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Study of Predicting Score for a Difficult Subarachnoid Block at a Tertiary Hospital

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Abstract

Background: Subarachnoid block has become very popular for lower abdominal and lower limb (surgical and orthopedic) surgeries. A relatively simple, easy and economical scoring system is devised pre operatively to assess the technical difficulty of performing subarachnoid block. Present study was aimed to study a predicting score for a difficult subarachnoid block at a tertiary hospital. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in patients aged 21 -80 years, belonging to ASA physical status class I and II, undergoing surgeries below umbilicus and lower limb, under subarachnoid block. Parameters assessed were predictive score, number of attempts made & number of new skin pricks. **Results:** The sampling method included 275 cases. Spinal landmark was palpable in 87% of patients and it was not palpable in 13% of patients. There is a statistically significant association with P<0.0001 between the score and number of attempts. As the score is 4 or > 4 (which indicates a difficult subarachnoid block performance), the number of attempts to perform a successful block is increased. There is a statistically significant association with age and score. There is a statistical significance between BMI and the number of attempts with P<0.0001. There is a statistical significance between BMI and number of new skin pricks with a P<0.0001.As the BMI increases the number of skin pricks made for successful subarachnoid block increases. There is a statistical significance between the number of new skin prick and the number of attempts made for a successful subarachnoid block with a P<0.0001. **Conclusion:** Total score increases with increase in age, BMI, non-palpability of spinal landmark and presence of abnormal spine. This scoring system is very simple, easy and economical method done preoperatively to assess the patient body characteristics and devising a score.

Keywords: subarachnoid block, spinal landmark, difficult block, scoring system

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Introduction

Subarachnoid block has become very popular for lower abdominal and lower limb (surgical and orthopedic) surgeries. It has many advantages. It is technically easy and more economical. There is reduced incidence of postoperative nausea and vomiting. It is

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dependable, failure rate is much less, awareness is not a problem as seen in general anesthesia, and it eliminates the poly pharmacy that is seen in general anesthesia.[1,2]

Anticipated technical difficulty is one factor that can influence the anesthesiologist's decision to perform subarachnoid block. The problems associated with the procedure may be associated with patient dissatisfaction, neurological sequelae, hematoma. Unpleasant experience to the patients due to multiple attempts in performing subarachnoid block may be hazardous. [3,4,5]

A relatively simple, easy and economical scoring system is devised pre operatively to assess the technical difficulty of performing subarachnoid block. The characteristics of the patients have been classified according to their age, BMI, spinal bony landmarks to assess interspinous space and any spinal bony deformity like kyphosis, scoliosis. Each patient undergoing subarachnoid block was given a score from 0-7, according to patient characteristics. Calculating the difficulty score before subarachnoid block, 4 and > 4 score is indicative of difficulty in performing the subarachnoid block. Present study was aimed to study a predicting score for a difficult subarachnoid block at a tertiary hospital.

Material And Methods

Present study was single-center, prospective, observational study, conducted in department of Anaesthesiology at Mallya Hospital, Bangalore, India. Study duration was of 1 year (June 2018 to May 2019). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Patients aged 21 -80 years, belonging to ASA physical status class I and II, undergoing surgeries below umbilicus and lower limb, under subarachnoid block, willing to participate in present study

Exclusion criteria

- Patients undergoing caesarean section
- Contraindications for regional techniques such as Local infection at the site of the planned puncture, Septicemia, Increased intracranial pressure, Neurological disorder, Coagulation defects/medicated with anti-coagulants
- Patient refusal

Study was explained to patients in local language & written consent was taken for participation & study. 275 patients who fulfilled the inclusion and exclusion criteria within the time course of study were selected. During the pre-operative assessment, parameters like age, sex, height and weight were noted. Palpation of the spinous process was done to assess the interspinous space and any spinal deformity like scoliosis, kyphosis were noted.

Based on these parameters a predictive score was derived.

SCORE Patient Characteristics	0	1	2	3
Age (yr.)	20-40	41-60	>60	
BMI	<22	22-27	>27-34	>34
Spinal bony landmarks	Clear	Unclear		
Spinal bony deformity	No	Yes		

Each patient was given a score from 0-7 according to patient characteristics. This score was calculated before the performance of subarachnoid block. A score of 4 and > 4 indicates a difficulty in performance of the subarachnoid block.

A lumbar subarachnoid block was performed by anesthesia resident with 2 years of experience under strict aseptic precautions with the patient in sitting position and the table flat. Lumbar puncture was done in L3-L4 interspace with 23G or 25G Quincke's needle after infiltration of the skin using 2% lignocaine 2 cc. The number of attempts made, redirections

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and number of new skin pricks made for a successful flow of clear CSF was noted and recorded. An attempt was defined as a new skin puncture, using a different interspace for giving spinal anaesthesia or change of needle whereas a redirection was defined as withdrawing the needle to skin and changing its direction before advancing again.

