veterinary Surgery* Vs. 2016; **45:214–222.** doi: 10.1111/vsu.12438. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
11. Veljkovic A, Dwyer T, Lau JT, Abbas KZ, Salat P, Brull R. Neurological complications related to elective orthopedic surgery: part 3: common foot and ankle procedures. *Regional Anesthesia & Pain Medicine.* 2015; **40:455.** doi: 10.1097/AAP.000000000000199. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
12. Hu N, Guo D, Wang H, Xie K, Wang C, Li Y, et al. Involvement of the blood-brain barrier opening in cognitive decline in aged rats following orthopedic surgery and high concentration of sevoflurane inhalation. *Brain Res.* 2014; **1551:13–24.** doi 10.1016/j.brainres.2014.01.015. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
13. Safavi M, Honarmand A, Negahban M. Attari M. *Prophylactic effects of intrathecal Meperidine and intravenous Ondansetron on shivering in patients undergoing lower extremity orthopedic surgery under spinal anesthesia.* 2014; **3:94–99.** [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
14. Dexmedetomidine prevents postoperative nausea and vomiting on patients during general anesthesia: A PRISMA-compliant meta-analysis of randomized controlled trials. Jin S, Liang DD, Chen C, Zhang M, Wang J. *Medicine (Baltimore)* 2017;96:0. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
15. Zisquit J, Nedeff N. StatPearls [Internet] Treasure Island, FL: StatPearls Publishing; 2023. Interscalene block. [[PubMed](#)] [[Google Scholar](#)]
16. An evaluation of brachial plexus block using a nerve stimulator versus ultrasound guidance: a randomized controlled trial. Singh S, Goyal R, Upadhyay KK, Sethi N, Sharma RM, Sharma A. *J Anaesthesiol Clin Pharmacol.* 2015; 31:370–374. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
17. Review of adjuvants to local anesthetics in peripheral nerve blocks: current and future trends. Krishna Prasad GV, Khanna S, Jaishree SV. *Saudi J Anaesth.* 2020; 14:77–84. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

18. The use of ultrasound guidance for perioperative neuraxial and peripheral nerve blocks in children. Guay J, Suresh S, Kopp S. *Cochrane Database Syst Rev.* 2019;2:0. [PMC free article] [PubMed] [Google Scholar]
19. Peripheral regional anesthesia using local anesthetics: old wine in new bottles? Gasteiger L, Kirchmair L, Hoerner E, Stundner O, Hollmann MW. *J Clin Med.* 2023;12 [PMC free article] [PubMed] [Google Scholar]
20. Regional anesthesia for orthopedic procedures: What orthopedic surgeons need to know. Kamel I, Ahmed MF, Sethi A. *World J Orthop.* 2022; 13:11–35. [PMC free article] [PubMed] [Google Scholar]
21. Additives to local anesthetics for peripheral nerve blockade. Brummett CM, Williams BA. *Int Anesthesiol Clin.* 2011; 49:104–116. [PMC free article] [PubMed] [Google Scholar]
22. Postoperative pain control. Garimella V, Cellini C. *Clin Colon Rectal Surg.* 2013;26:191–196. [PMC free article] [PubMed] [Google Scholar]