Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial

THESIS

Submitted to

All India Institute of Medical Sciences, Jodhpur

In partial fulfilment of the requirement for the degree of

DOCTOR OF MEDICINE (MD)

ANAESTHESIOLOGY AND CRITICAL CARE

JULY, 2020

AIIMS, JODHPUR **DR MRUTHYUNJAYA N S**

DECLARATION

I hereby declare that the thesis titled **"Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial"** embodies the original work carried out by me at All India Institute of Medical Sciences, Jodhpur.

DR MRUTHYUNJAYA N S

Department of Anaesthesiology and Critical Care

All India Institute of Medical Sciences,

Jodhpur.

DECLARATION

I hereby declare that the thesis titled **"Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial"** embodies the original work carried out by me at All India Institute of Medical Sciences, Jodhpur.

DR MRUTHYUNJAYA N S

Department of Anaesthesiology and Critical Care

All India Institute of Medical Sciences,

Jodhpur.

All India Institute of Medical Sciences, Jodhpur

CERTIFICATE

This is to certify that the thesis titled "**Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial**" is the bonafide work of Dr MRUTHYUNJAYA N S carried out under our guidance and supervision in the Department of Anaesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur.

Guide:

Dr Ankur Sharma

Associate Professor

Co-guide:

Dr Pradeep Kumar Bhatia

Professor and Head

Co-guide:

Dr Nikhil Kothari,

Additional Professor

Co-guide:

Dr Shilpa Goyal

Additional Professor

Co-guide:

Dr Kamlesh Kumari

Assistant Professor

All India Institute of Medical Sciences, Jodhpur

CERTIFICATE

This is to certify that the thesis titled "**Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial**" is the bonafide work of Dr MRUTHYUNJAYA N S carried out under our guidance and supervision in the Department of Anaesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur.

Guide:

Dr Ankur Sharma

Associate Professor

Co-guide:

Dr Pradeep Kumar Bhatia

Professor and Head

Co-guide:

Dr Nikhil Kothari,

Additional Professor

Co-guide:

Dr Shilpa Goyal

Additional Professor

Co-guide:

Dr Kamlesh Kumari

Assistant Professor

All India Institute of Medical Sciences, Jodhpur

CERTIFICATE

This is to certify that the thesis titled "**Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial**" is the bonafide work of Dr Mruthyunjaya N S carried out under my guidance and supervision in the Department of Anaesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur.

Dr Pradeep Kumar Bhatia
Professor & Head
Department of Anaesthesiology and Critical Care,
All India Institute of Medical Sciences, Jodhpur

All India Institute of Medical Sciences, Jodhpur

CERTIFICATE

This is to certify that the thesis titled "**Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial**" is the bonafide work of Dr Mruthyunjaya N S carried out under my guidance and supervision in the Department of Anaesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur.

Dr Pradeep Kumar Bhatia

Professor & Head

Department of Anaesthesiology and Critical Care,

All India Institute of Medical Sciences, Jodhpur

ACKNOWLEDGEMENT

Immeasurable appreciation and deepest gratitude for the help and support are extended to the following people who, in one way or another, have contributed in making this thesis possible.

I would firstly like to express my sincere thanks to my supervisor **Dr. Ankur Sharma** my MD thesis guide and Associate Professor in the Department of Trauma & Emergency (Anaesthesiology and Critical Care), All India Institute of Medical Sciences, Jodhpur, who patiently provided feedback and insights on multiple drafts throughout the process stage to the final draft. His guidance has made this work better, and I am grateful for that.

I extend my deepest thanks to **Dr Pradeep Kumar Bhatia**, my MD thesis co-guide and Professor and Head of the Department of Anaesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur, who made this work possible. His guidance and advice carried me through all the stages of writing my thesis. His valuable input and suggestions have been an integral ingredient in making this thesis a success.

I would also like to acknowledge **Dr Nikhil Kothari** (Additional Professor), **Dr Shilpa Goyal** (Additional Professor), and **Dr Kamlesh Kumari** (Assistant Professor) for their insights, perspectives and advice during the research as well as through the writing process. All their comments enabled me to streamline my thought process as I went ahead with the study.

I also wish to thank **Dr Akhil D Goel**, Assistant Professor in the Department of Community Medicine, for his intensive help with statistical analysis, which helped me immensely to understand and connect with the study.

I also cannot thank my parents and siblings enough, who have stood by me in difficult times. The thesis would not have reached its goal without their daily moral support and faith in me.

Lastly, I would like to thank my closest friends, colleagues, juniors and seniors who supported me throughout this process with encouraging words and an unending reserve of care.

I would also like to extend my sincere thanks to all the study participants, without whom this thesis would not have been complete.

Any omission in this brief acknowledgement does not mean a lack of gratitude. I express my gratitude to everyone who has supported me throughout and been with me as a part of this journey.

Dr Mruthyunjaya N S

Dedicated to my
Patients,
Teachers, Family
&
my Friends…

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Full Form
ASA	American Society of Anaesthesiologists
AST	Acoustic Shadowing Technique
BMI	Body Mass Index
BP	Blood Pressure
DNTP	Dynamic Needle Tip Positioning
DP	Direct Palpation
2D	2-Dimensional
CI	Confidence Interval
ICU	Intensive Care Unit
IQR	Interquartile Range
JR	Junior Resident
OR	Odds ratio
RA	Radial Artery
RCT	Randomised Control Trail
RR	Risk Ratio
SD	Standard deviation
SR	Senior Resident
TP	Traditional Palpation
TUSG	Traditional Ultra-sonography
US	Ultrasound
USG	Ultra-sonography

LIST OF TABLES

LIST OF FIGURES

PLAGIARISM CHECK CERTIFICATE

MRUTHYUNJAYA PLAG CHECK

ORIGINALITY REPORT

14%
SIMILARITY INDEX

PRIMARY SOURCES

1	www.ncbi.nlm.nih.gov Internet	78 words — 2%
2	Roy K. Kiberenge, Kenichi Ueda, Brett Rosauer. "Ultrasound-Guided Dynamic Needle Tip Positioning Technique Versus Palpation Technique for Radial Arterial Cannulation in Adult Surgical Patients", Anesthesia & Analgesia, 2018 Crossref	74 words — 2%
3	Hua-ping Huang, Wen-jun Zhao, Fang Wen, Xiao-yu Li. "Application of ultrasound-guided radial artery cannulation in paediatric patients: A systematic review and meta-analysis", Australian Critical Care, 2020 Crossref	65 words — 1%
4	journals.lww.com Internet	49 words — 1%
5	link.springer.com Internet	49 words — 1%
6	bmcmededuc.biomedcentral.com Internet	39 words — 1%
7	Sulagna Bhattacharjee, Souvik Maitra, Dalim K. Baidya. "Comparison between ultrasound guided technique and digital palpation technique for radial artery	31 words — 1%

SUMMARY

Background: Arterial cannulation is commonly done for invasive blood pressure measurement and frequent blood sampling. The most frequent challenge in arterial cannulation is threading the cannula inside the artery without puncturing the posterior wall. This can be accomplished using dynamic needle tip positioning technique by visualising the needle's tip through the course and guiding it. Another challenge in USG-guided cannulation is puncturing the artery while it is visible on the screen. This can be made simple by the acoustic shadowing technique, in which the needle is inserted between the shadows where the artery is made to lie between them. These methods are considered more effective than conventional palpation methods, with a higher rate of successful cannulation and fewer complications. In this study, the dynamic needle and the acoustic shadowing techniques are compared with the traditional palpation method for radial artery cannulation in adult patients.

Material and Methods: In this trial, 180 patients older than 18 years requiring arterial cannulation were randomised by a computer-generated method into 3 groups [Traditional palpation (TP), Dynamic needle tip positioning (DNTP) and acoustic shadow technique (AST)]. All the cannulations were performed by experienced anaesthetist who had performed more than 30 arterial cannulations both by palpation and ultrasound guided techniques. The primary outcome of the present study was the success rate of arterial cannulation in the first attempt. The secondary outcomes were total number of attempts in 5 minutes, time taken to cannulate artery, number of cannulas used, and complications related to the procedure (hematoma, bleeding, thrombosis etc.).

Results: The first attempt success rate among TP, DNTP and AST were 66.7%,66.7% and 71.7%, respectively, (p=0.794). The median time [IQR] taken for cannulation was 60.5 [37.0, 129.5] sec, 71.0 [50.0, 170.0] sec and 108.0[58.0, 181.0] sec, respectively, (p= 0.066) and the median number of cannulation attempts was 1, in all the three groups (p= 0.773). There was also no difference in the total number of cannulas used, overall success rate of cannulation and complications related to procedure in the three groups.

Conclusion: For, radial artery cannulation by TP, DNTP, and AST technique, there is no significant difference in first attempt success rate, the time taken for cannulation, the number of cannulas used and overall complications during cannulation. Hence USG guided

techniques, DNTP and AST, do not show any additional benefits over TP method for radial artery cannulation by experienced anaesthetist in adult patients.

INTRODUCTION

The American Society of anaesthesiologists(ASA) recommends that blood pressure monitoring should be one of the standard monitoring during anaesthesia (1,2). By measuring blood pressure, one can assess the hemodynamic stability of the patient(3); hence blood pressure monitoring is vital.

Blood pressure (BP) monitoring can be done by various methods, broadly classified into non-invasive and invasive BP monitoring. For, non-invasive BP monitoring, there are the palpation method, auscultatory method, and oscillatory method(4), and in the invasive BP monitoring , it is mainly done by cannulation of an artery.

The invasive method, i.e. arterial BP monitoring, gives the beat-to-beat reading. Therefore, invasive BP monitoring is superior to non-invasive for accuracy(5). Arterial cannulation is frequently carried out for the purpose of invasive arterial pressure monitoring and arterial blood gas analysis. It is utilised to direct the treatment of patients who are experiencing respiratory distress, shock, acid-base discrepancy, or electrolyte disturbance.

The most common artery used for cannulation is the radial artery because its easily palpable and with decreased risk of infection (6). Usually, the radial artery is cannulated utilising anatomical landmarks and palpation of the radial pulse.

Cannulation of the radial artery is challenging, mainly in a patient with shock with a feeble pulse, children with smaller diameter arteries and in old age with atherosclerosis. Multiple cannulation attempts may result in arterial hematoma, thrombosis, embolus formation, gangrene, and ischemia of the distal part of the hand (1,7,8). Moreover, for successful use of this technique, one needs experience. There have been several studies showing that ultrasound-guided cannulation of the radial artery has a higher success rate than palpation method (9).

Even though the ultrasound-guided method has improved puncture success, it still largely depends on the ultrasound operator's skill. The main reason for this is because ultrasonic imaging is two-dimensional. In order to overcome this limitation of ultrasound, the operator must acquire excellent hand-eye coordination and technical expertise. Therefore, a novel approach using two lines on the ultrasound probe (acoustic shadowing technique) was devised to address this limitation of ultrasound (10–12).

During cannulation, the short-axis ultrasound approach allows for the visualisation of key structures, including vessels and nerves. The long-axis approach gives good visualisation of the needle's position as it approaches and enters the artery, hence enhancing the success rate of cannula insertion. Dynamic needle tip positioning is a modified ultrasonic approach that resulted in a higher catheterization success than the long-axis in-plane view (13,14). It combines the benefits of short-axis out-of-plane and long-axis in-plane ultrasonic approaches.

To our knowledge, no study has been done to compare radial artery cannulation using the acoustic shadowing technique and dynamic needle tip positioning technique with palpation method with respect to success rate, and time for arterial cannulation. Therefore, in this research, we intend to compare these two ultrasound-guided techniques of radial arterial cannulation with palpation method in adult patients.

AIMS AND OBJECTIVES

Aim

To compare ultrasound guided dynamic needle tip positioning technique, Acoustic Shadowing Technique and Palpation technique for Radial Arterial Cannulation.

Outcomes

Primary

The success rate of arterial cannulation in the first attempt

Secondary

Total number of attempts in 5 minutes

Time taken to cannulation of radial artery

Number of cannulas used

Complications related to the procedure (hematoma, spasm, bleeding, thrombosis)

REVIEW OF LITERATURE

1. **Cheryl Peters** *et al*., in their study of ultrasound guidance versus direct palpation for radial artery catheterisation by expert operators among Canadian cardiac anaesthesiologists, showed that there were no differences between the TP (n = 62) vs US-guided (n = 63) groups in median time to cannula placement USG 104 [76–212] sec vs DP 104 [68– 270] sec with a p-value of 0.66, the number of re-directs USG 2 [0–6] vs DP 3 [1–5] with a P value of 0.82, or the number of attempts USG 1 [1–2] vs DP 1 [1–2] with a P value of 0.08. The first-attempt success rate was 56.4% in the DP group and 71.4 % in the US group, with a P value of 0.10. Failure and hematoma rates in the DP group were 21.0% and 22.6%, respectively, compared with 12.7% and 11.1% in the US group (P = 0.24 and 0.10, respectively). It showed that among experienced cardiac anaesthesiologists, the use of USG to facilitate radial arterial cannulation did not affect insertion times, the number of redirects or the number of attempts compared with palpation method (15).
2. **Kiberenge** *et al*., in their study on 260 patients, found the first-pass success rate was 83% in the DNTP group (n = 132) and 48% in the palpation group (n = 128) with a P value of < .001. The overall 5-minute success rate was 89% in the dynamic needle tip positioning technique group compared to 65% in the palpation group, with a P value of 0.001. The number of skin puncture attempts was significantly more in the palpation group, with P < 0.001. The median cannulation times were 81.5 (61–122) sec in the DNTP and 76 (48–175) sec in the palpation group (P=0.7)(13).
3. **Liu** *et al*., their study of modified dynamic needle tip positioning withs short-axis, out-of-plane, ultrasound-guided radial artery cannulation in neonates, enrolled 60 term neonates. They found that the success rates of the first attempt in the ultrasound and palpation groups were 40% (n = 30) and 10% (n = 30), respectively, with a P value of 0.007. The success rate was 96.7% in the ultrasound group and 60.0% in the palpation group, with a P value of 0.001. The average time to accomplish radial artery cannulation in the ultrasound and palpation groups was 91.4 ± 55.4 and 284.7 ± 153.6 seconds, respectively, with P <0.001. In addition, 3.3% of the patients in the ultrasound group and 26.7% in the palpation group suffered puncture hematoma with a p-value of 0.026. They concluded that modified dynamic needle tip positioning short-axis, out-of-plane, ultrasound-guided radial artery cannulation in neonates improved the first-attempt and total success rates and

decreases the total procedural time and incidence of cannulation-related complications(16).

4. **S Bhattacharjee** *et al*., in a meta-analysis including 1895 patients, found that overall radial artery cannulation success rate was similar between ultrasound-guided technique and digital palpation with p value 0.05. Ultrasound-guided radial artery cannulation was associated with a higher first-attempt success rate than digital palpation, with a p-value < 0.001. In their study, no difference was seen in time to radial artery cannulation with a p-value of 0.30 and mean the number of attempts with a p-value of 0.06 between USG guided technique and with palpation technique(9).
5. **Homam Moussa Pacha** et *al*., in a systemic review of 12 randomised controlled trials in the adult population found that ultrasound-guided radial artery cannulation was associated with increased first-attempt success rate and decreased failure rate. There were no significant differences in the risk of hematoma, the mean time to the first successful attempt or any successful attempt between both groups. In their study, the ultrasound-guided technique for radial artery cannulation had higher first-attempt success and lower failure rate than palpation alone, with no significant differences in access site hematoma or time to a successful attempt(17).
6. **ZheFeng Quan** *et al*., in their study on acoustic shadowing facilitation of radial artery cannulation under ultrasound guidance in young children, found that the success rate of cannulation on the first attempt was higher AST group (35 out of 39 [90%]) than the traditional ultrasound group (24 out of 40 [60%]) with a P value of 0.002. The ultrasound localisation time and puncture time were significantly less in the AST group than in the traditional ultrasound group, with localisation time AST 6 [5, 8] vs TUSG 18 [15, 21] seconds; puncture time AST 24 [15, 41] vs TUSG 40 [23, 56] seconds. It was concluded that acoustic shadowing through dual lines significantly improved the success rate of radial artery cannulation in young children (11).
7. **Levin** *et al*. conducted a study for radial artery cannulation in 69 patients and randomised between ultrasound group (34 patients) or palpation technique group (35 patients). The time from skin puncture to successful arterial catheterisation, time taken for cannulation, the number of attempts required, and the number of cannulas used was recorded for each group. Arterial cannulas were introduced on the first attempt in 21 cases (62%) by ultrasound method compared with 12 cases (34%) by palpation method (p = 0.03). The ultrasound group reduced the overall cannulation time (55.5 ± 63.8 vs 111.5 ± 121.5 s, p

= 0.17). They concluded that ultrasound is a valuable adjunct to arterial cannulation and increased the success rate of the first attempt(18).

8. **Lynn Zaremski** *et al*. conducted a study of palpation versus an ultrasound-guided approach for radial artery cannulation. They found that the success rate of initial radial catheterisation USG 87% vs TP 86.8 % (P = 0.999) and cannulation time USG 47 s [IQR, 20-90 s] vs TP 31 s [IQR, 20-75 s] (P = 0.179) were not significantly different between the ultrasound and palpation groups respectively. Pulse quality (none, weak, strong) was independently associated with access error in both groups (P < 0.001). Obesity was associated with access failure in the palpation group (P = 0.005) but not in the ultrasound group (P = 0.544). They concluded that the ultrasound-guided radial approach does not appear to provide any significant additional benefit over the palpation-guided approach alone (19).
9. **O'Horo** *et al***.** conducted a meta-analysis of 49 studies, including 30,841 arterial catheters as a source of infection in the blood and found that prevalence was significantly higher in the subset of studies. Studies reported cultures of all catheters (1.26/1000 days of catheterisation) compared with studies that only cultured when arterial catheters were suspected as the source of catheter-related bloodstream infections (0.70/1000 days of catheterisation). Pooled data also showed a significantly increased risk of infection at the various arterial catheterisation site compared with the radial artery catheterisation site (p=0.001). It is concluded that arterial catheters are an underappreciated cause of catheter-associated bacteraemia. Choosing the radial artery instead of the femoral artery reduces the risk of catheter-associated blood infections(20).
10. **Soo Yeon Kime** *et al*., their study of ultrasound-guided DNTP technique for radial artery cannulation in elderly patients found that the success rates on the first attempt were 85.9% and 72.3% in DNTP and TP, respectively (P<0.001) and the overall success rates were 99.2% and 93.0% in DNTP and TP, respectively (p=0. 01). In their study, the number of attempts were 1(1,1) and 1(1,3), in DNTP and TP respectively with a P value of <0.001. Cannulation time for successful attempts was 42 (32.55) sec in the DNTP group and 53 (36.78) sec in the palpation group (P < 0.001). The incidence of hematoma was significantly lower in the DNTP group (7%) compared with TP group (24.2%) (P < 0.001). Furthermore, it was concluded that ultrasound-guided radial artery cannulation with DNTP improves radial artery cannulation in elderly patients by increasing the success rate while minimising complications(14).

