Effect of Ultrasound Guided Glossopharyngeal Nerve Block Versus Blind Technique on Vital Measurements during Tonsillectomy

Yasmine Mohamed Elsaid A'mer[1], Mohamed Ibrahim Abd Elgawad[2], Fatma Mohamed Khamis[2], Hossam Mohamed Atef[3], Nihal Adel Nasr[4]

1. MB.BCH (2014), "MSc" Anesthesia, Intensive care and pain management, (Suez Canal University, 2019), Assistant Lecturer, department of Anesthesia & Intensive care, Faculty of medicine, Suez Canal University.
2. Professor of Anesthesiology, Faculty of medicine - Suez Canal University.
3. Assistant Professor of Anesthesiology, Faculty of medicine - Suez Canal University.
4. Lecture of Anesthesiology, Faculty of medicine - Suez Canal University.

*** Corresponding author: Yasmine Mohamed Elsaid A'mer**

Abstract

Background: Intraoperative circulatory stability in children undergoing tonsillectomy is a very important subject. There are two approaches described for this block: intraoral and peri-styloid. **Aim:** This study aimed to compare ultrasound-guided glossopharyngeal nerve block techniques (peri-styloid) with blind (intraoral) techniques on vital measurements during tonsillectomy. **Patients and Methods:** Patients were divided into two groups at random using opaque, sealed envelopes with sequential numbers: Ultrasound-guided GNB (group A) underwent an intraoral block using a 1 ml volume of a 0.25% bupivacaine mixture on both sides, while Blind GNB (group B) underwent an intraoral block using the same 1 ml volume. Vital measurements were recorded intraoperatively. **Results**: In our study, it was found that there were no statistically significant differences between Group A (ultrasound-guided GNB) and Group B (blind GNB) in terms of baseline HR and HR after block. However, there were highly statistically significant differences between the two groups in HR at the onset of surgery, HR after 15, 30, and 45 minutes, and HR during extubation. In terms of SBP, there were highly statistically significant differences between the two groups in SBP at baseline, SBP after block, SBP at the onset of surgery, and SBP after 15 minutes and during extubation. There were also statistically significant differences in SBP after 30 and 45 minutes. Regarding DBP, there were highly statistically significant

differences between the two groups in DBP at baseline, DBP at the onset of surgery, DBP after 15, 30, and 45 minutes, and DBP during extubation. However, there were no statistically significant differences between the two groups in DBP after block. **Conclusion:** Ultrasound-guided nerve block is becoming increasingly popular among anesthesiologists and pain physicians, and ultrasound-guided glossopharyngeal nerve block has also low effects on HR, SBP, and DBP.

Key words: Tonsillectomy, GNB, HR, Bl.P, Blind Technique.

Introduction

The nerve block approach, which involves injecting local anesthetics around nerves, including the nerve trunk, nerve plexus, and sympathetic conducting impulses, was used to obtain the desired clinical therapeutic outcome. The use of cocaine for ocular surface anesthetic was first disclosed by Austrian researcher at the Eye Conference in Heidelberg [1].

Later, it was discovered that cocaine may cause "physiological and segmental" anesthetic effects on motor and sensory fibers. This unique action the moniker "nerve block." 2. Nerve block techniques have advanced due to the introduction of local anesthetics such as lidocaine, bupivacaine, and ropivacaine, as well as their therapeutic application. Furthermore, the advancement of ultrasound technology led to the first publication of the ultrasonography-guided peripheral nerve block in 1994, which advanced the nerve block technique to a new technical level [2–5].

Recent years have seen a significant increase in the use of ultrasound technology to guide various nerve block treatments, including splanchnic nerve block (SNB), paravertebral block (PVB), stellate ganglion block (SGB), and even terminal small nerve block. Consequently, an increasing number of nerve block investigations have been carried out. Nerve blocks have been found to have specific positive functions in avoiding and regulating multi-system illnesses or symptoms, as well as improving patients' recovery after surgery (ERAS), in addition to their analgesic benefits in post-operative patients [6].

