ORIGINAL RESEARCH PAPER

Medical Science

SCORPION BITE AND ITS EFFECT ON SPINAL ANAESTHESIA-A CASE CONTROL STUDY

KEY WORDS: Scorpion bite, Subarachnoid blockade, Resistance or failure

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ABSTRACT

INTRODUCTION: To study effect of Scorpion bite on spinal anaesthesia in patients undergoing various surgeries.
METHOD: 50 patients undergoing various surgeries under subarachnoid block divided into groups SB and WB i.e. patients with scorpion bite and without bite (as control group) respectively and patients outcome were studied.
RESULT : There were no significant differences in patient demographics, group SB showed significantly prolonged onset of sensory and motor blockade as well as the peak of sensory and motor blockade as compared to group WB .
CONCLUSION: Scorpion bite (bites) and failure or resistance to local anaesthetics when given intra thecaly are associated with each other.

INTRODUCTION:

Pain is an unpleasant sensation which only the individual can appraise.[1] By rendering the patient pain free perioperatively, anaesthesiologists have succeeded to a considerable extent and regional anaesthesia always have played a vital role in it. A wide range of surgeries and related procedures requires different anaesthetic techniques but most commonly used is subarachnoid block[2].

Even if an experienced anaesthesiologist could not avoid subarachnoid block failure[3,4] due to reasons like obesity, abnormal spine, poor positioning of patient, technical difficulty, incorrect needle insertion, inaccurate drug dose, injection misplacement, inadequate intrathecal drug spread, inadequate drug action, local anaesthetic resistance etc[5]

It is difficult to diagnose the resistance to local anaesthetic injected in the Subarachnoid space[6]. As we know, mechanism of action of local anaesthetics is via the sodium channels, and resistance may develop due to possible mutations of this channel[7].

Through sodium channel blockade, scorpion neurotoxin (beta-toxins) exerts its clinical manifestations. scorpion sting or bite delivers venom into the circulation leading to massive endogenous catecholamines release due to delayed activation of sodium neuronal channels by the venom[8]. 'Buthus tamulus' (small, red, more toxic) and 'Palamneus gravimanus' (large, black, less toxic) are the two types of poisonous species of scorpion found most common in India and most lethal amongst all poisonous species is 'Mesobuthus tamulus' (the Indian red scorpion)[9].

Our study aims at comparing subarachnoid blockade efficacy in patients with previous scorpion bites and in patients with no such history.

METHOD:

After study approval from Institutional Ethics Committee, written informed consent was obtained from all patients after explaining the nature of the clinical study and the drugs to be used.

Total 50 patients ASA I and II between the age group of 18-60 undergoing various surgical procedures under subarachnoid blockade were included in this study and randomly divided into two groups SB and WB i.e. patients with scorpion bite and without bite (as control group) respectively. 17 mg of 0.5% hyperbaric bupivacaine (3.4ml) was administrated in both the groups.

Patient refusal, local skin infection, patient with allergy to study medication, ASA III and IV, any coagulopathies were excluded from the study. In the operation theatre through I.V. cannula (18G or 16G) each patient received intravenous ringer lactate solution 10 ml/kg before induction of subarachnoid block and infusion continue during surgery.

Before starting the procedure all the monitoring equipment (NIBP Cuff, Pulse Oxymeter, ECG) were attached to the patient and baseline values of Heart rate, BP, SpO_2 and Respiratory rate were recorded.

A Subarachnoid block was performed after all aseptic precaution and a 25 gauge Quinke spinal needle was inserted in sitting or left lateral position between the L3-L4 or L4-L5 inter vertebral space. After confirmation of CSF flow, drugs were administered slowly, Time zero was noted i.e. placement of drug in the subarachnoid space. The spinal needle was removed and patient was immediately turned to supine position and onset of sensory, motor block and sensory block level was checked.

Motor block was assessed using a modified Bromage score:
0=no motor loss
1=inability to flex hip
2=inability to flex hip and knee
3=inability to flex hip, knee and ankle
with motor recovery assumed when the score was zero

The Anaesthesiologist who assessed the sensory and motor spinal blocks for all patients was blinded to the group of the patient. General anaesthesia was administered, If after 20 min the block was inadequate.

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 20; Chicago Inc., USA). Statistical comparison was evaluated using the Chi-square or Fisher's exact tests. A value of $P < 0.05$ was considered statistically significant. The results were expressed as mean and standard deviation.

RESULT:

A total of 50 patients undergoing various surgical procedures under subarachnoid blockade were involved in this study. The two groups were comparable with respect to demographic data and there were no significant differences in patient demographics (Table 1).

Table 1. Patients characteristics

Demographic data (Mean ± SD)	SB	WB	Total
Patients	25	25	50
Age (years)			
18-25	4(16%)	7(28%)	11(22%)
26-35	8(32%)	5(20%)	13(26%)
36-45	6(24%)	7(28%)	13(26%)
46-55	6(24%)	4(16%)	10(20%)
56-60	1(4%)	2(8%)	3(6%)
Age in years (mean± SD)	5±2.645	5±2.121	10±4.123
Gender			
Male	15(60%)	20(80%)	35(70%)
Female	10(40%)	5(20%)	15(30%)
ASA Grade			
I	13(52%)	11(44%)	24(48%)
II	12(48%)	14(56%)	26(52%)

SB–patientswithscorpionbite
WB–patientswithoutscorpionbite
ASA-Americansocietyofanaesthesiologists

Inthisstudywefoundmostpatients(17)withhistoryofsinglescorpion biteinthepast.5patientsgavehistoryof2and3patients gavehistory of>2scorpionbitesinthepast(Table2).

