



## Original Research Article

## Observational study on the accuracy and speed of ultrasound guided transversus abdominis plane block with two different monitor positions

Subbulakshmi Sundaram<sup>1,\*</sup>, M Dhakshinamoorthy<sup>1</sup>, G Ashok Swaminathan<sup>2</sup>

<sup>1</sup>Dept. of Anesthesiology, Rajah Muthiah Medical College and Hospital, Annamalai University, Annamalinagar, Tamil Nadu, India

<sup>2</sup>Dept. of Plastic Surgery, Rajah Muthiah Medical College and Hospital, Annamalai University, Annamalinagar, Tamil Nadu, India



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## ABSTRACT

**Aim:** Aim of the study is to analyse the accuracy and speed of ultrasound guided transversus abdominis plane block with two different monitor positions.

**Materials and Methods:** Prospective observational study was conducted after institutional hospital ethics committee. Twenty four male patients posted for open inguinal hernia repair posted under spinal anaesthesia were selected and divided randomly into two groups and at the end of surgery USG TAP block was given. Group I – USG monitor was kept in line, whereas in Group II – USG monitor was kept in perpendicular to the participant. Twelve anaesthetists who had performed more than 20 procedure were selected and they performed one procedure in each group. History of back pain and neck pain was elicited and any discomfort during procedure was recorded. Accuracy of USG image was recorded. Time taken for the procedure was recorded for both groups.

**Result:** Twelve anaesthetists were selected for this prospective study. Time taken to perform USG TAP in Group I vs Group II was (69.08 ± 8.19 s vs 80.16 ± 4.84s). Difference was statistically significant (p<0.001). Needle placement was significantly more accurate when anaesthetists had the monitor in front of them than to the side (Score was 15 vs 24). Out of 12 anaesthetists, 4 had history of neck pain previously and one was taking treatment for the same. When performed in Group I they had no discomfort but when performed in Group II, anaesthetists with positive history had discomfort during the procedure.

**Conclusion:** It was concluded that the performance of USG TAP block was comfortable and more accurate and the procedure time was shorter, if the monitor was kept in line of the sight of the operator.

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### 1. Introduction

Ultrasound guided regional anaesthesia (UGRA) has gained popularity during the last decade. Its main advantage is the ability to identify anatomical structures in real time; needle trajectory and injectate around the nerve structures.<sup>1</sup> Meta analysis have shown that, the overall success rate of UGRA is higher when compared to other methods.<sup>2</sup> UGRA procedures are fast, quick in onset, provide prolonged action, with low risk of vascular punctures and

local anaesthetic toxicity.<sup>3</sup> Some of the prerequisites of successful UGRA blockade include knowledge of human anatomy and principles related to USG blocks such as good hand skills, hand eye coordination and proper position of monitor and needle placements. Educating and training anaesthesiologists to the highest standards is of paramount importance to deliver high such quality care.

This prompted us to conduct an observational study on the accuracy and speed of ultrasound guided transversus abdominis plane block (TAP) with two different monitor position for hernia surgeries. Inguinal hernia repair is one of the most commonly performed surgical procedures worldwide.<sup>4</sup> With the advent of UGRA techniques, the TAP

\* Corresponding author.

E-mail address: [subbulakshmisundaram76@gmail.com](mailto:subbulakshmisundaram76@gmail.com) (S. Sundaram).

block has proven to be effective in reducing acute post operative pain.<sup>5</sup> TAP blocks have been described as an effective component of multimodal post operative analgesia for various abdominal procedures like hysterectomy, appendectomy, colorectal surgeries, TURP and inguinal hernia. Controlling acute post operative pain reduces the incidence of chronic pain development.<sup>6</sup>

## 2. Materials and Methods

After approval of hospital ethics committee and after obtaining written informed consent from anaesthetists and patients, a prospective observational study on the accuracy and speed of USG TAP block with two different monitor positions is conducted. In first group monitor was kept in line of sight and in second group monitor was kept perpendicular to the participant. Twelve anaesthetists performed one procedure in each group. Anaesthetists who had performed more than 20 procedures were included in the study. History of back and neck pain was elicited and any discomfort during the procedure was recorded. Twenty four male patients of age 18-60 years of ASA I & II posted for inguinal hernia repair under spinal anaesthesia were included in the study. Patient refusal, BMI > 30 kg/m<sup>2</sup>, bilateral hernias were excluded from the study. Recruitment was dependent on the patient and anaesthesiologists consent and availability of investigator who was responsible for data collection.

All the procedures were done under spinal anaesthesia under standard sterile protocol. On the completion of surgical procedure USG TAP block was performed with standard sterile precautions. Heart rate, oxygen saturation, non invasive blood pressure monitoring, electrocardiograph were monitored during the procedure. After the identification of iliac crest and sub costal margin, linear probe of frequency 6-14 MHz (SonoSite SII) was placed in midaxillary line on a transverse plane. After visualization of abdominal layers, 23G 50 mm insulated nerve block needle was inserted 1 cm medial to the probe and was advanced using in plane technique. Observation period started from probe positioning to injection of 20 ml of 0.25% bupivacaine between internal oblique and transversus abdominis muscles. Quality of image was scored from 1 to 4 as described by Oliveira<sup>7</sup> as shown in Table 1. Statistical analysis was performed using statistical package for social sciences (SPSS).

**Table 1:** Image of accuracy score by Oliveira

1	Ideal – The needle was in full visualization during its progression.
2	Good – Needle's tip was visible during the entire progression but the shaft was only partially visible.
3	Satisfactory – Only the needle's tip was visible.
4	Poor – Only tissue distortion could be observed during the needle progression.