Aim of the Work

This study aimed to compare ultrasound-guided glossopharyngeal nerve block techniques (peri-styloid) with blind (intraoral) techniques on vital measurements during tonsillectomy.

Patients and methods

This was a prospective randomized controlled trial conducted at the operating theatres in Suez Canal University hospitals (2020-2023) All patients undergoing elective tonsillectomy surgery under general anesthesia after approval of Hospital Ethics Committee and written informed consent from parents of children.

Children with physical status (ASA) 1 or (ASA) 2 (American society of anesthesiologists) Physical status grade 1 = normal healthy patient, Physical status grade 2 = patient with mild systemic disease (no functional limitations), both sexes (male and female) and age group was between 3 - 7 years old were included in the study. While, Emergency surgery, infection at the injection site, children with diabetes mellitus, cardiac, renal or liver diseases, obstructive sleep apnea syndrome, blood disease or bleeding tendency, those suspected for having hypersensitivity to the used medication, age > 7 and < 3 years, morbid obesity (BMI > 30) and congenital anomalies were excluded from the study.

Based on a computer-generated list (www.random.org) provided by an independent investigator following induction of anesthesia, subjects will be randomly allocated (using sequentially numbered, opaque, sealed envelopes) to one of two groups: Ultrasound guided GNB (group A) was received block under ultrasound guidance using 1 ml volume 0.25% bupivacaine mixture on both sides. Blind GNB (group B) was received block intraoral in both sides using 1 ml volume 0.25% bupivacaine mixture on both sides.

All patients were subjected to preoperative assessment. I.V line 22 gauge or 24 gauge was inserted. All children were pre-medicated 30 minutes before surgery with atropine 0.01 mg/kg and midazolam 0.04 mg/kg, intravenously preoperatively through a 22 or 24gauge cannula. All measurements were made with the patient in the supine position before starting surgery. Time of vital signs recording and keep pulse, blood pressure around normal. Patients were monitored intraoperatively by non-invasive oscillometric arterial blood pressure (NIBP), electrocardiogram (ECG), pulse oximeter; end-tidal CO2, end-tidal isoflurane. Pre-oxygenation with 100% oxygen for 3 min. Induction of anesthesia was done with intravenous Fentanyl 1 μg/kg and propofol 2.5 mg/kg. Atracurium 0.5 mg/kg was administered for mechanical ventilation via endotracheal tube of suitable size according to the age of the patient. Anesthesia was maintained by isoflurane (MAC1.2%); Controlled ventilation was maintained by (1:1) oxygen to air. After the induction of the anesthesia, all children received an intravenous fluid infusion composed of D5 ½ at a rate

of 6 mL/kg/hour. Paracetamol 15 mg/kg I.V. was administered over the span of 15 minutes. Before tonsillectomy, glossopharyngeal nerve block was carried out using 2 mL (1 mL in each side) of a local anesthetic mixture composed of 0.25% plain bupivacaine, in both groups. The same expert surgeon using the same technique (bipolar electrocautery) carried out tonsillectomies.

Group (A). ultrasound guided glossopharyngeal block described by Liu et al. [7]:

- The patient was placed in the lateral position with a thin pillow under the head.
- The area over the mastoid process was scanned by SonoSite M-Turbo® (Fujifilm SonoSite, USA) ultrasound using a linear array probe to locate the mastoid and the mandibular angle, and a line (M1) was draw between the two landmarks.
- Another line was drawn from 1.5 cm above the posterior edge of the mandibular angle to the mastoid (M2).
- The linear array probe was placed on M2 to visualize the styloid process.
- The scanning sequence was parallel to M2, moving up and down to find the clearest image of the styloid process.
- Subsequently, color flow Doppler was used to identify the internal carotid artery and the vein mixed blood flow signals below or behind the styloid process.
- A 22-gauge cannula needle was directed for ultrasound-guided lateral puncture of the mandible in plane.
- When the needle tip reached the styloid process, it was slid through the styloid process to the back of the styloid process, and the needle path is depicted.
- When no blood or cerebrospinal fluid appeared after careful withdrawal the needle, 1 ml of 0.25% bupivacaine mixture were slowly injected under real-time ultrasound guidance, repeated on the other side over 3 min.

