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Original article

13 A COMPARATIVE STUDY OF EFFICACY AND SAFETY OF ULTRASOUNDGUIDED DOUBLE TAP BLOCK WITH CONVENTIONAL REGIONAL ANAESTHESIA FOR OPEN INGUINAL HERNIA REPAIR IN GERIATRIC PATIENTS Authors DR.Devanshi Shah, DR.Manisha Kapdi

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ABSTRACT

Background: Geriatric patients of open hernia repair have comorbidities.**, Impaired cardiorespiratory reserves ultrasoundguided regional blocks nowadays very popular**

Aims & objectives: to explore USG guided double TAP block with conventional anaesthesia technique

Observations and results: Double TAP block provided less sensorimotor blockage,& prolonged Postoperative analgesia then unilateralspinal anaesthesia

Conclusion:USG guided double TAP block can be alternative to unilateral spinal anaesthesia in geriatric patients for open unilateral hernia repair.

KEY words: USG guided Double TAP block (TAP block,IIG ,IH block),open hernia repair, geriatric patients.

INTRODUCTION

Inguinal hernia repair surgery is one of the commonestsurgery in male geriatric patients . (1)

These procedures can be done under general anesthesia (GA), neuraxial anesthesia (spinal or epidural) or peripheral nerve blocks and TAP block. Geriatric patients have poor cardiorespiratory reserves so general anaesthesia may not be a good option for inguinal hernia repair surgery because it affects cardiopulmonary functions the most.

Neuraxial anesthesia (spinal or epidural anesthesia) is an attractive choice But in geriatric patients hypotension and other hemodynamic changes are often observed as autonomic nervous system response is diminished with aging and sympathetic block with epidural anesthesia cannot be controlled (2).Cardiovascular system may be profoundly affected by spinal anaesthesia due to unavoidable sympathetic blockade. Hypotension is the most frequent side effect of spinal anaesthesia, occurring in more than 30% of patients (3). In conventional spinal anaesthesia it is not possible to limit the accompanied sympathetic block that normally exceeds the sensory block by 2-6 segments (4, 5). **Ward et al** (6) reported a decrease in mean arterial blood pressure of 21.3% of the base line following spinal anesthesia. The unilateral spinal anesthesia has been claimed by many as an alternative technique, to restrict the undesired sympathetic block (7) and is useful in geriatric patients.

The transversus abdominis plane (TAP) block is a relatively new regional anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall (8). It has a high margin of safety and is technically simple to perform, especially under ultrasound guidance. TAP block can preserve bladder and lower limb motor function thereby assisting early mobilization after surgery.Historicaly described just a decade ago, it has undergone several modifications, which have highlighted its potential utility for an increasing array of surgical procedures (9). Despite a relatively low risk of complications and a high success rate using modern ultrasoundguided techniques, TAP blocks can be good alternative to spinal anaesthesia (10).

this study was undertaken to compare the safety and efficacy of double TAP (TAP,IIG,IH) block and unilateral spinal anesthesia for inguinal hernia repair surgery in geriatric patients.

MATERIAL AND METHODS

The study was a comparative study conducted in the department of anaesthesiology, VS general Hospital, NHLM Medical college, AhmedabadGujarat, India, aftera written informed consent was taken from all the patients. Our study had 60 adultmale patients of more than 60 years of age and of American Society of Anaesthesiologists (ASA) grade I and II divided randomly into two groups of 30 each (using sealed random envelope). They were given either Ultrasoud guided double TAP(TAP,IIG,IH) block or unilateral spinal anaesthesia for unilateral fully reducible indirect inguinal hernia repair surgery with mesh repair.