11. **QiZou** *et al*. conducted a study on single and double developing lines for ultrasound-guided radial artery cannulation in obese patients and found that in the single or dual line development group, the success rate of radial artery catheterisation at the first attempt was higher than in the control group (control vs single vs dual, 71% vs 90% vs with 91%, P=0.001). In addition, the single and dual lines had a shorter time to the successful procedure on the first attempt and a lower overall rate of complications i. e. vascular spasm and hematoma, compared with the control group (procedure time: control vs single vs double, 63 sec vs 54 s vs 40 s, P< 0.001). They concluded that single- and dual lines improved the first trial success rates and reduced complication rates of ultrasound-guided radial artery cannulation in obese patients(12).
12. **Rui Dong** *et al*. conducted a study on the application of the acoustic shadowing for radial artery puncture and cannulation teaching in standardised training for residents. They noted the success rate for radial artery puncture at the first attempt in the AST group was 78.43%. It was significantly higher than the traditional ultrasound-guided group, 58.00% ($p = 0.027$). The ultrasonic positioning time and cannulation time in the AST teaching group were significantly shorter than that of the traditional ultrasound-guided group ($p = 0.012$) respectively. However, no significant differences were observed in the incidence of local hematomas and teaching satisfaction scores between the two groups(10).

METHODOLOGY

Study Setting

Patients in the study group were intervened for radial arterial cannulation in the operation theatre at AIIMS JODHPUR, Rajasthan. This study was submitted to the Clinical Trials Registry of India (with the clinical trial number of CTRI/2021/08/036059) after receiving clearance from the Institutional Ethics Committee of AIIMS JODHPUR with letter no. AIIMS/IEC/2021/3292 on March 12, 2021.

Study Design: Randomised control trial

Study participants:

Inclusion criteria

Adult patients, more than 18 years, undergoing major surgeries where an arterial line was required for continuous BP monitoring or arterial blood sampling.

Exclusion criteria:

- Signs of an infection on the skin or the presence of a wound close to the puncture site
- Circulation abnormalities of the hand (Allen's test positive)
- Patients who were not willing to give consent for the study
- Patients with shock/ hemodynamically unstable patients

Methodology

Patients were randomised into three groups using a web-based randomization tool (www.randomizer.org).

Group **TP:** Palpation technique

Group **DNTP:** Dynamic needle tip positioning technique

Group **AST:** Acoustic shadowing technique

Interventions

Patients submitted their informed consent in writing before participating in the study. Following enrolment, patients were given a random assignment to one of 3 groups (Group TP, DNTP and AST). The group identification slip was put in a prenumbered, packed, and

dark-colored envelope so the group's identity could remain concealed. Immediately before the radial artery cannulation, the sealed envelopes were opened to determine the group allocation. This was carried out utilizing a predetermined protocol after the onset of general anesthesia.

The patient's arm was abducted, and the wrist was extended by placing a towel roll under the wrist. Under aseptic precaution, the radial artery was cannulated according to group allocation using a 20 G arterial cannula (Becton Dickinson, Sandy, Utah, USA) by either of the 3 techniques.

Techniques of arterial cannulation

Group TP=Traditional palpation technique [TP]: The radial arterial pulse was palpated by the operator using their non-dominant hand. The needle and cannula were progressed at a 15° to 30° angle toward the radial artery until a flashback of blood was noticed in the needle hub. When blood began to appear in the hub, the needle angle was gently reduced, and the arterial cannula was advanced.

Fig:1 Traditional palpation technique

Group AST=Acoustic shadowing technique [AST]: The x-ray-detectable surgical gauze was used to extract the metal-containing strand, which was then positioned parallel to one another on the ultrasound probe. The ultrasound image of these radio-opaque strands provided acoustic shadow as a cannulation guide. After this, the USG probe was used to visualise the radial artery. The probe was placed in such a way that the radial artery was located between these shadows. The needle was then entered at a 30° angle to the skin along the edge of the probe, in between two strands on the probe. Once the needle was inserted into the radial artery, the angle of the needle was lowered from 30° to 15°, and the needle was gently pushed forward for 1 to 2 mm after withdrawing the needle a few millimetres into the cannula. Following this, the cannula was entirely inserted into the radial artery (11).

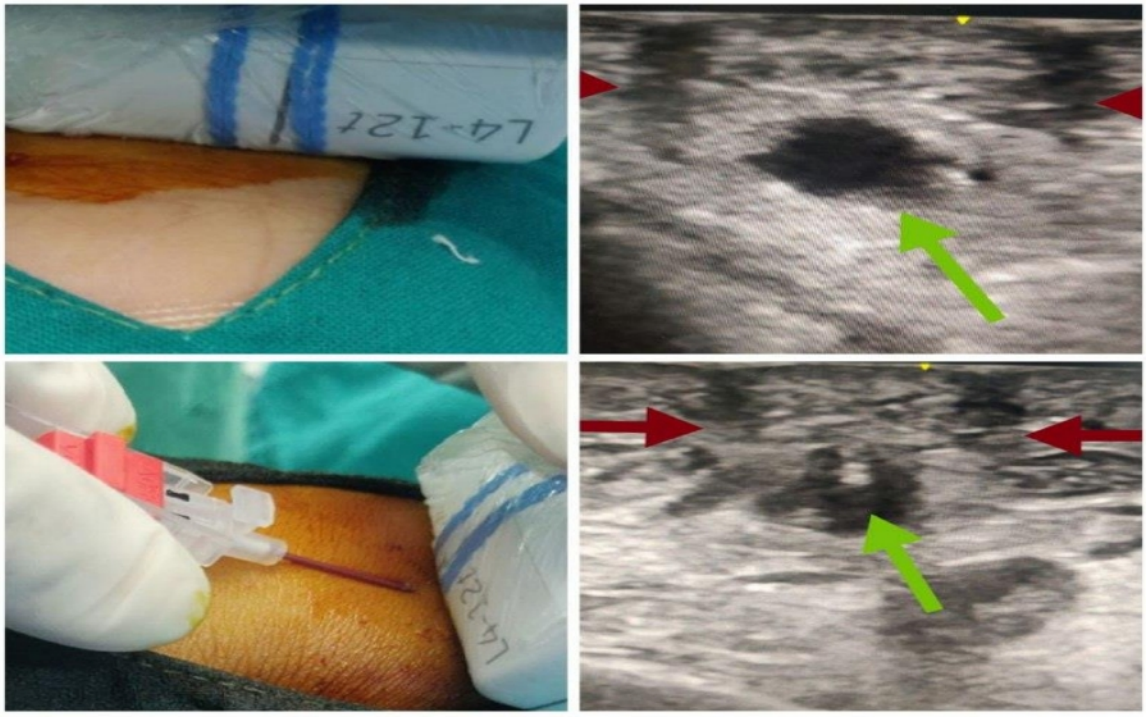


Fig 2: Acoustic shadowing technique, left upper quadrant showing usg probe with blue colour radio opaque thread over it, and corresponding usg image in right upper quadrant with brown arrow showing Acoustic shadow created using radio opaque threads, green arrow showing artery.

Group DNTP= Dynamic needle tip positioning technique [DNTP]: After acquiring a short-axis, out-of-plane image of the radial artery, the needle and cannula were inserted at an angle of 30° to 40° into the skin until the hyperechoic needle tip was seen on the ultrasound imaging. The ultrasound probe was then positioned proximally across the arm, away from the needle insertion site, until the needle tip disappeared from the ultrasound imaging. The

needle and cannula were advanced a few millimetres until the ultrasound scan once again revealed the needle tip. At this time, the approach angle was reduced such that the needle tip remained in the centre of the arterial lumen. Within the arterial lumen, the needle and cannula were incrementally advanced for at least 1 cm. The cannula was then threaded on to the needle(13).

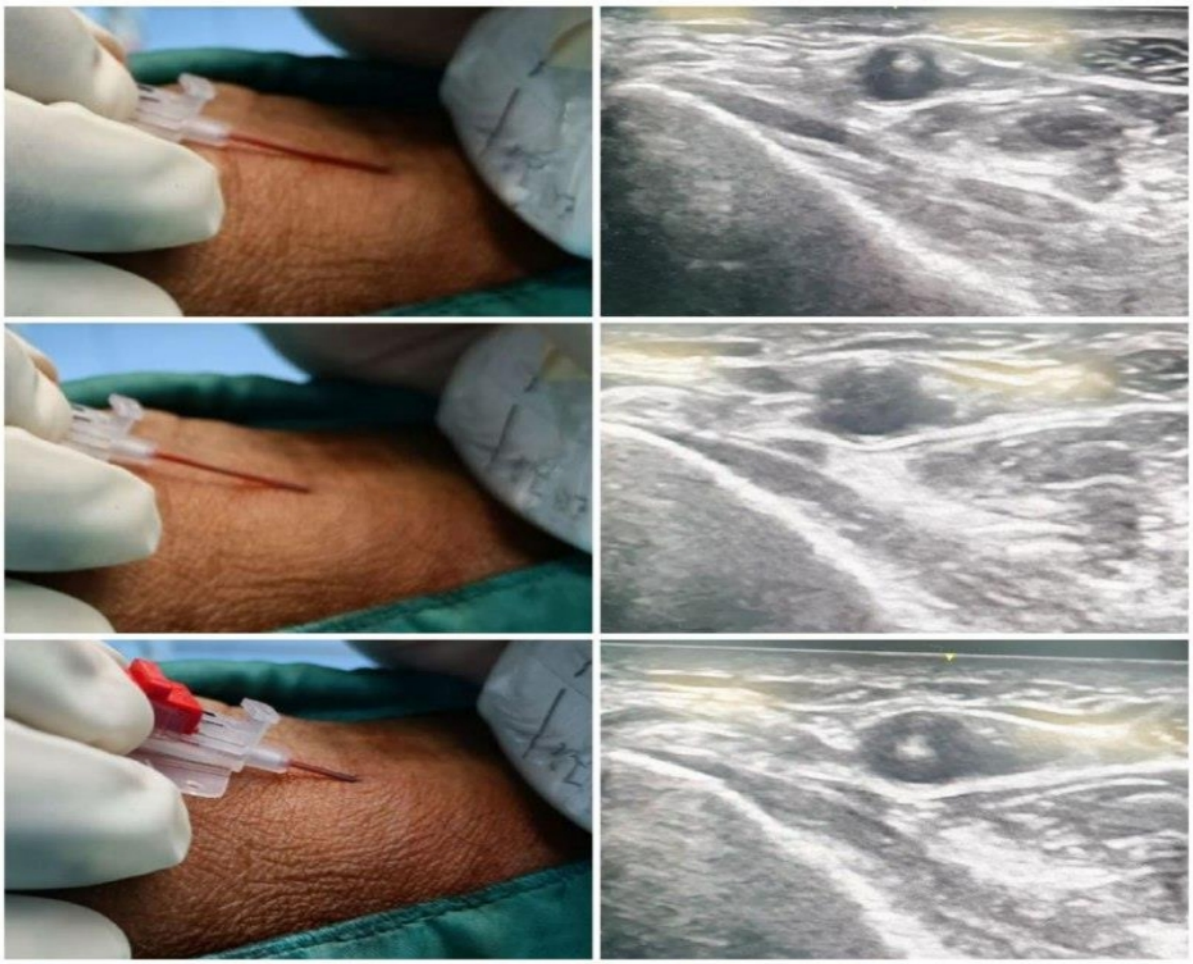


Fig 3: Dynamic needle tip technique

In group DNTP and AST, radial artery was cannulated using a linear probe of an ultrasound machine (GE Venue GO R3, GE Healthcare, WI, USA). All arterial cannulations were performed by experienced anaesthetists who had performed more than 30 arterial cannulations by both by palpation method and ultrasound techniques. An anaesthetist who was unaware of group allocation gathered primary and secondary outcome data for this study.

Start time: Beginning of ultrasound scanning in group DNTP/AST group and palpation of the patient's wrist in group TP.

End Time: When a free arterial flow in the cannula was seen.

Technique Failure: If, after 5 minutes, the targeted radial artery had not been cannulated, it was considered as failure and the operator was free to use any technique.

STATISTICAL ANALYSIS

Statistical analysis

- **Sample size:** QUAN ZF(11) found that acoustic shadowing technique of arterial cannulation had a first attempt cannulation success at 90% compared to 60% in the control group. Using this for calculation, we estimated a **sample size of 60 per group**, with 80% power, 95% confidence level (adjusted for three groups) and 20% contingency.

- The total number of patients recruited were **180.**

- Data was entered and analysed using SPSS IBM software version 22 (IBM SPSS Advanced Statistics, Chicago, IL, USA).

- In our study, we used the chi-square test to evaluate nominal data such as gender distribution, first attempt success rate, and number of cannulas changed that are presented as frequency and percentages. The Freeman-Halton extension of the Fisher exact probability test was used to compare the nominal data, which were provided in terms of frequency and percentages for the overall success rate and overall complications.

- The Shapiro Wilk test revealed that age distribution, total cannulation time, and total cannulation attempts, did not follow normal distribution as a result, these are presented as median and IQR [interquartile range] derived and compared using the Mann Whitney U test.

- A p-value of less than 0.05 was regarded as statistically significant.

RESULTS

This study was conducted in the department of Anaesthesiology and Critical Care at the All India Institute of Medical Sciences, Jodhpur between January 2021 and July 2022. Based on the requirement for arterial cannulation, 180 patients (60 in each group) participated in this study.

Fig 4: CONSORT Diagram

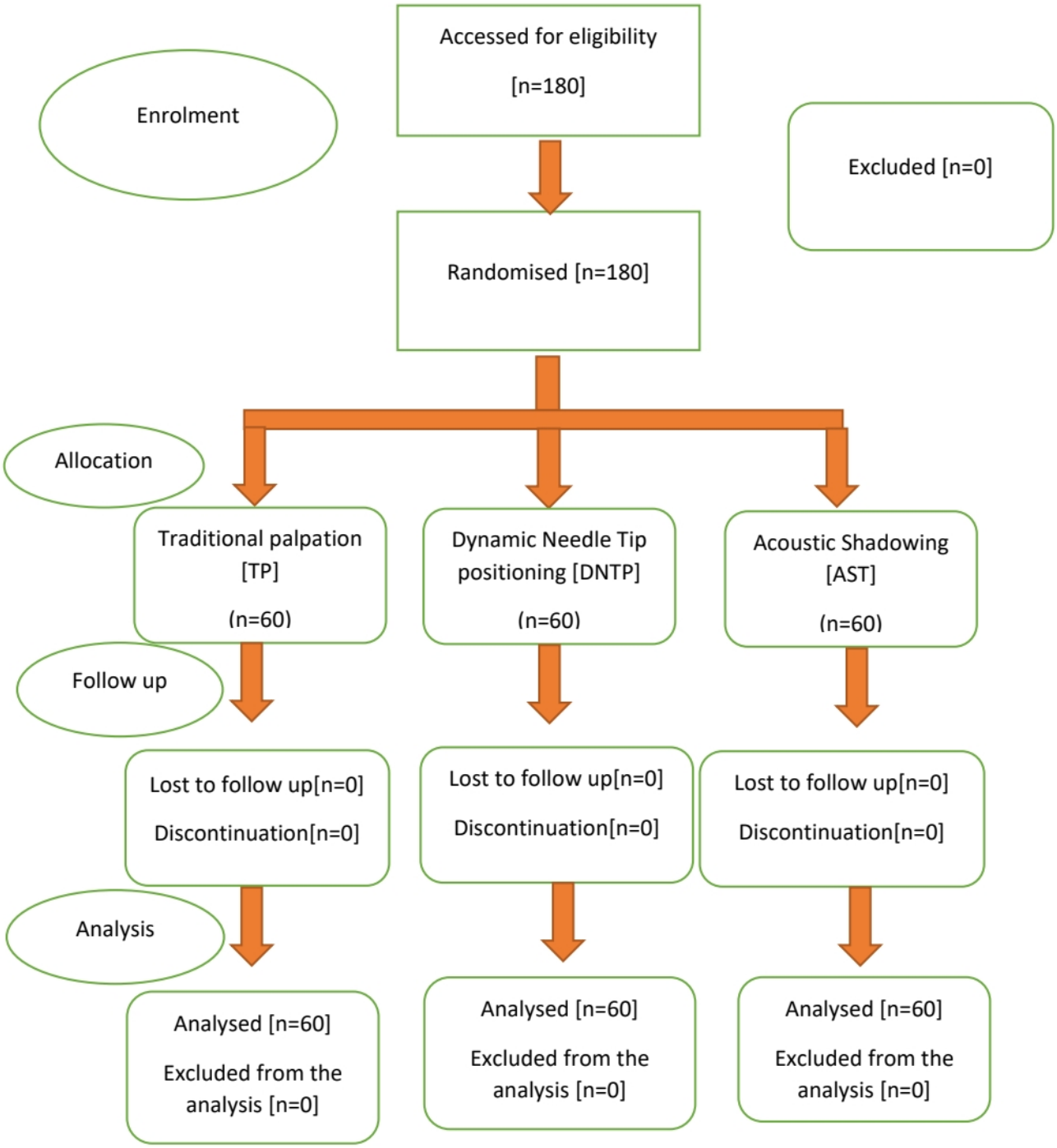


Table 1: Comparison of Age distribution among the three groups.

	Groups								
	Traditional palpation			Dynamic needle positioning technique			Acoustic shadowing technique		
	Median	Q1	Q3	Median	Q1	Q3	Median	Q1	Q3
Age (years)	51.5	41.5	64.0	47.5	36	60.0	50.5	40.5	60.5

The above table shows the comparison of the distribution of age among the three groups. The p-values is 0.466, calculated using Mann Whitney U test, which is statistically insignificant, i.e. age is comparable among the three groups.

Figure 5: Comparison of Age distribution among the three groups.

