JMSCR Vol||05||Issue||02||Pages 17287-17291||February 2017

www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i2.09

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Pain Relief after Arthroscopic Knee Surgery- Intra-Articular Dexmedetomidine and Fentanyl: A Randomized Control Study

Authors
Dr Narayan Acharya[1], Dr Daityari Routray[2]
[1]Assoc Prof, Department of Anaesthesiology, MKCG Medical College, Berhampur, Odisha
[2]Prof, Department of Anaesthesiology, MKCG Medical College, Berhampur, Odisha
Corresponding Author
Dr Narayan Acharya Assoc Prof
Department of Anaesthesiology, MKCG Medical College, Berhampur, Odisha
Email: *drnarayan2017@gmail.com, Mobile no-7008115431*

Abstract
Background: *No single ideal intra-articular drug has been found for postoperative pain management which is a common and distressing symptom after knee arthroscopy. This study was done to study the efficacy of intra-articular dexmedetomidine and fentanyl for postoperative pain relief in patients undergoing arthroscopic knee surgeries.*
Method: *Fifty patients of American Society of Anaesthesiologists of grade I/II, aged 20-60 years posted for arthroscopic knee surgery were randomly divided into groups I (fentanyl group) and group II (dexmedetomidine group). 25 patients in group I received I µg/ kg of fentanyl diluted to 10 ml in normal saline and group II patients received I µg/kg of dexmedetomidine diluted to 10 ml in normal saline via intra-articular route at the end of the surgery. Visual analogue (VAS) score, time to give the first dose of analgesia and total dose of analgesic required in the first 24hr was recorded in each group.*
Results: *VAS score was less and time to first analgesic requirement was greater in group II in comparison to group I which was statistically significant . Total dose of analgesic used in group II patients was significantly less compared to patients in group I which was statistically significant.*
Conclusion: *Intra-articular dexmedetomidine is more potent in providing prolonged postoperative analgesia after arthroscopic knee surgeries and reduces the total dose of analgesic requirement postoperatively compared to fentanyl.*
Keywords: *dexmedetomidine, intra-articular, knee arthroscopy, fentanyl.*

Introduction

Arthroscopic surgeries is commonly performed as an outpatient procedure in modern orthopaedic setup.[1] Arthroscopic knee surgery is minimally invasive and involves repair of ligaments and menisci but it can evoke variable levels of pain postoperatively, which at times is very distressing for patients.[2] Postoperative pain can prevent early mobilization, delays the discharge, and rehabilitation. Different intra-articlular analgesic agents for day care arthroscopy have been studied but search for an ideal agent goes on. It should have rapid onset of action, have a prolonged duration of action, be easy to administer and be without serious adverse effects.[8] Dexmedetomidine is highly selective alpha2 adrenergic agonist with

different sedative, anxiolytic, analgesic, and sympatholytic effects.[3] They have been used intravenously and has shown to provide some analgesic effect after arthroscopic knee surgery but has produced side effects like hypotension and bradycardia.[4] Due to paucity of studies in literature we have compared dexmedetomidine and fentanyl as intra-articular analgesic in knee arthroscopic surgery.

Method

Approval was obtained from the ethical committee of the institution and written informed consent was obtained from all the patients.

Fifty patients of either sex between the age group of 20-60 years belonging to American Society of Anaesthesiologists (ASA) Class 1 and 2 undergoing elective arthroscopic knee surgery were included in the study. Type of anaesthetic technique was spinal anaesthesia using 3 ml of 0.5% hyperbaric bupivacaine. All the patients were divided into two groups I and II with 25 patients in each group. Group I was the fentanyl group and Group II was the dexmedetomidine group. Group II received intra-articular dexmedetomidine 1 µg/ kg diluted to 10 ml of normal saline at the end of procedure and Group 1 received intra-articular fentanyl 1µg/ kg diluted to 10 ml of normal saline. Patients with impaired renal and hepatic function, history of heart disease, uncontrolled hypertension, opioid or nonsteroidal anti-inflammatory drug use 24 h before surgery, cases in which drain insertion was required postoperatively were excluded from the study.

