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**Original Research Article**

# Effect of adding various doses of clonidine as an adjunct in Transversus abdominis plane block in unilateral inguinal hernioplasty

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## ABSTRACT

**Background:** Transverses abdominis plane (TAP) block is a new regional anaesthetic technique for postoperative analgesia in abdominal surgeries, as a part of multimodal analgesia. We evaluated effect of two different doses of clonidine as an adjunct in TAP block in patients underwent unilateral inguinal hernioplasty.
**Methods:** Sixty adult patients undergoing unilateral inguinal hernioplasty were randomized into two groups, Group A (n=30) received bilateral TAP block with bupivacaine 0.25% 38cc + clonidine (1cc) 150 microgram +1cc NS=40cc, Group B (n=30) received bupivacaine 0.25% 38cc+clonidine (2cc) 300 microgram=40cc, at the end of surgery. The postoperative pain was evaluated by visual analog score (VAS) for pain scoring at 2, 4, 6, 12 and at 24 hours. Subjective assessment of duration of analgesia was done.
**Results:** The VAS score in patients who received clonidine 300 microgram Group B as an adjunct was significantly lower than who received 150 microgram Group A. Duration of analgesia was longer in Group B. 2 patients in Group B showed bradycardia treated with atropine. Sedation score was lesser in Group A.
**Conclusions:** Clonidine showed dose dependant analgesia and adverse effect in TAP block for postoperative analgesia. Higher doses of clonidine may be used as an adjunct in TAP block.

**Keywords:** Clonidine, Postoperative pain, TAP block, Postoperative analgesia, VAS score

## INTRODUCTION

A substantial component of pain experienced by the patient after abdominal surgery is derived from anterior abdominal wall incision.[1] The anterior abdominal wall is innervated by nerve afferents that course through the transversus abdominis fascial plane.[2] Rafi first described TAP block using landmark technique in 2001.[3]

TAP block is regional anaesthetic technique that provide analgesia to anterior abdominal wall from skin to parietal peritoneum including anterior abdominal muscles, but it fails to cover visceral pain.[4]

McDonnell and colleagues used this block, using a landmark method in patients after both lower middle abdominal laparotomy and caesarean section and found a significant reduction in postoperative morphine requirement in first 24-36 hours.[5-7] This prospective, double blind, randomized study was conducted to evaluate the analgesic efficacy and adverse effect of two different doses of clonidine as an adjunct in TAP block in patients underwent unilateral inguinal hernioplasty.

## METHODS

After receiving Institutional ethical committee approval and explained written consent from patients undergoing elective unilateral inguinal hernioplasty were enrolled in the study. Patients aged 18-70 years, weighing between 50-70 kg, ASA grade I-II were selected for the study. Patients with known allergy to study drugs, any contraindication for spinal anaesthesia, any obstructed inguinal hernia or any emergency surgery for hernia were excluded from the study.

All the patients were monitored for heart rate, noninvasive blood pressure, Spo2. Heart rate less than 50 and MAP less than 55 were considered as bradycardia and hypotension respectively. The surgery was conducted under spinal anaesthesia with 3ml, 0.5% bupivacaine (Heavy). All the monitored parameters maintained within normal limit intra and post operatively up to 24 hours except 2 patients of Group B showed bradycardia after receiving TAP block.

The bilateral TAP block was given by a single experienced investigator at the end of surgery for postoperative analgesia as a part of multimodal analgesic regime. A 24 G 2.5-inch needle was used to give block. The needle was blunted by rubbing it on sponge holder provided in the sterile tray. The entry point was at the mid axillary line, two inches cephalad to iliac crest over the triangle of Petit. The needle was advanced perpendicular to the skin in the coronal plane until the first resistance of external oblique muscle was felt, further advancement of the needle result in pop sensation as the needle entered a plane between the external and internal oblique fascial layers.

A seconded resistance was felt as the needle passed through the internal oblique muscle layer. Second pop was felt on the needle reached the transversus abdominis plane between internal oblique and traverses abdominis muscle. After negative aspiration to exclude vascular puncture, total volume of 38cc 0.25% Bupivacaine +clonidine 1cc (150µg) +1cc NS=40cc (Group A) or 38 cc Bupivacaine 0.25%+ 2cc clonidine (300µg) =40cc (Group B), were prepared by an anesthesiologist not a part of study further, the total volume was divided equally and administered bilaterally.