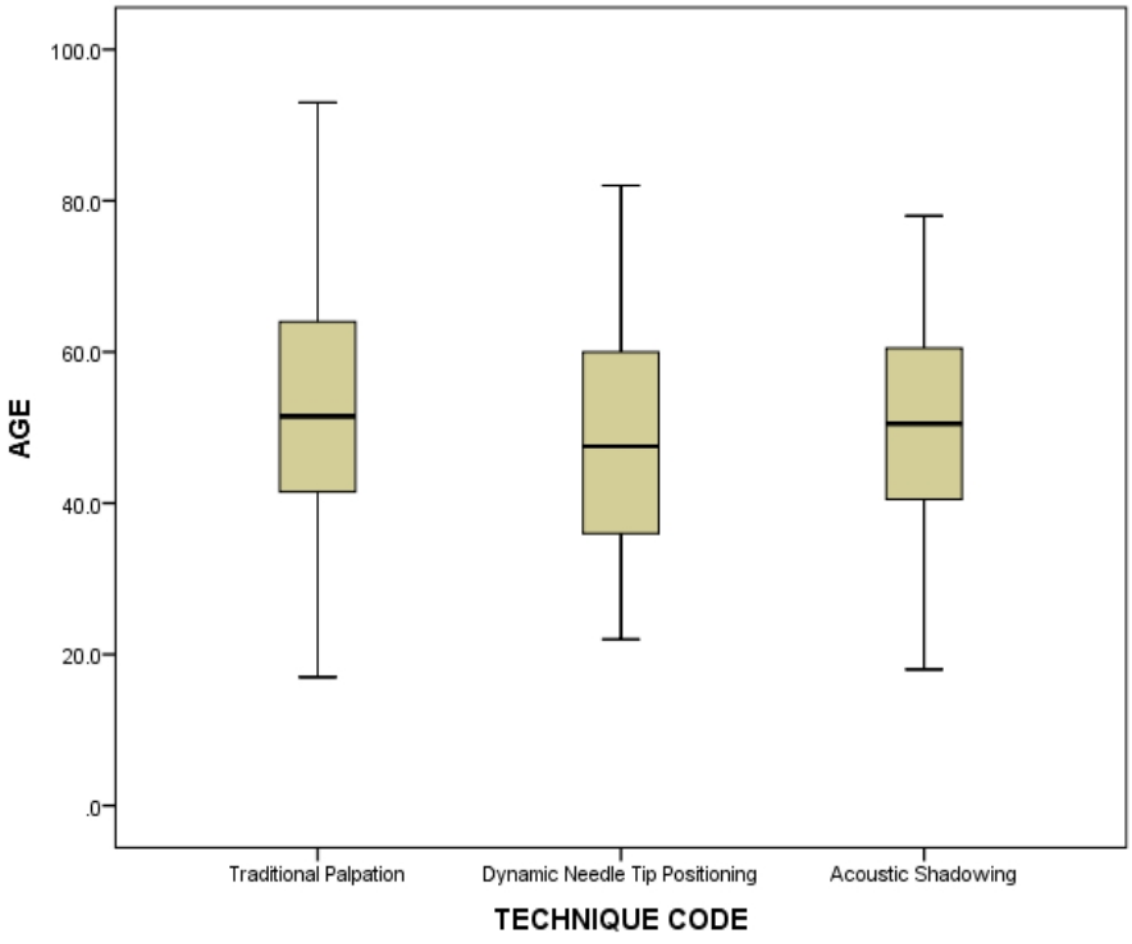


Table 2: Comparison of gender distribution among the three groups

Gender Distribution						
			Groups			
			Traditional palpation	Dynamic needle tip positioning	Acoustic shadowing	Total
SEX	Female	Count	36	37	36	109
		%	60.0%	61.7%	60.0%	60.55%
	Male	Count	24	23	24	71
		%	40.0%	38.3%	40.0%	39.55%
Total		Count	60	60	60	180
		%	100.0%	100.0%	100.0%	100.0%

The above table shows the sex distribution among the groups. The p-value was calculated using the Chi-square test (p= 0.977) and is statistically insignificant.

Figure 6: Comparison of gender distribution among the three groups.

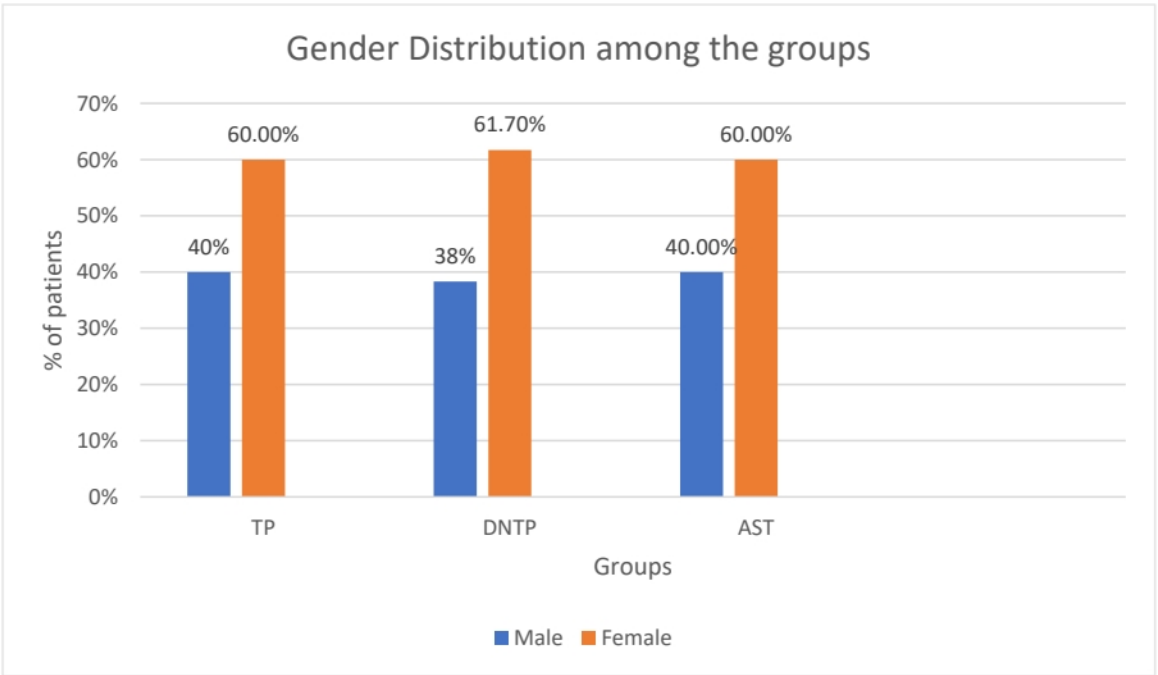


Table 3: Comparison of the first attempt success rate of radial artery cannulation between three groups.

		Groups						P Value
		Traditional palpation		Dynamic needle tip		Acoustic shadowing		
		Count	Column N%	Count	Column N%	Count	Column N%	
Total number of attempts	First attempt	40	66.7%	40	66.7%	43	71.7%	0.794
	More than one attempt	20	33.3%	20	33.3%	17	28.3%	

The above table shows the comparison of the number of attempts for radial artery cannulation using three techniques. The p-value was calculated using the Chi-square test (p= 0.794). It was statistically insignificant, i.e., all three techniques were comparable for the first attempt success rate of radial artery cannulation.

Figure 7: Comparison of the first attempt success rate of RA cannulation between three groups.

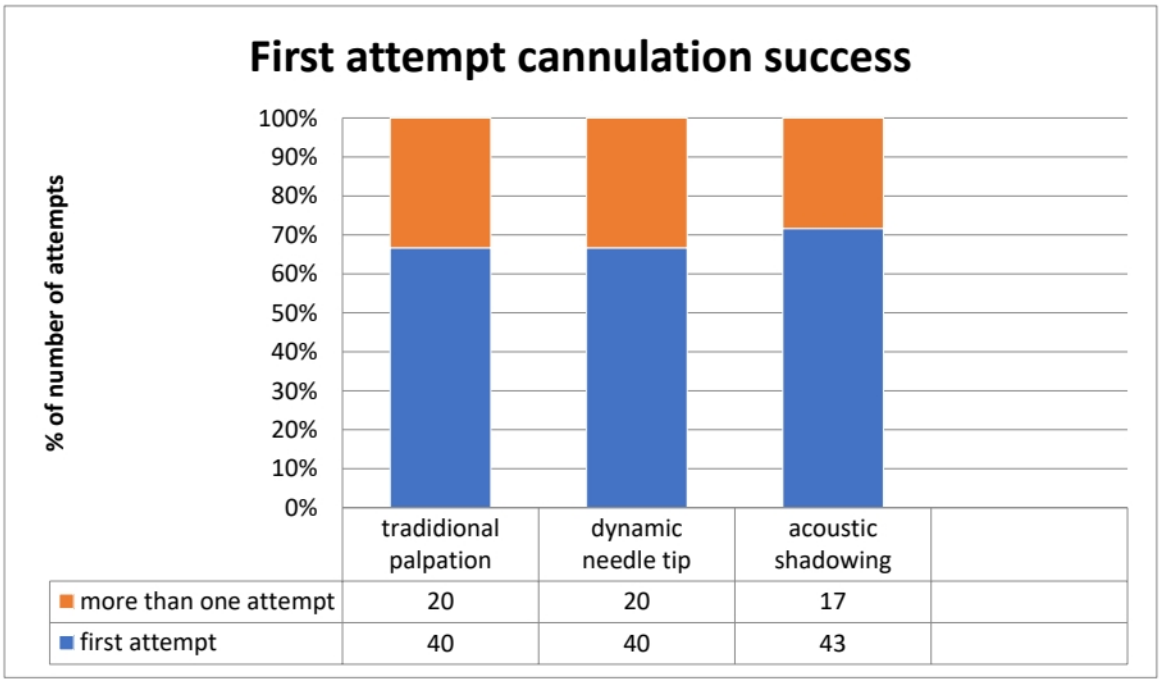


Table 4: Comparison of the total number of attempts for radial artery cannulation between three groups.

		Groups		
		Traditional palpation	Dynamic needle tip positioning	Acoustic shadowing technique
TOTAL NUMBER OF ATTEMPTS	One attempt	40	40	43
	Two attempts	16	15	14
	Three attempts	1	3	0
	Four attempts	1	1	2
	Five attempts	2	1	1

The above table shows the total number of attempts taken for cannulation among the three groups.

Figure 8: Comparison of the total number of attempts for radial artery cannulation between three groups

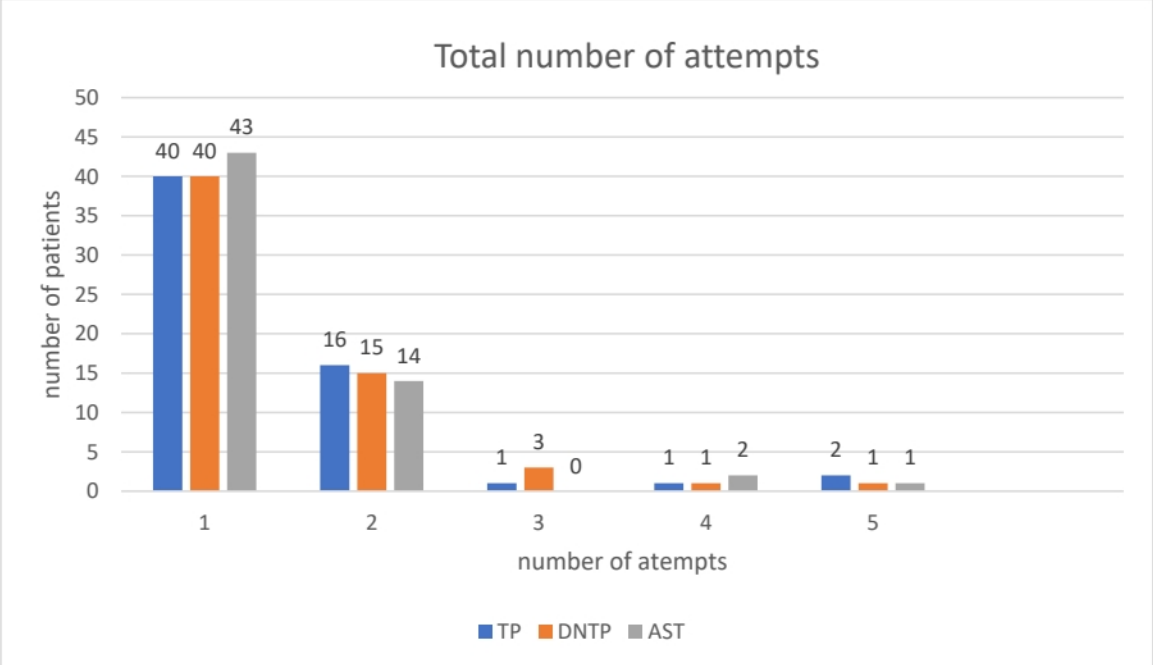


Table 5: Comparison of the median number of attempts taken for radial artery cannulation between three groups

	Groups								
	Traditional palpation			Dynamic needle tip positioning			Acoustic shadowing technique		
	Median	Q1	Q3	Median	Q1	Q3	Median	Q1	Q3
MEDIAN NUMBER OF ATTEMPTS	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0

The above table shows the median number of attempts taken for successful cannulation among the three groups; by Mann Whitney U Test, the p-value is 0.773, which is statistically insignificant.

Figure 9: Comparison of the median number of attempts for radial artery cannulation between three groups.

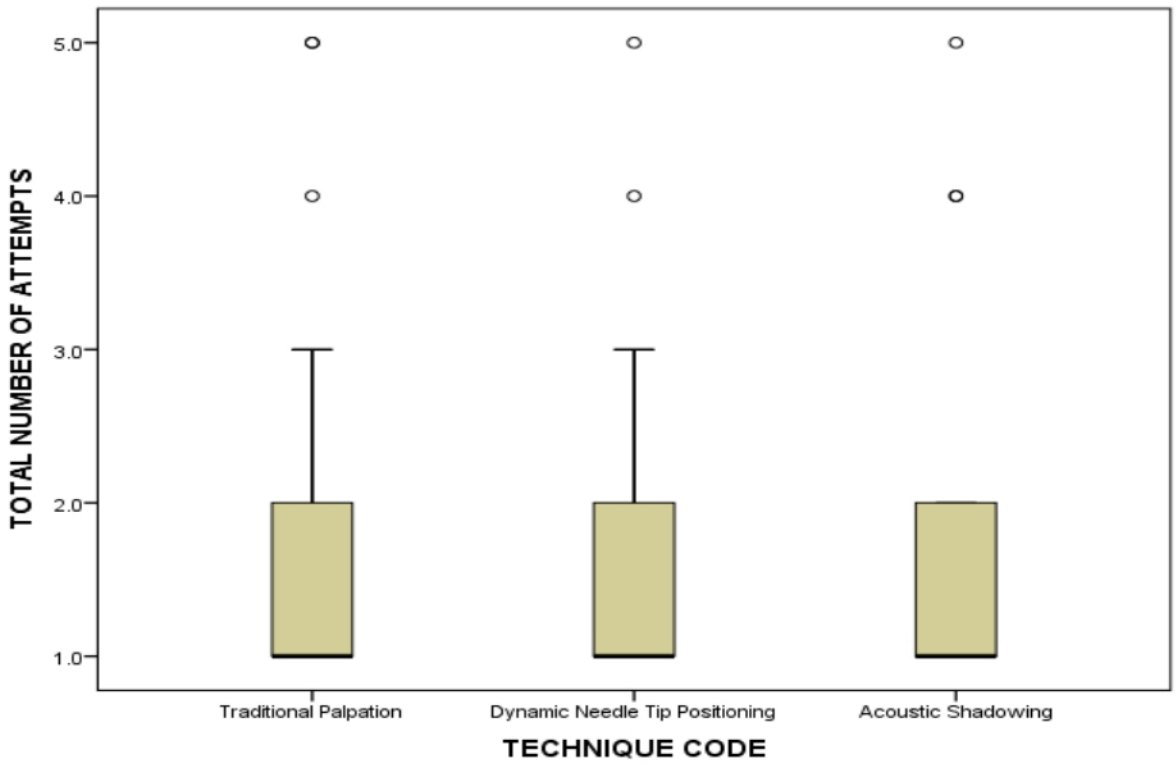


Table 6: Comparison of the time taken for radial artery cannulation between three groups.

Groups									
Traditional Palpation				Dynamic needle tip technique			Acoustic shadowing technique		
	Median	Q1	Q3	Median	Q1	Q3	Median	Q1	Q3
Time for cannulation (Seconds)	60.5	37.0	129.5	71.0	50.0	170.0	108.0	58.0	181.0

The above table shows the comparison of the time taken for cannulation. The median time for radial artery cannulation was statistically insignificant, with a p-value of 0.066 using the Mann-Whitney U Test.

Figure 10: Comparison of the time for radial artery cannulation between three groups.