The Exclusion criteria included patients who did those not give consent, those with known hypersensitivity to local anaesthetic drugs, patients having bleeding disorders, untreated or uncontrolled co-morbidities like diabetic mellitus, hypertension, ischemic heart disease, morbid obesity and chronic renal failure, those with infection at the site of injection, patients with psychiatric disorders, and metabolic diseases. Routine investigations like complete

blood counts, urine examination, bleeding time, clotting time, chest x-ray PA view, electrocardiogram and other relevant investigations were done in all patients pre-operatively. Group- T patients receivedUltrasound guided (USG)Transversus abdominis plane block (TAPB) with ilioinguinal and iliohypogastric nerve block 30ml of 0.375% isobaric bupivacaine,and isobaric lignocaine 1.5% 10 ml on the side of hernia repair and Group- S patients received Unilateral spinal anaesthesiawith 10mg (2.ml) of 0.5% hyperbaric bupivacaine. The same anesthetist performed all procedures in both groups. The patients were assessed thoroughly in the pre-operative room with Nil by mouth of6 hours a good IV access was secured and intravenous fluid (ringer lactate) started at 10 ml/kg. Thereafter, patients were shifted to operation theater and all standard monitoring devices were attached which included noninvasive blood pressure, Heart Rate, respiratory rate and SpO2. All patients were connected to venturimask and were given oxygen @ 4 litres/ min throughout the intraoperative procedure. Each patient was premedicated with intravenous ondansatron 0.04mg/kg in the operating room before the procedure. In group-R patients were placed in supine position on OT table. After draping and taking all aseptic precautions, the ultrasound guided (SonoSite,Micromaxx) transversus abdominis plane block was given using the following technique: A linear ultrasound probe (Micromaxx L 38e/10-5 MHZ) was placed transversely on the abdomen between cn and iliac crest in the mid-axillary line on the side to be blocked. The probe was then slided anteriorly or posteriorly and tilted as necessary in a cephalocaudad direction until a clear optimized image of the three lateral abdominal muscles (namely external oblique, internal oblique and transversus abdominis from outside inwards) and the transversus abdominis plane were visualized. Changing the depth and gain was used to achieve further optimization of the image. An 23G spinal needle was introduced from an anterio-medial position to a posterior and lateral direction using in-plane technique with entry point in the skin being 2cm away from the probe in order to improve needle visibility in the long axis. The needle trajectory proceeded in an anterio-posterior direction using in-plane technique, with local anaesthetic injection observed in real-time. A small test dose was used to confirm the transversus abdominis plane by observing the separation of fascia between internal oblique and transversus abdominis muscle. After confirming the transversus abdominis plane, total of 15ml of 0.375% isobaric bupivacaine was injected, in real time. USG guided Ilioinguinaland iliohypogastric blockwere given alsogiven between internal oblique &Transverse abdominis fascial plane more cephalic then anatomical landmark guided block between iliac crest And coastal margin (22) by10ml 0.375 %buivacaine. 10ml of isobaric lignocaine 1.5% was infiltrated from public tubercle towards umbilicus in subcutaneous plane.3ml of 1.5% lignocaine was given during surgery after identification of neck of sac ,to block genital branch of genitive moral nerveeffect of block was assessed by pin prick on the side of surgery every 5 minutes till

30 minutes. A successful block meant a sensory block of unilateral T10 to L1 dermatomes by 30 minutes, after which it was considered as a failure and patient was given GA.

group-S, the patients were placed in lateral position with side to be operated kept down. After taking aseptic precautions, dural puncture was performed using 25G Quinke's needle, inserted in midline at L3-L4 interspace. After dural puncture, bevel of the needle was turned towards the dependent side and 2ml of 0.5% hyperbaric bupivacaine (10mg) was injected. Lateral position was maintained for 10 minutes and then patients were turned to supine position. 10ml of isobaric lignocaine infiltration done between pubic tubercle to umbilicus to prevent pain due to stretching ofrectus sheath.Then prick method (by 25G hypodermic needle) was used to evaluate sensory block. Time of onset and time taken to achieve highest dermatomal level of sensory block was recorded. Motor blockade was assessed by using modified Bromage scale at the end of surgery. Patients with inadequate block in Group S were also converted to GA. Heart rate, continuous ECG, blood pressure and SpO2 were monitored and recordings were taken preoperatively, at 5 minutes intervals initially for 20 minutes, at 30 minutes, at 45 minutes, at 60 minutes and post-operativly.Patients were watched forPerioperative adverse effects like nausea, vomiting, bradycardia, hypotension, altered sensorium or seizure episodes due to inadvertent intravascular injection of LA, liver perforation, intraperitoneal injection, bowel perforation were recorded. Hypotension (defined as decrease in systolic blood pressure greater than 20% from baseline) was treated with ephedrine 6 mg IV bolus and was repeated if required. Bradycardia (Heart rate less than 60 beats per minute) was treated with 0.3-0.6 mg of atropine IV bolus.