Group (B): blind intraoral glossopharyngeal nerve block described by [8]:

- At supine position, sufficient mouth opening to allow adequate visualization and access to the base of the posterior tonsillar pillars (palatopharyngeal arch).
- Bilateral GNB was done under direct vision using the McIvor gag.
- A 22-gauge cannula needle set at an angle of 45 degrees at a distance of 1 cm from its tip.

- In the middle point of the palatopharyngeal fold (posterior tonsillar pillar), the needle pierced the retropharyngeal mucosa and was directed behind the posterior tonsillar pillar as lateral as possible.
- It was then inserted in the pharyngeal wall at a depth of about 0.5 cm.
- After careful aspiration, the prepared local anesthetic mixture was injected 1 ml volume slowly over the span of three minutes on both sides.
- At the end of the surgery, inhalational anesthesia was switched off and muscle relaxation was reversed (using neostigmine 0.05 mg/kg and atropine 0.01 mg/kg), with full awake extubation and the children being kept in lateral position. They were transported to the PACU for close observation and monitoring. They were discharged when the modified Aldrete score reached 10. An assistant physician, who was not participating in the study and who was blinded to its groups, obtained all measurements.

Statistical analysis

All Data was processed and analysed using the Statistical Package of Social Sciences (SPSS version 22.0). Data entry and statistical analysis of the collected data was performed by the use of reliable genuine software programme. The collected data were computerized and statistically analyzed using SPSS program (Statistical Package for Social Science) version 24. Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ($\chi 2$) and Fisher exact was used to calculate difference between qualitative variables as indicated. Quantitative data were expressed as mean and standard deviation. All statistical comparisons were two tailed with significance Level of P-value< 0.05 indicates significant while, $P \geq 0.05$ indicates non-significant difference.

Results

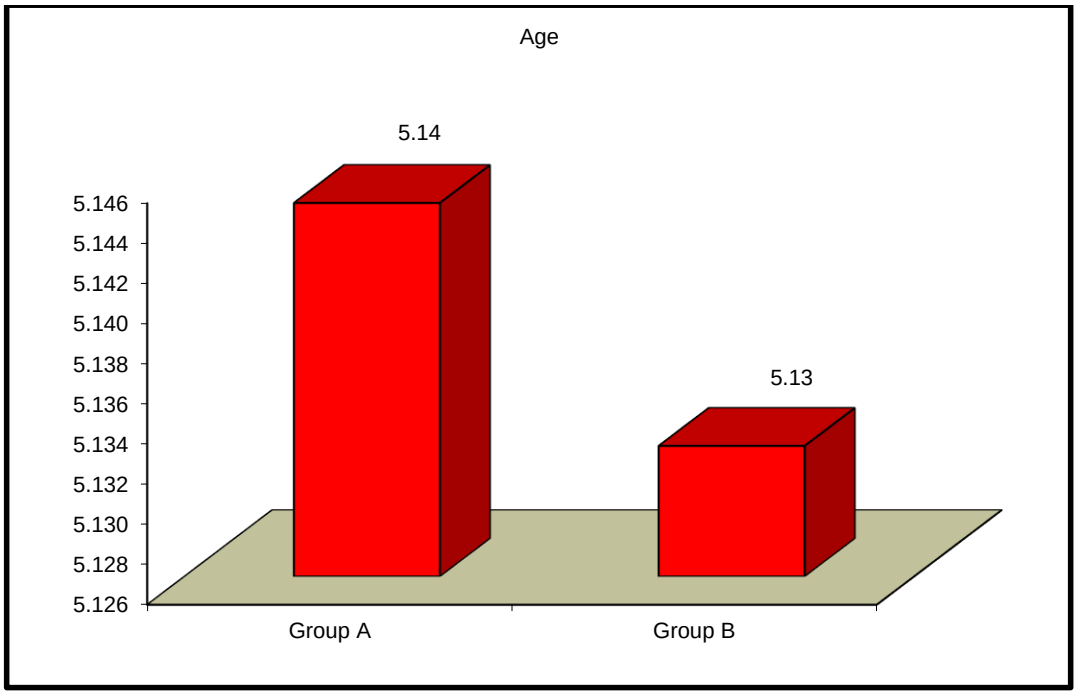

Figure (1): shows the difference between (Group A and Group B) regarding Age.