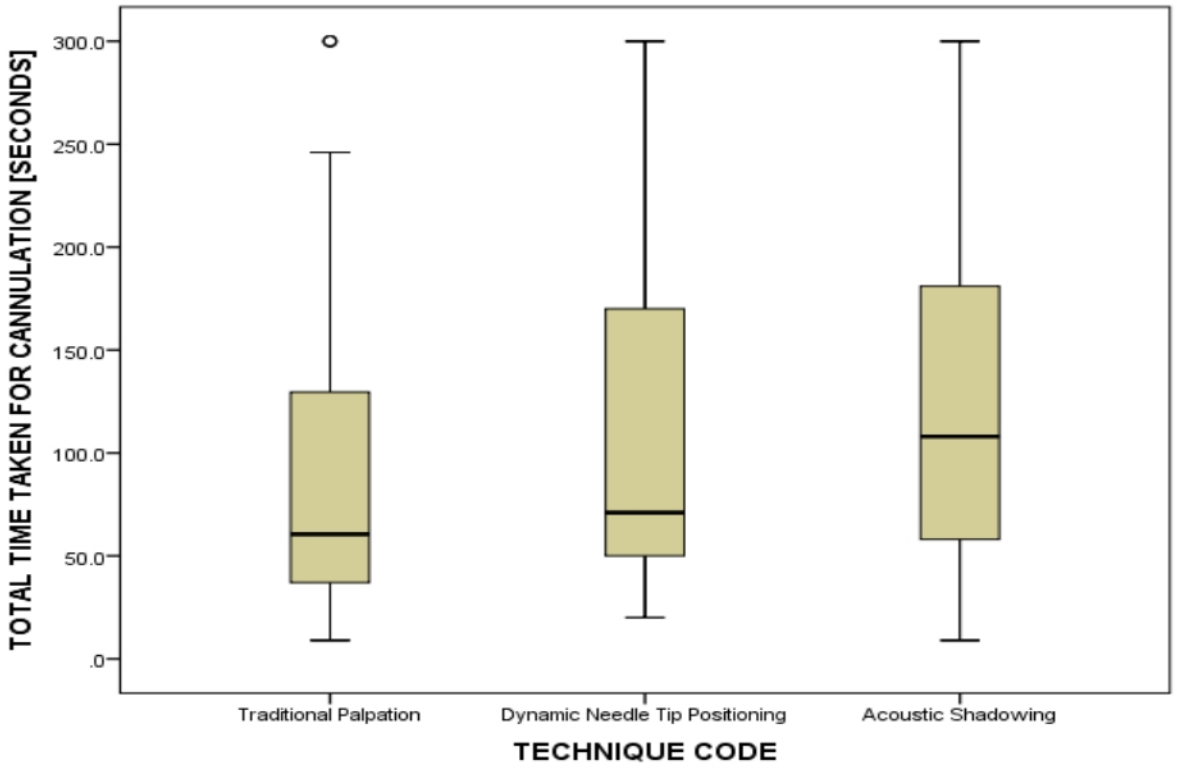


Table 7: Comparison of the Success rate of for radial artery cannulation, at 5 min between three groups

SUCCESS/FAILURE AT 5 MINUTES						
			Groups			Total
			TP	DNTP	AST	
SUCCESS/FAILURE	FAILURE	N	3	1	2	6
		%	5.0%	1.7%	3.3%	3.3%
	SUCCESS	N	57	59	58	174
		%	95.0%	98.3%	96.7%	96.7%
Total		N	60	60	60	180
		%	100.0%	100.0%	100.0%	100.0%

The above table shows the data comparing the overall success/failure rate among the three groups at 5 min. With p value 0.789 using Fisher exact probability test and the Freeman-Halton extension, it shows that it is statistically insignificant.

Figure 11: Comparison of the Success rate of radial artery cannulation, at 5 min between three groups

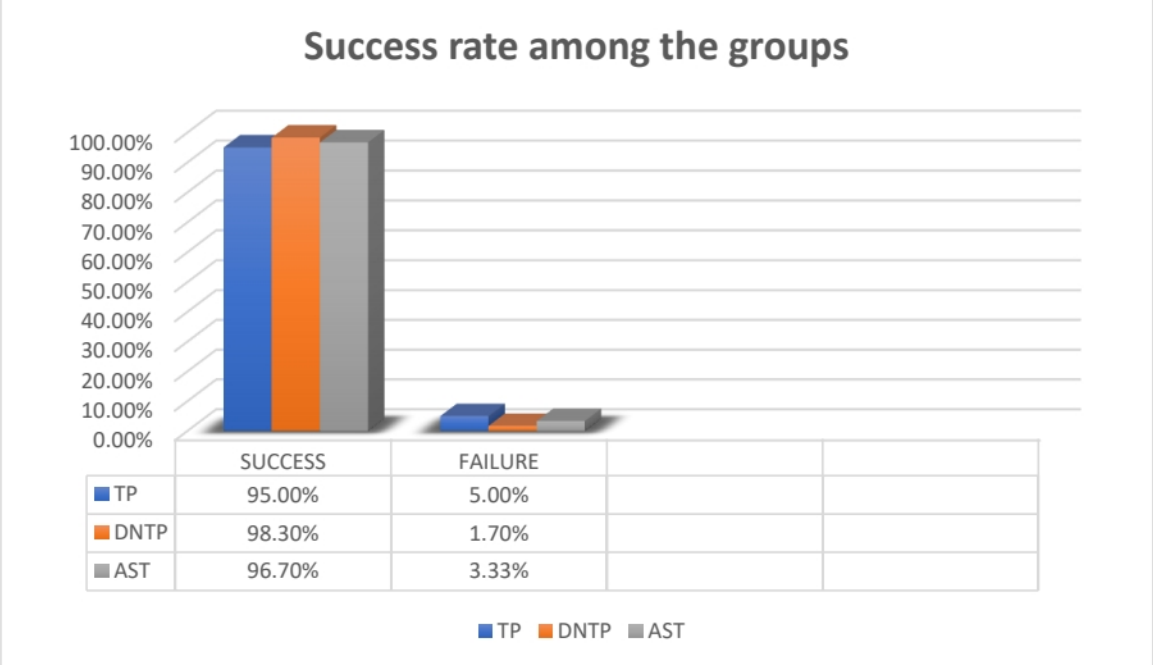


Table 8: Comparison of the total number of cannulas used for radial artery cannulation between three groups.

		Groups						P Value
		Traditional palpation		Dynamic needle tip technique		Acoustic shadowing technique		
		n	%	n	%	n	%	
The total number of cannulas changed	0	51	85%	53	88.33%	50	83.33%	0.915
	1	8	13.33%	6	10%	8	13.33%	
	2	1	1.66%	1	1.6%	2	3.33%	

The above data shows the number of arterial cannulas used while cannulation using the three techniques. The number of cannulas used was comparable between the three techniques. The p-value was calculated using the Chi-square test (p=0.915) and is statistically insignificant, i.e., all three techniques were comparable for the number of cannulas used.

Figure 12: Comparison of the total number of cannulas used for radial artery cannulation between three groups.

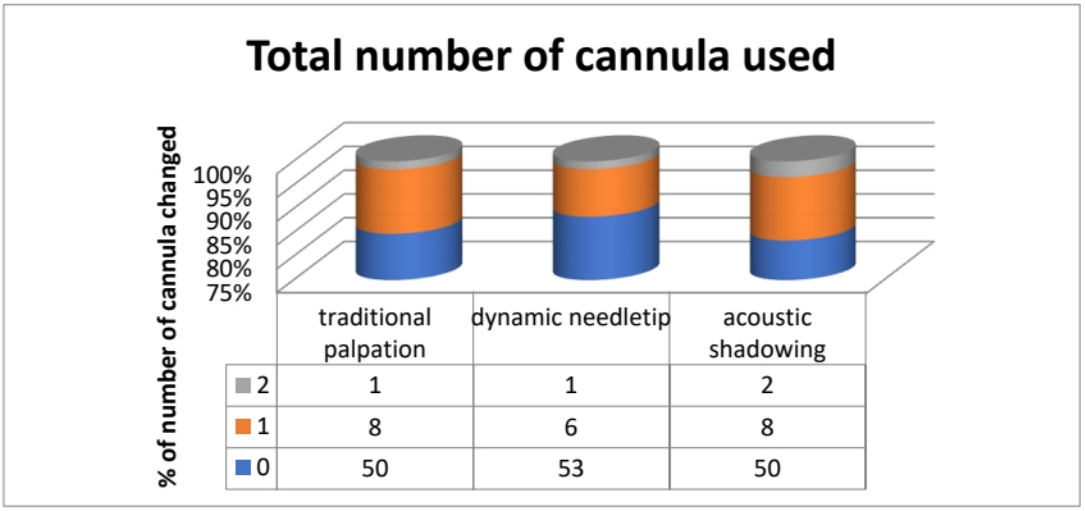


Table 9: Comparison of complications during radial artery cannulation between 3 groups

		Groups					
		Traditional palpation		Dynamic needle tip technique		Acoustic shadowing technique	
		n	%	n	%	n	%
Complications	Hematoma	2	3.33%	0	0.0%	0	0.0%
	Spasm	1	1.7 %	1	1.7%	1	1.7%
	Hematoma and spasm	0	0.0%	0	0.0%	1	1.7%
	None	57	95%	59	98.3%	58	96.7%

The above data shows the complications that occurred while radial artery cannulation using the three techniques.

Figure 13: Comparison of complications during radial artery cannulation between three groups

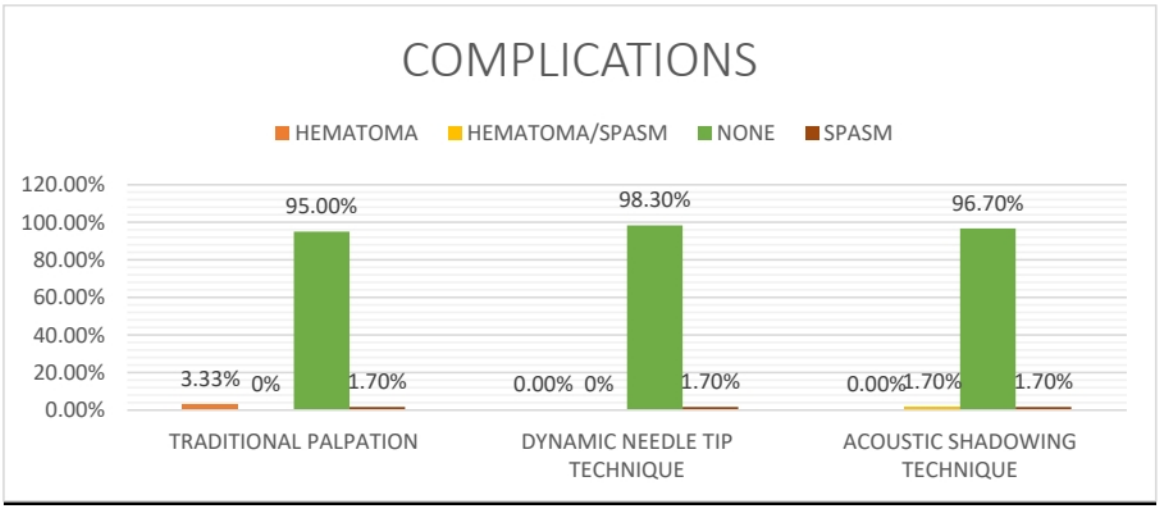
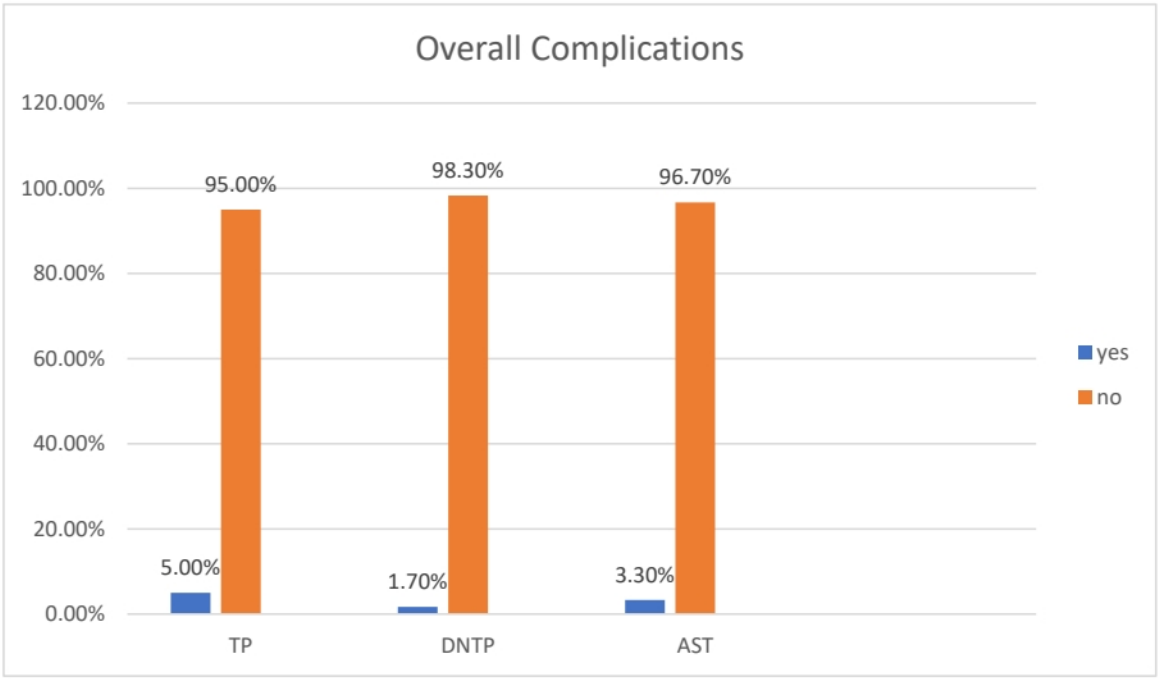


Table 10: Comparison of overall complications during radial artery cannulation between three groups

			Groups			Total
			Traditional palpation	Dynamic needle tip position	Acoustic shadow technique	
COMPLICATIONS	Yes	n	3	1	2	6
		%	5.0%	1.7%	3.3%	3.3%
	No	n	57	59	58	174
		%	95%	98.3%	96.7%	96.7%
Total		n	60	60	60	180
		%	100.0%	100.0%	100.0%	100.0%

The above table shows the comparison of overall complications during radial arterial cannulation among the three groups. With p value 0.789 using Fisher exact probability test and Freeman-Halton extension, it indicates statistically insignificance between the 3 groups.

Figure 14: Comparison of overall complications during radial artery cannulation between 3 groups.



DISCUSSION

There are different methods of arterial cannulation, all of which have their advantages and disadvantages in terms of first attempt success rate, time for cannulation and complications. The common problem in arterial cannulation is the insertion of the cannula through the artery after puncturing because, most of the time, there can be posterior wall puncture, and the cannula tip can pass through the posterior wall. So, the posterior wall puncture can be avoided by USG guided dynamic needle tip positioning technique, where one can visualise the needle tip through the USG and making sure that the tip is inside the artery and not puncturing the posterior wall and the cannula is advanced with the USG making sure the tip is inside the arteria lumen throughout the cannulation time(13,14,16).

The dynamic needle tip technique helps prevent posterior wall puncturing and helps thread the cannula easily(13,14), but a less experienced or trained person with USG may have difficulty in puncturing the artery using USG due to less orientation. This can be achieved by making guide, i.e. acoustic shadows (10,11), which can be created by radio-opaque threads, so that the observer can puncture between the threads after making sure that artery lies between the acoustic shadows.

In the present study, we compared the traditional palpation technique and two new USG techniques, i.e. dynamic needle tip technique and acoustic shading technique for cannulation of the radial artery, most commonly used for invasive blood pressure monitoring. In our study, three groups were comparable for demographic variables i.e. age and sex. The primary outcome of the study was to compare the first attempt success rate between the three techniques of arterial cannulation and secondary outcomes were total number of attempts in 5 minutes, time taken to cannulate, number of cannulas used, and complication related to the procedure (hematoma, bleeding, thrombosis).

The present study comparing for first attempt success rate showed no statistical significance among the three groups with a p-value of 0.794. This is similar to the study by **Cheryl Peters** *et al*. (15),which showed that the first-attempt success rate was 56.4% in the palpation group and 71.4 % in the USG group with a P value of 0.10. However, **S Bhattacharjee**(9) *et al*. meta-analysis and **Homam Moussa Pacha** et *al.* (17), the systemic review showed a significant increase in first attempt success rate in the USG guided technique than in the palpation technique. Furthermore, unlike our study, **ZheFeng Quan** *et*

al. (11)and ***Zou*** *et al*. (12) in their study comparing AST and TP techniques showed significant increase in first attempt success rate in AST than in TP group, with a p-value of 0.002 and 0.001, respectively. Contrary to our results, **Kiberenge** *et al.* (13), **Soo Yeon Kime** *et al*. (14) and **Liu** *et al.* (16), comparing DNTP with TP for radial arterial cannulation showed that there was significant increase in first-attempt success rate with a p-value of 0.001, <0.001 and 0.007 respectively. This difference in the first attempt cannulation success can be attributed to the operators experience for arterial cannulation. In the present study, all arterial cannulations were performed by experienced anaesthetists who had performed more than 30 arterial cannulations both by palpation method and ultrasound techniques.

In this study, the total number of attempts required to cannulate the artery was statistically insignificant with a p-value of 0.773 and a median number of attempts was 1 in all the three groups. In this aspect, our study was similar to the study conducted by **Cheryl Peters** *et al*. (15), who showed that number of attempts for arterial cannulation was 1 [1–2] vs 1 [1–2], respectively, in USG and TP groups (p=0.08). **S Bhattacharjee** *et al*. (9)in their meta-analysis, showed no difference in the mean number of attempts between palpation and USG guided arterial cannulation. However, there are studies which showed that there is a significant decrease in the number of attempts for arterial cannulation by USG guided cannulation in comparison to palpation method eg. **Kiberenge** *et al.* (13), **Levin** *et al.* (18), and Soo **Yeon Kime** *et al*. (14) with a p-value of < 0.001, 0.003 and <0.001 respectively. This variability in the number of arterial cannulation attempts can be related to the operator's experience with arterial cannulation. All arterial cannulations in this research were conducted by experienced anaesthetists.

In our study, there was no significant difference in time taken for arterial cannulation among the 3 groups, with median time for cannulation among the three groups TP, DNTP, and AST was 60.5 [37.0, 129.5] sec, 71.0 [50.0, 170.0] sec and 108.0[58.0, 181.0] sec, respectively, (p= 0.066). Our results were similar to the study conducted by **Cheryl peters** et al(15), where they showed that there is no difference between the TP vs USG-guided groups for time to arterial cannulation {104 [76–212] sec vs 104 [68– 270] sec}, respectively (P = 0.66). Similarly, in a study conducted by **Lynn Zaremski** *et al*(19), comparing direct palpation and USG guidance for radial artery cannulation during cardiac catheterisation showed that time to access for artery cannulation was 47 [20-90] sec versus 31 [20-75] sec respectively (p= 0.179). Similar to our results, in a metanalysis conducted by **S Bhattacharjee** *et al* (9)comparing palpation and USG guided radial artery cannulation also

concluded that there was no difference in time to cannulate(p = 0.30). Our result was also similar to the study conducted by **Kiberenge** *et al* (13) where they compared DNTP and palpation method for radial artery cannulation which showed that the median cannulation times were 81.5 (61–122) sec in the DNTP group and 76 (48–175) sec in the palpation group (p=0.7). However, our study's result is not similar to the study conducted by **Liu** *et al*. (16), comparing the DNTP technique and palpation technique for radial artery cannulation which showed that the average time taken for radial artery cannulation in the ultrasound and palpation groups were 91.4 ± 55.4 sec and 284.7 ± 153.6 sec, respectively (P < .001). **Soo Yeon Kime** *et al*. (14) in their study comparing DNTP and palpation method for radial artery cannulation also showed that cannulation time was 42 (32,55) sec in the DNTP group and 53 (36,78) sec in the palpation group (*P*<0.001), which was not similar to our study. Contrary to our result, **Rui Dong** *et al.* (10) in their study including residents undergoing training, showed that arterial cannulation time in the AST group was significantly shorter than that of the traditional ultrasound-guided group. It can be due to the difference in operator experience between our and other studies. All arterial cannulations in this study were performed by anaesthetists with sufficient expertise.