The quality of block was assessed according to the following scale:

Numeric Scale for Quality of Block:

Grade IV: (Excellent) No complaint from patient.

Grade III: (Good) Minor complaint with no need for the supplemental analgesics.

Grade II: (Moderate) Complaint that required supplemental analgesia.

Grade I: (Unsuccessful) Patient given general anaesthesia.

Intermittent bolus of 25-50 mcg of fentanyl was given intravenously to patients who needed supplemental analgesics. All patients were observed in postoperative recovery room for duration of analgesia ,time to first rescue analgesic requirement and total analgesic consumption in 24 hours. The patients were assessed for pain based on VisualAnalogue scale (VAS). The patients were explain about VAS in detail.. Tramadol 50 mg intravenous was used

as a rescue analgesic in patients who had VAS score >3 postoperatively. Comparability of the groups was analyzed by student's t test. For intragroup comparison paired't' test was used and for intergroup comparison unpaired't' test was used. we used a sample size of total 60 patients (30 in each group). For all statistical analysis, the value of p <0.05 was considered statistically significant and value of p <0.001 was considered highly significant. All statistical tests were done using SPSS software version 16.0). Graphs were prepared using Microsoft excel. Data was expressed as mean ± standard deviation.

The various observations noted included time of onset of sensory block, time to reach maximum/highest level of sensory block, maximum motor block (modified bromage scale), duration of surgery, VAS postoperatively at 4 hourly intervals upto first 24 hours, time taken for first rescue analgesia postoperatively (duration of analgesia) and total analgesic consumption in first 24 hours, quality of block, and incidence of any adverse effects (eg- bradycardia, hypotension, nausea, vomiting, headache, bowel perforation, bladder retention etc)

OBSERVATIONS The baseline demographic parameters were statistically comparable in both groups (Table 1). The intraoperative hemodynamic parameters were comparable regarding Heart rate (HR), but SBP, DBP and MBP were significantly reduced in Group S (figure 1). 3patients had hypotension and 2 patients had Bradycardia in Group S while no complications were seen in Group T. The time needed to perform block and time needed for maximum level of sensory block were significantly more in Group T. There was significantly lower VAS scores in Group T (figure 2)and the duration of post operative analgesia was significantly higher in Group T (Table 2). The total dose of rescue analgesic required in Group T was significantly less (Table 2). The total fentanyl consumption was higher in Group T. a significantly higher number of patients in Group T had lower bromage scores (Table 2).

TABLE 1 DEMOGRAPHICS

	GROUP T	GROUP S	P value	Significance
	MEAN±SD	MEAN±SD	> 0.5	NS
AGE (YEARS)	64.4±4.7	69.85±6.14	> 0.5	NS

HEIGHT (CM)	156.0±3.2	155.8±3.1	> 0.5	NS

ADVERSE EFFECTS	GROUP T	GROUP S
Bradycardia	0	2
hypotension	0	3
(nausea/ vomiting)	0	0
headache	0	0
LA toxicity	0	0

WEIGHT(KG)	63.45±5.3	65.5±6.86	> 0.5	NS
ASA grade (I/II)	22/8	23/7	> 0.5	NS
DURATION OF SURGERY (MIN)	60.24±6.21	61.82±6.51	> 0.5	NS

