



“PRE-PROCEDURAL ULTRASOUND GUIDED V/S LANDMARK TECHNIQUE TO IDENTIFY THE INTRATHECAL SPACE IN ADULT PATIENTS UNDERGOING LOWER LIMB SURGERIES” A PROSPECTIVE RANDOMISED CONTROL TRAIL

Anaesthesiology

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ABSTRACT

Background: The landmark technique is most commonly practised to identify the site of puncture by palpating the interspinous spaces, but locating the site of puncture is difficult, which is associated with back pain and PDPH which is directly related with multiple puncture and attempts. Ultrasound guided technique helps in identifying intervertebral space, which improves the quality of analgesia by directly depositing in correct space and reduces the procedure related complications. **Aims & Objectives:** To study the effectiveness of pre procedural USG v/s landmark technique to identify the intrathecal space by single attempt success, time taken to perform spinal anaesthesia, incidence of back pain and PDPH. **Materials & Methods:** A prospective randomised control trail was carried out in 100 patients (50 in Group EF i.e., Landmark technique and 50 in Group EG i.e., Ultrasound guided technique) of 18 to 55 years of age scheduled to undergo elective lower limb surgeries. **Results:** When we compared by single attempt success in group EF 7(14%) and group EG 29(58%) respectively; $p < 0.001$, time taken to perform spinal anaesthesia in group EF is 114.28 seconds and group EG is 75.91 seconds respectively $p < 0.001$, incidence of back pain in group EF 16(32%) and group EG 4(8%) respectively $p = 0.001$ and PDPH in group EF 8(16%) and group EG 2(4%) respectively $p = 0.02$, between the two groups, the difference was statistically significant. **Conclusion:** Ultrasound guided blockade is more effective as compared to Landmark technique as it improves first pass needle success rate and reduces the number of needle puncture attempts, decrease the procedural time, thus lowering the risk of back pain and PDPH.

KEYWORDS

INTRODUCTION

Spinal anaesthesia is the most widely performed using landmark technique and its success relies on the proper identification of the anatomical landmark^{1,2,7}.

The landmark technique for spinal anaesthesia is associated with in back pain and postdural puncture headache (PDPH) which are directly related with multiple puncture and attempts^{1,2,3}.

Ultrasound guided technique of spinal anaesthesia helps in identifying intervertebral space and assessment of depth. It also improves the success rate of first entry and minimize the number of puncture and allowing the selection of needle length and improves the quality of analgesia by depositing in correct space and reduces the procedure related complication^{2,3,4,5,6,7}. Therefore ultrasound guided spinal anaesthesia is more effective than the landmark technique to assess intrathecal space and subsequent spinal anaesthesia especially when patients are obese and elderly.

Henceforth in our study we want to compare the effectiveness of landmark technique and pre procedural USG guided assessment of intrathecal space in our set up.

Aims & Objectives

Our study aimed at compare the effectiveness of pre-procedural ultrasound assisted v/s landmark technique to identify the intrathecal space in patients undergoing lower limb surgeries.

Objectives: Our study primary objective is single attempt success rate and secondary objective is to compare time taken to perform spinal anaesthesia, incidence of back pain and PDPH.

MATERIALS AND METHODS

A prospective randomised control trail was carried out in 100 patients (50 in group EF i.e., Landmark technique and 50 in group EG i.e., Ultrasound guided technique) of 18 to 55 years of age in Department of Anaesthesiology and Critical Care at Navodaya Medical College Hospital and Research Centre, Raichur, patients are scheduled to undergo elective lower limb surgeries.

Study Duration: 18 months

Study Design: A prospective randomised control trail

Sample Size: 100 patients

Inclusion Criteria

1. Patients belonging to ASA I and II
2. Age: Adult more than 18-55 years of either sex
3. Patients undergoing elective lower limb surgeries

Exclusion Criteria

1. Patient refusal
2. Hypersensitivity to local anaesthesia
3. Local infection at the site of lumbar puncture
4. Bleeding disorders
5. Deformity of the vertebral spine and previous spine surgeries
6. Patients with pre-existing significant systemic disease

Sample Size

The sample size was calculated based on the formula used for sample size calculation for prospective randomised control trail

$$n = \frac{4pq}{d^2}$$

Chi square (χ^2) Test is used for test significance

p is prevalence 80 %

q is non - prevalence 20 %

d is Allowable error 10% of $p = 8$

By substituting the values in the above formula, the sample size obtained was 100

Statistical Analysis

A prospective randomised control trail was used to characterize the study sample by first pass success rate, back pain, time taken to perform spinal anaesthesia, back pain and PDPH. Statistical analysis was performed using SPSS 24.0 version IBM USA. Significance was set as $P < 0.05$

RESULTS

The Hospital based prospective randomised control trail was conducted at the operation theatre of Navodaya Medical College Hospital and Research Centre, Raichur. A total of 100 patients were included in the study, of which 78 were males and 32 were females.