Parameters assessed were predictive score, number of attempts made & number of new skin pricks The collected data was entered in an excel sheet and was transported to the Statistical Package for Social Services (SPSS vs 20). The categorical data was analysed using the frequencies and percentages. The quantitative data was presented by using measures of the central tendency. The Chi square test was used as the significance test for the categorical variables and Analysis of Variance was used as the test of significance for the quantitative variables.

Results

The sampling method included 275 cases who fulfilled the inclusion and exclusion criteria within the time course of study were selected. Majority were from 21-40 years age group (45.09 %) followed by 41-60 years age group (39.27 %) & > 60 years age group (15.63 %). 59% were male patients whereas, 41% constituted female patients. In majority of patients, BMI was 22 -27 (45.8 %) & > 22 (41.5 %).

Spinal landmark was palpable in 87% of patients and it was not palpable in 13% of patients. Single attempt was required in 71 % cases while 29 % required > 1 attempt. 43 % cases required new skin prick while 57 % cases were done in single skin prick.

Table 1: General characteristics

	No. of patients	**Percentage**
Age groups (in years)		
21-40	124	45.09
41-60	108	39.27
>60	43	15.63
Gender		
Male	162	59
Female	113	41
BMI (Kg/m^2)		
<22	114	41.5
22-27	126	45.8
28-34	28	10.1
>34	7	2.5
Spinal landmark		
Palpable (P)	239	86.9
Not Palpable (NP)	36	13.1
No of attempts		
1 attempt	196	71
> 1 attempt	79	29
New skin prick		
No new skin prick	198	57
New skin prick present	77	43

There is a statistically significant association with P<0.0001 between the score and number of attempts. As the score is 4 or > 4 (which indicates a difficult subarachnoid block performance), the number of attempts to perform a successful block is increased.

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Table 2: SCORE AND ATTEMPTS

Score	1 attempt	> 1 attempt	p value
<4	99.4	81.1	<0.0001
≥ 4	0.5	18.9	

There is a statistically significant association with age and score. As the age increases the score also increases.

There is a statistically significant association with age and spinal landmark palpability. As the age increases the palpability of the spinal landmark becomes difficult.

There is a statistical insignificance between the age and number of attempts . this means age is not an independent factor predicting difficult subarachnoid block.

Table 3: Age & other parameters

Age in years	Score		Spinal landmark		Number of attempts	
	<4 (%)	≥ 4 (%)	Palpable (P)	Not Palpable (NP)	1 attempt (%)	> 1 attempt (%)
21-40	46.3	25	48.3	25.6	47.4	39.2
41-60	39.3	37.5	37.2	51.2	37.2	44.3
>60	14.2	37.5	14.4	23.07	15.3	16.4
p value	0.030		< 0.05		0.4	

There is a statistical significance between BMI and the total score as P<0.0001. As the BMI increases the total score increases.

There is a statistical significance between BMI and the number of attempts with P<0.0001. It shows as the BMI increases the number of attempts needed for successful subarachnoid block increases.

There is a statistical significance between BMI and the spinal landmark with a P<0.0001. As the BMI increases the palpability of the spinal landmark becomes difficult.

There is a statistical significance between BMI and number of new skin pricks with a P<0.0001.Hence, as the BMI increases the number of skin pricks made for successful subarachnoid block increases.

Table 4: BMI & other parameters

BMI (Kg/m^2)	Score		Spinal landmark		Number of attempts		New skin prick	
	<4 (%)	≥ 4 (%)	Palpable (P)	Not Palpable (NP)	1 attempt (%)	> 1 attempt (%)	No new prick (% Cases)	New prick present (% Cases)
<22	43.6	6.2	42.2	36.1	39.2	46.8	38.7	48.1
22-27	48.2	18.75	48.9	30.5	59.6	31.6	52.6	31.6
27-34	8.1	31.25	8.7	13.8	10.7	12.6	8.7	11.4
>34	0	43.75	0	19.4	0	8.8	0	8.8
p value	< 0.0001		< 0.0001		< 0.0001		< 0.0001	

There is a statistical significance between the spinal landmark and the total score with a P<0.0001. As the total score increases the palpability of the spinal landmark is difficult.

There is a statistical significance between the spinal landmark and the number of attempts with a P<0.0001. As the palpability of the spinal landmark is difficult the number of attempts needed to perform the successful subarachnoid block increases.

