A COMPARATIVE CLINICAL STUDY OF INTRAARTICULAR CLONIDINE V/S DEXMEDETOMIDINE IN ARTHROSCOPIC KNEE SURGERIES (ACL REPAIR) FOR POSTOPERATIVE ANALGESIA

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ABSTRACT

BACKGROUND

Both clonidine and dexmedetomidine morphine (Both a2 agonists) provide enhanced patient analgesia after arthroscopic knee surgeries when administered via intraarticular route.

OBJECTIVES

To compare the duration of post-operative analgesia of clonidine and dexmedetomidine when administered intraarticularly as well as haemodynamic stability after arthroscopic knee surgeries.

METHODOLOGY

This is a randomized trial study involving 40 pts. of ASA grade 1 and 2 of aged between 18 and 60 yrs. Patients were divided randomly into two groups as group C (n=20) and group D (n=20). After arthroscopic knee surgeries, postoperative pain was measured by VAS score at 0, 30 mins, 60 mins, 90 mins, 120 mins and then every 2 hrly up to 24 hrs. Side effects and vital signs were also noted. Duration of analgesia was noted in each case as when VAS score ≥3.

RESULTS

Mean duration of analgesia in postoperative period in group D was 18.4 hrs. ± 4.95 and in group C 15.1 hrs. ± 2.71. Differences in duration of analgesia was statistically significant (P<0.05) when compared by student 't' test. VAS scores were also lower in group D compared to group at 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 hrs. postoperative period. No major side effects were noted in both groups in dosages used.

CONCLUSION

Dexmedetomidine produced more prolonged post-operative analgesia (mean 18.4 hrs.) than clonidine (mean 15.1 hrs.), which is statistically significant (P<0.05). No major side effects were noted in both groups in clinically used dosages.

KEYWORDS

Arthroscopic Knee Surgery, Intraarticular Injection Clonidine, Dexmedetomidine, Post-Operative Analgesia.

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INTRODUCTION

Arthroscopic knee surgery is one of the most common minimally invasive surgical procedures in modern orthopaedic setup. Knee arthroscopy is very often performed as day-case surgery. It seems that ambulatory arthroscopic surgery of the knee is preferred by the majority of properly selected and well informed patients.[1] It has been reported that a significant number of patients have moderate-to-severe pain 24 hours after ambulatory surgery in general and knee arthroscopy in particular and pain affects the patient's activity level and satisfaction.[2,3] In an effort to provide an effective, safe and long-lasting post-arthroscopy analgesia, several studies using different drugs and regimes have been published during the last two decades.

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Previous studies with intraarticular ropivacaine.[4], fentanyl.[5] and dexmedetomidine.[6] had proved their efficacy in providing postoperative analgesia in arthroscopic knee surgery. Dexmedetomidine is highly selective (Eight times more selective than clonidine).[7] specific and potent; α2-adrenergic agonist has analgesic, sedative, antihypertensive and anaesthetic sparing effects when used in a systemic route.[8] In the present study, we used dexmedetomidine intraarticularly in dose of 100 mcg post arthroscopy.

Clonidine, an α2 agonist also has a peripheral analgesic effect.[9] Intraarticular bupivacaine provides enhanced postoperative analgesia after arthroscopic knee surgeries.[10] The addition of either dexmedetomidine or clonidine to intraarticular bupivacaine improves postoperative analgesia compared with either drug alone.[11]

The primary objective of this study was to compare the duration of analgesic effects and haemodynamic stability of dexmedetomidine and clonidine when administered intraarticularly after arthroscopic knee surgeries.

MATERIALS AND METHODS

After Institutional Review Board approval, informed written consent was obtained from 40 pts. scheduled to undergo

elective arthroscopic knee ACL repair in BLDEUs Shri B. M. Patil Medical College and Hospital, Vijaypur.

Patients eligible for participation were aged between 18 to 60 yrs. and were ASA physical status 1 and 2. Patients excluded had a contraindication to use of clonidine or dexmedetomidine or local anaesthetics.