In the operating room, baseline noninvasive blood pressure, electrocardiogram, heart rate, and arterial oxygen saturation was monitored in all the patients. Visual analogue scale (VAS was explained to all patients preoperatively (o-no pain and 10- worst pain imaginable). Intravenous line was secured in all the patients. Using aseptic precautions lumber puncture was established with a midline approach at L3- L4 inter space suing 25G Quincke spinal needle and 3 ml of 0.5% bupivacaine (hyperbaric) was injected slowly in the lateral decubitus position which was maintained for 10 min before starting the procedure. The adequacy of spinal block was assessed and confirmed when sensory block was up to T12 level and motor block >2 score with modified Bromage scale (o-no block, 1-hip blocked, 2-hip and knee blocked, 3-hip, knee and ankle blocked) on the operative limb.

At the end of the surgery, group I patients received 10 ml fentanyl solution containing fentanyl as per the dose of 1 µg/kg via intra-articular route and Group II patients received 10 ml of dexmedetomidine solution containing1 µg/kg intra-articularly minute before the release of tourniquet. Intraoperative vitals like heart rate and mean arterial pressure were noted at 5 min intervals for the first 30 min, then every 15 min till completion of surgery. Hypotension (decrease in mean arterial pressure >25% from baseline) was treated with intravenous fluids and ephedrine while bradycardia (heart rate<50 beats/min) was treated with atropine. Heart rate mean arterial pressure and pain scores (VAS) were noted at 1,2,4,6,8,12,18 and 24 h postoperatively.

Intravenous paracetamol 1000 mg was administered if the VAS pain score was ≥4 and repeated at every 8 hours. Time to first analgesic dose and total dose of paracetamol was recorded during the first 24 h in the postoperative period. Side effects such as nausea, vomiting, bradycardia, and hypotension were also noted.

Based on a pilot study with an assumption of a standard deviation of 10, a group size of 25 patients in each group was found to be sufficient to have a power of 90% for comparing VAS at 5% level of significance. Number, percentage, mean and standard deviation were used for data description. To compare the data in two groups, the t-test and Mann-Whitney test were used. SPSS version 18 was used for data analysis and p value < 0.5 was considered statistically significant.

Results

In this study, there was no statistically significant difference between the two groups in terms of age,sex,height, weight, ASA status and duration of surgery as shown in table 1.

Table 1: Patient demographic data

Variables	Group I(n=25)	Group II(n=25)	P value
Age (yrs.)	36.04 ±11.6	35±9.6	0.98
Sex(M/F)	23/7	22/8	0.45
Height(cm)	165.16±13.32	159±11.4	0.12
Weight(kg)	56.04±3.91	54.38±3.84	0.42
ASA Physical status(I/II)	11/14	12/13	0.57

Group II patients who received intra-articular dexmedetomidine showed significantly lower VAS scores at 1,2,4,6,12 and 24 h compared to Group I patients who received intra-articular fentanyl as shown in table 2 which was statistically significant.

Table 2: VAS score

VAS score-time of follow up	Group I	Group II	P value
1hr	1.7 ± 1.7	1.26 ±1.5	P< 0.001
2 hr	1.8± 0.5	1.4± 1.9	P< 0.001
4 hr	2.9± 0.5	1.3± 1.76	P< 0.001
6 hr	3.4 ±0.5	1.2± 1.38	P< 0.001
12 hr	4.8± 0.8	3.9± 0.4	P< 0.001
24 hr	4.8± 0.6	4.3± 0.5	P< 0.001

Time to first analgesic dose was also compared between the two groups and it was observed that it was significantly lesser in patients Group I (352.6 ±19.45min) than Group II (380.4±24.5 min) as shown in table 3 which was statistically significant. Duration of analgesia was prolonged in group II(360.04 ±11.6 min)in comparison to group I(305±19.6min) which was statistically significant.

Table-3: Duration and time of need of analgesia

Variables	Group I	Group II	P value
Duration of analgesia(min)	305±19.6	360.04 ±11.6	P< 0.001
Lack of need for analgesia(no of patients)	18	23	P< 0.001
Need for analgesia(no of patients)	12	7	P< 0.001
Total dose of paracetamol consumption(mg)	1105.5± 40.2mg	760.0± 15.6	P< 0.001
Time to first analgesia(min)	352.6 ±19.45	380.4±24.5	P< 0.001

The total requirement of iv paracetamol for rescue analgesia for dexmedetomidine group (760.0± 15.6mg) was significantly lower than that for the clonidine group (1105.5± 40.2mg). Overall in dexmedetomidine group only 7 patients required analgesia in the first 24 h postoperatively in comparison to 12 in fentanyl group which was statistically significant.