TABLE 2 :COMPARISON OF SENSORY MOTOR BLOCK CHARACTERISTICS AND USAGE OF DRUGS

PARAMETER	GROUP T (N=30)	GROUP S (N=30)	p VALUE	INFERENCE
Time needed to perform block (mins)	15.22±1.55	10.20±0.52	< 0.001	HS
Time needed for maximum level of sensory block	28.0±1.29	6.68±0.74	< 0.001	HS
Modified bromage score (3/2/1/0)	0/0/0/30	12/10/8/0	< 0.001	HS
Time taken for first analgesia	941.0±23.18	240.25±5.44	< 0.001	HS
Total rescue analgesia	57.5±24.5	110±20.5	< 0.001	HS
Total fentanyl used in mcg	76.25±23.61	50.0±0.0	< 0.001	HS
Quality of block (4/3/2/1)	0/10/20/0	28/2/0/0	< 0.001	HS

TABLE 3

ADVERSE EFFECTS

liver perforation/ bowel hematoma, intra peritoneal injection)	0	0
Urinary Retention	0	2

TABLE 4

QUALITY OF BLOCK IN BOTH GROUPS

GRADE	GROUP T(%)	GROUP S(%)
4	0 (0%)	28(92.5.%)
3	9 (30.0%)	2 (7.5%)
2	21 (70.0%)	0 (0.0%)
1	0 (0.0%)	0 (0.0%)

GRADE4: Excellent

GRADE 3: Good

GRADE2:MODERATE

GRADE1: FAILED

FIGURE 1COMPARISON OFPER OPRETIVE HEMODYNAMICS(n=30 in each group)