When we compared by single attempt success in group EF 7(14%) and group EG 29(58%) respectively; $p < 0.001$, time taken to perform spinal anaesthesia in group EF is 114.28 seconds and group EG is 75.91 seconds, mean difference is 38.37 seconds, respectively $p < 0.001$, incidence of back pain in group EF 16(32%) and group EG 4(8%)

respectively; $p=0.001$ and PDPH in group EF 8(16%) and group EG 2(4%) respectively; $p=0.02$, between the two groups, the difference was statistically significant.

Table 1. Comparison Of Single Attempt Success Of Anaesthesia Between Group EF And Group EG:

Study Group	First pass success rate		Total	p-value
	No	Yes		
	Frequency (%)	Frequency (%)	Frequency (%)	
Group EF	43 (86%)	7 (14%)	50 (100%)	<0.001*
Group EG	21 (42%)	29 (58%)	50 (100%)	

Table 2. Comparison Of Time Taken To Perform Spinal Anaesthesia Between Group EF And Group EG:

Time taken for spinal (secs)	Mean (SD)	Mean difference	p-value
Group EF	114.28 (5.355)	38.37	<0.001*
Group EG	75.91 (5.023)		

Table 3. Comparison Of Back Pain Between Group EF And Group EG:

Study Group	Back pain		Total	p-value
	No	Yes		
	Frequency (%)	Frequency (%)	Frequency (%)	
Group EF	34 (68%)	16 (32%)	50 (100%)	0.001*
Group EG	46 (92%)	4(8%)	50 (100%)	

Table 4. Comparison Of PDPH Between Group EF And Group EG:

Study Group	PDPH		Total	p-value
	No	Yes		
	Frequency (%)	Frequency (%)	Frequency (%)	
Group EF	42 (84%)	8 (16%)	50 (100%)	0.02*
Group EG	48 (96%)	2 (4%)	50 (100%)	

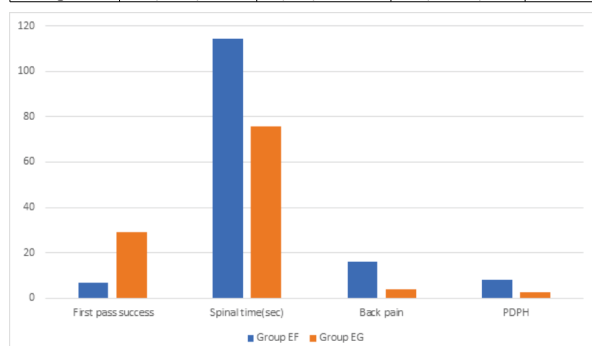


Figure shows that first pass success rate in Group EF 86% and Group EG 42%, spinal time(seconds) in Group EF 114.28 sec and Group EG 75.91 sec, back pain in Group EF 32% and Group EG 8% and PDPH in Group EF 16% and Group EG 4% respectively;

DISCUSSION

The identification of intrathecal space has traditionally been achieved by an anatomical landmark, which is an blind approach which causes multiple puncture, attempts which leads to post spinal complication.

Scapinelli et al., Chin et al. and de Filho et al.^{12,13,14} multiple needle passes and manipulations are the independent predictors for the complications associated with spinal anaesthesia, such as back pain, patient dissatisfaction, post-dural puncture headache, paresthesia, hematoma, and persistent neurologic deficit

Identification of correct interspinous space is one of the important steps for successful spinal anaesthesia as it minimises the number of attempts, punctures and needle redirections which in turn reduces the risk of back pain, PDPH and trauma to neural structures which can reduced by using pre-procedural ultrasound assisted spinal anaesthesia.

Rakhi Khemka et al.⁹ and Halpern et al.¹⁰ reported an overall identification accuracy rate for ultrasound of about 68%.

Chin et al.¹¹ the use of USG in adult patients with difficult surface landmarks was reported to increase the success of the first attempt (65% vs 32%) compared with the landmark group.

Schnabel et al.¹⁵ reported an improvement in the efficacy and safety of neuraxial blocks in obstetrics with ultrasound guidance and concluded that an ultrasound may lower the rate of procedure related adverse events.

Sahin et al.¹⁶ also showed that theb total duration of the spinal procedure was shorter in the ultrasound technique.

CONCLUSION

Pre-procedural ultrasound guided blockade can facilitate spinal anaesthesia in patients, regarding the first attempt success, minimizing the number of needles passes and punctures, improves the patient satisfaction and is more effective as compared to landmark technique as it lowering the risk of back pain and PDPH irrespective to longer total procedure time.

Pre-procedural ultrasound technique has a clinical benefit and it is superior to the traditional anatomical landmark guided spinal anaesthesia.

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