The patients were randomly divided into two groups (Group A, n=30 and Group B, n=30) by a computer generated random sequence. Postoperative pain was evaluated by Visual Analog Score (VAS) of 0-100mm (0=no pain, 100=worst pain) for pain scoring at 2, 4, 6, 12 and 24 hours.

Patients were evaluated for side effects as bradycardia, hypotension, dry mouth, sedation [bradycardia (<50 bpm), hypotension (<55MAP)]. Sedation was evaluated with Wilson sedation score at rating (1-5), 1=fully awake and oriented, 2=drowsy, 3= eyes closed but arousable to command, 4=eyes closed but arousable to mild physical stimulation (ear lobe tug), and 5=eyes closed but unarousable to mild physical stimulation.

Duration of analgesia was calculated from the time of giving block at end of surgery to the time when VAS was equal to or more than 6 (moderate pain). Rescue analgesic used was inj diclofenac 75mg *i.m.* maximum 3 times a day as practiced in our institute.

## RESULTS

About 60 patients were included in the study, randomly divided in two groups, Group A{n=30) and Group B (30). Both the groups were similar with respect to patient's characteristics data, ASA physical status and baseline vitals (Table 1).

**Table 1: Comparison of various demographic variables between the two groups (N=60).**

| Variable | Group A [Mean±SD] (n=30) | Group B [Mean±SD] (n=30) | 't' Value | P Value |
|---|---|---|---|---|
| Age (years) | 46.59±5.29 | 45.16±3.42 | 1.24, df=58 | 0.218, NS |
| BMI (kg/m$^2$) | 26.24±4.22 | 25.72±4.95 | 0.44, df=58 | 0.663, NS |
| SBP (mmHg) | 113.32±6.18 | 112.49±4.89 | 3.35, df=58 | 0.112NS |
| DBP (mmHg) | 65.12±4.72 | 63.59±2.48 | 1.57, df=58 | 0.121, NS |
| Heart rate (per min) | 62.18±4.98 | 61.62±3.25 | 0.51, df=58 | 0.608, NS |
| SpO2 (%) | 98.09±1.25 | 97.68±1.45 | 1.17, df=58 | 0.245, NS |
| **ASA grade** | | | | |
| Grade 1 | 24 | 26 | Z= -0.70 | 0.487, NS |
| Grade 2 | 6 | 4 | Z=0.70 | 0.487, NS |

Unpaired' test applied. For proportions, Z test for two sample proportion applied. A P value of <0.05 was taken as statistically significant.

**Table 2: Comparison of VAS score between the two groups at different time intervals (N=60).**

| Time interval hours | Group A [Mean±SD] (n=30) | Group B [Mean±SD] (n=30) | 't' Value | P Value |
|---|---|---|---|---|
| 0 | 0 | 0 | - | - |
| 2 | 0.67±0.32 | 0.62±0.12 | 5.60, df=58 | 0.000* |
| 4 | 2.63±4.21 | 0.98±0.69 | 2.11, df=58 | 0.038* |
| 6 | 4.18±0.93 | 1.50±3.53 | 4.02, df=58 | 0.000* |
| 12 | 5.25±2.92 | 2.57±4.85 | 1.89, df=58 | 0.062, NS |
| 24 | 6.29±5.18 | 3.95±5.92 | 1.62, df=58 | 0.108, NS |

Unpaired 't' test applied. A P value of <0.05 was taken as statistically significant.

Patients received higher concentration of clonidine had significantly lower pain score up to 6 hours, there were no difference in pain score at 12 and 24 hours (Table 2).

**Table 3: Comparison of duration of analgesia between the two groups (N=60).**

| Variable | Group A [Mean±SD] (n=30) | Group B [Mean±SD] (n=30) | 't' Value | P Value |
|---|---|---|---|---|
| Duration of analgesia (min) | 450.82±7.18 | 629.78±6.59 | 100.57, df=58 | 0.000* |

Unpaired 't' test applied. A P value of < 0.05 was taken as statistically significant.