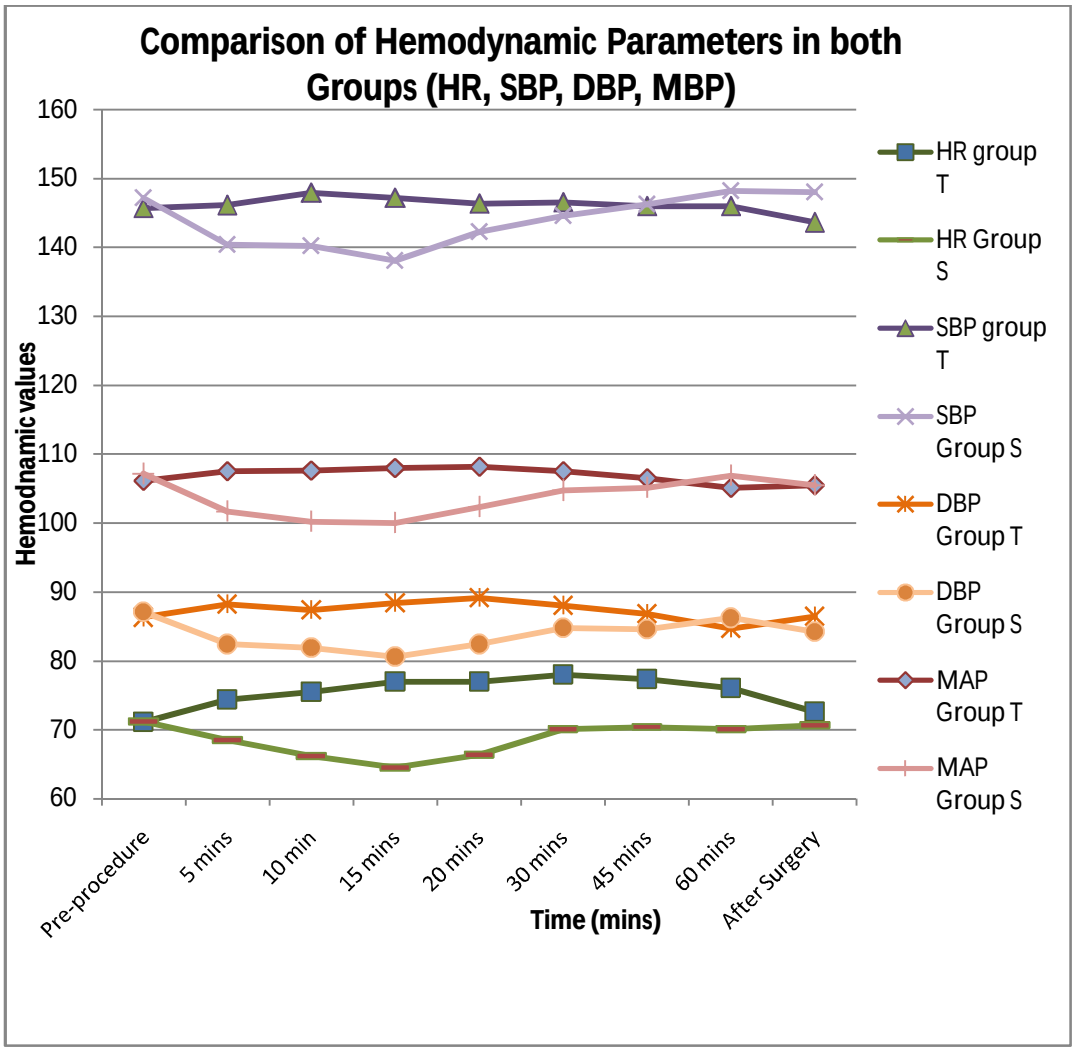
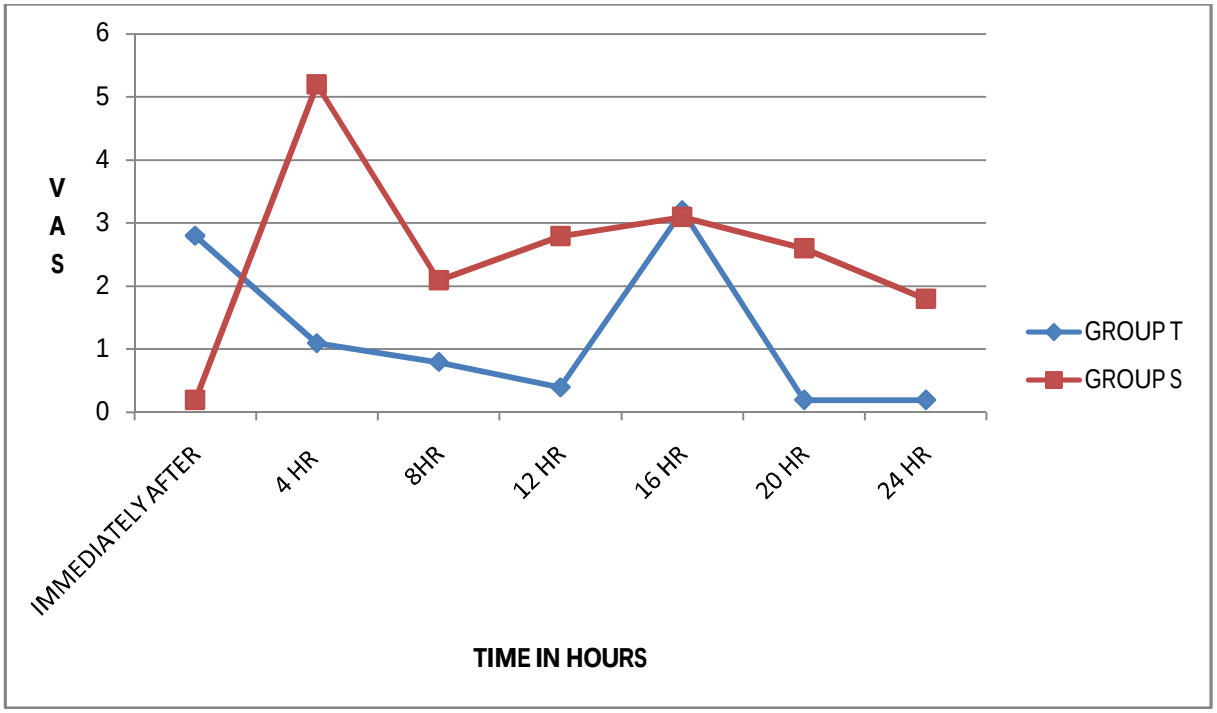

