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Adjunct use of dexmedetomidine to lignocaine for intravenous regional anaesthesia

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Abstract

Background: This randomised, double-blind, prospective research compares the effects of lignocaine with dexmedetomidine on sensory and motor block onset time, intraoperative sedation, tourniquet discomfort, and postoperative analgesia in patients undergoing intravenous regional anaesthetic.

Methods: The Department of Aneasthology, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Telangana, India, between September 2020 to August 2021, is the site of this prospective, randomised, double-blind control trial. Following permission from the institutional review board, 50 patients aged 20-60 years old with ASA physical status grades I and II who were scheduled for upper limb procedures lasting less than 90 minutes were included.

Results: Regarding age, sex, weight, and operation time, there were no significant differences between the Groups. Compared to Group B's 5.270.58 minutes and 18.071.26 minutes for the beginning of sensory and motor block, Group A's 1.80.76 minutes is much shorter. Recovery times for sensation and movement in Group A were 18.873.27 minutes and 25.63.82 minutes, respectively, while in Group B those numbers were 4.80.7 minutes and 2.530.51 minutes. Group A had 1.770.43 cases of sedation, while Group B had 1. The average time for postoperative analgesia in Group A was 416.245.73 minutes, while in Group B, this number was just 11.330.96 minutes. There were no negative reactions.

Conclusion: With the addition of Dexmedetomidine 0.5 micrograms/kg to lignocaine for intravenous regional anaesthetic, the onset of sensory and motor blocking was accelerated, tourniquet pain was reduced, post-operative analgesia lasted longer, and hemodynamic stability was improved, all without adverse effects.

Keywords: Tourniquet, postoperative analgesia, and dexmedetomidine

Introduction

Since its inception in August Bier's hands in 1908, Intravenous Regional Anaesthesia (IVRA) has grown to become an important tool for anesthesiologists. A period of time saw widespread use of this strategy [1]. The intravenous procedure lost favour as soon as simpler, more dependable methods of blocking the brachial plexus were available. In 1963, Holmes brought it back to life by using lignocaine because he believed it provided more consistent anaesthesia than procaine. A number of small technological advancements have made intravenous regional anaesthesia the preferred route of anaesthetic administration for outpatient limb treatments requiring local anaesthetic [2, 3].

It's advantageous in that it's quick to initiate, easy to recover from, effectively blocks traffic, and doesn't break the bank. Faster onset time, reduction of tourniquet pain, longer post-operative analgesia, enhanced peri-operative analgesia, and a lower risk of local anaesthetic toxicity are only some of the ways that adjuvants have increased the use of regional anaesthesia [4, 5].

Dexmedetomidine's efficacy as an intravenous regional anaesthetic adjuvant how well Dexmedetomidine works as an adjuvant in Intravenous regional anaesthetic to stop tourniquet pain. Intravenous regional anaesthetic with dexmedetomidine as an adjuvant extends the time until postoperative pain returns to baseline. It wasn't until 1908 that August Bier first described intravenous regional anaesthesia [6]. When he administered local anaesthetic intravenously between the tourniquets, he found that the anaesthetic took effect quickly in that spot. After being forgotten for a while, Holmes revived the method in the 1960s, and it quickly gained popularity. Today, the approach is somewhat altered by employing a single or double tourniquet at a single location and administering local anaesthetic as far away from the cuff as feasible [7].

However, there is a risk of toxic systemic doses of local anaesthetic if the incorrect cuff is accidentally deflated when using a double tourniquet to maximise safety and lessen tourniquet discomfort in the conscious patient. The administration of intravenous regional anaesthesia is a relatively straightforward process that does not need in-depth familiarity with the human body. There is an almost perfect success rate (96-100%) and almost little downtime (1%). Minor surgical operations involving the extremities can benefit from this tried-and-true, low-risk way of delivering anaesthetic when performed by trained medical professionals [7, 8].

Dexmedetomidine, a 2-agonist, has analgesic effects via inhibiting nerve action potentials, particularly in C fibres, and by acting on 2-adrenergic receptors in the axon terminals of nerves. When used in conjunction with local anaesthetics, it helps to alleviate discomfort during surgery. Greater patient satisfaction, faster hospital release, cost effectiveness, and low dangers are all the outcome of the additive actions of these drugs [9].

Methods

The Department of Anaesthesiology, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Telangana, India, between September 2020 to August 2021, is the site of this prospective, randomised, double-blind control trial. Following permission from the institutional review board, 50 patients aged 20-60 years old with ASA physical status grades I and II who were scheduled for upper limb procedures lasting less than 90 minutes were included.

