ORIGINAL RESEARCH PAPER

Volume-7 | Issue-5 | May-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"TO STUDY THE EFFECT OF INTRATHECAL ADDITION OF CLONIDINE TO BUPIVACAINE ON TOURNIQUET RELATED HAEMODYNAMICS IN LOWER LIMB ORTHOPAEDIC SURGERIES.."

Anaesthesiology

Dr Tahir ali khan Associate Professor, CMCH, Bhopal.

Dr Santosh Bhaskar Professor, CMCH, Bhopal

Dr Tripti Vatsalya* Associate Professor, GMC, Bhopal. *Corresponding Author

ABSTRACT

Application of tourniquet is an integral part of lower limb orthopedic surgeries, however it is associated with tourniquet pain and haemodynamic changes both on inflation and deflation. Intrathecal addition of clonidine to local anaesthetics has gained popularity for increased duration of aanalgesia but it is associated with increased incidence of hypotension and bradycardia. We undertook this study with the objective to study the effects of addition of intrathecal clonidine to bupivacaine on tourniquet related haemodynamic changes in lower limb orthopaedic surgeries.

60 patients undergoing lower limb orthopedic surgeries in the dept of anaesthesiogy, GMC, Bhopal with tourniquet application under SAB were randomly divided in two groups:

Group P: To receive 3.0 ml Bupivacaine + 0.2 ml NS (placebo).

Group C: To receive 3.0 ml Bupivacaine + 30 mcg clonidine.

Both the groups were observed for changes in blood pressure and heart rate during tourniquet inflation and deflation. Also tourniquet pain was observed both intraoperatively and postoperatively and compared in both the groups along with sedation and other adverse effects.

Intrathecal addition of clonidine to bupivacaine significantly increases the duration of analgesia. Although the fall in BP after tourniquet deflation was more in clonidine group, the difference was not statistically significant.

KEYWORDS

tourniquet, clonidine, intrathecal, orthopaedic.

Application of tourniquet is an integral part of lower limb orthopaedic surgeries as they provide clear surgical fields and minimize the blood loss, however their use may be associated with many local and systemic complications([1,2]). Exsanguination of both lower limbs at the time of inflation can increase the circulating blood volume by ≈ 15% , resulting in transient increase in central venous pressure and systolic blood pressure, which gradually return to pretourniquet levels. After deflation of the tourniquet, central venous pressure and arterial blood pressure decrease for 15 min as a result of a shift of blood volume back into the limb and post ischaemic reactive hyperaemia associated with a decrease in peripheral vascular resistance.

Addition of Intrathecal clonidine (an alpha 2 agonists) to local anaesthetics is a well known and frequently used modality that not only improves the sensory and motor blockade after spinal anesthesia but also increases the duration of blockade and therefore has gained popularity and is being used commonly for lower limb orthopaedic surgeries([3,4,5,6]). However, clonidine being a centrally acting alpha 2 agonist results in hypotension and bradycardia, which are often significant([7,8,9,10,11]).

We undertook this study to look out for any exaggerated hypotension or any other adverse event with the use of intrathecal clonidine in lower limb orthopaedic surgeries, with special regards to inflation and deflation of tourniquet.

Material and methods

60 patients of ASA grade I and II, aged 20-60 years, undergoing lower limb orthopaedic surgeries were included in our study. Patients with known sensitivity to amide local anaesthetic, Bleeding diathesis, Neurological, neuromuscular, or psychiatric condition, Peripheral neuropathy, DVT in the limb, Reynaud's disease, and peripheral vascular disease, history of hypertension, severe renal, hepatic, respiratory or cardiac disease were excluded from this study.