Comparison of Hemodynamic Parameters in both Groups (HR, SBP, DBP, MBP)
Hemodnamic values
160
150
140
130
120
110
100
90
80
70
60
Pre-procedure
5 mins
10 min
15 mins
20 mins
30 mins
45 mins
60 mins
After Surgery
Time (mins)
HR group T
HR Group S
SBP group T
SBP Group S
DBP Group T
DBP Group S
MAP Group T
MAP Group S

FIGURE 2

MEAN VAS SCORE IN FIRST 24HOURS (n=30)



DISCUSSION: Ultrasound is ramponedly used in this decade for Regional anaesthesia.as it provides better visualisation, provide precise lower dosage and better sensorimotor block with virtue of few adverse effects.ilioinguinal and iliohypogastric nerve blocks also provide regional blockage but with TAP block,Local infiltration from public tubercle towards umbilicus to curtail sensation from opposite side fingers,and infiltration at neck of sac provide total field block for unilateral hernia repair. Transverse abdominis plane (TAP) block is a holly grail of regional anaesthesia technique that provides analgesia following abdominal surgery. TAP block significantly reduces pain associated with lower abdominal surgery, regardless of whether it is used as sole anaesthetic or for postoperative analgesia USG has provided the required precision and safety to this truncal block.Time required to perform block has been also curtailed with USG guidence(22)

Unilateral spinal anaesthesia using 0.5% bupivacaine is a standard and effective regional anesthesia technique in restricting sympathetic block in all high risk patients including geriatric patients. Minimal haemodynamic changes following this technique is observed. The present study was carried with the aim of establishing the efficacy and safety of USG guided TAP,IIG,IH blocks(21) in comparison to unilateral spinal block in geriatric patients.

The DEMOGRAPHIC data of the patients in both groups (table1) were similar in age,mean height, weight and ASA grades. The duration of surgical procedure was also comparable in both groups.

The DURATIONrequired to perform block (table 2) was greater in group15.22±1.55min.) in comparison to group-S (10.20±0.52 min) and was found to be highly significant ($p<0.001$).

TheTIMEto highest/maximum level of sensory block (table 2) was higher in group T (28±1.29 min) as compared to group S (6.68±0.74 min) and was found to be highly significant ($p<0.001$). **Shibata et al** (2007) assessed the extent of ultrasound guided TAP block by pinprick method &found that the mean upper and lower level of sensory block at 30 min after local anesthetic injection were T10 (range, T9–11) and L1 (range, T12–L1), respectively(11). In group T of our study the time to reach the maximum level of sensory block was 28±1.29 min. Thus the results in our study was comparable to the above study. **Nesek Adam et al** (2011) compare between unilateral and bilateral spinal anesthesia in hypertensive patients and found the mean time for peak onset of sensory block was 5.4±0.8 min in their unilateral group as compared to 5.1±0.8 min in bilateral group (12). In group S of our study the time to reach the highest level of sensory block was 6.68±0.74 min which was comparable to the above two studies.

There was NO MOTOR blockade in group T whereas mean modified Bromage scale grade was 2.05±0.55 in group S (table 2), a highly significant difference ($p<0.001$). **Zorica Jankovic et al** (2009) also found that there are no motor deficiency in TAP block (14). In the study of **Nesek Adam et al** (2011), for comparison between unilateral and bilateral spinal anaesthesia, the mean modified bromage scale was 2.5±0.6 min in unilateral and 2.4±0.6 min in bilateral group at 15 minute of block, which is consistent with our study (12).

In group-T HR was higher compared to their pre-procedure values at all time intervals measured (figure 1). This rise in heart rate may be attributed to many factors like anxiety or inability to achieve excellent grade of block with TAP block. In group-S the heart rate was lower compared to their pre-procedure value at all time interval measured. Heart rate then returned to pre-procedure values after 20 minutes.

