ORIGINAL RESEARCH

To evaluate the efficacy of intra-articular ropivacaine for postoperative analgesia after arthroscopic procedures on the knee

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ABSTRACT

Aim: The purpose of this study is to evaluate the efficacy of intra-articular ropivacaine for postoperative analgesia after arthroscopic procedures on the knee. **Materials & methods:** The current investigation was carried out at the department of anaesthesia with the intention of determining the efficacy of intra-articular Ropivacaine in providing postoperative analgesia in patients who had had arthroscopic knee surgeries. One hundred participants in all who were scheduled to have arthroscopic surgery on their knees participated in the study. **Results:** It was discovered that the patients in group A had a mean heart rate of 86.1, 96.5, 101.9, and 82.1 at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 12 hours and postoperative 24 hours, respectively. The patients in group B were found to have a mean heart rate of 76.4, 78.3, 79.4, 80.3, and 87.8 correspondingly at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 12 hours and postoperative 24 hours. When the two groups were statistically compared, it was found that the patients in the control group had a much larger variance in their heart rates than the patients in the study group. It was discovered that the patients in group 1 had mean VAS scores of 3.1, 4.0, 4.4, 3.4, and 3.6 accordingly at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 12 hours and postoperative 24 hours. These scores were obtained after surgery. At one hour, two hours, eight hours, twelve hours, and twenty-four hours after surgery, the patients in Group 2 had mean VAS scores of zero, 1.1, 1.6, 2.1, and 3.1, respectively, on the Visual Analog Scale. When the data was analysed statistically, they found some significant differences. **Conclusion:** we concluded that, based on the findings presented above, an intra-articular dosage of ropivacaine greatly increased the duration of postoperative analgesia without causing any negative side effects. Therefore, more research is strongly encouraged.

Keywords: Intra-articular ropivacaine, postoperative analgesia, arthroscopic, knee

INTRODUCTION

Those who suffer from degenerative knee disease have the highest incidence of arthroscopic knee surgery, making it the most frequent kind of ambulatory orthopaedic operation and the ninth most common type of ambulatory procedure overall. At today's state-of-the-art orthopaedic facilities, postoperative arthroscopic knee surgery is one of the most often performed minimally invasive surgical techniques. It is linked to a varying degree of postoperative pain, which originates from the irritation of free nerve endings in the synovial tissue, anterior fat pad, and joint capsule during the surgical excision and resection procedures. Opiate administered intra-articularly may lower the amount of chronic pain experienced and provide analgesia for up to 24 hours. [1-3]

In order to prevent the transmission of action potentials, local anaesthetics disrupt the sodium channels that are connected to those potentials. It is possible that administering midazolam intra-articularly will elicit analgesic effects comparable to those produced by its usage in central neuraxial analgesia. When utilised in high concentrations or when accidentally administered intravascularly, bupivacaine, like all amide anaesthetics, has been linked to cardiotoxicity. Bupivacaine is a well-established long-acting regional anaesthetic.

Ropivacaine is a long-acting regional anaesthetic that is structurally related to Bupivacaine. Bupivacaine is the parent compound of ropivacaine. In contrast to bupivacaine, which is a racemate, it is a pure form of the S (-) enantiomer that was developed with the goal of lowering the potential for toxicity while simultaneously improving the relative sensory and motor block profiles. Ropivacaine inhibits the influx of sodium ions and, as a result, prevents impulses from being transmitted along nerve fibres. This inhibition can be reversed. The inhibition of potassium channels, which is dose-dependent, amplifies the effects of this action.[4- 6] As a result, the current study was designed to investigate the efficacy of intra-articular Ropivacaine in providing postoperative analgesia following arthroscopic procedures performed on the knee.

MATERIALS & METHODS

The current investigation was carried out at the department of anaesthesia with the intention of determining the efficacy of intra-articular Ropivacaine in providing postoperative analgesia in patients who had had arthroscopic knee surgeries. After thorough explanation of the research procedure to all of the participants, ethical permission was acquired from the institution's ethics committee, and each patient gave their signed consent to participate in the study. One hundred participants in all who were scheduled to have arthroscopic surgery on their knees participated in the study.