Patients were randomly divided into two groups as group D (n=20) and group C (n=20). All patients of both groups were premedicated with Inj. Glycopyrrolate 0.2 mg IV and Inj. midazolam 1 mg IV. After placement of all routine monitors (NIBP, SPO2, ECG), all vitals were recorded before and after premedication. All pts. in both groups were induced under spinal anaesthesia with Inj. bupivacaine heavy 0.5%, 3 mL under all aseptic and antiseptic precautions. Temp, pulse, BP, SPO2 were monitored throughout intraoperative period at 0, 30, 60, 90 mins.

After completion of the surgery, the patients were given following drugs intraarticularly through arthroscopic port depending on group.

Group D received Inj. dexmedetomidine 100 mcg + Inj. bupivacaine 0.25%, 20 mL.

Group C received Inj. clonidine 100 mcg + Inj. bupivacaine 0.25%, 20 mL.

All vitals like temperature, pulse, BP and VAS score for pain were monitored and recorded postoperative at 0, 30, 60, 90, 120 mins and thereafter 2 hrly upto 24 hrs. All patients were instructed preoperatively in the use of the 10-cm Visual Analogue Scale (VAS) for pain, 0=no pain to 10=the worst imaginable pain. Demographic data were analysed by using analysis of variance.

Duration of analgesia was recorded as VAS score ≥3 in the postop period. The side effects or complications if any are also noted in postoperative period. Total duration of analgesia of both the groups were compared by using student's 't' test.

Statistical Analysis

The data was analysed using Microsoft Excel software. Descriptive statistics was used to analyse the data. Chi-square test was used to find out the association.

RESULTS

	Group D (n=20) Mean±SD	Group C (n=20) Mean±SD	P value
Mean age (yrs.)	37.4±9.5	36.1±8.644	>0.05
Mean wt (kg)	63.55±3.1	63.33±2.75	>0.05
Sex (Male: Female)	10:10	12:08	>0.05
ASA Grade 1:2	8:12	8:12	>0.05
Mean Duration of Surgery (min)	65±8.5	70±6.5	>0.05

Table 1: Demographic Data of Both Groups

There were no significant differences between the two groups with respect to age, sex, weight or the duration of surgery. No patient experienced hypotension (Mean arterial pressure <20% of baseline), hypoxaemia (SpO2 <90%) or bradycardia (heart rate <60 bpm). No pt. complained of sedation or other side effects. The differences were statistically not significant (P>0.05).

	Group D (N=20)	Group C (N=20)	P value
Before premedication	84.2±5.85	81±4.72	0.0608
After premedication	83.5±4.24	81.9±3.75	0.3338
Intraoperative 0 min	82.05±4.23	80.3±4.91	0.2351
30 mins	82.1±4.24	79.7±3.96	0.2448
60 mins	81.4±5.64	79.7±3.90	0.42528
Post-operative 0 min	81.7±6.74	79.4±4.5	0.3030
30 mins	80.5±6.80	79.3±4.95	0.52901
60 mins	81.9±6.78	78.4±4.38	0.06147
90 mins	81±6.24	78±3.72	0.07450
2 hrs.	80.6±6.39	77.9±4.02	0.1198
4 hrs.	80.7±6.19	78±5.23	0.1450
6 hrs.	80.6±6.68	78.1±3.5	0.1484
8 hrs.	80.9±6.56	78.9±2.75	0.2179
10 hrs.	80.1±5.48	78.3±3.13	0.21222
12 hrs.	80.1±5.36	78.6±4.35	0.3384
14 hrs.	80±5.31	78±4.40	0.2028
16 hrs.	81.4±5.12	76.7±3.96	0.002077 <0.05
18 hrs.	80.9±5.01	76.5±4.53	0.00475 <0.05
20 hrs.	81.6±4.75	77.3±4.78	0.003625 <0.05
22 hrs.	80.6±4.5	77.5±5.01	0.03853 <0.05
24 hrs.	80.7±4.40	76.5±4.85	0.0046 <0.05

Table 2: Mean Pulse Rate Per Minute of Both Groups

The above table shows mean pulse rates of group D and group C; statistically there is no significant difference between these two groups up to 14 hrs. postoperatively, but at 16, 18, 20, 22, 24 hrs. there is statistically significant difference observed (p<0.05) that is group C show lower mean pulse rates than group D.