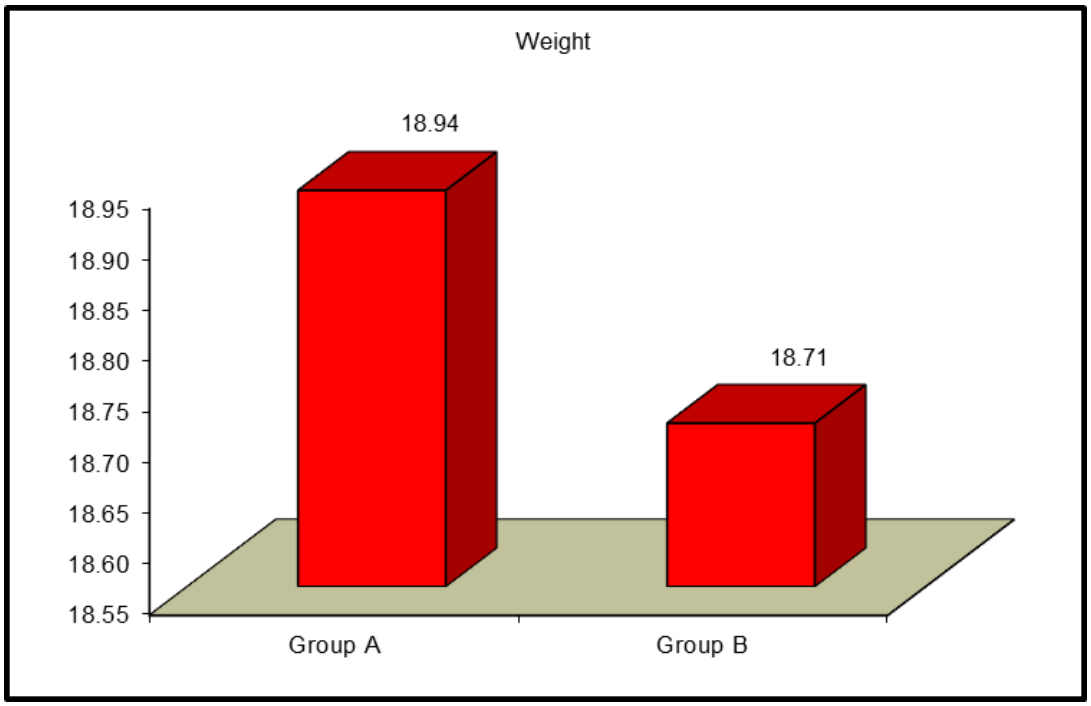

Figure (2): shows the difference between (Group A and Group B) regarding Weight

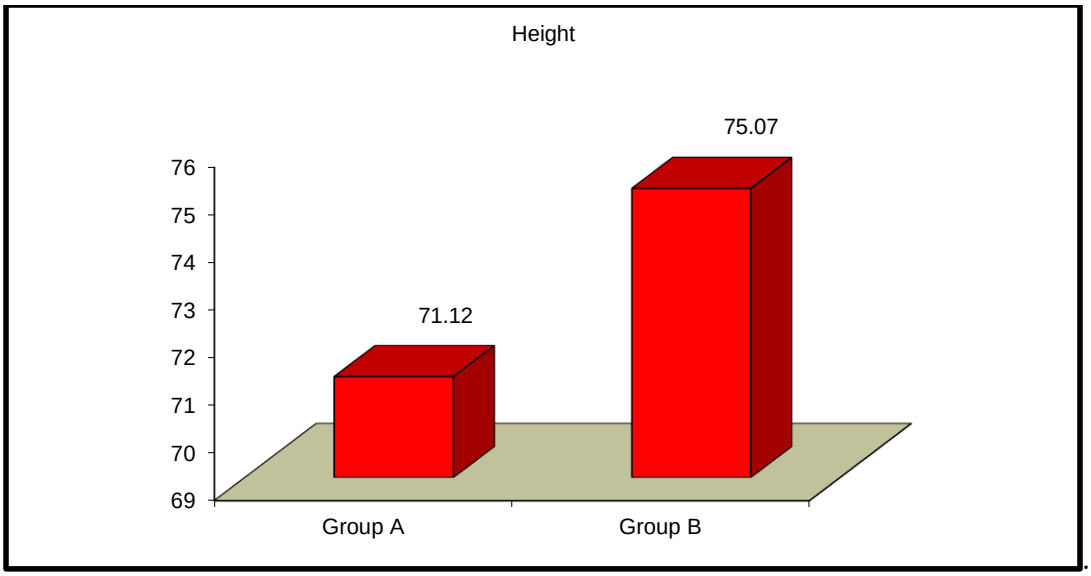

Figure (3): shows the difference between (Group A and Group B) regarding Height.

As illustrated in **figures (1-3)**; the average Age in Group A were; 5.14 ± 1.13, while average Age in Group B were 5.13 ± 1.18, the average Weight in Group A were; 18.94 ± 4.26, while average Weight in Group B were 18.71 ± 3.15 and the average Height in Group A were; 71.12 ± 11.43, while average Height in Group B were 75.07 ± 8.91. There were no statistically significant difference between Group A and Group B regarding Age and Weight, and there were statistically significant difference between Group A and Group B regarding Height.

Table (1): *Comparison between Group A (no. =83) and Group B (no. =83) regarding HR.*

HR		***Group A***	***Group B***	***Test value•***	***P-value***	***Sig.***
		No. = 83	***No. = 83***			
Base line	*Mean ± SD*	*132.72 ± 13.20*	*131.24 ± 10.96*	*0.787*	*0.432*	*NS*
	Range	*110 – 167*	*110 – 165*			
After block	*Mean ± SD*	*115.10 ± 10.87*	*116.40 ± 7.54*	*-0.896*	*0.372*	*NS*
	Range	*90 – 145*	*100 – 140*			
Onset of surgery	*Mean ± SD*	*121.12 ± 12.82*	*114.00 ± 6.35*	*4.534*	*0.000*	*HS*
	Range	*95 – 155*	*99 – 130*			
After 15 min	*Mean ± SD*	*119.07 ± 10.74*	*112.04 ± 6.36*	*5.137*	*0.000*	*HS*
	Range	*95 – 148*	*95 – 130*			
After 30 min	*Mean ± SD*	*118.51 ± 10.31*	*112.87 ± 4.80*	*4.518*	*0.000*	*HS*
	Range	*95 – 146*	*101 – 125*			