INCLUSION CRITERION

- ASA group I and II patients undergoing Arthroscopic Knee Surgeries.
- Age group 20 to 60 years.

The patients were all assigned at random to one of two research groups: Group A, which served as the control group, and Group B. (Intra- articular Ropivacaine group). On the evening before surgery, a pre-anesthesia evaluation was carried out on each and every one of the patients. It was possible to get all of the patients' complete demographic information. Before beginning the operations, a comprehensive haematological and biochemical profile was taken of each and every patient. Arthroscopic procedures were performed on each patient in accordance with the classification group to which they belonged. Monitoring of the patient's hemodynamic parameters was performed continuously. Postoperatively For the purpose of determining whether or not postoperative analgesia was necessary, a visual analogue scale was used. All of the results were compiled in a sheet using Microsoft Excel, and the SPSS software, version 25.0, was used to perform the analysis. For the purpose of determining the level of significance, we used the Chi-square test, the Mann-Whitney U test, and the unpaired t test.

RESULTS

In the current investigation, a total of one hundred different patients participated in the analysis. It was discovered that patients in group A had a mean age of 41.69 years, whereas patients in group B had a mean age of 44.01 years. It was discovered that the patients in group A had a mean heart rate of 86.1, 96.5, 101.9, and 82.1 at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 12 hours and postoperative 24 hours, respectively. The patients in group B were found to have a mean heart rate of 76.4, 78.3, 79.4, 80.3, and 87.8 correspondingly at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 12 hours and postoperative 24 hours. When the two groups were statistically compared, it was found that the patients in the control group had a much larger variance in their heart rates than the patients in the study group. It was discovered that the patients in group 1 had mean VAS scores of 3.1, 4.0, 4.4, 3.4, and 3.6 accordingly at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 12 hours and postoperative 24 hours. These scores were obtained after surgery. At one hour, two hours, eight hours, twelve hours, and twenty-four hours after surgery, the patients in Group 2 had mean VAS scores of zero, 1.1, 1.6, 2.1, and 3.1, respectively, on the Visual Analog Scale. When the data was analysed statistically, they found some significant differences. The current research indicated that the patients in the control group required postoperative analgesia on average after 99.7 minutes, whereas the patients in the study group required 242 minutes before their first postoperative analgesic prescription was needed. Statistically speaking, the comparison produced results that were statistically significant.

Table 1: Age-wise distribution of patients

Age group(years)	Group A		Group B	
	Number of patients	Percentage	Number of patients	Percentage
Below 25	3	6	6	12
25-35	7	14	7	14
35-45	16	32	12	24
45-55	16	32	16	32
above 55	8	16	9	18
Total	50	100	50	100

Table 2: Comparison of mean heart rate

Heart rate (beats/min)	Group A	Group B	p- value
Preoperative	76.7	75.3	0.21
Postoperative – baseline	80.3	82.1	0.44
1 hrs	86.1	76.4	0.001
2 hrs	96.5	78.3	0.01
8 hrs	101.9	79.4	0.01
12 hrs	82.1	80.3	0.03
24 hrs	90.4	87.8	0.36

Table 3: Comparison of mean respiratory rate

Respiratory rate (per min)	Group A	Group B	p- value
Preoperative	14.7	14.4	0.24
Postoperative – baseline	14.3	14.0	0.15
1 hrs	14.0	14.3	0.33
2 hrs	14.1	13.9	0.49
8 hrs	13.6	14.1	0.31
12 hrs	14.3	13.9	0.54
24 hrs	14.0	14.4	0.38

Table 4: Comparison of mean VAS

VAS	Group A	Group B	p- value
Postoperative – baseline	0	0	-
1 hrs	3.1	0	0.01
2 hrs	4.0	1.1	0.01
8 hrs	4.4	1.6	0.02
12 hrs	3.4	2.1	0.01
24 hrs	3.6	3.1	0.25

Table 5: Time to first postoperative analgesia requirement

Time to first postoperative analgesia requirement	Group A	Group B	p- value
Time (minutes)	99.7	242.0	0.01