Participants were not included if they had an allergy to local anaesthetics, sickle cell anaemia, raynaud's syndrome, scleroderma, a local infection, Paget's disease, insufficient fasting (less than 6 hours), or a contraindication to Dexmedetomidine. A pre-operative assessment was performed. 45 minutes before surgery, all patients were given 0.15 milligrammes per kilogramme of body weight (mg/kg) of intramuscularly injected midazolam. We had our medications and resuscitation supplies on standby just in case. Continuous monitoring of the patient's heart rate, blood pressure, and arterial oxygen saturation was performed after initial measurements were taken. To administer the anaesthetic, a 22 G cannula was inserted intravenously as far down the anaesthetized arm as feasible. A vein was accessed in the other arm in case it was essential to provide fluids or medication. Extra padding was used to prevent any creases from forming and the tourniquet's edges from making contact with the patient's flesh when they were put on the patient's arm. In order to stop the bleeding in the arm, an Esmarch bandage was used. If this was not feasible, exsanguination was accomplished by holding the arm in an elevated position with the axillary artery compressed for two to three minutes.

Results

Fifty patients were enrolled in the trial. The patients were split into two groups, one receiving one medicine and the other receiving the other. Patients in Group A were given 40 ml of lignocaine with 0.5 microgram/kg of Dexmedetomidine, whereas those in Group B were given 40 ml of lignocaine at a concentration of 0.5%.

Table 1: Age distribution

Age group	Group A		Group B	
	No	%	No	%
20 – 29 years	6	23.3	7	30
30 – 39 years	7	30	7	30
40 – 49 years	8	33.3	6	23.3
50 & Above	4	13.3	5	16.7
Total	25	100	25	100
SD	8.7 years		10.8 years	
'p'	0.5127 Not sign.			

Group A had a mean age of 37.8 whereas group B had a mean age of 36.8. No change was seen (p = 0.5127).

Table 2: Sex distribution

Age group	Group A		Group B	
	No	%	No	%
Male	14	56.0	12	48.0
Female	11	44.0	13	52.0
Total	25	100	25	100
'p'	0.514			

It was mostly men (56.0%) in Group A and mostly females (48.0%) in Group B. There was no discernible gender gap in the sample (p > 0.514).

Table 3: Weight

Parameter	Weight	
	Group A	Group B
Range	42 – 50	42 – 52
Mean	50.0	51.5
SD	4.98	5.10
'p'	0.8471	

The patients in both groups did not substantially vary from one another in terms of their mean weights.

Table 4: Type of Surgery

Surgery done	Group A		Group B	
	No	%	No	%
Ganglion excision	11	40	9	33.3
K.Fix for # phalanx	10	36.7	7	30
Tendon Repair	2	13.3	5	23.3
SSG	2	10	4	13.3
Total	25	100	25	100

Ganglion excision and k wire fixation for the number phalanx were the operations that were done the most often in both of the groups.

Table 5: Sensory onset time

Parameters	Sensory onset time	
	Group A	Group B
Range	1-4	4-7
Mean	1.7	5.37
SD	0.81	0.59
'p'	0.0011 Significant	

Group A had a sensory start time of 1.81 + 0.89 minutes, which was statistically lower than Group B (p = 0.0011).

Table 6: Motor onset time

Parameters	Motor onset time	
	Group A	Group B
Range	10-16	16-21
Mean	12.89	18.08
SD	1.65	1.28
'p'	0.0002 Significant	

There was a statistically significant difference between the motor onset time of Group A and that of Group B.

Table 7: Duration of Surgery

Parameters	Duration of surgery	
	Group A	Group B
Range	38-55	41-56
Mean	45.78	46.45
SD	5.51	5.35
'p'	0.5147 Not significant	

Duration of surgery was similar in both the groups with no statistically significant difference

Table 8: Rescue Analgesia

Rescue Analgesia	Group A		Group B	
	no	%	no	%
Yes	-	-	22	88
No	25	100	3	12
'p'	0.0003 Significant			

In Group B, there were 21 patients who needed rescue analgesia, but in Group A, there was not a single patient who needed it. This had a big impact on the statistics.

Table 9: Sensory Recovery Time

Parameters	Sensory Recovery Time	
	Group A	Group B
Range	11-23	4-7
Mean	19.88	4.9
SD	3.87	0.82
'p'	0.0002 Significant	

In Group A, the sensory recovery time following the removal of the tourniquet was 19.88 + 2.37 minutes, whereas in Group B, it was a substantially shorter 4.7 + 0.61 minutes.