In the present study, we also compared the overall success rate of cannulation within five minutes, which was also statistically insignificant with a p-value of 0.789. Successful cannulation rates were 95%, 98.3%, and 96.7% among TP, DNTP, and AST, respectively, which was similar to the study done by **Cheryl Peters** *et al*. (15) which also showed that there was no significant difference for overall success rate between palpation and USG guided techniques. Similar to our study, **S Bhattacharjee** *et al*. (9) showed that overall cannulation success rate was similar between ultrasound-guided technique and palpation method. However, a study conducted by **Kiberenge** *et al*. (13) comparing DNTP and TP methods in radial artery cannulation showed that the overall 5 minute success rate was 89% in the DNTP group compared to 65% in the palpation group (P < .001), which was not similar to our study. Also, unlike our study, **Liu** *et al*. (16)in their study showed that the total success rate was 96.7% in the ultrasound group and 60.0% in the palpation group (P = .001), but here the study population was neonates unlike adults in our study.

Our study also compared overall complications such as hematoma and arterial spasm, in the 3 groups. The rate of overall complications between the three groups TP, DNTP and AST, were 5.0 %,1.7% and 3.3%, respectively, with a p-value of 0.789, which is insignificant. In our study, there were no complications related to infection/sepsis because the

arterial cannulations were done only for perioperative monitoring of arterial blood pressures, after which the cannula was removed in the postoperative care unit and then the patient was shifted to the ward, so maximum time patient had arterial cannulation was less than 12 hours; hence, the risk of infection was also less. In our study, hematoma and arterial spasms were also less in all three groups. Similar to our study, **Cheryl Peters** *et al*. (15), **Homam Moussa Pacha** et *al*. (17)and Rui **Dong** *et al*. (10) in their study concluded that there was no difference in overall complications between the study groups. Unlike our study, **Soo Yeon Kime** *et al*. (14) in their study found that hematoma formation was substantially less in the DNTP group 7% vs TP group 24.2%; (P<0.001). Contrary to our result, **Liu** *et al*. (16), in their study**,** found that 3.3% of the neonates in the USG group and 26.7% in the palpation group had puncture hematoma (P = .026). This difference of complications in various studies can be attributed to the difference in the age group of study population and operator's experience for arterial cannulation.

A 20 G arterial cannula (Becton Dickinson, Sandy, Utah, USA] costs around 564 rupees/unit. During cannulation, if it takes time, cannula may get blocked, and sometime during the threading of the cannula, there are chances that the cannula may get shear off. All these may lead to a change in the cannula, burdening the hospital or the patient. In our study, we also compared the number of cannulas used in all the three groups. We found no significant number of cannulas changed among the three groups during arterial cannulation (p= 0.915).

Study Strengths and limitation

To our knowledge, no study has been done to compare radial artery cannulation between three groups, TP, DNTP and AST, for first-attempt success rate, time taken for cannulation, number of cannulas changed and complications. Our study is a randomised trial which included a reasonable number of patients.

It did, however, have certain limitations.

1. The research was conducted in a single centre.

2. With the DNTP approach, needle alignment with the USG beam could be difficult for inexperienced operators.

3. These techniques in emergency settings warrant more research because this study was done in an operating room.

4. In our study, we compared adult patients, where pulse palpation was relatively easy, compared to neonates and infants, where USG may have a role in cannulation. Hence further research for arterial cannulation in these age groups should be carried out (16,21).

5. In our study, we included adult patients who were hemodynamically stable with normal BP; hence further research should be done in patients with hypotension and shock where palpation of the pulse is difficult (22).

6. In our study, the operator, i.e. who did cannulation, were experienced anaesthetist, who had performed more than 30 arterial cannulations both by palpation method and ultrasound techniques. Hence further studies involving operators i.e. residents with less experience in cannulation should be done (10).

7. Here, we used the dynamic needle tip positioning technique and acoustic shadowing technique separately for cannulation, where both have their limitations. So further studies involving both techniques in the same arterial cannulation may increase the first attempt success rate and decrease the time taken for cannulation.

8. Here, we compared all three techniques for cannulation for radial artery cannulation, which is more frequently done. However, other arteries like posterior tibial artery(23), dorsalis pedis artery(23) etc. may be considered in future studies.

9. More studies with larger sample sizes and comparisons with alternative techniques of USG-guided arterial cannulation are needed in the future.

CONCLUSION

The current study compared TP, DNTP and AST techniques for radial artery cannulation by experienced anaesthetists in adult patients for first-attempt success rate, the total number of attempts for cannulation, time taken for cannulation and complications.

Neither of the techniques TP, DNTP or AST, have a higher first-attempt success rate for radial artery cannulation. This means neither of the three techniques has advantages over others with respect to the first attempt success rate in radial artery cannulation.

Also, there is no significant difference in the total number of attempts, time taken for cannulation and complications among the three groups.

Hence, we conclude that USG guided DNTP and AST techniques for radial arterial cannulation in adult patients by experienced anaesthetists do not have any advantages over palpation method.

BIBLIOGRAPHY

1.Scheer BV, Perel A, Pfeiffer UJ. Clinical review: Complications and risk factors of peripheral arterial catheters used for haemodynamic monitoring in anaesthesia and intensive care medicine. Crit Care. 2002 Apr 18;6(3):199.

2.Bartels K, Esper SA, Thiele RH. Blood Pressure Monitoring for the Anesthesiologist: A Practical Review. Anesth Analg. 2016 Jun 1;122(6):1866–79.

3.Lamia B, Chemla D, Richard C, Teboul JL. Clinical review: interpretation of arterial pressure wave in shock states. Crit Care. 2005;9(6):1–6.

4.Meidert AS, Saugel B. Techniques for noninvasive monitoring of arterial blood pressure. Front Med. 2018;4:231.

5.Ribezzo S, Spina E, Di Bartolomeo S, Sanson G. Noninvasive techniques for blood pressure measurement are not a reliable alternative to direct measurement: a randomised crossover trial in ICU. Sci World J. 2014;2014.

6.Slogoff S, Keats AS, Arlund C. On the safety of radial artery cannulation. In: The Journal of the American Society of Anesthesiologists. The American Society of Anesthesiologists; 1983. p. 42–7.

7.Ying Y, Lin X ju, Chen M juan, Cao Y, Yao Y tai, Group EICA (EICA). Severe ischemia after radial artery catheterisation: A literature review of published cases. J Vasc Access. 2022;11297298221101784.

8.Crossland SG, Neviaser RJ. Complications of radial artery catheterisation. The hand. 1977;9(3):287–90.

9. Bhattacharjee S, Maitra S, Baidya DK. Comparison between ultrasound-guided technique and digital palpation technique for radial artery cannulation in adult patients: An updated meta-analysis of randomised controlled trials. J Clin Anesth. 2018 Jun 1;47:54–9.

10.Dong R, Chen J, Wang H, Liu Z, Sun X, Guo Y, et al. The application of the acoustic shadowing facilitates guidance in radial artery puncture and cannulation teaching in standardised training for residents: a randomised controlled trial. BMC Med Educ. 2022 Apr 11;22(1):263.

11. Quan Z, Zhang L, Zhou C, Chi P, He H, Li Y. Acoustic Shadowing Facilitates Ultrasound-guided Radial Artery Cannulation in Young Children. Anesthesiology. 2019 Nov 1;131(5):1018–24.

12. Zou Q, Jiang J, Shi C, Wu B, Gui B, Zhou X. Single and double developing lines improve ultrasound-guided radial artery catheterisation in obese patients: A Randomized Controlled Trial. Anaesth Crit Care Pain Med. 2022 Oct 25;101166.

13. Kiberenge RK, Ueda K, Rosauer B. Ultrasound-Guided Dynamic Needle Tip Positioning Technique Versus Palpation Technique for Radial Arterial Cannulation in Adult Surgical Patients: A Randomized Controlled Trial. Anesth Analg. 2018 Jan 1;126(1):120–6.

14.Kim SY, Kim KN, Jeong MA, Lee BS, Lim HJ. Ultrasound-guided dynamic needle tip positioning technique for radial artery cannulation in elderly patients: A prospective randomised controlled study. PLOS ONE. 2021 May 14;16(5):e0251712.

15.Peters C, Schwarz SKW, Yarnold CH, Kojic K, Kojic S, Head SJ. Ultrasound guidance versus direct palpation for radial artery catheterisation by expert operators: a randomised trial among Canadian cardiac anesthesiologists. Can J Anesth Can Anesth. 2015 Nov 1;62(11):1161–8.

16. Liu L, Tan Y, Li S, Tian J. "Modified Dynamic Needle Tip Positioning" Short-Axis, Out-of-Plane, Ultrasound-Guided Radial Artery Cannulation in Neonates: A Randomized Controlled Trial. Anesth Analg. 2019 Jul;129(1):178–83.

17. Moussa Pacha H, Alahdab F, Al-khadra Y, Idris A, Rabbat F, Darmoch F, et al. Ultrasound-guided versus palpation-guided radial artery catheterisation in adult population: A systematic review and meta-analysis of randomised controlled trials. Am Heart J. 2018 Oct 1;204:1–8.

18. Levin PD, Sheinin O, Gozal Y. Use of ultrasound guidance in the insertion of radial artery catheters. Crit Care Med. 2003 Feb;31(2):481–4.

19.Lynn Zaremski1 2. Prospective Comparison of Palpation Versus Ultrasound-Guided Radial Access for Cardiac Catheterization. J Invasive Cardiol [Internet]. 2013 Sep 27 [cited 2022 Nov 1];25(10). Available from: https://www.hmpgloballearningnetwork.com/site/jic/articles/prospective-comparison-palpation-versus-ultrasound-guided-radial-access-cardiac-catheteriza

20.O'Horo JC, Maki DG, Krupp AE, Safdar N. Arterial Catheters as a Source of Bloodstream Infection: A Systematic Review and Meta-Analysis*. Crit Care Med. 2014 Jun;42(6):1334–9.

21. Takeshita J, Yoshida T, Nakajima Y, Nakayama Y, Nishiyama K, Ito Y, et al. Superiority of dynamic needle tip positioning for ultrasound-guided peripheral venous catheterisation in patients younger than 2 years old: a randomised controlled trial. Pediatr Crit Care Med. 2019;20(9):e410–4.

22. Seyhan AU, Ak R. Ultrasound guidance versus conventional technique for radial artery puncture in septic shock patients: A pilot study. J Vasc Access. 2021;11297298211023300.

23. Takeshita J, Tachibana K, Nakayama Y, Nakajima Y, Hamada H, Yamashita T, et al. Ultrasound-guided dynamic needle tip positioning versus conventional palpation approach for catheterisation of posterior tibial or dorsalis pedis artery in infants and small children. Br J Anaesth. 2021;126(4):e140–2.

ANNEXURES

Annexure - 1

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर
All India Institute of Medical Sciences, Jodhpur
संस्थागत नैतिकता समिति
Institutional Ethics Committee

No. AIIMS/IEC/2021/3457 **Date: 12/03/2021**

ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: **AIIMS/IEC/2021/3292**

Project title: **"Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomized controlled trial"**

Nature of Project:	**Research Project Submitted for Expedited Review**
Submitted as:	**M.D. Dissertation**
Student Name:	**Dr. Mruthyunjaya N S**
Guide:	**Dr. Ankur Sharma**
Co-Guide:	**Dr. Pradeep Bhatia, Dr. Nikhil Kothari, Dr. Shilpa Goyal & Dr. Kamlesh Kumari**

Institutional Ethics Committee after thorough consideration accorded its approval on above project.

The investigator may therefore commence the research from the date of this certificate, using the reference number indicated above.

Please note that the AIIMS IEC must be informed immediately of:

- Any material change in the conditions or undertakings mentioned in the document.
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.
- In case of any issue related to compensation, the responsibility lies with the Investigator and Co-Investigators.

The Principal Investigator must report to the AIIMS IEC in the prescribed format, where applicable, bi-annually, and at the end of the project, in respect of ethical compliance.

AIIMS IEC retains the right to withdraw or amend this if:

- Any unethical principle or practices are revealed or suspected
- Relevant information has been withheld or misrepresented

AIIMS IEC shall have an access to any information or data at any time during the course or after completion of the project.

Please Note that this approval will be rectified whenever it is possible to hold a meeting in person of the Institutional Ethics Committee. It is possible that the PI may be asked to give more clarifications or the Institutional Ethics Committee may withhold the project. The Institutional Ethics Committee is adopting this procedure due to COVID-19 (Corona Virus) situation. If the Institutional Ethics Committee does not get back to you, this means your project has been cleared by the IEC.

On behalf of Ethics Committee, I wish you success in your research.

Dr. Praveen Sharma
Member Secretary
Member secretary
Institutional Ethics Committee
AIIMS,Jodhpur

Basni Phase-2, Jodhpur, Rajasthan-342005; **Website:** www.aiimsjodhpur.edu.in; **Phone:** 0291-2740741 Extn. 3109
E-mail : ethicscommittee@aiimsjodhpur.edu.in; ethicscommitteeaiimsjdh@gmail.com

Annexure - 2

All India Institute of Medical Sciences Jodhpur, Rajasthan

Patient Informed Consent Form (PICF)

Title of the project: **"Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial"**

Name of the PG Student: **Dr Mruthyunjaya N S.** Tel. No. : **9449197078**

Patient/Volunteer Identification No. : _____

I, _____ S/o or D/o _____R/o _____ _____give my full, free, voluntary consent to be a part of the study **Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial"** the procedure and nature of which has been explained to me in my own language to my full satisfaction. I confirm that I have had the opportunity to ask questions.

I understand my participation is voluntary, and I am aware of my right to opt-out of the study at any time without giving any reason.

I understand that the information collected about me and any of my medical records may be looked at by a responsible individual from AIIMS, Jodhpur. I give permission for these individuals to have access to my records.

I agree to take part in the above study.

Date: _____ _____

Place: _____ Signature/Left thumb impression

This is to certify that the above consent has been obtained in my presence.

Date: _____ _____

Place: _____ Signature of Principal Investigator

1. Witness 1

_____

Signature

Name: _____

Address: _____

2. Witness 2

_____

Signature

Name: _____

Address: _____

Annexure - 3

ऑल इंडिया इंस्टिट्यूट ऑफ मैडिकल साईंसिस जोधपुर, राजस्थान

रोगी सूचित सहमति प्रपत्र

प्रोजेक्ट का शीर्षक: " वयस्क मरीजों में अल्ट्रासाउंड-गाईडेड डायनेमिक नीडल टिप पोजिशनिंग टेक्नीक का अकॉस्टिक शैडोइंग टेक्नीक के साथ रेडियल धमनी का केन्युलेशन: एक यादृच्छिक नियंत्रित परीक्षण"

प्रमुख अन्वेषक: डॉ मृत्युंजय एन एस टेल. संख्या: 9449197078

रोगी पहचान सं. : _____

मैं,_____पुत्र/,पुत्री_____निवासी_____ _____" वयस्क मरीजों में अल्ट्रासाउंड-गाईडेड डायनेमिक नीडल टिप पोजिशनिंग टेक्नीक का अकॉस्टिक शैडोइंग टेक्नीक के साथ रेडियल धमनी का केन्युलेशन: एक यादृच्छिक नियंत्रित परीक्षण का हिस्सा बनने के लिए मेरी पूर्ण, स्वतंत्र, स्वैच्छिक सहमति देता हूँ, जिसकी प्रक्रिया और प्रकृति मुझे अपनी भाषा में अपनी पूर्ण संतुष्टि के लिए समझाया गया है। मैं पुष्टि करता हूं कि मुझे प्रश्न पूछने का अवसर मिला है।

मैं समझता हूं कि मेरी भागीदारी स्वैच्छिक है और किसी भी कारण के बिना किसी भी समय अध्ययन से बाहर निकलने के मेरे अधिकार से अवगत हूं।

मैं समझता हूं कि मेरे और मेरे किसी भी मेडिकल रिकॉर्ड के बारे में एकत्र की गई जानकारी एम्स, जोधपुर से जिम्मेदार व्यक्ति द्वारा देखी जा सकती है। मैं इन व्यक्तियों के लिए अपने रिकॉर्ड तक पहुंचने की अनुमति देता हूं।

मैं उपरोक्त अध्ययन में भाग लेने के लिए सहमत हूं।

तारीख: _____ _____

स्थान: _____ हस्ताक्षर / बाएं अंगूठे चिह्न

यह प्रमाणित करने के लिए कि उपर्युक्त सहमति मेरी उपस्थिति में प्राप्त की गई है।

तारीख: _____ _____

स्थान: _____ **प्रधान अन्वेषक के हस्ताक्षर**

1. गवाह 1 2. गवाह 2

_____ _____

हस्ताक्षर हस्ताक्षर

नाम: नाम:

पता पता

Annexure - 4

All India Institute of Medical Sciences Jodhpur, Rajasthan
PARTICIPANT INFORMATION SHEET (PIS)

Title of the project: **"Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial"**

Name of the PG Student: **Dr Mruthyunjaya N S.** Tel. No.: **9449197078**

I have been explained in my own understanding language by the attending anaesthesiologist that they are comparing the success rate of three different techniques of radial artery cannulation. I may be placed in group P [palpation technique] or group D [Ultrasound guided-Dynamic Needle Tip technique], or [Ultrasound guided-Acoustic Shadow technique] as per the randomisation number, but I will be unaware of the group I belong to. I will participate in this study from the beginning of anaesthesia till artery cannulation by either technique. I will be monitored in the intraoperative and postoperative periods per the hospital's anaesthesia protocol.

If this technique is superior, it will help reduce the number of attempts of artery cannulation, lesser duration of cannula insertion time, and its complications like digital ischemia, haemorrhage, thrombosis, and hematoma formation.

I have been explained that the occurrence of any significant side effects due to the use of the study techniques is extremely rare as both techniques are found to be very safe. I had a chance to go through the literature supporting the safe use of both these techniques in human beings. If any complication does occur, I will be provided free treatment by the hospital. No disability or death is expected from the study. I may withdraw myself from this study at any time, and it will not affect my routine care. The data obtained from me will be used for the purpose of the study only. All my records will be kept confidential. No extra cost and blood samples are required. I confirm that I have had the opportunity to ask questions.