DISCUSSION

Knee arthroscopy may be carried out as an outpatient treatment employing a range of different approaches to sedation and anaesthesia. This treatment is minimally invasive and includes the repair of ligaments and menisci. Further analgesia is necessary to give pain relief owing to the severe discomfort that patients complain of postoperatively, and this surgery repairs ligaments and menisci. This can be especially difficult for the anesthesiologist, who has to decide whether or not the patient and procedure are suitable for outpatient surgery. Additionally, the anesthesiologist needs to choose an anaesthetic that is sufficient for the procedure, but also fulfils the patient's expectation of having a straightforward postoperative recovery with minimal pain. [6, 7] Patients who have had arthroscopic knee procedures may have varying degrees of discomfort, which may at times be very unpleasant for them. Pain during surgery might delay early mobility, release, and rehabilitation after the procedure. Several anaesthetic agents for day care arthroscopy have been investigated, but research still needs to be done to find the most effective one. [8] As a result, the current research was designed to investigate the efficacy of intra-articular Ropivacaine in providing postoperative analgesia after arthroscopic procedures performed on the knee.

In the current investigation, a total of one hundred different patients participated in the analysis. It was discovered that patients in group A had a mean age of 41.69 years, whereas patients in group B had a mean age of 44.01 years. When the two groups' mean heart rates were compared statistically, it was found that the patients in the control group had a significantly higher variation in their heart rate than the patients in the study group did. This was the case even though the study group had a lower mean heart rate. Patients who were undergoing arthroscopic anterior cruciate ligament reconstruction (ACLR) under general anaesthesia were tested to see if the addition of a preincisional femoral 3-in-1 block to intra-articular instillation with ropivacaine 0.2% at the end of surgery improved postoperative pain control. This hypothesis was tested by Schwarz SK et al. In patients undergoing ACLR under general anaesthesia, the researchers discovered that there was no difference in the amount of postoperative analgesic medication

required between those who received an intra-articular instillation of ropivacaine 0.2% alone or a femoral 3-in-1 block with ropivacaine 0.2%. [9]

In the current study, the mean VAS among the patients in group A at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, postoperative 12 hours, and postoperative 24 hours was found to be 3.1, 4.0, 4.4, 3.4, and 3.6 respectively. These values were found at postoperative 1 hour, postoperative 2 hours, postoperative 8 hours, and postoperative 24 hours. At one hour, two hours, eight hours, twelve hours, and twenty-four hours after surgery, the patients in Group 2 had mean VAS scores of zero, 1.1, 1.6, 2.1, and 3.1, respectively, on the Visual Analog Scale. When the data was analysed statistically, they found some significant differences. M.iniche S. and colleagues conducted an analysis of double-blind, randomised, controlled trials of intra-articular local anaesthetic to determine its efficacy in the management of postoperative pain after arthroscopic knee surgery when compared with a placebo or with no therapy at all. Just two out of the six studies that looked at the length of time between the first request for analgesia and its administration found a substantial lengthening of the pain relief to last between 30 and 50 minutes. Although it is mild to moderate and only lasts for a short period of time, intra-articular local anaesthesia may be of clinical significance in day-case surgery due to its potential to reduce postoperative pain in patients undergoing arthroscopic knee surgery. There is some evidence to support this claim; however, the evidence is not conclusive. [10]

The current research indicated that the patients in the control group required postoperative analgesia on average after 99.7 minutes, whereas the patients in the study group required 242 minutes before their first postoperative analgesic prescription was needed. Statistically speaking, the comparison produced results that were statistically significant. In a study that was conducted in a double-blind fashion, Zaric D. and his colleagues evaluated the dosage response of sensory and motor block during continuous epidural infusion of 0.1, 0.2, or 0.3% ropivacaine in volunteers. The reference solution, bupivacaine 0.25 percent, and the control solution, isotonic saline, were both employed in this study. As compared with bupivacaine, the regression phase was substantially shorter when administered with any of the three doses of ropivacaine (P .01). While ropivacaine 0.1% only induced moderate analgesia and a little reduction in motor function, the patient was able to walk about freely throughout the whole inquiry. [11]

CONCLUSION

The authors came to the conclusion that, based on the findings presented above, an intra-articular dosage of ropivacaine greatly increased the duration of postoperative analgesia without causing any negative side effects. Therefore, more research is strongly encouraged.

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