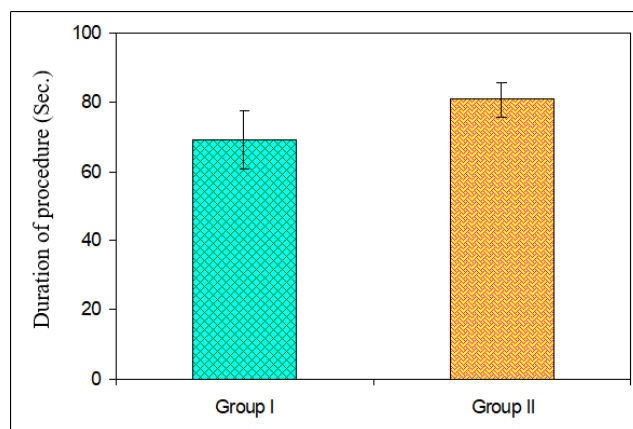
## 3. Results

Twelve anaesthetists were recruited and performed one procedure in each group. Time taken by anaesthetists to perform the block in group I was 69.08 ± 8.19 Sec. whereas in Group II was 80.6 ± 4.84 Sec. as shown in Table 2. The difference was statistically significant between Group I and II (P < 0.00) as shown in Figure 1.

**Table 2:** Comparison of duration of procedure and accuracy of needle placement between group I and group II

	Group I	Group II	P value
Duration of procedure (Sec.)	69.08 ± 8.19*	80.6 ± 4.84*	< 0.001(s)
Total image accuracy score	15	24	< 0.01 (s)

\* Values are expressed as mean ± SD; S – Significant



**Fig. 1:** Comparison of duration of procedure between group I and group II

Image accuracy score was ideal nine times in Group I two times in Group II; score was good 3 times in Group I and 8 times in Group II; Satisfactory 2 times in Group II as shown in Table 3. Total image accuracy score in Group I was 15 whereas in Group II it was 24. Chi-square test was applied. Critical value of chi-square distribution with df 2 is 9.210 which was more than the calculated value 8.727 (< 0.001 statistically significant). Out of 12 anaesthetists, 4 had history of neck pain previously and one was on the treatment for the same. When performed in Group I, they had no discomfort, but when performed in Group II, 2 anaesthetists with positive history had discomfort during the procedure. All the blocks were successful.

**Table 3:** Image accuracy score

Group	Ideal	Good	Satisfactory	Poor
Group I	9	3	–	–
Group II	2	8	2	–

#### 4. Discussion

Our study indicated that performance of USG TAP block was comfortable and more accurate and procedure time was shorter, if the monitor was kept in front. This was supported by Chapman,<sup>8</sup> who stated that the anatomical area and screen should be in same line of view during the procedure. He also stressed the importance of keeping the screen at the eye level of operator.

Langford<sup>9</sup> et al. who studied the performance of 31 anaesthetists on phantom with two monitor positions, found that the accuracy of needle placement was more when monitor was kept in front. He also stressed the importance of accuracy of needle placement not only to increase the success of blockade but also to reduce accidental damage to other nearby structures.

Speer<sup>10</sup> in his study described two ways of placing transducer while performing task on pork phantom model, where the monitor was kept in front during the procedures. He found that there was reduction in time to perform the task and the quality of needle imaging was better when the transducer was placed along the visual axis (ALVA) compared to transducer kept across the visual axis (ACVA). He also suggested that this ergonomic aspect will be appropriate for novices learning USG procedures.

This is in accordance with our study, where duration of procedure was short when the monitor was in line with visual axis. But it was contradicted by Langford<sup>9</sup> who stated that for anaesthetists with limited USG experience speed was not improved by aligning the monitor in line of sight of operator.

Wilson<sup>11</sup> compared ALVA and ACVA techniques in medical students on phantom, found that ALVA techniques minimizes the needle passes, decrease the time required for task completion. He also stressed the ALVA techniques enhance the patient safety and outcome when performed by trainees. And it improved the ergonomic performance of the task which was also preferred by trainees. In our study 2 of the 4 anaesthetists with positive neck pain history had mild discomfort during the procedure. They preferred, the monitor in front procedures. Maintaining a bad posture is the source of muscle fatigue and it reduces the performance of operator.<sup>12</sup> Janki<sup>13</sup> in his study stated that the musculoskeletal complaints may lead to even work absence. Musculoskeletal disorders are a significant occupational hazards in conventional medical practice.<sup>14,15</sup> Block performance doesn't represent an occupational hazard to most anaesthesiologists. However such hazards may apply to those with preexisting back or neck condition or to those who perform many more blocks.<sup>16</sup> Our study differs from other studies where they use phantoms; the experience of operator who participated had varied experience. The experience of anaesthetists in our study is uniform, they had done more than 20 USG procedure and the study was conducted on patients who under went hernia repair under spinal anaesthesia.

Advantage of our study is same experienced anaesthetists performed procedure in two groups. Limitation of our study is participants knew that they were observed during the procedure.

#### 5. Conclusion

Safe practice of UGRA requires both knowledge and practical skills. In all our cases monitor position didn't affect the success of the block, but keeping the monitor in front improves the efficacy and safety of the procedure. It improves ergonomic performance and reduces the procedure time significantly which is always preferred when many number of cases are being done.

#### 6. Source of Funding

None.

#### 7. Conflict of Interest

None.

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### Author biography

**Subbulakshmi Sundaram** Associate Professor

**M Dhakshinamoorthy** Professor and Head

**G Ashok Swaminathan** Associate Professor

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