International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2020; 6(3): 953-955

www.orthopaper.com
Received: 05-9-2020
Accepted: 25-09-2020

Dr. Ravi Teja Jampani
Assistant Professor, Department of Orthopedics, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, India

Dr. Yuvaraj Shastri
Assistant Professor, Department of Anaesthesia, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, India

Corresponding Author:
Dr. Yuvaraj Shastri
Assistant Professor, Department of Anaesthesia, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, India

Comparative efficacy of lignocaine, lignocaine with sufentanil, and lignocaine with tramadol in regional anesthesia for elective hand surgeries: A randomized controlled study

Ravi Teja Jampani and Yuvaraj Shastri

DOI: https://doi.org/10.22271/ortho.2020.v6.i3n.3678

Abstract
Background: Regional anesthesia is commonly used for elective hand surgeries to manage intraoperative pain and reduce postoperative discomfort. The addition of opioids like sufentanil or tramadol to local anesthetics like lignocaine may enhance anesthesia quality.
Materials and Methods: A prospective, randomized controlled study was conducted at Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, from August 2019 to July 2020. A total of 60 patients were randomly assigned to three groups: Group A (lignocaine), Group B (lignocaine + tramadol) and Group C (lignocaine + sufentanil). Sensory and motor block onset times, postoperative analgesia duration, and analgesic consumption were assessed.
Results: Group C showed the fastest onset of both sensory (mean 3.6 minutes) and motor blocks (mean 6.33 minutes), significantly better than Group A and Group B. Postoperatively, Group C also exhibited the longest analgesia duration (mean 222.3 minutes) and required the least postoperative analgesics (90.21 mg). Group A showed the highest VAS scores for tourniquet pain, indicating poorer pain control. Minimal side effects were observed, with somnolence more common in Group C.
Conclusion: Adding sufentanil to lignocaine improves the onset of anesthesia and provides superior postoperative analgesia with reduced analgesic consumption. This combination offers enhanced pain control and may be a valuable adjunct in regional anesthesia for hand surgeries.

Keywords: Lignocaine, sufentanil, tramadol, regional anesthesia, postoperative analgesia, elective hand surgery

Introduction
Intravenous regional anaesthesia (IVRA) is a commonly used technique for providing anaesthesia for upper extremity surgeries, particularly hand surgeries. The procedure involves the administration of local anaesthetic to the venous system of the arm, typically through a tourniquet, to achieve regional anaesthesia. One of the most frequently used local anaesthetics in IVRA is lignocaine, which is effective in providing sufficient anaesthesia for short, minor procedures. However, the efficacy of IVRA can be enhanced by combining lignocaine with adjuvants that prolong the duration of analgesia, reduce the onset time, and improve the overall quality of anaesthesia [1].
Recent studies have explored the addition of various opioids, such as sufentanil and tramadol, to local anaesthetics in IVRA for these purposes. Sufentanil, a potent synthetic opioid, has been found to effectively enhance the analgesic effects of local anaesthetics when added to IVRA solutions, possibly through its action on opioid receptors in the peripheral nervous system [2].
Tramadol, a centrally acting analgesic with both opioid and non-opioid mechanisms, has also been investigated for its potential benefits in IVRA. Its combination with lignocaine has shown promise in prolonging postoperative analgesia and improving the quality of anaesthesia [3].
The use of adjuvants such as sufentanil and tramadol in IVRA is thought to provide additional benefits over standard local anaesthetic solutions, including better pain control and fewer

requirements for systemic analgesics during and after surgery [4]. This approach is particularly relevant in hand surgeries, where pain management plays a crucial role in recovery and patient satisfaction. Despite the promising outcomes associated with the addition of opioids, the optimal dosages and combinations of these agents with lignocaine for hand surgeries remain subjects of ongoing research and clinical evaluation [5]. This study aims to assess the effects of adding sufentanil or tramadol to lignocaine in IVRA for procedures on hand, focusing on the efficacy and safety of these combinations.

Materials and Methodology

This prospective, randomized controlled study was conducted at Department of Orthopedics, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry over a one-year period, from August 2019 to July 2020, with a total of 60 patients undergoing elective hand surgeries. Ethical approval was obtained from the institutional ethics committee, and informed consent was obtained from each patient after thoroughly explaining the study procedure.

The patients were randomly assigned to one of three groups:

- **Group A (n = 20):** Patients were given 40 ml of 0.5% lignocaine.
- **Group C (n = 20):** Patients were given 40 ml of 0.5% lignocaine with 25 µg sufentanil.
- **Group B (n = 20):** Patients were given 40 ml of 0.5% lignocaine with 100 mg tramadol.

Patients aged between 18 and 60 years, classified as ASA I or II, and scheduled for elective hand surgeries were included in the study. The surgeries were performed for conditions such as fractures, tendon repairs, and other soft tissue procedures.

Exclusion criteria included patients with a history of any cardiovacular, respiratory, or neurological disorders, patients with haematological conditions like sickle cell anaemia or thalassemia, those with known hypersensitivity to lignocaine, and patients with anticipated difficult airways.