In group-T there were no significant changes in the systolic, diastolic and mean blood pressures (SBP,DBP,MAP)compared to their Baselinevalues.In group-S there was a statistically significant fall in the systolic, diastolic and mean blood pressures after giving unilateral spinal block. Hypotension was noticed in 10% patients (3 out of 30 patients), that was treated with 6.0 mg of mephentermine IV bolus. Blood pressures returned to their Baseline values after 15 minutes. In the study of**Sulagna Bhattacharjee et al** (20) systolic and diastolic BP were significantly higher

in Group N (TAP block with normal saline followed by general anesthesia) in comparison to group B (TAP block with 0.25% Bupivacaine followed by general anaesthesia) (15).**K. O Connor et al** (2010) reported that there is no haemodynamic sequelae of neuraxial symapathectomy in TAP block as in neuraxial block (16). The fall in SBP and DBP after unilateral spinal was similar to study by **Casati et al** (1999)in the unilateral spinal group,They noticed hypotension in 10% patients that were treated with 100mcgof phenylephrine (17). **Nesek Adam et al** (2011) had also noticed slight decrease in blood pressure in their unilateral group. They also noticed hypotension in 10% patients (12).

The duration of analgesia(the time taken for first rescue analgesic) (table 2) was more in group-T (941.0±235.18 min) as compared to group-S (240.25±5.44 min).The mean VAS immediately after surgery was more in group-T (2.8±0.55) in comparison to group-S (0.2±0.32) (highly significant, $p<0.001$). The mean VAS afterwards was more in group-S in comparison to group-T. The finding of prolonged postoperative analgesia after USG TAPB is similar to studies by other authors. **Iyad Abbas Salman et al** (2012) have observed that traditional treatment had better pain control in 1st 2 hours whereas TAP block was better thereafter (18). Similarly in the study of **Isil Davarci et al** the VAS score was <1 up to 90 minute and increased gradually to 1, 3, 3 at 2, 4 and 6 hour respectively and then decreased to 1.5 at 24 hours, in their USA group (unilateral skontrol group (unilateral spinal anaesthesia with Bupivacaine alone) (13).

The quality of block (table 4) was better in group-S in comparison to group-T. As TAP block have no effect on visceral pain, hence quality of block were poorer in TAP group [no patients (0.0%) in grade 4 (excellent) block, 10patients (30.0%) in grade3(good) block, 20 patients (70.0%) in grade 2 (moderate) block and nopatients (0%) in grade 1.

Comparing the side effects and complications in both groups, there were no side effects or complications in group-T. **Karim Mukhtar et al** (2009) stated that TAP block have high margin of safety, especially under ultrasound guidance. There have been no reported complication to date with the ultrasound guided technique (20). In group-S, 2patient (7.5%) presented with bradycardia and 3 patients (10.0%) presented with hypotension. Limiting the spread of the spinal block by giving unilateral spinal greatly reduced the haemodynamic impact, which is due to compensation by a reflex vasoconstriction in the non-blocked areas. Clinical trials comparing unilateral spinal anaesthesia with conventional bilateral spinal block have demostrated that cardiac index values are much more stable during the former than during the latter, with a smaller reduction in arterial blood pressure and heart rate, and a much lower incidence of clinically relevant hypotension (5% Vs 20%) (**Casati et al 1999**) (17). TAP block thus provides better stable hemodynamic profile.

Regarding limitations of our study, one was the small sample size and hence future studies need to evaluate further.

CONCLUSION:

(TAP,IIG,IH,)Double TAP block is more efficacious than unilateral spinal block for inguinal hernia repair in geriatric patients in terms of prolonged post operative analgesia, excellent hemodynamic stability with minimal incidence ofadverse effects.

Lauren steffel Etal used USG guided TAP & double TAP(TAP,IH,IIG) block for open unilateral hernia repair & they found double TAP block more beneficial.(22) interns of sensorimotor blockage.

unilateral spinal block provides earlyonset,excellent quality of intra-operative block, limited duration of analgesia, peroperative haemodynamic adverse effects.

Double TAP(TAP ,IIG,IH)block can be used safely as an attractive alternative as sole anaesthetic technique for open hernia repair in geriatric patients who are high risk for general or neuraxial anesthesia.

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