There is a statistical significance between the spinal landmark and the number of new skin

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prick with a P<0.0001. As the palpability of the spinal landmark is difficult the number of new skin prick needed to perform the successful subarachnoid block increases.

Table 5: Spinal landmark & other parameters

Spinal landmark	Score		Number of attempts		New skin prick	
	<4 (%)	≥ 4 (%)	1 attempt (%)	> 1 attempt (%)	No new prick (%s)	New prick present (%)
Palpable (P)	91.1	18.75	96.9	61.03	96.9	61
Not Palpable (NP)	8.8	81.25	3	38.9	3	38.9
p value	< 0.0001		< 0.0001		< 0.0001	

There is a statistical significance between the number of new skin prick and the number of attempts made for a successful subarachnoid block with a P<0.0001.

There is a statistical significance between the spinal landmark and the number of attempts with a P<0.0001. As the palpability of the spinal landmark is difficult the number of attempts needed to perform the successful subarachnoid block increases.

There is a statistical significance between the spinal landmark and the number of new skin prick with a P<0.0001. As the palpability of the spinal landmark is difficult the number of new skin prick needed to perform the successful subarachnoid block increases.

Table 6: Number of new skin prick with number of attempts

Number of new skin prick	1 attempt (% Cases)	> 1 attempt (% Cases)
No new prick	99.4	2.5
New prick present	0.5	97.5

Discussion

Subarachnoid block has become one of the techniques in the arsenal of the modern anaesthesiologist despite waxing and waning of its popularity over the past 100 years since its introduction into clinical practice. Anticipated technical difficulty is one factor that can influence the anesthesiologist's decision to perform subarachnoid blockade. Problems during the procedure may be associated with patient dissatisfaction, neurological sequelae, hematoma.

Unpleasant experience to the patients at multiple attempts at subarachnoid block may be hazardous. Patient will not accept for the subsequent subarachnoid blocks. The complications will increase. Accurate preoperative prediction of difficulty adds to the delivery of high success rate. Hence a scoring system for subarachnoid block was developed based on the characteristics of the patients. A relatively simple, easy and economical scoring system was devised pre operatively to assess the technical difficulty of performing subarachnoid block by the anesthesiologist.

The characteristics of the patients have been classified according to their age, BMI, spinal bony landmarks to assess interspinous space and any spinal bony deformity like kyphosis, scoliosis.

In this study, it was noted that as the age increased the total score increased with p=0.03(4 and > 4).But increasing age, did not increase the number of attempts for a successful subarachnoid block. With P=0.4, we found a statistical insignificance between the age and number of attempts. This means age is not an independent factor predicting difficult subarachnoid block. Comparing with a study done by Atallah *et al.*,[5] found that age is not an independent predictor for a difficult subarachnoid block. Similar findings were noted in present study.

In our study it was observed that as the BMI of the patient was increasing there was a

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difficulty in performing a successful subarachnoid block. The total score (4 and > 4) increased; the number of attempts needed for successful subarachnoid block also increased. The spinal landmark was not palpable as the BMI increased. The number of new skin pricks made for successful subarachnoid block also increased significantly. All these observations were statistically significant with a P <0.0001. Atallah *et al.*,[5] found a positive correlation with increase in BMI and the difficulty in performing a successful subarachnoid block. BMI was an independent predictor for the difficulty in subarachnoid block.

In another study done by Sprung *et al.*,[6] in which 595 neuraxial blocks were done to predict difficulty in performing the procedure. They concluded that the body habitus is an independent predictor for the difficulty in performing the subarachnoid block.

In this study it was found that as the age increased the palpability of the interspinous landmark was difficult. An increase in BMI also increased the non-palpability of the interspinous space. The number of attempts needed for the successful subarachnoid block also increased, and the number of new skin pricks made also increased as the interspinous is difficult to palpate. All these observations were statistically significant with a P <0.0001. Observations made by Atallah *et al.*,[5] and Sprung at al.,[6] showed that inter spinous landmark is an independent predictor of difficult subarachnoid block.

Karzzan M[7] has also observed that the spinal landmark is an important predictor of the difficult subarachnoid block. De Oliveira *et al.*,[8] has concluded in his study that the successful location of the subarachnoid block at first attempt is largely influenced by the quality of patients anatomical landmark, the adequacy of patient positioning and providers level of experience. On the contrary Sprung *et al.*,[6] and Ruzman T *et al.*,[9] in their study have found that providers level of experience is not a predictor for difficulty in achieving successful subarachnoid block. Hence in our study we fixed experience for subarachnoid block provider of 2years and it was not included as a difficulty parameter for subarachnoid block.