Table 10: Motor Recovery Time

Parameters	Motor Recovery time (in minutes)	
	Group A	Group B
Range	14 – 34	2-4
Mean	24.9	2.62
SD	3.78	0.61
'p'	0.0002 Significant	

The motor recovery time for Group A was much longer than the time for Group B, and this difference was statistically significant, with a p value of 0.0002.

Table 11: Duration of Postoperative Analgesia

Parameters	Time when VAS > 3	
	Group A	Group B
Range	281 – 491	11-14
Mean	415.3	12.24
SD	46.87	0.87
'p'	0.0002 Significant	

In Group A, it took VAS 415.3 + 46.87 minutes to attain a score of 3, but in Group B it only took 11.14+0.87 minutes. The value of p for this difference was 0.0002, which indicated that it was statistically significant.

Discussion

Intravenous regional anaesthesia involves the administration of local anaesthetics to a specific limb through the veins by occluding the arm proximally to produce conduction blockage. It must be risk-free, non-threatening, and comfortable for the patient, provide enough access to the surgical site, and disrupt the body's homeostatic processes as little as possible [10]. There are a lot of benefits to using intravenous regional anaesthesia. It's easy to use,

consistently effective, and has a short delay between symptoms appearing and when they subside. Despite these benefits, intravenous regional anaesthesia has drawbacks such as insufficient postoperative analgesia and tourniquet pain. Adding Dexmedetomidine as an adjuvant was an effort to remedy these issues in the current trial [11, 12].

Patients in both Group A and Group B were similar to one another in terms of age, sex, weight, and operation length. My research shows that in Group A, sensory and motor blockage set in far sooner than in Group B. When the cuff is deflated, there is a comparable recovery profile for both sensation and movement. Findings are consistent with research by Esmoğlu, A., *et al.* The incidence of tourniquet discomfort, as measured by supplementing during surgery, was 0% in Group A and 70% in Group B; this difference was statistically significant (p 0.0001). Dexmedetomidine has been shown to reduce the frequency of tourniquet discomfort in a similar research by Memis *et al.* The time to first analgesic necessity after surgery was 416.2 + 45.73 minutes in Group A and 19.4 +/- 11 minutes in Group B. A p-value of 0.0001 indicates extreme statistical significance. Group A had a sedation score of 1.770.43, whereas Group B only had a sedation score of 1.00. In this case, p = 0.0001 [13-15].

Sixty patients between the ages of 20 and 60 with ASA physical status I who required forearm and hand procedures participated in this research at the Govt. Rajaji hospital in Madurai. They split into two groups of thirty apiece. 0.5 micrograms per kilogramme of dexmedetomidine was administered to 40 millilitres of 0.5% lignocaine for intravenous regional anaesthesia. 40ml of 0.5% lignocaine intravenously injected for regional anaesthesia. This research shown that when Dexmedetomidine was combined with lignocaine in intravenous regional anaesthesia, the duration of postoperative analgesia was significantly increased compared to when lignocaine was used alone. The start times for both sensation and movement were shorter in Group A compared to Group B. Sedation-related patient comfort is higher in Group A than Group B. Group A had a lower incidence of tourniquet discomfort compared to Group B. Both groups showed comparable cardiovascular stability. Both groups had no adverse effects [16-18].

Despite the significance of a fibres and unmyelinated C fibre in tourniquet pain, its mechanism is still not well understood. Dexmedetomidine reduces nerve action potentials not via the activation of alpha-2 adrenergic receptors but rather through a mechanism specific to C fibres. This mechanism might be responsible for the observed impact, since it explains why perineural delivery of the medication results in a more potent local anaesthetic block. Finally, the drug's analgesic action may originate from its blocking of -2 adrenergic receptors in nerve terminals. In addition to its local anaesthetic impact, dexmedetomidine was shown to delay the onset of tourniquet discomfort and decrease the need for intra- and postoperative analgesia in this investigation. Dexmedetomidine, at a dosage of 0.5 micrograms/kg, may be administered as an adjuvant for intravenous regional anaesthesia, resulting in longer-lasting postoperative analgesia and less tourniquet discomfort [19-21].

Conclusion

After examining the data and performing statistical analysis, the researchers concluded that adding 0.5 micrograms of

dexmedetomidine per kilogramme of body weight to lignocaine for intravenous regional anaesthesia resulted in a quicker onset of sensory and motor blockade, a lower incidence of tourniquet pain, an increased duration of post-operative analgesia, and improved hemodynamic stability, all of which were achieved without adverse effects.

Conflict of Interest

None

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Nil

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