After taking informed consent, patients were randomly divided into two groups :

Group B- (n=30): To receive spinal anaesthesia with bupivacaine 0.5% heavy 3 ml + 0.2ml NS **(CONTROL GROUP)**

Group BC-(n=30):To receive spinal anaesthesia with bupivacaine 0.5% heavy 3.0ml + clonidine 30 mcg **(CLONIDINE GROUP)**

IV line was secured and all patients were administered 10-15ml/kg of lactated ringer solution.Premedication with inj.ranitidine 50mg i.v. & inj. ondansatron 4 mg i.v. was given. Monitors were attatched and preoperative HR, BP, RR, SPO2 recorded .Maintaining all aseptic precautions Sub Arachnoid Block was administered in L3-L4 space via 25 G spinal needle, a total of 3.2 ml drug was given in both the groups.Sensory and motor block was assessed using pin prick and modified Bromage scale respectively.

A pneumatic tourniquet was placed on the lower extremity to be operated. Limb was elevated for 5 min and tourniquet was inflated with an inflation pressure 100 mm Hg more than SBP. Haemodynamic instability was defined as a 30% reduction in mean arterial BP from baseline value and was treated with 300 mL of additional fluids and IV ephedrine (6-mg bolus) if required. Bradycardia was defined as a heart rate of less than 60 and was treated with iv atropine 0.6 mg. The analgesia time was recorded up to first rescue analgesia requirement, provided by Diclofenac sodium 75mg intramuscularly on demand. Blood pressure and heart rate were recorded continously and evaluated at following points:

- Before induction(**baseline**),
- 5, 10 and 15 min after induction,
- Just before limb elevation and tourniquet inflation,
- 1,2,3,5,10 min. **after tourniquet inflation**,
- just before tourniquet deflation(**predeflation**),
- For the purpose of study, Values are presented as mean (SD range), MAP and HR values were computed as % changes from baseline. Statistical analysis was done using unpaired t test.

Results

Table 1

Demographic profile

	Group B	Group BC
Age (yr.)	31.2±7.9	33.6±9.3
Sex(male/ female)	22/8	24/6
Height(cm)	165.8±8.4	164.3±7.1
Weight(kg)	63.3±10.8	64.9±11.2
Tourniquet time (min)	50.3 ± 7.4	48.6 ± 8.6

The two Groups were similar and comparable with respect to age, sex, weight , height , and tourniquet time.

Table 2
MAP after induction

	Group B	Group BC	p value
Baseline	98.1±9.1	97.9±8.3	>0.05
5 min After induction	91.2±6.1	88.5±6.6	>0.05
10 min after induction	90.6±5.8	85.9±6.7	>0.05

A fall in MAP was observed in clonidine group after induction as compared to control group, though the difference was not statistically significant

Table 3
MAP on tourniquet inflation

	Group B	Group BC	p value
Before limb elevation	90.3±6.8	84.5±7.4	>0.05
Just before tourniquet inflation	93.4±6.6	85.9±7.4	>0.05
1 min.	92.5±7.7	84.7±9.3	>0.05
2 min.	89.6±8.4	86.0±8.7	>0.05
3 min.	87.8±7.6	83.2±6.2	>0.05
5 min.	87.4±6.2	82.4±7.9	>0.05
10 min.	88.3±6.6	81.6±7.7	>0.05

MAP in clonidine group was lower than that of bupivacaine group at the measured intervals but the difference was not statistically significant.

Table 4
MAP on tourniquet Deflation

	Group B	Group BC	p value
Just before tourniquet deflation	92.5±3.5	83.7±3.9	>0.05
1 min.	85.9±3.2	79.2±3.0	>0.05
2 min.	83.6±3.9	77.5±4.1	>0.05
3 min.	84.4±4.2	77.4±4.4	>0.05
5 min.	84.6±3.0	77.8±3.4	>0.05
10 min.	84.7±4.5	78.9±4.3	>0.05

MAP in clonidine group was lower than that of bupivacaine group with the difference being statistically insignificant. However, when percentage fall in MAP from the pre deflation value was compared, there was no difference in percentage fall in BP from predeflation value between the two groups.