Discussion

In our study, we have used intra-articular dexmedetomidine and fentanyl for postoperative analgesia in patients undergoing arthroscopic knee surgeries with spinal anaesthesia as the anaesthetic technique and observed the patients for 24 h postoperatively. The results in our study shows that intra-articular dexmedetomidine has reduced the incidence of postoperative pain, has reduced the total analgesic requirement, and prolonged the time to first analgesic dose requirement in comparison to intra-articular fentanyl.

The mechanism of intra-articular action of dexmedetomidine is not clearly understood, but it may be similar to that suggested for clonidine.

Clonidine acts on alpha 2 adrenergic presynaptic receptor and inhibits release of norepinephrine at peripheral afferent nociceptors. It has analgesic effect by inhibiting nerve impulses through C and Aδ fibers and via modulation of opioid analgesic pathway and also may stimulate the release of enkephalin-like substance at peripheral sites.Fentanyl produces analgesia by acting on peripheral opiod receptors[5,6]

Previous studies have used inntra-articular dexmedetomidine and other drugs like morphine and clonidine for postoperative analgesia[7,8,9] But the search for ideal drug goes on.

Al-Metwalli et al compared three groups using intra-articular dexmedetomidine, intravenous dexmedetomidine and placebo, and concluded that intra-articular dexmedetomidine in a dose of 1 µg /kg enhanced postoperative pain relief and also reduced the need for postoperative analgesia and prolonged the time to first analgesic request. These results are in agreement with our study.[10]

El-Hamamsy et al compared inta-articular dexmedetomidine and fentanyl with bupivacaine 0.25% in a volume of 30 ml. They concluded that both dexmedetomidine and fentanyl in combination with bupivacaine resulted in increased time to first analgesic request and decreased the need for postoperative analgesia as well as increased the duration of pain relief as compared with bupivacaine alone. [11]

Paul et al concluded that intra-articular dexmedetomidine added as an adjunct to ropivacaine in patients undergoing arthroscopic knee surgery improved the quality and duration of postoperative analgesia.[12]

Alipour et al evaluated the efficacy of intra-articular dexmedetomidine and concluded that intra-articular dexmedetomidine in a dose of 1 µg /kg alleviates postoperative pain, reduces the need for narcotics as analgesics and increases the time to first analgesic request.[13]

Sun et al in a meta-analysis assessed the efficacy and safety of a single dose intra-articular clonidine for postoperative pain following arthroscopic knee surgery and concluded that analgesic effect of clonidine is mild and short lasting, for just 4 h after injection suggesting that intra-articular clonidine alone could not provide sufficient postoperative analgesia which was similar to our study. Postoperative hypotension was also observed that precluded its use in ambulatory settings.[14]

Ahmed M et al concluded that intra-articular bupivacaine/dexmedetomidine provides better analgesia compared to bupivacaine/ketamine and both are superior to bupivacaine alone following knee arthroscopy.[15]

Buerkle et al concluded in his study that most patients were very much satisfied with the postoperative analgesic regimen receiving the combination of morphine and clonidine at 24 h postoperatively. [16]

Manuar M et al in their study compared intra-articular ropivacaine ,fentanyl and dexmedetomidine for pain relief and suggested that ropivacaine was better than both fentanyl and dexmedetomidine.[17] From above studies it can be summarized that intra-articular fentanyl alone cannot produce prolonged analgesia. But dexmedetomidine alone can be used as a potent intra-articular analgesic for postoperative pain management.

Conclusion

Intra-articular dexmedetomidine alone provides effective postoperative analgesia following arthroscopic knee surgery in comparison to intra-articular fentanyl alone. Intra-articular dexmedetomidine reduced the total analgesic dose requirement and prolonged the time to need for first analgesic dose.