Chin K J *et al.*,[4] in their study of 120 patients with inclusion criteria of BMI>35 kg/m^2, poorly palpable spinous process, moderate to severe lumbar scoliosis and previous lumbar spine surgeries found that pre-procedural ultrasound imaging facilitates performance of spinal anaesthesia in non-obstetric patients with difficult anatomic landmarks.

In our study, the difficulty score of 4 and >4 was associated with increase in age, BMI, poor palpability of landmarks, presence of spinal deformity. Although age was associated with increased score, it was not a statistically significant independent predictor of difficult subarachnoid block. Hence, the patients who have score of 4 and >4 with high BMI or poor spinal landmarks or spinal deformities, if subjected to pre- procedural USG imaging of the spine could benefit from a successful first attempt subarachnoid block. It may thereby, reduce the cost of subjecting all the patients for USG imaging.

The scoring system is an effective, simple and easy method that is tabulated preoperatively by the anesthesiologist by assessing patient body characteristics, spinal landmarks and any spinal deformities. Depending on these characteristics a score is devised, and the ease of performing the subarachnoid block may be predicted. Such anticipation will reduce the incidence of traumatic needle placement, as a difficult anticipated subarachnoid block will make an experienced anesthesiologist provider to perform a successful block or choose an alternative technique like USG guided subarachnoid block or regional nerve block or general anaesthesia as needed for the surgery.[9,10,11]

Limitations of present study were comorbidities of the patients and the regular drug usage were not considered which might affect the performance and outcome of the subarachnoid block. A large multicenter studies would be required to extrapolate the results onto the general population.

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Conclusion

In conclusion, this study showed that by devising a score by considering patient characteristics preoperatively. Total score increases with increase in age, BMI, non-palpability of spinal landmark and presence of abnormal spine. As the score increases to 4 and > 4, the difficulty in performing a successful subarachnoid block increases. The number of attempts and the number of new skin pricks made increased with increase in total score to 4 and > 4. BMI and spinal landmark are independent predictors of difficult subarachnoid block.

This scoring system is very simple, easy and economical method done preoperatively to assess the patient body characteristics and devising a score. Depending on the score, any difficulty in performing the subarachnoid block can be anticipated during the procedure and will help the anaesthesiologist to choose an alternative technique like USG guided subarachnoid block or regional nerve block or general anaesthesia as needed for the surgery.

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REFERENCES

1. Collins VJ. “Postoperative complications peculiar to spinal anaesthesia”. Chapter 58, Principles of anaesthesiology, 3rd Edn, Philadeiphia, Lea and Febiger, 1993: 1555-1570.
2. Collins VJ. “The History of Anaesthesiology”. Chapter 1, Principles of Anaesthesiology, 3rd Edn, Philadeiphia, Lea and Febiger, 1993: p3-28.
3. Kim JH, Song SY, Kim BJ. Predicting the difficulty in performing a neuraxial blockade. Korean J Anaesthesiol 2011;61:377-81.
4. Chin KJ, Perlas A, Chan V, Brown-Shreves D, Koshkin A, Vaishnav V. Ultrasound Imaging Facilitates Spinal Anesthesia inAdults with Difficult Surface Anatomic Landmarks. Anaesthesiology. 2011 Jul; 115(1):94-101.
5. Atallah MM, Dimian AD and Sharrab AA. Development of a Difficulty Score for Spinal Anesthesia. BJA 2004; 92: 354-360.
6. Sprung J,Bourke DL,Grass J,Hammes J,Marcha E,Thomas P *et al.* Predicting the Difficulty Neuraxial block; a Prospective study. Anesth Analg 1999; 89: 384-386.
7. Mazen AK. Primary Score Predicting the Difficulty of Neuraxial block. Anesth analg 2002; 94: 476-477.
8. de Oliveira GR, Gomes HP, da Fonseca MHZ, Hoffman JC,Pederneiras SG, Gascia JHS. Predictors of Successful Neuraxial block; a Prospective study. European Journal of Anesthesiology 2002; 19(6): 447-451.
9. Ruzman T,Gulam D *et al.*Factors associated with difficult neuraxial blockade.Local and Regional Anaesth 2014; 7: 47 52.
10. Hossein Khoshrang, Siavash Falahatkar,Abtin Heidarzadeh, Mohsen Abad, *et al.* Predicting Difficulty Score for Spinal Anesthesia in Transurethral Lithotripsy Surgery Anesth Pain Med. 2014 Oct; 4(4): e16244
11. Hariharan Shankar, Kanishka Rajput, Karthik Murugiah. Correlation between spinous process dimensions and ease of spinal anaesthesia. Indian Journal of Anaesthesia 2012;56:250-254.