Figure 1 Trend in MAP (Mean Arterial Pressure) on tourniquet inflation

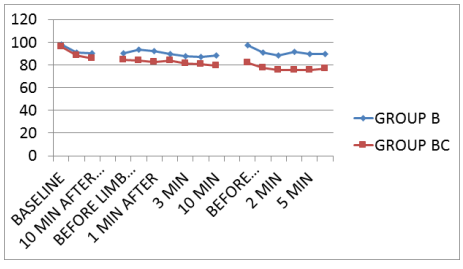

Figure 2 Trend in MAP on tourniquet deflation

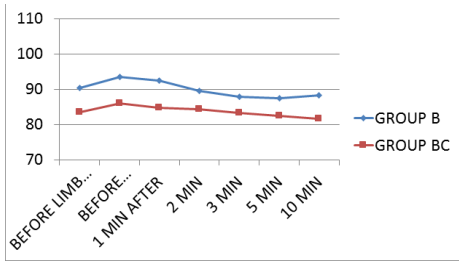

Table 5
Changes in heart rate after induction

	Group B	Group BC	P value
Before induction	84.3±3.4	83.7±3.9	>0.05
5 min after induction	78.8±3.1	76.4±4.1	>0.05
10 min after induction	76.3±5.9	72.4±6.4	>0.05

Table 6
Changes in heart rate on tourniquet inflation

	Group B		Group BC	
Before limb elevation	75.9±6.2	% change from baseline	68.1±5.7	% change from baseline
Just before tourniquet inflation	78.1±4.1	+2.8%	66.8±4.4	-1.9%
1 min.	74.5±4.7	-1.9%	66.1±3.3	-2.9%
2 min.	71.8±3.6	-4.4%	63.4±3.7	-6.9%
3 min.	71.1±3.8	-6.3%	64.0±2.5	-6.6%
5 min.	71.4±4.9	-6.2%	63.0±5.0	-7.1%
10 min.	72.4±4.9	-4.6%	62.1±5.4	-7.8%

Table 7
Changes in heart rate on tourniquet deflation

	Group B		Group BC	
Just before tuorniquet deflation	73.2±4.2	% change from baseline	68.4±3.8	% change from baseline
1 min.	78.7±4.0	+7.5%	71.1±3.6	+3.9%
2 min.	80.4±4.5	+9.8%	72.2±3,9	+5.5%
3 min.	82.8±4.7	+13.1%	72.5±4.8	+7.4%
5 min.	85.9 ±3.2	+17.3%	72.3±4.0	+5.9%
10min.	85.3±3.0	+16.5%	72.7±4.2	+6.2%

Table 8
Motor and sensory block

	GROUP B	GROUP BC	p value
MOTOR BLOCK (min)	154.2±11.7	217.4±13.2	<0.05
TIME TO RESCUE ANALGESIA (min)	248.4±14.9	419±17.6+	<0.05

Motor block and time to rescue analgesia was significantly longer in clonidine group as compared to plain bupivacaine group.

Table 9
Adverse effects

	Group B	Group BC
Tourniquet Pain	Nil	Nil
Sedation	0	0
Bradycardia (PR < 60)	0	2
Nausea	1	1

No significant adverse event was observed in both the groups.

DISCUSSION

Intrathecal addition of clonidine, to increase the duration and depth of subarachnoid block has become an integral part in day to day anaesthesia practice with many studies establishing its effectiveness. Clonidine, being an alpha 2 agonist, reduces central sympethatic outflow and results in hypotension and bradycardia. Similarly, a fall in blood pressure is usually observed with tachycardia at the time of tourniquet deflation, which could , at times significant if tourniquet is applied for long duration. When literature was searched, we could find very few studies pertaining to the effects of intrathecal clonidine on tourniquet related haemodynamics.

Therefore, we undertook this study to look out for any exaggerated hypotension or any other adverse event with the use of intrathecal

clonidine in lower limb orthopaedic surgeries, with special regards to inflation and deflation of tourniquet.