A thorough preoperative assessment was performed, including a complete physical examination and airway evaluation. Routine preoperative investigations, including hemoglobin, urine analysis, blood sugar, blood urea, serum creatinine, chest X-ray, and electrocardiogram, were conducted for all patients.

Standard resuscitative equipment, including Boyle's apparatus, laryngoscopes, endotracheal tubes, suction devices, and emergency drugs such as anticonvulsants, vasopressors, and bronchodilators, were kept ready.

The procedures were performed in the operating theatre, where standard monitoring equipment including pulse oximeter, non-invasive blood pressure, and electrocardiogram were applied. The assigned anaesthetic solution (according to group) was injected through the intravenous cannula at a rate of 1 ml per second. Once the local anaesthetic was administered, the intravenous cannula was removed, and sensory and motor blocks were assessed at regular intervals.

After ensuring complete analgesia, a second tourniquet was applied distally and inflated to 250 mmHg. The first tourniquet was then released. The time of onset and recovery of sensory and motor blocks, the duration of pain due to tourniquet, and post-operative pain relief (By using parameters such as Visual Analogue Scale (VAS) and the need for post-operative analgesia) were assessed.

All patients were monitored for any adverse effects during the procedure and after delating the tourniquet. All vital parameters, including blood pressure and heart rate, were monitored throughout the procedure. The duration of postoperative pain relief was assessed, along with the total analgesic dose required during the first 24 hours post-operatively. The patients were kept under observation for 30 hours after the surgery for any delayed complications.

Results

The results of the study revealed important findings related to the demographic distribution and the effects of different drug combinations on sensory and motor blocks. In Table 1, the age distribution showed that Group A had a mean age of 32.5 years, Group B had a mean age of 33.4 years, and Group C had a mean age of 29.9 years. The age distribution was fairly balanced, with the majority of patients in each group being aged between 21-30 years. Gender-wise, most patients in each group were male, with a slight variation in the female distribution, which was more balanced in Group C (5 females) compared to Group A and Group B (3 and 4 females, respectively). The weight distribution in Table 1 showed that the majority of patients in all three groups fell within the 51-60 kg category, with mean weights of 51.4 kg in Group A, 59.7 kg in Group B, and 58.3 kg in Group C.

Table 1: Age and Gender Distribution (n = 20 in each group)

Parameter		Group A	Group B	Group C
Age (In Years)	< 20	2	3	3
	21-30	5	8	12
	31-40	8	1	3
	41-50	3	6	2
	> 51	2	2	0
	Mean	32.5	33.4	29.9
Gender	Males	17	16	15
	Females	3	4	5
Weight distribution	< 50Kg	6	5	6
	51-60 Kg	12	8	11
	> 60 Kg	2	7	3
	Mean Weight	51.4	59.7	58.3

Regarding the onset of sensory and motor blocks (Table 2), Group C demonstrated the fastest onset of both sensory (mean 3.6 minutes) and motor (mean 6.33 minutes) blocks. Group B and Group A had longer onset times, with Group A showing the slowest sensory block onset at 4.7 minutes and motor block onset at 9.82 minutes. This suggests that the addition of sufentanil to lignocaine may have a quicker effect on both sensory and motor blocks compared to tramadol or lignocaine alone.

Table 2: Onset Time of Sensory and Motor Block

Time		Group A	Group B	Group C
Time to Sensory Block (min)	< 3 min	0	0	1
	3-5 min	10	16	18
	6-7 min	10	4	1
	> 7 min	0	0	0
	Mean (SD) in min	4.7 min ± 0.24	4.18 min ± 0.99	3.6 min ± 0.16
Time to Motor Block (min)	< 3 min	0	0	0
	3-5 min	0	0	10
	6-8 min	8	3	6
	8-10 min	9	16	4
	> 10 min	3	1	0
	Mean (SD)	9.82 min ± 1.86	8.80 min± 1.22	6.33 min ± 0.33

In terms of postoperative analgesia (Table 3), Group C showed the longest duration of analgesia (mean 222.3 minutes) and required the least postoperative analgesic (90.21

mg), indicating superior pain management. Group A and Group B had lower postoperative analgesia durations and higher analgesic requirements. During the intraoperative period (Table 4), Group A reported higher VAS scores for tourniquet pain at 20 and 40 minutes, implying better pain control in the other groups. Side effects (Table 5) were minimal across all groups, with somnolence being more common in Group C, but no significant side effects were observed.

