Research Article

Efficacy conventional interscalene (IS) approach Vs novel transscalene (TS) approach of brachial plexus block

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Abstract

Introduction: Interscalene (IS) approach is used mainly for shoulder and upper arm surgeries. Interscalene approach has been conventionally used since many decades and is found to be highly useful in blocking the brachial plexus. However since the block is performed in the cervical region there is possibility of various complications. The new transscalene approach has been recently described in literature where the puncture site is more posterolateral compared to conventional interscalene approach and hence the risk of complications is likely to be less. **Aims and objectives:** to study the efficacy conventional interscalene (IS) approach Vs novel transscalene (TS) approach of brachial plexus block in various shoulder and upper limb surgeries. **Material and method:** In the present randomized double blind study 60 patients undergoing various shoulder and upper limb surgeries were selected and were randomly divided in TS Group (Transscalene approach) and IS Group (Interscalene approach) containing 30 patients each. Detail history and clinical examination was done in all the study patients. The blocks were induced by using standard protocol. The time required for induction of block and number of attempts was noted down in the proforma. Continuous monitoring of patients was done in the surgery and was done till the effect of block is withdrawn completely. The occurrence of complication was also noted. In the circumstance of inadequate or patchy action of the block, the block was converted to general anaesthesia. If in case surgery was unduly prolonged and the effect of the block wore off, rescue analgesia with intravenous ketamine given. The data obtained in this study was analyzed using unpaired 't' test. **Results:** In TS group in 56.67% patients block was established in first attempt whereas in 43.33% patients second attempt was required. In IS group in no patients block was established in first attempt. 36.67% required two attempts and 56.67% required three attempts. The mean time taken for procedure in TS group was 4.42±1.20min whereas in IS group was 7.4±1.5min. The difference observed in number of attempts and mean procedure time was statistically significant in TS and IS group. The mean duration of sensory and motor block in TS and IS group was nearly same and the difference was also statistically insignificant in both the groups. In TS group no complication was observed had whereas in IS one patient had vocal cord palsy and one had Horner syndrome. The success rate of block In TS group was 86.67% whereas in IS group was 80%. **Conclusion:** Transscalene approach is safe and effective approach for brachial plexus block as it takes less number of attempts, less time to perform, comparable success rate, comparable onset and duration of motor block and sensory analgesia when compared with interscalene approach in patients undergoing upper limb surgeries.

Key Word: brachial plexus block, interscalene approach, transscalene approach, success rate.

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INTRODUCTION

In 1884 Mates[1] records that "Halstead" in New York at St. Luke's-Roosevelt Hospital Centre, who first operated under brachial plexus anaesthesia, when he freed the cords and nerves of the brachial plexus probably from the scar tissue after blocking the roots in the neck with Cocaine solution. Whereas in 1897- Crile[2], the Professor of clinical surgery in Western Research University, Ohio,

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disarticulated the shoulder joint after rendering the arm insensitive by blocking the brachial plexus. This he did by infiltrating the subcutaneous tissue above the clavicle with 0.1% Cocaine, exposing the brachial plexus and under direct vision injecting each nerve trunk with 0.5% Cocaine. Since then lots of development in has occurred in brachial plexus block. Interscalene (IS) approach is used mainly for shoulder and upper arm surgeries. Interscalene approach has been conventionally used since many decades and is found to be highly useful in blocking the brachial plexus. Many studies were conducted to find out safety and efficacy of interscalene block.[3,4,5,6,7.] Since the Interscalene block is performed in the cervical region there is possibility of vascular puncture[8,9,10,11] ipsilateral phrenic nerve palsy, ipsilateral vocal cord paralysis, pneumothorax, Horner's syndrome etc. Also rarely one may have total spinal / epidural injection while performing interscalene block. Since the plexus's roots are widely placed in the neck area there is at times sparing of few distal dermatomes as well. The new transscalene approach has been recently described in literature where the puncture site is more posterolateral compared to conventional interscalene approach and hence the risk of complications is likely to be less[12]. Thus in the present study we tried to compare the conventional interscalene approach with new transscalene approach in terms of safety and efficacy.

AIMS AND OBJECTIVES

To study the efficacy conventional interscalene (IS) approach Vs novel transscalene (TS) approach of brachial plexus block in various shoulder and upper limb surgeries.