Source of support-nil
Conflict of interest-none

References

1. Barash GP, Cullen FB. Stoelting KR, Cahalan KM, Stock MC. Clinical anesthesia. In: Terese TH, Denise JW. Editors. Anaesthesia for Orthopaedic Surgery. 6th ed. India: Wolters Kluwer;2009.p.1385.

2. Miller RD, Eriksson IL, Fleisher AL, Weiner-Kronish JP, Young WL. Miller's anesthesia. In: Michael KU, editor. Anesthesia for Orthopedic Surgery. 7th ed. Philadelphia: Churchill Livingstone;2010.P2249-50.
3. Fanelli G, Borghi B, Casati A, Bertini L, Montebugnoli M, Torri G. Unilateral bupivacaine spinal anesthesia for outpatient knee arthroscopy. Italian Study Group on Unilateral Spinal Anesthesia. Can J Anaesth 2000;47:746-51.
4. Esmaoglu A, Karaoglu S, Mizrak A,Boyaci A. Bilateral vs. unilateral spinal anaesthesia for outpatient knee arthroscopies. Knee Surg Sports Traumatal Arthrosc 2004;12:155-8.
5. Bondok RS, Abd El-Hady AM. Intra-articular magnesium is effective for post-operative analgesia in arthroscopic knee surgery. Br J Anaesth 2006;97:389-92.
6. Kaeding CC, Hill JA, Katz J, Benson L. Bupivacaine use after knee arthroscopy: Pharmacokinetics and pain control study. Arthroscopy 1990;6:33-9.
7. Gerlach AT, Dasta JF. Dexmedetomidine: An updated review. Ann Pharmacother 2007;41:245-52.
8. Gomed-Vazquez ME, Hernandez-Salazar E, Hemandez-Jimenez A, Perez-Sanchez A, Zepeda-Lopez VA, Salazar-Paramo M. Clinical analgesic efficacy and side effects of dexmedetomidine in the early postoperative period after arthroscopic knee surgery. J Clin Anaesth 2007;19:576-82.
9. Tan PH, Buerkle H, Cheng JT, Shih HC, Chou WY, Yang LC. Double-blind parallel comparison of multiple doses of apraclonidine, clonidine and placebo administered intra-articularly to patients undergoing arthroscopic knee surgery.Clin J Pain 2004;20:256-60.
10. Al-Metwalli RR, Mowafi HA, Ismail SA, Siddiqui AK, Al-Ghamdi AM, Shafi MA, et al. Effect of intra-articular dexmedetomidine on postoperative analgesia after arthroscopic knee surgery. Br J Anaesth 2008;101:395-9.
11. El-Hamamsy M, Dorgham M. Intra-articular adjuvant analgesics following knee arthroscopy: Comparison between dexmedetomidine and fentanyl. Res J Med Sci 2009;4:355-60.
12. Paul S, Bhattacharjee DP, Ghosh S, Dawn S, Chatterjee N. Efficacy of intra-articular dexmedetomidine for postoperative analgesia in arthroscopic knee surgery. Ceylon Med J 2010;55:111-5.
13. Alipour M. Tabari M. Faz RF. Makhmalbaf H, Salehi M, Moosavitekye SM, Effect of dexmedetomidine on postoperative pain in knee arthroscopic surgery; a randomized controlled clinical trial. Arch Bone Jt Surg 20142:52-6.
14. Sun R, Zhao W, Hao Q. Tian H, Tian J. LiL, et al. Intra-articular clonidine for post-operative analgesia following arthroscopic knee surgery: A systematic review and meta-analysis. Knee Surg Sports Traumatol Arthrose 2014;22:2076-84.
15. Ahmed M. ELbadawy, Atef K. Salama, Molham M. Mohammad Comparative study of intra-articular dexmedetomidine versus ketamine as adjuvant analgesics after knee arthroscopy. Egyptian Journal of Anaesthesia. 2015;31(4):309–314
16. Buerkle H, Huge V, Wolfgart M. Intra-articular clonidine analgesia after knee arthroscopy. Eur J Anaesthesiol. 2000 May;17(5):295-9.
17. Das A.Hajra B,Dutta S.Pain relief after arthroscopic knee surgery: A comparison of intra-articular ropivacaine,fentanyl and dexmedetomidine:A prospective double blinded randomized controlled study.Saudi J Anaesth.2014;8(2):233-237.