Table 2.Frequency and percentage of scorpion bites in the GroupSB

Bites	Patients	%
1	17	68
2	5	20
>2	3	12
Total	25	100

SB–patientswithscorpionbite

Inthisstudygeneralanaesthesiawasgiven due to complete failure of subarachnoidblockadeandwasdocumentedonlyinthosepatients(7 out of 25) who had previous history of scorpion bite < 6 months. Patientswhohadhistoryofscorpionbite>6monthsbackdidnotshow failureofsubarachnoidblockade(9outof25patientsshoweddelayed sensoryormotorblockade).Adequatesubarachnoidblockwasnoted in those patients (5 out of 25) who had history of scorpion bite >12 months in the past. Thus the effect of scorpion bite on subarachnoid blockadeismorepronouncedinrecentbitesandgraduallywanesoff after12monthsduration.

Table 3: Duration of scorpion bite and its association with efficacyofsubarachnoidblockadeingroupSB

Scorpion bite duration (months)	Patients (%)	Adequate blockade	Inadequate (Failed) blockade	Delayed sensory or motor blockade
<6	9(36%)	0	7(28%)	2(8%)
6-12	9(36%)	0	0	9(36%)
>12	7(28%)	5(20%)	0	2(8%)
Total	25(100%)	5(20%)	7(28%)	13(52%)

SB–patientswithscorpionbite

In this case control study group SB showed significantly prolonged onsetofsensoryandmotorblockadeaswellasthepeakofsensoryand motorblockadeascomparedtogroupWB(P<0.0001).(Table4).This showsthatefficacyofsubarachnoidblockadeissignificantlyreduced inpatientswithpasthistoryofscorpionsting.

Table4.CharacteristicsofSubarachnoidblockade

	SB	WB	p value
Onset of sensory blockade (min)	3.08 1.087	1.42 0.4252	<0.0001
Onset of motor blockade (min)	4.26 0.2236	2.03 0.4102	<0.0001
Peak of sensory blockade (min)	7.056 0.394	3.702 0.340	<0.0001
Peak of motor blockade (min)	8.936 0.4211	4.52 0.420	<0.0001

SB–patientswithscorpionbitegroup.
WB –patients without scorpion bite group.
Values in mean ± standard deviation. P > 0.05 Not significant, P < 0.05 significant.
p<0.0001 extremely significant

DISCUSSION :

There are number of factors that causes failure or resistance to the subarachnoid blockade though it is uncommon in routine practice due to skilled anaesthetist with good techniques and equipment available. Ruling out other causes our study shows that failure or resistance to subarachnoid blockade is may be due to scorpion bite history in the past in patients undergoing various surgeries.

We found that there is a delay in the onset as well as peak effect of sensory and motor blockade in patients with previous history of scorpion bite when compared to patients with no such history. This study also found an association between complete subarachnoid blockade failure needing its conversion into general anaesthesia and number of scorpion bites (multiple bites) or most recent bite. Our study also noted that patients with previous history of scorpion bite > 12 months showed delayed onset and peak of sensory or motor or both blockade. While patients with no history of bite showed adequate subarachnoid blockade.

Tropical countries shows more incidence of scorpion bite and scorpions are found mostly in dwelling crevices, under logs or debris, underground burrows , many field and plantations. Maximum incidence of scorpion bite occurs in summer and rainy season (breeding season) [12]. Because of predominant rural background, rural dwellings, agricultural activities, practice of sleeping on floor and not wearing footwear, Scorpion bites is common in this region.

Local anaesthetics and scorpion venom containing neurotoxins both acts on sodium channels. And any alterations or mutations in these receptors located in the sodium channel may contribute to resistance to local anaesthetics[13]. Sodium channels are composed of and ß subunits (beta-1 and beta-2) and the subunit involves four homologous domains (I to IV) and each of these domains is made up of 6 trans membrane segments (S1 to S6). S4 segment play a key role in sodium channel activation [13]. ß toxin of scorpion bite bind to receptor site 4 of voltage gated sodium channels thereby modifying the activation process of the channel[14,15].

Generation and propagation of action potentials and their transmission in excitable cells is carried by voltage-gated sodium channels[16,17,18] and scorpion neurotoxin acts on these channels. Antibody mediated resistance to local anaesthetics is may be a possibility due to antigenic nature of scorpion venom producing antigen-antibody reaction resulting in formation of antibodies to the scorpion venom.

Limitations of this study are primary and secondary outcomes, wide range of experience of the anaesthesiologists who performed the spinal anaesthesia, patients with other comorbidities like diabetic neuropathy etc.

In our country especially villages scorpion bite is not uncommon still a history of it is not a relevant part of anaesthesiology history taking. Keeping in view the results of this study all patients undergoing various surgeries should be screened for history of scorpion bite and if patients have past history of scorpion bite then anaesthesiologist should be prepared for possibility of failure or resistance to local anaesthetics needing general anaesthesia to such patients.

CONCLUSION :

Inadequate blockade, failure or resistance or resistance to local anaesthetics can be due to scorpion bite history in past in patients undergoing various surgeries needing conversion of block in general anaesthesia. So always ask history regarding scorpion bite (bites).

ACKNOWLEDGMENT :

I convey my gratitude towards my Professor and Head of department Anaesthesiology Dr. Aditya Agarwal for help and guidance while doing this study.

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