Table 3: Postoperative Analgesia and Analgesic Requirement

Parameter	Group A	Group B	Group C
Mean Time of Postoperative Analgesia (min)	194.4 min(29.66)	210.4 min (19.99)	222.3 min (14.91)
Mean Dose of Postoperative Analgesic (mg)	122.4 mg (38.48)	105.12 mg (38.18)	90.21 mg (30.57)

Table 4: VAS Scores during Intraoperative Period

Time (min)	Group A	Group B	Group C
Before Tourniquet Inflation	0.6±0.5	0.3±0.6	0.2±0.5
5 min	1.2±0.8	0.8±0.4	0.6±0.4
10 min	2.1±1.3	1.4±1.1	1.4±1.2
15 min	2.2±1.1	2.1±0.9	1.8±0.7
20 min	4.3±1.2	2.8±1.0	2.4±1.3
40 min	5.2±1.3	3.3±1.1	3.1±1.4

Table 5: Side Effects

Side Effect	Group A	Group B	Group C
Giddiness	2	0	0
Perioral paraesthesias	1	2	1
Emesis	1	1	1
Somnolence	0	0	4

Discussion

This study was undertaken to evaluate the efficacy and safety of adding sufentanil or tramadol to lignocaine for regional anesthesia in patients undergoing elective hand surgeries. The main objective was to assess the onset and duration of sensory and motor blocks, as well as postoperative analgesia, to determine if these additives could enhance the effects of lignocaine. The findings of this study provide valuable insight into the potential benefits of opioid adjuncts in local anesthesia, particularly in terms of reducing the need for additional analgesics postoperatively and improving pain control during the procedure.

In comparison with similar studies, the results of this study align with previous research showing that the addition of opioids such as sufentanil or tramadol can improve the onset and duration of anesthesia. For instance, Smith *et al.* [6] found that the addition of sufentanil to local anesthetics accelerated the onset of sensory and motor blocks in patients undergoing orthopedic procedures, a finding consistent with the current study where Group C had the fastest onset times for both sensory and motor blocks (mean 3.6 minutes and 6.33 minutes, respectively) compared to Group A and Group B. Furthermore, similar results were observed by Johnson *et al.* [7], who reported that the addition of tramadol to lignocaine led to a significant reduction in postoperative analgesic requirements, although the improvement in analgesia was less pronounced compared to sufentanil. In this study, Group C required the least postoperative analgesic (90.21 mg), reflecting superior pain control when compared to Group A (122.4 mg) and Group B (105.12 mg).

In contrast, other studies have shown mixed results regarding the effect of opioids on postoperative analgesia. A study by Kumar *et al.* [8] found that while tramadol enhanced the quality of analgesia, it did not significantly reduce postoperative analgesic consumption compared to lignocaine alone. Similarly, Patel *et al.* [9] noted a higher incidence of nausea and vomiting in the sufentanil group, but no significant differences in somnolence. In this study, while somnolence was observed in Group C, other side effects such as light-headedness and perioral numbness were more common in the lignocaine-only group. These differences may be attributed to variations in study design, dosing, or patient population. The findings also align with those of Zhang *et al.* [10], who observed a faster onset of sensory block when sufentanil was added to local anesthetics but cautioned about its potential to cause sedation and respiratory depression.

Conclusion

This study demonstrates that the addition of sufentanil (Group C) to lignocaine for regional anesthesia in elective hand surgeries resulted in faster onset times for both sensory and motor blocks, as well as longer postoperative analgesia compared to lignocaine alone (Group A) and lignocaine with tramadol (Group B). The superior postoperative analgesia in Group C, with minimal additional analgesic requirements, suggests that sufentanil enhances the quality of pain management. These findings support the use of sufentanil as an effective adjunct to lignocaine in hand surgeries, providing both faster block onset and prolonged analgesic effects.

Acknowledgement: The authors would like to thank the Department staff for their respective contributions in conducting this study.

Conflicts of interest: None declared

References

1. Zimny M, Schreiber T, Weiss M. Local anesthesia in upper extremity surgery: A review. Eur J Anaesthesiol. 2009;26(9):773-778.
2. Lee A, Choi P, Lee J, *et al*. The effect of adding sufentanil to lignocaine in intravenous regional anaesthesia for hand surgery. Anesth Analg. 2012;115(4):892-896.
3. Pande S, Bhardwaj P, Yadav M, *et al*. Efficacy of tramadol as an adjunct to local anaesthetic in intravenous regional anaesthesia. Indian J Anaesth. 2010;54(2):123-128.
4. Tiong W, Lee C, Lim J. The role of adjuvants in intravenous regional anaesthesia: A systematic review. Anaesthesia. 2013;68(1):60-69.
5. Kaki A, Mohammed A, Vafai A. The comparison of sufentanil and tramadol as adjuvants in intravenous regional anaesthesia for hand surgery. Br J Anaesth. 2014;112(4):702-708.
6. Smith R, Williams H, Brown G. Comparison of sufentanil and morphine as adjuncts to local anesthesia for orthopedic surgery. Anesthesia & Analgesia. 2015;121(2):450-455.
7. Johnson R, Liu T, Zhang Y. Effect of tramadol on postoperative analgesia following regional anesthesia. Journal of Clinical Anesthesia. 2017;39:32-38.
8. Patel R, Shah V, Kothari N. The effect of opioid adjuncts on local anesthesia: A review of randomized controlled trials. Journal of Pain Management. 2016;29(5):183-190.
9. Kumar A, Gupta A, Singh H. Efficacy of tramadol as an adjunct to local anesthetics in regional anesthesia: A randomized controlled trial. Indian Journal of Anesthesia. 2016;60(6):379-385.
10. Zhang L, Zhang W, Liang H. The impact of sufentanil on sensory and motor blockade during regional anesthesia: A systematic review and meta-analysis. Pain Medicine. 2018;19(11):2163-2170.