A fall in MAP and heart rate was observed after induction in clonidine group as compared to control group which persisted at all measured intervals thereafter, though the difference was not statistically significant. This finding is consistent with with Strebel et al[4], Sethi B S et al[5], Singh R et al[7], Niemi L et al [9] and Thakur A et al [10]. This fall in blood pressure and heart rate can be attributed to reduced central sympethatic outflow by intrathecal clonidine. Zalunardo M P[11] demonstrated attenuation in pressor response during tourniquet inflation with intravenous clonidine during general anaesthesia.

After an initial fall in blood pressure and heart rate and stabilization at a lower level, no additional haemodynamic instability was observed after tourniquet deflation in our study which was against the results of Sarkar et al[12] who concluded that oral clonidine premedication exacerbated the reduction in MAP after tourniquet deflation. However, low dose intrathecal clonidine was used in our study as compared to high dose oral clonidine used by sarkar et al.

Significant prolongation in duration of motor blockade and time to rescue analgesia was observed in our study which was in conjunction with most of the abovementioned studies.

No major adverse event was observed in either of the groups in our study.

However, blood pressure measurements in our study was by non invasive method, lack of real time invasive blood pressure monitoring was a genuine limitation of our study.

Conclusion

The results of our study showed that addition of clonidine to intrathecal bupivacaine provide a longer duration of analgesia and motor blockade without significant change in hemodynamics associated with tourniquet inflation and deflation. There was no statistical difference between two groups in hemodynamic changes assoiated with tourniquet inflation and deflation in lower limb orthopeadic surgeries.

References

1) Ivan n ramoz- galvez : Procedures under tourniquet, Anaesthesia and Intensive care medicine 2003 77-79.
2) Odinsson A, Finsen V **:** Tourniquet use and its complications in Norway. J Bone Joint Surg [Br] 2006;88-B:1090-2.
3) Gecaj-Gashi A et al : Intrathecal clonidine added to small-dose bupivacaine prolongs postoperative analgesia in patients undergoing transurethral surgery Can Urol Assoc J 2012;6(1):25-9.
4) Strebel S, Gurzeler JA, Schneider MC : Small dose intrthecal clonidine and isobaric bupivacaine for orthopaedic surgery: a Dose Response study. Anesth Analg 2004; 99:1231-8.
5) Singh R, Gupta D, Jain A : the effect of intrathecal clonidine to hyperbaric bupivacaine on postoperative pain after lower segment caesarean section : A randomized control trial.
6) Sethi B S, Manuel M, Shrivastav D : Efficacy of analgesic effects of low dose intrathecal clonidine as adjuant to bupivacaine Indian Journal of Anaesthesia 2007; 51 (5) : 415-419.
7) van Tuijl I, van Klei WA, van der Werff DB, Kalkman CJ : . The effect of addition of intrathecal clonidine to hyperbaric bupivacaine on postoperative pain and morphine requirements after caesarean section: A randomized controlled trial. Br J Anaesth 2006;97:365-70.
8) Grandhe RP, Wig J, Yaddanapudi LN : Evaluation of bupivacaineclonidine combination for unilateral spinal anesthesia in lower limb orthopaedic surgery. J Anaesth Clin Pharmacol 2008;24:155-8.
9) Niemi L : Effects of intrathecal clonidine on duration of bupivacaine spinal anaesthesia, hemodynamic and postoperative analgesia in patients undergoing knee arthroscopy. Acta Anesthesiol Scand 1994;38:724-8.
10) Thakur A, Bhardwaj M, Kaur K, Dureja J, Hooda S, Taxak S. : Intrathecal clonidine as an adjuvant to hyperbaric bupivacaine in patients undergoing inguinal herniorrhaphy: A randomized double-blinded study. J Anaesthesiol Clin Pharmacol 2013;29:66-70.
11) Zalunardo M P: Preoperative Clonidine Blunts Hyperadrenergic and Hyperdynamic Responses to Prolonged Tourniquet Pressure During General Anesthesia Anesth Analg 2002;94:615–8)
12) Sarkar S, Acharya A, Pahari S : Effect of oral clonidine premedication on haemodynamic response to tourniquet deflation following epidural anaesthesia for lower extrmity surgeries. Indian J Anaesth 2006 ; 50(4) : 266-270.