After 45 min	*Mean ± SD*	*118.13 ± 9.85*	*112.39 ± 5.16*	*4.710*	*0.000*	*HS*
	Range	*94 – 144*	*99 – 125*			
During Extubation	*Mean ± SD*	*126.39 ± 10.56*	*119.58 ± 5.35*	*5.238*	*0.000*	*HS*
	Range	*99 – 155*	*110 – 135*			

P-value > 0.05: Non significant (NS); P-value < 0.05: Significant (S); P-value < 0.01: highly significant (HS)
****: Chi-square test, •: Independent t-test***

As illustrated in table (1); the average HR Base line in Group A were; 132.72 ± 13.20, while average HR Base line in Group B were 131.24 ± 10.96, the average HR After block in Group A were; 115.10 ± 10.87, while average HR After block in Group B were 116.40 ± 7.54, the average HR Onset of surgery in Group A were; 121.12 ± 12.82, while average HR Onset of surgery in Group B were 114.00 ± 6.35, the average HR After 15 min in Group A were; 119.07 ± 10.74, while average HR After 15 min in Group B were 112.04 ± 6.36, the average HR After 30 min in Group A were; 118.51 ± 10.31, while average HR After 30 min in Group B were 112.87 ± 4.80, the average HR After 45 min in Group A were; 118.13 ± 9.85, while average HR After 45 min in Group B were 112.39 ± 5.16 and the average HR During Extubation in Group A were; 126.39 ± 10.56, while average HR During Extubation in Group B were 119.58 ± 5.35. There were no statistically significant difference between Group A and Group B regarding HR Base line and HR After block, and there were highly statistically significant difference between Group A and Group B regarding HR Onset of surgery, HR After 15 min, HR after 30 min, HR After 45 min and HR During Extubation.