	Group D (N=20)	Group C (N=20)	P value
Before premedication	96.36±4.85	95.2±5.44	0.4837
After premedication	95.46±3.79	95.7±4.09	0.8528
Intraoperative 0 min	94.33±3.01	93±4.27	0.26229
30 mins	91.8±3.60	90.33±4.94	0.29123
60 mins	92.93±3.01	90.36±5.12	0.06301
Post-operative 0 min	93.06±3.34	90.66±5.33	0.0979
30 mins	92.33±3.94	90.33±4.87	0.16239
60 mins	92.64±3.71	91±4.6	0.2193
90 mins	92.9±2.87	92.5±3.2	0.1493
2 hrs.	93.33±2.97	93.02±3.4	0.0860
4 hrs.	93.9±2.86	93.3±3.01	0.05418
6 hrs.	93.43±3.47	91.8±3.25	0.305
8 hrs.	93.76±3.72	92±3.5	0.0130
10 hrs.	92.63±2.97	91.89±3.01	0.5073
12 hrs.	93.13±3.17	92.9±3.20	0.454
14 hrs.	93.43±4.53	93.13±3.78	0.1358
16 hrs.	93.73±3.10	91.9±3.20	0.029118
18 hrs.	93.33±3.68	93.10±3.75	0.2290
20 hrs.	93.13±4.43	92.9±4.15	0.2855
22 hrs.	93.1±3.54	92.88±4.01	0.6633
24 hrs.	93.76±2.89	93.5±3.01	0.0089

Table 3: Mean Arterial Pressure (mmHg) of Both Groups

The above table confers that mean arterial pressures of both the groups are comparable and there is no significant difference between the groups with regard to mean arterial pressure.

	Group D Mean±SD	Group C Mean±SD	P value
0 min	0	0	
30 mins	0	0	
60 mins	0	0	
90 mins	0	0	
2 hrs.	0	0.1±0.307	0.1625
4 hrs.	0	0.4±0.57	0.0075 <0.05
6 hrs.	0	0.65±0.58	8.8720
8 hrs.	0.2±0.41	1.05±0.75	0.00013 <0.05
10 hrs.	0.4±0.502	1.5±0.68	1.57496
12 hrs.	0.8±0.615	2.05±0.82	4.3318
14 hrs.	1.55±0.604	2.35±0.81	0.001178 <0.05
16 hrs.	2.3±0.571	3.05±0.686	0.00059 <0.05
18 hrs.	2.75±0.55	3.5±0.76	0.00106 <0.05
20 hrs.	3.15±0.74	4±0.56	0.00025 <0.05
22 hrs.	3.85±0.745	4.75±0.71	0.00038 <0.05
24 hrs.	4.55±0.60	5.35±0.67	0.003210, <0.05

Table 4: Comparison of Post-Operative Mean VAS Score

The above table shows mean VAS scores of both groups in post-operative period. It is evident that mean VAS score of group D was lower than the group C. Statistically significant was observed in group D at postoperative period at 4 hrs. ($p<0.05$), 8 hrs. ($p<0.05$), 14 hrs. ($p<0.05$), and then up to 24 hrs.

	Group D Mean±SD	Group C Mean±SD	P value
Duration (HRS.)	18.4±4.958	15.1±2.712	0.0003 <0.05

Table 5: Total Mean Duration of Post-Operative Analgesia (VAS≥3) in Both Groups (Hours)

The above table shows that mean duration of post-operative analgesia was longer in group D, i.e. 18.4 hrs., while that of group C was 15.1 hrs.

The difference between the two groups was significant with regard to postop duration of analgesia when it is tested by student's 't' test. Postoperative analgesia duration was considered when VAS score ≥3 in postoperative period. The p value is 0.0003, which is significant.