**Table 4: Comparison of various side effects between the two groups [N=60].**

| Grade 5 variable | Group BC1 [number] (n=30) | Group BC5 [number] (n=30) | Z Value | P Value |
|---|---|---|---|---|
| Hypotension | 0 (0.0%) | 0 (0.0%) | - | - |
| Dry mouth | 0 (0.0%) | 0 (0.0%) | - | - |
| Bradycardia | 0 (0.0%) | 2 (6.7%) | -1.46 | 0.143, NS |
| **Sedation score** | | | | |
| Grade 1 | 0 | 0 | - | - |
| Grade 2 | 30 | 22 | 3.30 | 0.001* |
| Grade 3 | 0 | 8 | -3.30 | 0.001* |
| Grade 4 | 0 | 0 | - | - |
| Grade 5 | 0 | 0 | - | - |

For proportions, Z test for two sample proportion applied, a P value of < 0.05 was taken as statistically significant.

## DISCUSSION

TAP block has been shown to reduce postoperative pain score, rescue analgesic consumption, early ambulation and discharge after various abdominal surgeries like colectomy, appendicectomy, hysterectomy, caesarean section and prostectomy.[8] Over the time various local anaesthetic from lignocaine to bupivacaine, levobupivacaine ropivacaine in different concentration are used to give TAP block.

By using different adjunct like adrenaline, ketamine, clonidine etc to local anaesthetic duration of analgesia can be prolonged block. Several dose response studies have been performed using clonidine intrathecally epidurally axillary block but concerning TAP block more evidences are not available.[9-13]

This study was done to evaluate that does increase in the dose of clonidine would increase the effect of TAP block. Adverse effect of drug was also studied. Group A received Bupivacaine 0.25% 38cc+clonidine 150µg+NS1CC, Group B received Bupivacaine 0.25% 38cc+clonidine 300µg. It was a bilateral block. There was significant difference in VAS score at 2, 4 and 6 hours but at 12 and 24 hours difference was insignificant. During early period effect was dose dependant but at 12 hours or after effect of block was completely wearied off irrespective the dose of clonidine used Connelly and colleague found that using clonidine 0.5µg/kg *i.m.* or in wound site infiltration in patients undergoing inguinal hernia repair offer analgesia only for 2 hours postoperatively suggested using higher doses of clonidine.[14] Dogrul and colleagues demonstrated that topical administration of clonidine elicits anti-nociception by blocking the emerging pain signals at peripheral terminal through alpha 2 adrenoceptor without producing undesirable central side effects.[15]

Clonidine produces dose dependent analgesia on parental administration.[16-18] Buttner et al. studied effect of mepivacaine plus 120 and 250 microgram clonidine with mepivacaine alone in axillary nerve block failed to found clear cut relationship between clonidine dose and duration of analgesia or side effect, but in our study duration of analgesia was significantly (p=0.0001) higher in Group B (Table 3).[19] Elliots and colleague failed to find any significant difference in postoperative analgesic consumption after im or wound infiltration of clonidine (150µg) in inguinal herniorraphy under inguinal hernia block with 29ml 0.25% bupivacaine.[20]

In our study patients in Group A (clonidine 150µg) did not show any adverse effect (Table 4) while 2 patients in Group B showed bradycardia responded to *i.v* atropine but incidence was insignificant (p=0.143) when compared with other group. All the patients in Group A and Group B were calm and sedated, sedation score was grade 1 except 8 patients of Group B who showed grade 2 sedation (Table 4).

Although intravenous clonidine causes sedation, but association is less when used in peripheral block, McCartney et al reviewed 27 studies and reported that only 5 studies showed increased sedation where clonidine used as additive, among patients who sedated only one required oxygenation who received 300µg clonidine, and no patients required ventilator support.[21]

## CONCLUSION

TAP block is safe and effective way of treating postoperative pain, addition of clonidine enhances the duration of the block. Clonidine showed dose dependent analgesia and side effect as VAS score was less and duration of analgesia was more in Group B (clonidine 300 microgram), but some adverse effect was also noted, and managed with routine measures. There is advantage of using higher dose of clonidine in TAP block for postoperative analgesia in unilateral inguinal hernioplasty.

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