Table (2): *Comparison between Group A (no. =83) and Group B (no. =83) regarding SBP.*

SBP		***Group A***	***Group B***	***Test value•***	***P-value***	***Sig.***
		No. = 83	***No. = 83***			
Base line	*Mean ± SD* *Range*	*82.39 ± 8.65* *70 – 110*	*85.89 ± 6.70* *70 – 110*	*-2.919*	*0.004*	*HS*
After block	*Mean ± SD* *Range*	*84.19 ± 7.21* *70 – 100*	*86.82 ± 4.22* *74 – 100*	*-2.864*	*0.005*	*HS*
Onset of surgery	*Mean ± SD* *Range*	*89.36 ± 6.82* *75 – 110*	*86.90 ± 1.78* *81 – 90*	*3.175*	*0.002*	*HS*
After 15 min	*Mean ± SD* *Range*	*88.37 ± 5.02* *77 – 100*	*86.48 ± 2.70* *80 – 90*	*3.023*	*0.003*	*HS*
After 30 min	*Mean ± SD* *Range*	*88.86 ± 5.09* *77 – 100*	*87.51 ± 2.06* *80 – 90*	*2.237*	*0.027*	*S*
After 45 min	*Mean ± SD* *Range*	*89.51 ± 4.95* *80 – 100*	*88.02 ± 1.93* *80 – 98*	*2.540*	*0.012*	*S*
During Extubation	*Mean ± SD* *Range*	*94.07 ± 6.32* *80 – 110*	*86.13 ± 2.38* *81 – 92*	*10.706*	*0.000*	*HS*

P-value > 0.05: Non significant (NS); P-value < 0.05: Significant (S); P-value < 0.01: highly significant (HS)
****: Chi-square test, •: Independent t-test***

As illustrated in table (2); the average SBP Base line in Group A were; 82.39 ± 8.65, while average SBP Base line in Group B were 85.89 ± 6.70, the average SBP After block in Group A were; 84.19 ± 7.21, while average SBP After block in Group B were 86.82 ± 4.22, the average SBP Onset of surgery in Group A were; 89.36 ± 6.82, while average SBP Onset of surgery in Group B were 86.90 ± 1.78, the average SBP After 15 min in Group A were; 88.37 ± 5.02, while average SBP After 15 min in Group B were 86.48 ± 2.70, the average SBP After 30 min in Group A were; 88.86 ± 5.09, while average SBP After 30 min in Group B were 87.51 ± 2.06, the average SBP After 45 min in Group A were; 89.51 ± 4.95, while average SBP After 45 min in Group B were 88.02 ± 1.93 and the average SBP During Extubation in Group A were; 94.07 ± 6.32, while average SBP During Extubation in Group B were 86.13 ± 2.38. There were statistically significant difference between Group A and Group B regarding SBP After block, SBP Onset of surgery, SBP After 15 min and SBP During Extubation, and SBP after 30 min and SBP After 45 min.