DISCUSSION

There is a drive towards day surgery for arthroscopic Anterior Cruciate Ligament (ACL) reconstruction. The increasing pressure on beds, incidence of hospital acquired infection and financial implications are some of the factors fuelling this trend. Despite the increase in the number of outpatient surgical procedures, one of the limiting factors is the adequate understanding and management of post-operative pain.[4]

There are no studies that closely examined the pattern of analgesia consumption and pain in the first 16 to 20 hours after surgery. Furthermore, the considerable inter-patient variability in postoperative analgesic requirements reported in the literature had not been studied.[12]

Our study revealed that intraarticular clonidine (150 mcg) with local anaesthetic bupivacaine 0.25%, 20 mL produced increased postoperative analgesia but less when compared to the intraarticular dexmedetomidine (100 mcg) with 0.25% bupivacaine, 20 mL. Ramunas Tamosiunas et al[9] conducted a randomized trial to evaluate the efficacy of intraarticular 0.5%, 20 mL bupivacaine and a compound of bupivacaine with clonidine for postoperative analgesia after arthroscopic knee surgery. They used clonidine in a dose of 1 mcg/kg. They concluded that the compound of intraarticular bupivacaine and clonidine suppresses pain better than intraarticular injection of bupivacaine or use of usual systemic analgesics ($p<0.05$). In our study we used both clonidine 150 mcg and morphine 2 mg resulted in equivocal analgesia, whereas the combination failed to demonstrate an enhanced analgesic effect. Wanda Joshi et al have demonstrated that the analgesic effect of bupivacaine was enhanced by the addition of IA clonidine.[11] Gentil et al were first investigators to study the analgesic effects of morphine and clonidine in humans when used alone and in combination after arthroscopic knee surgeries.[10] In our study, we compared duration of postop analgesia of clonidine with dexmedetomidine. We also used clonidine in a dose of 150 mcg in our study, but the dose of dexmedetomidine was 100 mcg. Wanda Joshi et al[11] also showed addition of clonidine provided more effective analgesia. The analgesic effects of α2-adrenergic agonist could be mediated through supraspinal, spinal and peripheral action.[13]

In our study, the analgesic effect of intra-articular clonidine and dexmedetomidine appears mainly due to a direct local action. The mechanism of analgesic effects for intra-articular dexmedetomidine might be similar to those suggested for intra-articular clonidine. Clonidine may act on presynaptic α2-adrenergic receptors and inhibit the release of norepinephrine at peripheral afferent nociceptors.[14] Clonidine has also been shown to provide a local anaesthetic effect, which inhibits the conduction of nerve signals through C and Aδ fibers.[15] and may stimulate the release of enkephalin-like substances at peripheral sites.[16] Al-Metwalli et al study found that intra-articular dexmedetomidine enhanced postoperative analgesia after arthroscopic knee surgery with an increased time to first analgesic request and a decreased need for postoperative analgesia.[6] The study conducted by S Paul et al, showed that intraarticular dexmedetomidine as an adjunct to ropivacaine in pts. undergoing arthroscopic knee surgery have improved quality and duration of postoperative analgesia.[17]

Arthroscopic knee surgery is commonly performed on day-case basis. However, postoperative pain may be an obstacle for discharge and early rehabilitation. Several analgesic strategies such as systemic medication, central or peripheral blocks and intra-articular drug administration have been used to control pain after arthroscopic knee surgery.[18] However, none is free from limitations such as the need for special equipment and monitoring or the risk of complications that may delay discharge or cause re-admission. Although, the

pain has been reported slight-to-moderate and of short duration, a review of 20 studies showed evidence for reduction in postoperative pain after intra-articular local anaesthesia following arthroscopic knee surgery.[19] No adverse effects or toxicity attributable to the intra-articular administration of local anaesthetics were reported in this review.[20]

CONCLUSION

In our study, we have observed that IA administration of dexmedetomidine 100 mcg with bupivacaine produces more prolonged postoperative analgesia upto 24 hrs. with mean duration of analgesia being group D (18.4±4.958) ($p<0.05$) and VAS score ≥3 than IA administration of clonidine 150 mcg with bupivacaine group C with mean duration of analgesia being 15.1±2.71 2 hrs. VAS score ≥3 with low pain scores for dexmedetomidine after arthroscopic knee surgeries. So we recommend that dosage of dexmedetomidine 100 mcg +bupivacaine 20 mL 0.25% or clonidine 150 mcg+bupivacaine 20 mL 0.25% are optimum for alleviating severe pain of arthroscopic knee surgeries for initial 24 hrs. postoperatively without any side effects.

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