Date: _____
Place: _____ Signature/Left thumb impression

This is to certify that the above consent has been obtained in my presence.

Date: _____

Signature of Principal Investigator

Place : _____

Witness 1 2. Witness 2

Signature Signature

Name: _____ Name: _____

Annexure - 5

ऑल इंडिया इंस्टिट्यूट ऑफ मैडिकल साईंसिस जोधपुर, राजस्थान

रोगी सूचना पत्रक

प्रोजेक्ट का शीर्षक: "वयस्क मरीजों में अल्ट्रासाउंड-गाईडेड डायनेमिक नीडल टिप पोजिशनिंग टेक्नीक का अकॉस्टिक शैडोइंग टेक्नीक के साथ रेडियल धमनी का केन्युलेशन: एक यादृच्छिक नियंत्रित परीक्षण"
"

मुख अन्वेषक: डॉ मृत्युंजय एन एस टेल. संख्या: 9449197078

मुझे अपनी भाषा में एनेस्थेसियोलॉजिस्ट द्वारा समझाया गया है कि वे रेडियल धमनी केन्युलेशन की तीन अलग-अलग तकनीकों की सफलता दर की तुलना कर रहे हैं।। मुझे यादृच्छिकता संख्या के अनुसार, समूह पी [पैलपेटरी तकनीक] या समूह डी [अल्ट्रासाउंड गाइडेड-डायनेमिक नीडल टिप तकनीक] या समूह ए [अल्ट्रासाउंड गाइडेड-अकॉस्टिक शैडो तकनीक] में रखा जा सकता है। लेकिन मैं उस ग्रुप से अनजान रहूंगा। मैं इस अध्ययन में एनेस्थीसिया की शुरुआत से लेकर दोनों तकनीक मे से किसी एक के द्वारा धमनी के केन्युलेशन होने तक में हिस्सा लूँगा मुझे अस्पताल के एनेस्थीसिया प्रोटोकॉल के अनुसार दोनों अंतःक्रियात्मक और इसके पश्चात की अवधि में निगरानी मे रखा जायेगा ।

यदि इस तकनीक को बेहतर पाया जाता है, तो यह धमनी केन्युलेशन के प्रयासों की संख्या, केन्युलेशन समय की अवधि और साथ ही यह डिजिटल इस्केमिआ , रक्तस्राव, घनास्त्रता और हेमटोमा गठन जैसी जटिलताओं को कम करेगा ।

मुझे समझाया गया है कि इन अध्ययन तकनीकों के उपयोग के कारण किसी भी महत्वपूर्ण दुष्प्रभाव की घटना अत्यंत दुर्लभ है क्योंकि दोनों तकनीकों को बहुत सुरक्षित पाया गया है । मुझे इन दोनों तकनीकों के मानव में सुरक्षित उपयोग का समर्थन करने वाले साहित्य को जानने का मौका मिला। यदि कोई जटिलता होती है, तो मुझे अस्पताल द्वारा मुफ्त उपचार प्रदान किया जाएगा। अध्ययन से कोई विकलांगता या मृत्यु होने की सम्भावना नहीं है । मैं किसी भी समय इस अध्ययन से खुद को हटा सकता हूं और यह मेरी नियमित देखभाल को प्रभावित नहीं करेगा। मुझसे प्राप्त डेटा का उपयोग केवल अध्ययन के उद्देश्य के लिए किया जाएगा। मेरे सभी रिकॉर्ड गोपनीय रखे जाएंगे। कोई अतिरिक्त लागत और रक्त के नमूने की आवश्यकता नहीं है। मैं पुष्टि करता हूं कि मुझे प्रश्न पूछने का अवसर मिला है।

तारीख: _____ _____

स्थान: _____

हस्ताक्षर / बाएं अंगूठे चिह्न

यह प्रमाणित करने के लिए कि उपर्युक्त सहमति मेरी उपस्थिति में प्राप्त की गई है।

तारीख: _____ _____

स्थान: _____ प्रधान अन्वेषक के हस्ताक्षर

1. गवाह 1 2. गवाह 2

_____ _____

हस्ताक्षर हस्ताक्षर

नाम: नाम:

पता पता

Annexure - 6

Proforma

S.No. Date:

Thesis Title: Comparison of two ultrasound-guided techniques (dynamic needle tip positioning and acoustic shadowing) with conventional palpation technique for radial arterial cannulation in adult patients: a randomised controlled trial

IPD Serial no/Sticker:

Observer: Name:

OT number:

Surgery/procedure:

Technique: Traditional Palpation/Dynamic needle tip /Acoustic shadowing.

Start time:

Number of times the cannula off from the skin:

Number of cannulas changed:

End Time (when the free flow is established in the cannula):

Total time taken for cannulation:

Total number of attempts:

Complications, if any, observed:

Result of canalising the selected artery (after 5 min): successful/failure

Remarks, if any, from the observer:

NAME	DATE	AIIMS ID	AGE	SEX	OT NUMBER	SURGERY/PROCEDURE	TECHNIQUE	TECHNIQUE CODE	START TIME	NUMBER OF TIMES CANNULA OFF FROM SKIN	NUMBER OF CANNULA CHANGED	END TIME[WHEN FREE FLOW IS ESTABLISHED]	TOTAL TIME TAKEN FOR CANNULATION [SECONDS]	TOTAL NUMBER OF ATTEMPTS	COMPLICATIONS	COMPLICATIONS CODE	SUCCESS/ FAILURE	REMARKS
KANAKA DEVI	17/09/2021	AIIMS/JDH/2021/08/000718	34	F	408	WLE AND RECONSTRUCTION	TRADITIONAL PALPATION	1	03:01:22PM	1	0	3:03:41PM	139	2	NONE	N	SUCCESS	NONE
LUNI DEVI	17/09/2021	AIIMS/JDH/2021/04/008613	66	F	409	WLE AND SUBMENTAL MADIBULECTOMY AND MRND	DYNAMIC NEEDLE	2	9:03:18AM	0	0	9:04:20am	62	1	NONE	N	SUCCESS	NONE
JAMNA DEVI	20/09/2021	AIIMS/JDH/2020/02/007584	54	F	408	WLE AND SEGMENTAL MANDIBULECTOMY AND MRND	TRADITIONAL PALPATION	1	9:10:11AM	0	0	9:13:24AM	193	1	NONE	N	SUCCESS	NONE
NANAK RAM	20/09/2021	AIIMS/JDH/2021/04/001948	37	M	409	WLE AND NECK DESECTION AND PMMC FLAP	ACOUSTIC SHADOWING	3	9:11:34AM	0	0	9:15:34AM	240	1	NONE	N	SUCCESS	NONE
CHANCHAL MATHUR	21/09/2021	AIIMS/JDH/2014/11/001848	60	F	409	PALLIATIVE MRM	DYNAMIC NEEDLE	2	9;15:22AM	0	0	9:18:24AM	182	1	NONE	N	SUCCESS	NONE
RACHANA YADAV	21/09/2021	AIIMS/JDH/2021/08/004492	17	F	408	TOTAL PARATIDECTOMY	TRADITIONAL PALPATION	1	9:04:22AM	1	1	9:08:28AM	246	2	NONE	N	SUCCESS	NONE
BABU DEVI	21/09/2021	AIIMS/JDH/2021/07/015271	38	F	408	TOTAL THIROIDECTOMY	ACOUSTIC SHADOWING	3	12:40:05PM	0	0	12:44:10PM	245	1	NONE	N	SUCCESS	NONE
ROOPA BABAL	22/09/2021	AIIMS/JDH/2021/09/007965	30	F	408	COMPLETE THYROIDECTOMY	DYNAMIC NEEDLE	2	9;12:09AM	0	0	09:14:20AM	131	1	NONE	N	SUCCESS	NONE
OM PRAKASH	22/09/2021	AIIMS/JDH/2021/08/006242	49	M	408	WLE AND RT SOND RECONSTRUCTION	ACOUSTIC SHADOWING	3	3:20:12PM	3	1	3:24:20PM	248	4	NONE	N	SUCCESS	NONE
GAVRI DEVI	23/09/2021	AIIMS/JDH/2021/09/004341	93	F	408	RIGHT MRM	TRADITIONAL PALPATION	1	9:05:32AM	4	2	-	>300	5	HEMATOMA	C	FAILURE	CHANGED TO DYNAMIC NEEDLE TECHNIQUE
MISHRI KHAN	23/09/2021	AIIMS/JDH/2021/04/010409	75	M	408	LOW ANTEROR RESECTION	TRADITIONAL PALPATION	1	3:05:22PM	0	0	3:05:54PM	32	1	NONE	N	SUCCESS	NONE
NAJMA MANSOOR	24/09/2021	AIIMS/JDH/2021/04/007818	61	F	409	WLE WITH COMPOSTIE RESECTION AND MRND	DYNAMIC NEEDLE	2	12:25:00PM	0	0	12:28:12PM	192	1	NONE	N	SUCCESS	NONE
SUMER DEVI	27/09/2021	AIIMS/JDH/2021/09/015441	45	F	409	LEFT LAP RADICAL NEPHRECTOMY	DYNAMIC NEEDLE	2	9:06;38AM	1	0	9;09:39 AM	181	2	NONE	N	SUCCESS	NONE
SAYARA	27/09/2021	AIIMS/JDH/2021/09/008129	58	F	409	PRIMARY CYTO REDUCTIVE SURGERY	ACOUSTIC SHADOWING	3	3;10:11PM	1	0	3;13;23PM	192	2	NONE	N	SUCCESS	NONE
HARI RAM	28/09/2021	AIIMS/JDH/2021/06/009005	60	M	408	WLE WITH MRND WITH SUB MENTAL FLAP	TRADITIONAL PALPATION	1	9:23:20AM	0	0	9:24:06AM	44	1	NONE	N	SUCCESS	NONE
SATYAVATHI	28/09/2021	AIIMS/JDH/2021/09/009359	40	F	409	PRIMARY CYTO REDUCTIVE SURGERY	ACOUSTIC SHADOWING	3	1;20:22PM	0	0	01:22:00PM	98	1	NONE	N	SUCCESS	NONE
BANVAR SINGH	29/09/2021	AIIMS/JDH/2021/09/011521	74	M	408	DIGNAOSTIC LAP AND RADICAL GARTRECTOMY	DYNAMIC NEEDLE	2	9:15:28AM	0	0	9;18:34AM	186	1	NONE	N	SUCCESS	NONE
SUADEVI	30/09/2021	AIIMS/JDH/2021/08/002249	50	F	408	RIGHT MRM	ACOUSTIC SHADOWING	3	9;12:30 AM	1	1	9:14:00AM	90	2	NONE	N	SUCCESS	NONE
HEMA RAM	30/09/2021	AIIMS/JDH/2021/07/006499	52	M	408	WLE WITH RT SOMND	TRADITIONAL PALPATION	1	12:05;11PM	0	0	12:05:45PM	34	1	NONE	N	SUCCESS	NONE
KOYAL DEVI	01/10/2021	AIIMS/JDH/2021/07/003009	78	F	409	LEFT MRM	ACOUSTIC SHADOWING	3	9;28:25AM	0	0	9:31;26AM	181	1	NONE	N	SUCCESS	NONE
SHYAM LA	01/10/2021	AIIMS/JDH/2021/09/005258	55	M	409	RIGHT RADICAL NEPHRECTOMY	DYNAMIC NEEDLE	2	12:20:05PM	0	0	12:22:06PM	121	1	NONE	N	SUCCESS	NONE
DEERAJ LAMBA	04/10/2021	AIIMS/JDH/2019/11/008043	46	M	409	WLE RIGH SEGMENTAL MANDIBULECTOMY	TRADITIONAL PALPATION	1	9:28:00AM	4	1	-	>300	5	HEMATOMA	C	FAILURE	CHANGED TO DYNAMIC NEEDLE TECHNIQUE
GULFISHAN	04/10/2021	AIIMS/JDH/2018/08/004520	40	F	409	TRANS ABDOMIANAL HISTERECTOMY	DYNAMIC NEEDLE	2	2:55:40PM	0	0	02:58:42PM	182	1	NONE	N	SUCCESS	NONE
MADHU BALA	05/10/2021	AIIMS/JDH/2021/01/019405	63	F	408	INTERVAL CYTOREDUCTION	ACOUSTIC SHADOWING	3	9:13:44AM	0	0	9:16;45AM	181	1	NONE	N	SUCCESS	NONE
DHAI DEVI	05/10/2021	AIIMS/JDH/2018/02/013566	37	F	409	TOTAL THYROIDECTOMY	TRADITIONAL PALPATION	1	3;45:55PM	0	0	3:46:15PM	20	1	NONE	N	SUCCESS	NONE
BHRAMANANDA	06/10/2021	AIIMS/JDH/2021/09/015232	72	M	408	TOTAL PARATIDECTOMY	DYNAMIC NEEDLE	2	9;21:34AM	0	0	09:22:38AM	64	1	NONE	N	SUCCESS	NONE
ALKA	07/10/2021	AIIMS/JDH/2021/10/002363	28	F	409	RIGHT BREAST CONSERVATIVE SURGERY	TRADITIONAL PALPATION	1	9:24:22AM	1	0	9:26:50AM	148	2	NONE	N	SUCCESS	NONE
NAJMA BANU	07/10/2021	AIIMS/JDH/2019/07/005617	42	F	408	LEFT MRM	ACOUSTIC SHADOWING	3	1:38:33PM	0	0	1;41:33PM	180	1	NONE	N	SUCCESS	NONE
SANTOSH	07/10/2021	AIIMS/JDH/2021/06/012562	25	F	409	TOTAL THYROIDECTOMY	DYNAMIC NEEDLE	2	3;55:12PM	0	0	3:57:14PM	122	1	NONE	N	SUCCESS	NONE
GEETA DEVI	11/10/2021	AIIMS/JDH/2021/05/009641	67	F	408	INTERVAL CYTOREDUCTION	TRADITIONAL PALPATION	1	2:55:40PM	1	0	2:57:55PM	135	2	NONE	N	SUCCESS	NONE
PARVATHI	11/10/2021	AIIMS/JDH/2021/04/010640	47	F	409	LEFT MRM	DYNAMIC NEEDLE	2	1:4019PM	0	0	1:41:21PM	62	1	NONE	N	SUCCESS	NONE
DINESH	12/10/2021	AIIMS/JDH/2021/04/014745	18	M	408	WLE	ACOUSTIC SHADOWING	3	2:02;12PM	0	0	2:04:14PM	122	1	NONE	N	SUCCESS	NONE
GAVARAI DEVI	13/10/2021	AIIMS/JDH/2021/01/012006	65	F	409	ILEOSTOMY CLOSURE	TRADITIONAL PALPATION	1	9;28:34AM	0	0	9:30:32AM	118	1	NONE	N	SUCCESS	NONE
LALITHA	18/10/2021	AIIMS/JDH/2021/07/001804	57	F	408	CYTOREDUCTION	ACOUSTIC SHADOWING	3	2:28:24PM	0	0	2:29:20PM	56	1	NONE	N	SUCCESS	NONE
DHAFU DEVI	21/10/2021	AIIMS/JDH/2021/08/017570	63	F	409	RADICAL HYSTERECTOMY	DYNAMIC NEEDLE	2	9:14:54AM	0	0	9:15:58AM	64	1	NONE	N	SUCCESS	NONE
REETI KUMAR	22/10/2021	AIIMS/JDH/2021/05/006067	51	F	408	RIGHT MRM	TRADITIONAL PALPATION	1	3;40;40PM	0	0	3:41:42PM	62	1	NONE	N	SUCCESS	NONE
SAYARA	22/10/2021	AIIMS/JDH/2021/10/011171	48	F	409	STAGING LAPROTOMY	TRADITIONAL PALPATION	1	3;50:40PM	0	0	3:50:59PM	19	1	NONE	N	SUCCESS	NONE
SAMDI	26/10/2021	AIIMS/JDH/2021/02/005782	66	F	408	RIGHT MRM	ACOUSTIC SHADOWING	3	2:55:30PM	0	0	2:56:45PM	75	1	NONE	N	SUCCESS	NONE
HARMAT BANU	27/10/2021	AIIMS/JDH/2021/09/004037	61	F	408	LAP EXCISION	DYNAMIC NEEDLE	2	9:09;22AM	0	0	9:10:22AM	60	1	NONE	N	SUCCESS	NONE
DALI	28/10/2021	AIIMS/JDH/2021/07/005050	65	F	409	INTERVAL CYTOREDUCTION	DYNAMIC NEEDLE	2	9:21:20AM	0	0	09:21:58AM	38	1	NONE	N	SUCCESS	NONE
DOLA RAM	28/10/2021	AIIMS/JDH/2021/07/003239	32	M	408	FREE FLAP ALT	ACOUSTIC SHADOWING	3	12:20:22PM	0	0	12:22:22PM	120	1	NONE	N	SUCCESS	NONE
PUSHPA DEVI	01/11/2021	AIIMS/JDH/2021/03/010282	56	F	408	LEFT MRM	TRADITIONAL PALPATION	1	9:24:01AM	0	0	9:25:21AM	80	1	NONE	N	SUCCESS	NONE
PARVAHTHI DEVI	04/11/2021	AIIMS/JDH/2021/08/016938	72	F	408	INTERVAL CYTOREDUCTION	TRADITIONAL PALPATION	1	9;19;09AM	0	0	9:21;10AM	121	1	NONE	N	SUCCESS	NONE
MANOJ MITHAL	09/11/2021	AIIMS/JDH/2021/06/000773	48	M	408	LAP EXCISION OF TUMOR	ACOUSTIC SHADOWING	3	9:28:04AM	0	0	09:29:02AM	58	1	NONE	N	SUCCESS	NONE
SOHAN LAL	10/11/2021	AIIMS/JDH/2021/06/002222	33	M	408	WLE RT SUB MENTAL MANDIBULECTOMY	DYNAMIC NEEDLE	2	12:50;13 PM	1	0	12:53:00PM	167	2	NONE	N	SUCCESS	NONE
ABE KAUSAR	11/11/2021	AIIMS/JDH/2021/09/001339	36	F	409	WLE AND RECONSTRUCTION	TRADITIONAL PALPATION	1	4;04:32PM	1	0	4:05:34PM	62	2	NONE	N	SUCCESS	NONE
MASTHAN	12/11/2021	AIIMS/JDH/2021/09/012238	70	M	408	WLE AND SUBMENTAL MADIBULECTOMY AND MRND	TRADITIONAL PALPATION	1	11:55:24AM	0	0	11:57:34AM	130	1	NONE	N	SUCCESS	NONE
MOHAN LAL SUTHAR	15/11/2021	AIIMS/JDH/2021/06/002913	40	M	408	EXPLORATORY LAP AND PROCEED	ACOUSTIC SHADOWING	3	09;20;22AM	0	0	9:21:22AM	60	1	NONE	N	SUCCESS	NONE
RAJBER KAUR	16/11/2021	AIIMS/JDH/2021/10/017474	30	F	408	BREAST CONSERVATIVE SURGERY	DYNAMIC NEEDLE	2	12:21:18PM	1	0	12:24:24PM	186	2	NONE	N	SUCCESS	NONE
MOH IQBAL	17/11/2021	AIIMS/JDH/2021/02/002540	50	M	408	WLE AND LEFT C2 COMPOSITE GRAFT	DYNAMIC NEEDLE	2	9:21:20AM	0	0	9:21;59AM	39	1	NONE	N	SUCCESS	NONE
DHANAWANTHI	18/11/2021	AIIMS/JDH/2021/06/006781	38	F	409	LEFT MRM	ACOUSTIC SHADOWING	3	2:44:30PM	1	1	2;48:38PM	248	2	NONE	N	SUCCESS	NONE
SIKUDI	18/11/2021	AIIMS/JDH/2021/11/006637	64	F	408	RADICAL HYSTERECTOMY	TRADITIONAL PALPATION	1	12;08:04PM	0	0	12;08:40PM	36	1	NONE	N	SUCCESS	NONE
JIYA DEVI	23/11/2021	AIIMS/JDH/2021/02/011378	66	F	408	RIGHT MRM	TRADITIONAL PALPATION	1	9;28:20AM	1	1	9:30:30AM	130	2	NONE	N	SUCCESS	NONE
LEELA KANWAR	23/11/2021	AIIMS/JDH/2021/11/009893	29	F	408	TOTAL THYROIDECTOMY	DYNAMIC NEEDLE	2	12:44:24PM	0	0	12:46:25PM	121	1	NONE	N	SUCCESS	NONE
KIYA TRAM	24/11/2021	AIIMS/JDH/2021/10/013398	46	M	409	WLE WITH MRND WITH SUB MENTAL MANIBULECTOMY	ACOUSTIC SHADOWING	3	1:05;38PM	0	0	1:09:38PM	240	1	NONE	N	SUCCESS	NONE
SHANTI DEVI	25/11/2021	AIIMS/JDH/2021/03/013630	66	F	409	RIGHT MRM	DYNAMIC NEEDLE	2	9:11:23AM	0	0	9:12:34AM	71	1	NONE	N	SUCCESS	NONE
KHADAR KHAN	25/11/2021	AIIMS/JDH/2021/11/004713	63	M	408	RIGHT RADICAL NEPHRECTOMY	ACOUSTIC SHADOWING	3	12:21:20PM	1	1	12:24:50PM	210	2	NONE	N	SUCCESS	NONE
MAMTHA	29/11/2021	AIIMS/JDH/2021/11/010926	40	F	408	WLE AND RT MRND	DYNAMIC NEEDLE	2	9:20:23AM	0	0	9:20:58AM	35	1	NONE	N	SUCCESS	NONE
NARBADA DEVI MUTHA	30/11/2021	AIIMS/JDH/2019/11/010173	58	F	409	LEFT HEPATECTOMUY	TRADITIONAL PALPATION	1	9:15:47AM	0	0	9:16:02AM	15	1	NONE	N	SUCCESS	NONE
ANJU VYAS	01/12/2021	AIIMS/JDH/2021/03/008530	46	F	409	RIGTH MRM	ACOUSTIC SHADOWING	3	3;55:11PM	1	0	3:58:12PM	181	2	NONE	N	SUCCESS	NONE
ABIR CHAND TANVAR	02/12/2021	AIIMS/JDH/2021/10/019499	67	M	409	RT RADICAL NEPHRECTOMY	DYNAMIC NEEDLE	2	9:18:07AM	0	0	9:22:20PM	253	1	NONE	N	SUCCESS	NONE
MOHAN KANWAR	02/12/2021	AIIMS/JSH/2021/07/010193	51	F	408	INTERVAL CYTOREDUCTION	ACOUSTIC SHADOWING	3	3:02:05PM	1	1	3:05:08PM	183	2	NONE	N	SUCCESS	NONE
ARJUN PARASHAR	03/12/2021	AIIMS/JDH/2021/08/017031	28	M	409	WLE WITH RT MANDIBULECTOMY	DYNAMIC NEEDLE	2	10:44;42AM	0	0	10:45:15AM	68	1	NONE	N	SUCCESS	NONE
JATHI DEVI	06/12/2021	AIIMS/JDH/2021/10/006980	65	F	408	VATS ESOPHAGECTOMY	TRADITIONAL PALPATION	1	9:15:09AM	3	1	-	>300	4	SPASAM	C	FAILURE	CHANGED TO DYNAMIC NEEDLE TECHNIQUE
MAMTHA DEVI	06/12/2021	AIIMS/JDH/2021/11/016410	33	F	409	STAGING LAPROTOMY	TRADITIONAL PALPATION	1	2:13;02PM	0	0	2:15:00PM	118	1	NONE	N	SUCCESS	NONE
BASANTHI	07/12/2021	AIIMS/JDH/2021/11/010500	55	F	409	LEFT MRM	ACOUSTIC SHADOWING	3	12:44:50PM	0	0	12:45:30PM	40	1	NONE	N	SUCCESS	NONE
SHYAM LAL	08/12/2021	AIIMS/JDH/2021/09/001074	43	M	409	WLE WITH COMPOSITE FLAP	DYNAMIC NEEDLE	2	9:17;34AM	0	0	9:20:36AM	182	1	NONE	N	SUCCESS	NONE
MANJU	08/12/2021	AIIMS/JDH/2021/05/008730	42	F	409	LEFT BCS	TRADITIONAL PALPATION	1	3;22:07PM	0	0	3:22:47PM	40	1	NONE	N	SUCCESS	NONE
BHIKI DEVI	09/12/2021	AIIMS/JDH/2021/07/003955	43	F	408	LOWER ANTERIOR RESECTION	DYNAMIC NEEDLE	2	2:28:44PM	0	0	2:32:44PM	240	1	NONE	N	SUCCESS	NONE
NANU RAM	13/12/2021	AIIMS/JDH/2019/01/028629	52	M	409	RT MRND	ACOUSTIC SHADOWING	3	9:11:17AM	1	1	9:14:18AM	181	2	NONE	N	SUCCESS	NONE
DAMI DEVI	14/12/2021	AIIMS/JDH/2021/12/005581	56	F	408	PRIMARY CYTO REDUCTIVE SURGERY	DYNAMIC NEEDLE	2	3:24;45 PM	1	1	3:28:55PM	250	2	NONE	N	SUCCESS	NONE
YUSUF ALI	15/12/2021	AIIMS/JDH/2021/11/001533	62	M	408	WLE WITH RECONSTRUCTION	ACOUSTIC SHADOWING	3	9:18:19AM	0	0	9:19:22AM	63	1	NONE	N	SUCCESS	NONE
SAROJ	16/12/2021	AIIMS/JDH/2021/05/004597	43	F	408	LEFT MRM	DYNAMIC NEEDLE	2	9:15:45AM	1	1	9:18:46AM	181	2	NONE	N	SUCCESS	NONE
KAMAL DEVI	17/12/2021	AIIMS/JDH/2021/11/014762	59	F	409	EXPLORATORY LAP AND PROCEED	ACOUSTIC SHADOWING	3	9:44:32AM	0	0	9:45:39AM	67	1	NONE	N	SUCCESS	NONE
SHANTHI DEVI	20/12/2021	AIIMS/JDH/2021/07/004960	54	F	409	RIGHT MRM	TRADITIONAL PALPATION	1	9:09;24AM	0	0	9:12:59AM	205	1	NONE	N	SUCCESS	NONE
SHARDHA LAKHARA	21/12/2021	AIIMS/JDH/2021/11/0101477	53	F	408	LEFT BCS	DYNAMIC NEEDLE	2	9:17:23AM	0	0	9:17:59AM	36	1	NONE	N	SUCCESS	NONE
MAFU KANWAR	21/12/2021	AIIMS/JDH/2021/12/009470	48	F	408	DIVERSION COLOSTOMY	TRADITIONAL PALPATION	1	2:55:32PM	1	1	2:58:32PM	180	2	NONE	N	SUCCESS	NONE
DAN SINGH	22/12/2021	AIIMS/JDH/2021/11/013176	93	M	409	WLE WITH SSG	TRADITIONAL PALPATION	1	9:32:34AM	1	1	9:35:38AM	124	2	NONE	N	SUCCESS	NONE
HIRA RAM	22/12/2021	AIIMS/JDH/2021/12/006732	24	M	408	WLE WITH MRND	DYNAMIC NEEDLE	2	3:55:52PM	0	0	3:58:45PM	173	1	NONE	N	SUCCESS	NONE
JYOTHI DEVI	23/12/2021	AIIMS/JDH/2021/10/006930	65	F	409	EXPLORATORY LAP AND PROCEED	ACOUSTIC SHADOWING	3	9:12:12;AM	0	0	9:14:30AM	138	1	NONE	N	SUCCESS	NONE
HASINA BANU	24/12/2021	AIIMS/JDH/2021/11/010536	60	F	409	WHIPPLES PROCEDURE	DYNAMIC NEEDLE	2	9:24:24AM	0	0	9:24:58AM	34	1	NONE	N	SUCCESS	NONE
INDU GEHALOT	28/12/2021	AIIMS/JDH/2015/09/009311	59	F	408	INTERVAL CYTOREDUCTION	ACOUSTIC SHADOWING	3	9:23:21AM	1	1	9:25:26AM	125	2	NONE	N	SUCCESS	NONE
KAILASH CHANDRA	29/12/2021	AIIMS/JDH/2019/06/006439	52	M	409	EXCISION OF TUMOR	TRADITIONAL PALPATION	1	1;45:39PM	0	0	1:47:56PM	137	1	NONE	N	SUCCESS	NONE
ABDHUL SADIK	30/12/2021	AIIMS/JDH/2021/12/002138	40	M	409	WLE WITH EXTENDED HEMI MANDIBULECTOMY	ACOUSTIC SHADOWING	3	9:11:34AM	0	0	9:13:36AM	122	1	NONE	N	SUCCESS	NONE
BAJUDI	30/12/2021	AIIMS/JDH/2021/11/005802	60	F	409	STAGING LAPROTOMY	DYNAMIC NEEDLE	2	2:41:11PM	4	2	-	>300	5	SPASAM	C	FAILURE	CATHETER IN FEMORAL ARTERY
RAM JOT TAWANI	31/12/2021	AIIMS/JDH/2018/10/008118	55	F	409	LEFT MRM	TRADITIONAL PALPATION	1	1:31:30PM	0	0	1:31:42PM	12	1	NONE	N	SUCCESS	NONE
DURGA	03/01/2022	AIIMS/JDH/2021/12/016860	60	F	409	PRIMARY CYTO REDUCTIVE SURGERY	ACOUSTIC SHADOWING	3	2:35:45PM	1	0	2:37:58PM	133	2	NONE	N	SUCCESS	NONE
MEERA	04/01/2022	AIIMS/JDH/2021/12/004611	48	F	408	WLE WITH LEFT MRND	TRADITIONAL PALPATION	1	9:17:24AM	0	0	9:18:34AM	70	1	NONE	N	SUCCESS	NONE
MEHRUNE	05/01/2022	AIIMS/JDH/2021/11/008423	66	F	409	WLE WITH LEFT MRND	DYNAMIC NEEDLE	2	9;12:23AM	0	0	9:12:49AM	26	1	NONE	N	SUCCESS	NONE