Table (3): *Comparison between Group A (no. =83) and Group B (no. =83) regarding DBP.*

DBP		***Group A***	***Group B***	***Test value•***	***P-value***	***Sig.***
		No. = 83	***No. = 83***			
Base line	*Mean ± SD* *Range*	*50.84 ± 9.40* *30 – 70*	*56.06 ± 7.35* *30 – 66*	*-3.984*	*0.000*	*HS*
After block	*Mean ± SD* *Range*	*53.64 ± 9.22* *30 – 66*	*55.40 ± 5.80* *40 – 70*	*-1.471*	*0.143*	*NS*
Onset of surgery	*Mean ± SD* *Range*	*57.54 ± 6.03* *40 – 70*	*55.06 ± 5.64* *40 – 65*	*2.738*	*0.007*	*HS*
After 15 min	*Mean ± SD* *Range*	*57.13 ± 5.00* *44 – 65*	*54.22 ± 5.62* *44 – 66*	*3.530*	*0.001*	*HS*
After 30 min	*Mean ± SD* *Range*	*58.30 ± 3.94* *50 – 65*	*54.25 ± 5.23* *45 – 65*	*5.631*	*0.000*	*HS*
After 45 min	*Mean ± SD* *Range*	*58.23 ± 3.94* *50 – 66*	*54.92 ± 5.43* *40 – 65*	*4.498*	*0.000*	*HS*
During Extubation	*Mean ± SD* *Range*	*60.30 ± 3.37* *50 – 70*	*52.77 ± 6.09* *40 – 65*	*9.854*	*0.000*	*HS*

P-value > 0.05: Non significant (NS); P-value < 0.05: Significant (S); P-value < 0.01: highly significant (HS)
****: Chi-square test, •: Independent t-test***

As illustrated in table (3); the average DBP Base line in Group A were; 50.84 ± 9.40, while average DBP Base line in Group B were 56.06 ± 7.35, the average DBP After block in Group A were; 53.64 ± 9.22, while average DBP After block in Group B were 55.40 ± 5.80, the

average DBP Onset of surgery in Group A were; 57.54 ± 6.03, while average DBP Onset of surgery in Group B were 55.06 ± 5.64, the average DBP After 15 min in Group A were; 57.13 ± 5.00, while average DBP After 15 min in Group B were 54.22 ± 5.62, the average DBP After 30 min in Group A were; 58.30 ± 3.94, while average DBP After 30 min in Group B were 54.25 ± 5.23, the average DBP After 45 min in Group A were; 58.23 ± 3.94, while average DBP After 45 min in Group B were 54.92 ± 5.43 and the average DBP During Extubation in Group A were; 60.30 ± 3.37, while average DBP During Extubation in Group B were 52.77 ± 6.09. There were highly statistically significant difference between Group A and Group B regarding DBP Base line, DBP Onset of surgery, DBP After 15 min, DBP after 30 min, DBP After 45 min and DBP During Extubation, and there were no statistically significant difference between Group A and Group B regarding DBP After block.

Discussion

In our investigation, baseline heart rate and heart rate after block were not observed to differ statistically significantly between Group A (ultrasound-guided GPNB) and Group B (blind GPNB). On the other hand, HR at the beginning of surgery, HR after 15, 30, and 45 minutes, and HR during extubation showed highly statistically significant differences between the two groups.

In terms of SBP, there were variations between the two groups that were highly statistically significant at baseline, following block, at the beginning of operation, and after 15 minutes and during extubation. After 30 and 45 minutes, there were statistically significant variations in SBP as well.

When it came to DBP, there were very substantial disparities between the two groups at baseline, at the beginning of the procedure, at 15, 30, and 45 minutes, and during the extubation process. But in DBP following block, there were no statistically significant changes between the two groups.

The hemodynamic effects of blind subgluteal sciatic nerve block and ultrasound-guided lumbar plexus block were compared by Kim et al. [9].

According to the study, patients' SBP and HR measurements were significantly lower in the ultrasound-guided group than in the blind group.

According to Kim et al. [10], patients in the blind group showed significantly higher SBP and DBP readings than those in the ultrasound-guided group.

In a 2020 study, Kumar et al. compared the use of ultrasound guidance with blind inguinal field block for postoperative analgesia in patients having surgery for an inguinal hernia. According to the study, patients' SBP and HR measurements were significantly lower in the ultrasound-guided group than in the blind group [11].

Conclusion

Ultrasound-guided nerve block is becoming increasingly popular among anesthesiologists and pain physicians, and ultrasound-guided glossopharyngeal nerve block has also low effects on HR, SBP, and DBP.

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