MEERA	06/01/2022	AIIMS/JDH/2021/12/004611	48	F	409	FREE FLAP RECONSTRUCTION	DYNAMIC NEEDLE	2	2:20:43PM	0	0	2:21:49PM	66	1	NONE	N	SUCCESS	NONE
JIHIMA DEV	07/01/2021	AIIMS/JDH/2021/12/010265	53	F	408	STAGING LAPROTOMY	ACOUSTIC SHADOWING	3	9:20:22AM	0	0	9:22:42AM	140	1	NONE	N	SUCCESS	NONE
SUSHILA	07/01/2022	AIIMS/JDH/2021/12/01943	35	F	409	WLE WITH MRND WITH PMMC RECONSTRUCTION	DYNAMIC NEEDLE	2	2:20:12PM	1	0	2:21:28PM	76	2	NONE	N	SUCCESS	NONE
DHRAMVEER	10/01/2022	AIIMS/JDH/2022/01/022905	42	M	408	WLE WITH MRND WITH PMMC RECONSTRUCTION	TRADITIONAL PALPATION	1	9:22;23AM	0	0	9:23:02AM	39	1	NONE	N	SUCCESS	NONE
PAWANI DEVI	11/01/2022	AIIMS/JDH/2021/06/003046	43	F	409	RT BCS WITH LN DISECTION	ACOUSTIC SHADOWING	3	9:22:23AM	0	0	9:24:21AM	118	1	NONE	N	SUCCESS	NONE
GODA RAM	12/01/2022	AIIMS/JDH/2021/12/011228	49	M	409	WLE WITH FREE FLAP RECONSTRUCTION	ACOUSTIC SHADOWING	3	9:50:20AM	0	0	9:51:48AM	88	1	NONE	N	SUCCESS	NONE
KALI DEVI	12/01/2022	AIIMS/JDH/2022/01/023685	40	F	409	WLE WITH LT MRND WIITH PMMC FLAP	TRADITIONAL PALPATION	1	12:58:32PM	1	0	12:59:02PM	30	2	NONE	N	SUCCESS	NONE
SOHAN RAM	13/01/2022	AIIMS/JDH/2022/01/025777	37	M	409	WLE WITH MRND WITH PMMC RECONSTRUCTION	DYNAMIC NEEDLE	2	09:20:13AM	1	1	09:21:58AM	105	2	NONE	N	SUCCESS	NONE
KHERAJ RAM	14/01/2022	AIIMS/JDH/2021/12/012789	66	M	409	WLE WITH RECONSTRUCTION	ACOUSTIC SHADOWING	3	10:45;23AM	0	0	10:48:32AM	189	1	NONE	N	SUCCESS	NONE
MO RAHIM	17/01/2022	AIIMS/JDH/2021/12/014123	40	M	408	WLE WITH PMMC FLAP	TRADITIONAL PALPATION	1	9:22:23AM	0	0	09:24:32AM	129	1	NONE	N	SUCCESS	NONE
CHAMPA DEVI	17/01/2022	AIIMS/JDH/2021/10/011035	47	F	409	TOTAL LARYGECTOMY	DYNAMICNEEDLE	2	10:45:38AM	0	0	10:47:44AM	126	1	NONE	N	SUCCESS	NONE
LALITHA	19/01/2022	AIIMS/JDH/2021/12/009397	70	F	409	WLE AND RECONSTRUCTION	TRADITIONAL PALPATION	1	9;17:20 AM	1	0	9:20:33AM	193	2	NONE	N	SUCCESS	NONE
SAYARA	19/01/2022	AIIMS/JDH/2021/06/009128	61	F	408	LEFT MRM	ACOUSTIC SHADOWING	3	12:08:09PM	0	0	12:11:30PM	201	1	NONE	N	SUCCESS	NONE
NATHI DEVI	21/01/2022	AIIMS/JDH/2022/01/028880	35	F	409	TOTAL ABDOMINAL HYTERECTOMY	DYNAMIC NEEDLE	2	9:30:13AM	1	1	9:32:32AM	139	2	NONE	N	SUCCESS	NONE
KAVITHA	25/01/2022	AIIMS/JDH/2021/02/011227	40	F	408	LEFT MRM	ACOUSTIC SHADOWING	3	9:10:41AM	4	2	-	>300	5	HEMATOMA/SPASAM	C	FAILURE	CATHETER IN FEMORAL ARTERY
KAMALA DEVI	28/01/2022	AIIMS/JDH/2022/01/026692	43	F	409	RIGHT MRM	ACOUSTIC SHADOWING	3	1:35:49PM	0	0	1:36:09PM	20		NONE	N	SUCCESS	NONE
MAGA RAM	31/01/2022	AIIMS/JDH/2022/01/033176	54	M	408	WLE WITH LT SOHND	DYNAMIC NEEDLE	2	9:08:32AM	0	0	9:09:12AM	40	1	NONE	N	SUCCESS	NONE
JETAHA RAM	31/01/2022	AIIMS/JDH/2019/03/016443	37	M	408	WLE WITH RT MRND WITH PMMC	TRADITIONAL PALPATION	1	1:35:54PM	1	0	1:37:58PM	124	2	NONE	N	SUCCESS	NONE
BAYA BAI	02/02/2022	AIIMS/JDH/2022/01/034873	70	F	408	STAGING LAPROTOMY	ACOUSTIC SHADOWING	3	9:21;14AM	0		9:22:15AM	61	1	NONE	N	SUCCESS	NONE
VIJAY SINGH	02/02/2022	AIIMS/JDH/2021/12/011947	40	M	409	WLE WITH RIGHT SEGMENTAL MANDIBULECTOMY	DYNAMIC NEEDLE	2	1:01:23PM	1	0	1:03;34PM	131	2	NONE	N	SUCCESS	NONE
TOG PURI	07/02/2022	AIIMS/JDH/2017/07/013837	39	M	409	TOTAL THYROIDECTOMY	ACOUSTIC SHADOWING	3	12:44:42PM	0	0	12:45:00PM	18	1	NONE	N	SUCCESS	NONE
SURESH KUMAR	08/02/2022	AIIMS/JDH/2022/01/020226	64	M	408	WHIPPLES PROCEDURE	TRADITIONAL PALPATION	1	09:16:20AM	0	0	09:16:32AM	12	1	NONE	N	SUCCESS	NONE
KISHORE SAHNI	09/02/2022	AIIMS/JDH/2021/12/014775	40	M	408	WLE WITH MANDIBULECTOMY WITH MRND	DYNAMIC NEEDLE	2	9:24:32AM	1	0	09:24:58AM	26	2	NONE	N	SUCCESS	NONE
DINESH KUMAR	09/02/2022	AIIMS/JDH/2022/01/021629	25	M	409	RIGHT HIGH INGUINAL ORCHIDECTOMY	ACOUSTIC SHADOWING	3	11:45:24AM	0	0	11:46 27 AM	90	1	NONE	N	SUCCESS	NONE
RASHIDA	14/02/2022	AIIMS/JDH/2021/12/012233	56	M	408	WLE WITH MRND WITH MANDIBULECTOMY	DYNAMIC NEEDLE	2	9;31:40AM	1	0	9;32:24 AM	44	2	NONE	N	SUCCESS	NONE
KHETA RAM	15/02/2022	AIIMS/JDH/2022/01/022959	45	M	409	WLE WITH MRND	TRADITIONAL PALPATION	1	9:14:22AM	0	0	09:15:12AM	50	1	NONE	N	SUCCESS	NONE
MANJU DEVI	15/02/2022	AIIMS/JDH/2022/01/033498	56	F	409	HYSTERECTOMY	ACOUSTIC SHADOWING	3	2:48:12PM	0	0	02:49:02PM	50	1	NONE	N	SUCCESS	NONE
LEELA	16/02/2022	AIIMS/JDH/2022/01/026405	45	F	408	WLE WITH MRND	DYNAMIC NEEDLE	2	09:21:31AM	0	0	9:23:21AM	110	1	NONE	N	SUCCESS	NONE
SAMUDI	17/02/2022	AIIMS/JDH/2021/02/012082	48	F	409	RIGHT MRM	TRADITIONAL PALPATION	1	09:23:12AM	0		09:23:21AM	9	1	NONE	N	SUCCESS	NONE
JARINA	17/02/2022	AIIMS/JDH/2022/02/003392	26	F	408	LAP AND PROCEED	TRADITIONAL PALPATION	1	12:53:23PM	0	0	12:54:20PM	57	1	NONE	N	SUCCESS	NONE
KRISHNA	17/02/2022	AIIMS/JDH/2022/01/028432	55	F	12-Feb	INTERVAL CYTOREDUCTION	DYNAMIC NEEDLE	2	2:10:51PM	0	0	2:11:42PM	51	1	NONE	N	SUCCESS	NONE
NARAYAN RAM	21/02/2022	AIIMS/JDH/2022/01/029848	58	M	409	RIGHT NEPHRECTOMY	DYNAMIC NEEDLE	2	09:17:57AM	1	1	9:19:47AM	110	2	NONE	N	SUCCESS	NONE
PRAKASH GODARA	21/02/2022	AIIMS/JDH/2021/12/019263	35	M	409	LEFT SEGMENTAL MANDIBULECTOMY	ACOUSTIC SHADOWING	3	1;20;23 PM	1	0	1:22:00PM	97	2	NONE	N	SUCCESS	NONE
VEERENDRA DEORA	22/02/2022	AIIMS/JDH/2022/01/024985	41	M	409	WLE WITH SEGMENTAL MANDIBULECTOMY	TRADITIONAL PALPATION	1	09:09:21AM	0	0	09:10:02AM	41	1	NONE	N	SUCCESS	NONE
JEETHU KANWAR	23/02/2022	AIIMS/JDH/2021/09/009468	42	F	408	HIPEC	DYNAMIC NEEDLE	2	09:29:20AM	0	0	09:29:40AM	20	1	NONE	N	SUCCESS	NONE
JHAMAKU	24/02/2022	AIIMS/JDH/2021/11/000857	69	F	408	INTERVAL CYTOREDUCTION	ACOUSTIC SHADOWING	3	09:29:00AM	0	0	9:29:32:AM	32	1	NONE	N	SUCCESS	NONE
HEMI DEVI	24/02/2022	AIIMS/JDH/2021/09/001305	66	F	408	POSTERIOR EXCENTERATION	TRADITIONAL PALPATION	1	1:41:32PM	0	0	1:42:42PM	70	1	NONE	N	SUCCESS	NONE
DAKU DEVI	25/02/2022	AIIMS/JDH/2022/01/034748	60	F	409	RT MRM	DYNAMIC NEEDLE	2	3:50:32PM	2	1	3:54:32PM	240	3	NONE	N	SUCCESS	NONE
AMAN SINGH BHATI	28/02/2022	AIIMS/JDH/2022/02/010810	71	M	408	LARYNGECTOMY	ACOUSTIC SHADOWING	3	09:28:30AM	1	0	9:30:44AM	134	2	NONE	N	SUCCESS	NONE
SAMIM BANU	03/03/2022	AIIMS/JDH/2021/06/008842	28	F	408	LEFT MRM	DYNAMIC NEEDLE	2	09:17:13AM	3	0	09:21:24AM	251	4	NONE	N	SUCCESS	NONE
PUNMA RAM	03/03/2022	AIIMS/JDH/2022/02/002207	41	M	409	WLE WITH SOHND	ACOUSTIC SHADOWING	3	1:51;32 PM	1	0	1:52:22PM	50	2	NONE	N	SUCCESS	NONE
HARI OM KANWAR	04/03/2022	AIIMS/JDH/2021/06/002121	47	F	409	RIGHT MRM	TRADITIONAL PALPATION	1	2:54:39PM	0	0	2:55:29PM	50	1	NONE	N	SUCCESS	NONE
FARIDA	07/03/2022	AIIMS/JDH/2021/10/016460	52	F	408	LAP MACEWENS ESOPHEGECTOMY	TRADITIONAL PALPATION	1	09:20:22AM	0	0	09:22:18AM	118	1	NONE	N	SUCCESS	NONE
MANJU	07/03/2022	AIIMS/JDH/2017/11/014615	44	F	409	DIADNOSTIC LAPROSOPY	ACOUSTIC SHADOWING	3	3:19:18PM	0	0	3:19:58PM	40	1	NONE	N	SUCCESS	NONE
BHANWAR SINGH	08/03/2022	AIIMS/JDH/2022/02/014975	62	M	408	WHIPPLES PROCEDURE	DYNMIC NEEDLE	2	9:16:22AM	1	0	9:18:24AM	122	2	NONE	N	SUCCESS	NONE
KAILASH CHAND	08/03/2022	AIIMS/JDH/2018/07/017183	54	M	409	WIDE LOCAL EXCISION	ACOUSTIC SHADOWING	3	12:22:18PM	3	2	-	>300	4	SPASAM	C	FAILURE	FEMORAL ARTERY CATHETERIZED
GOGI DEVI	09/03/2022	AIIMS/JDH/2022/02/013476	72	F	408	WLE WITH PMMC FLAP	TRADITIONAL PALPATION	1	9:23:20AM	0	0	09:23:40AM	20	1	NONE	N	SUCCESS	NONE
ASHOK VISHNAV	10/03/2022	AIIMS/JSH/2022/02/014643	45	M	409	LEFT MRND WITH PMMC FLAP	TRADITIONAL PALPATION	1	9:18:22AM	0	0	9:19:22AM	60	1	NONE	N	SUCCESS	NONE
GAYTREE	10/03/2022	AIIMS/JDH/2022/02/003170	56	F	408	BCS WITH LD FLAP	DYNAMIC NEEDLE	2	2:42:52PM	0	0	2:43:18PM	26	1	NONE	N	SUCCESS	NONE
DAULARAM	11/03/2022	AIIMS/JDH/2022/02/003977	33	M	409	WLE WITH ALT FREE FLAP	DYNAMIC NEEDLE	2	9:21:18AM	0	0	9:22:28AM	70	1	NONE	N	SUCCESS	NONE
MOHINI DEVI	14/03/2022	AIIMS/JDH/2021/11/015536	33	F	409	LEFT BCS WITH LD FLAP	ACOUSTIC SHADOWING	3	9:10:32AM	0	0	9:12:48AM	136	1	NONE	N	SUCCESS	NONE
SHAILAJA AGARWAL	14/03/2022	AIIMS/JDH/2021/08/013913	55	F	409	RT BCS WITH LN DISECTION	ACOUSTIC SHADOWING	3	2:58:23PM	0	0	2:59:42PM	79	1	NONE	N	SUCCESS	NONE
MADHU	14/03/2022	AIIMS/JDH/2022/03/000334	45	F	408	RT MRM	ACOUSTIC SHADOWING	3	4:32:23PM	0	0	4:33:23PM	60	1	NONE	N	SUCCESS	NONE
RANI DEVI	15/03/2022	AIIMS/JDH/2020/02/006259	52	F	408	TOTAL PELVIC EXTENTRATION	TRADITIONAL PALPATION	1	9:24;34AM	0	0	9:24:58AM	24	1	NONE	N	SUCCESS	NONE
ANIL	16/03/2022	AIIMS/JDH/2021/12/018058	41	M	409	WLE WITH SSG	DYNAMIC NEEDLE	2	9:18:23AM	0	0	9:18:48AM	25	1	NONE	N	SUCCESS	NONE
CHUKI DEVI	16/03/2022	AIIMS/JDH/2022/03/0019544	45	F	409	RADICAL HYSTERECTOMY	DYNAMIC NEEDLE	2	12:58:49PM	1	0	12:59:58PM	69	2	NONE	N	SUCCESS	NONE
KANTA	17/03/2022	AIIMS/JDH/2021/08/008577	35	F	409	LEFT BCSWITHLD FLAP RECONSTRUCTION	ACOUSTIC SHADOWING	3	9:32:12AM	0	0	9:32:24AM	12	1	NONE	N	SUCCESS	NONE
UMMEDA RAM	17/03/2022	AIIMS/JDH/2021/11/010367	37	M	408	SALVAGE NEK DISECTION	TRADITIONAL PALPATION	1	3:22:12PM	0	0	3:23:10PM	58	1	NONE	N	SUCCESS	NONE
RAMSWAROOP	21/03/2022	AIIMS/JDH/2022/01/033215	51	M	409	SEGMENTAL MADIBULECTOMY	DYNAMIC NEEDLE	2	9:18:23AM	0	0	9:19:12AM	49	1	NONE	N	SUCCESS	NONE
JAMNA DEVI	21/03/2022	AIIMS/JDH/2022/03/003018	66	F	407	LEFT BCS	ACOUSTIC SHADOWING	3	2:59:23PM	0	0	3:01:23PM	60	1	NONE	N	SUCCESS	NONE
MOH ILIYAS	22/03/2022	AIIMS/JDH/2022/03/005473	47	M	408	WLE WITH MRND WITH PMMC RECONSTRUCTION	TRADITIONAL PALPATION	1	9:24:32AM	0	0	9:25:32AM	60	1	NONE	N	SUCCESS	NONE
SUMAYARA	22/03/2022	AIIMS/JDH/2022/03/004496	22	F	408	DISTAL PANCREATECTOMY	DYNAMIC NEEDLE	2	1:42;32PM	0	0	1:43:43PM	71	1	NONE	N	SUCCESS	NONE
CHAGAN SINGH	23/03/2022	AIIMS/JDH/2022/02/005649	62	M	409	WLE WITH FREE FLAP RECONSTRUCTION	ACOUSTIC SHADOWING	3	9:30:12AM	1	1	9:32:21AM	129	2	NONE	N	SUCCESS	NONE
HANIFA	23/03/2022	AIIMS/JDH/2021/06/014070	33	M	408	RIGHT MRM	DYNAMIC NEEDLE	2	3;22:23PM	0	0	03:22:32PM	69	1	NONE	N	SUCCESS	NONE
RAMPAL	03/01/2022	AIIMS/JDH/2021/04/004029	62	M	407	OPEN ESOPHEGECTOMY	TRADITIONAL PALPATION	1	9:32:32AM	0	0	9:33:33AM	61	1	NONE	N	SUCCESS	NONE
PUSHPA KANWAR	04/01/2022	AIIMS/JDH/2021/12/017116	55	F	402	OPEN DECORTICATIONOF LIVER CYST	TRADITIONAL PALPATION	1	1:53:23PM	1	0	1:54:32PM	69	2	NONE	N	SUCCESS	NONE
KANHAIYA LAL	05/01/2022	AIIMS/JDH/2021/05/008133	62	M	407	OPEN LIMITED ILIOCOLONIC RESECTION	ACOUSTIC SHADOWING	3	9;34:23AM	0	0	9:34:32AM	9	1	NONE	N	SUCCESS	NONE
BIRDHA RAM	06/01/2022	AIIMS/JDH/2021/12/018364	58	M	407	EXP LAP AND PROCEED	DYNAMIC NEEDLE	2	12:42:32PM	0	0	12:42:57PM	25	1	NONE	N	SUCCESS	NONE
AEBU	07/01/2022	AIMMS/JDH/2021/12/018259	66	F	407	OPEN HELLERS MYOTOMY	ACOUSTIC SHADOWING	3	9:32:21AM	0	0	9:32:38AM	17	1	NONE	N	SUCCESS	NONE
SUHAN LAL	13/02/2022	AIIMS/JDH/2022/01/020507	44	M	402	EL,GI,FJ	TRADITIONAL PALPATION	1	9:12:32AM	2	0	9:15:21AM	169	3	NONE	N	SUCCESS	NONE
SUNIL SANKHALA	14/02/2022	AIIMS/JDH/2021/12/005127	23	M	407	OPEN SPLEENECTOMY	DYNAMIC NEEDLE	2	9:31:12AM	0	0	9:32:17AM	65	1	NONE	N	SUCCESS	NONE
SUSHILA DEVI	15/02/2022	AIIMS/JDH/2021/12/002003	56	F	407	LAP CHOLECYSTECTOMY	ACOUSTIC SHADOWING	3	9:12:10AM	0	0	9:13:12AM	62	1	NONE	N	SUCCESS	NONE
SONI DEVI	15/02/2022	AIIMS/JDH/2022/02/005702	82	F	402	LAP FUNDOPLICATION	DYNMIC NEEDLE	2	9:30:12AM	1	0	09:30:58AM	46	2	NONE	N	SUCCESS	NONE
AMIRA	21/02/2022	AIIMS/JDH/2022/02/008843	30	F	407	LAP CHOLECYSTECTOMY	DYNAMIC NEEDLE	2	9:13:12AM	2	0	9:14:13AM	61	3	NONE	N	SUCCESS	NONE
UMED KHAN	22/02/2022	AIIMS/JDH/2021/09/012811	60	M	407	STOMA CLOSURE	ACOUSTIC SHADOWING	3	9:20:12AM	0	0	9:21:10AM	58	1	NONE	N	SUCCESS	NONE
NIRDOSH DEVI	25/02/2022	AIIMS/JDH/2022/02/011424	34	F	402	WHIPPLES PROCEDURE	TRADITIONAL PALPATION	1	9:18:32:AM	1	1	9:19:21AM	49	2	NONE	N	SUCCESS	NONE
JAMNA DEVI	03/03/2022	AIIMS/JDH/2022/03/000008	82	F	407	TOTAL GASTRECTOMY	DYNAMIC NEEDLE	2	9:45:21AM	0	0	9:46:12AM	51	1	NONE	N	SUCCESS	NONE
KESI	09/03/2022	AIIMS/JDH/2021/10/008914	51	F	407	ESOPHAGECTOMY WITH GASATRIC PULL UP	TRADITIONAL PALPATION	1	9:50:12AM	1	0	9:50:59AM	47	2	NONE	N	SUCCESS	NONE
PABOO RAM	11/03/2022	AIIMS/JDH/2022/02/017721	42	M	407	RADICAL CHOLECYSTECTOMY	TRADITIONAL PALPATION	1	9:42:23AM	1	0	9:43:21AM	58	2	NONE	N	SUCCESS	NONE
DHARMA RAM	13/03/2022	AIIMS/JDH/2022/03/002423	50	M	407	OPEN HEPATECTOMY	DYNAMIC NEEDLE	2	9:52:12AM	2	0	9:54:14AM	122	3	NONE	N	SUCCESS	NONE
LALI	15/03/2022	AIIMS/JDH/2021/11/004449	46	F	402	LAP GASTRECTOMY	ACOUSTIC SHADOWING	3	9:42:21AM	0	0	9:42:34AM	13	1	NONE	N	SUCCESS	NONE
MOHAMMED TAIYYAB	16/03/2022	AIIMS/JDH/2022/03/006279	18	M	407	LAP HELLERS MYOTOMY	TRADITIONAL PALPATION	1	3:19:11PM	0	0	3:19:48PM	37	1	NONE	N	SUCCESS	NONE
RAHMAT KHATU	09/12/2022	AIIMS/JDH/2022/12/001976	42	F	407	HYDATID CYST DEROOFING	ACOUSTIC SHADOWING	3	9:14:12AM	0	0	9:16:10AM	118	1	NONE	N	SUCCESS	NONE
KANCHAN	21/03/2022	AIIMS/JDH/2021/07/001142	30	F	407	GRACILLEN FLAP REPAIR	ACOUSTIC SHADOWING	3	9:58:12AM	1	0	9:58:59AM	47	2	NONE	N	SUCCESS	NONE
VIDA RAM	08/12/2022	AIIMS/JDH/2022/12/000589	59	M	407	WHIPPLES PROCEDURE	ACOUSTIC SHADOWING	3	10:21:10AM	0	0	10:21;50AM	40	1	NONE	N	SUCCESS	NONE
CHENA RAM	22/03/2022	AIIMS/JDH/2022/03/004809	63	M	402	LEFT HEPATECTOMUY	TRADITIONAL PALPATION	1	9:52:13AM	0	0	9:52;28AM	15	1	NONE	N	SUCCESS	NONE
RAM KISHORE	23/03/2022	AIIMS/JDH/2022/03/006628	63	M	407	WHIPPLES PROCEDURE	TRADITIONAL PALPATION	1	9:46:12AM	0	0	9:47:12AM	60	1	NONE	N	SUCCESS	NONE
JAGDISH PRASAD	12/12/2022	AIIMS/JDH/2022/11/009192	46	M	407	CBD EXPLORATION	ACOUSTIC SHADOWING	3	10:14:22AM	0	0	10:16:28AM	126	1	NONE	N	SUCCESS	NONE
LEELA SONI	30/03/2022	AIIMS/JDH/2021/07/008891	65	F	407	OPEN CHOLECYSTECTOMY RADICAL	TRADITIONAL PALPATION	1	9:56:12AM	0	0	9:56:45AM	33	1	NONE	N	SUCCESS	NONE
JOGA RAM	31/03/2022	AIIMS/JDH/2022/03/016138	64	M	407	OPEN EI AND PROCEED	TRADITIONAL PALPATION	1	9:21:21AM	1	1	9:22:32AM	71	2	NONE	N	SUCCESS	NONE
OM PRAKASH	13/12/2022	AIIMS/JDH/2022/07/008764	28	M	407	EXPLORATIVE LAP AND PROCEED	TRADITIONAL PALPATION	1	9:25:50AM	0	0	9:26:27AM	37	1	NONE	N	SUCCESS	NONE