MATERIAL AND METHOD

The present randomized double blind study was conducted to study and compare the efficacy of conventional interscalene (IS) approach Vs novel transscalene (TS) approach of brachial plexus block used in various shoulder and upper limb surgeries. After obtaining approval from hospital academic and ethics committee the study was conducted. For the purpose of study total 60 patients admitted for various shoulder and upper limb surgeries were selected by using below mentioned inclusion and exclusion criteria.

Inclusion criteria

- Age group 18-70 years
- ASA grade 1 and 2 , 3
- Upper limb surgery

Exclusion criteria:

- Patient refusal for regional anaesthesia
- Any bleeding disorder
- Severe Respiratory dysfunction
- Neuro deficit involving upper limb.
- Local infection at the injection site.
- Contralateral pneumonectomy,
- Contralateral hemidiaphragm paralysis
- Contralateral vocal cord paralysis
- Allergy to L.A agents.

All the selected patients were randomly divided in two groups.

- **TS Group:** Transscalene approach (Novel approach)
- **IS Group**: Interscalene approach (Conventional approach)

Detail history and clinical examination was done in all the study patients. And the findings were recorded in a prestructured proforma. 7mg/kg of 2% lignocaine with adrenaline (5 micro gm/ml) + 1 ml/ 10 ml of soda bicarbonate + 1.5 mg / kg of 0.5% bupivacaine with 150 micro gram buprenorphine (Total volume – 30-40ml) was used in both the groups. Both the blocks were induced by using standard protocol. The time required for induction of block and number of attempts was noted down in the proforma. An intravenous drip was started before undertaking the procedure which continued throughout the length of surgery. Vital parameters were observed throughout the procedure and oxygen at the rate of 2L/min administered through oxygen mask.

Continuous monitoring of patients was done in the surgery and was done till the effect of block is withdrawn completely. The occurrence of complication was also noted. In the circumstance of inadequate or patchy action of the block, the block was converted to general anesthesia. If in case surgery was unduly prolonged and the effect of the block wore off, rescue analgesia with intravenous ketamine given. The data obtained in this study was analyzed using unpaired 't' test.

RESULTS

Table 1: Demographic data of study patients

Variable		TS Group	IS Group
	Age	33.1±12.74	36.13±10.11
Sex	Male	20 (66.67%)	25 (83.33%)
	Female	10 (33.33%)	5 (16.67%)

It was observed that mean age of patients in TS group was 33.1±12.74 years whereas that of IS group was 36.13±10.11years. The proportion of male patients in TS group was 66.67% whereas in IS group was 83.33%. The age and sex wise difference in TS and IS group was not statistically significant. Thus both groups were comparable.

Table 2: Distribution according to Number of attempts and time taken for procedure

Variable		TS Group	IS Group
Number of attempts	1	17 (56.67%)	0
	2	13 (43.33%)	11 (36.67%)
	3	0	17 (56.67%)
	≥4	0	2 (6.67%)
Time taken for procedure (min)		4.42±1.20	7.4±1.5

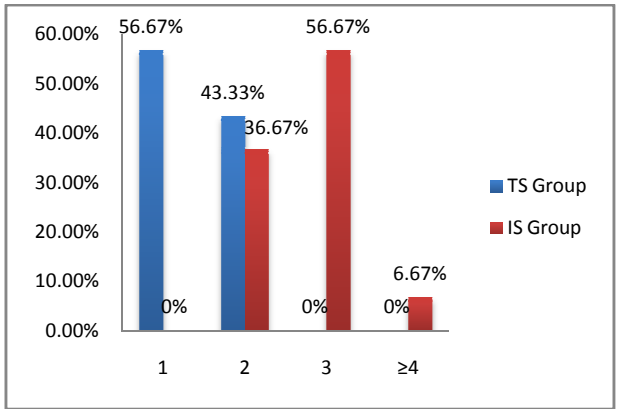

Figure 1: Distribution according to Number of attempts

In TS group in 56.67% patients block was established in first attempt whereas in 43.33% patients second attempt was required. In IS group in no patients block was established in first attempt. 36.67% required two attempts and 56.67% required three attempts. The mean time taken for procedure in TS group was 4.42±1.20min whereas in IS group was 7.4±1.5min. The difference observed in number of attempts and mean procedure time was statistically significant in TS and IS group.

Table 3: Distribution according to onset of action and duration of sensory and motor block

Duration	TS Group	IS Group
Onset of action (min)-Sensory	8.93±3.09	8.67±1.78
Onset of action (min)-Motor	19.39±5.97	21.15±4.27
Duration of Block (min)-Sensory	400.36±70.21	393.70±76.12
Duration of Block (min)-Motor	336.57±57.96	336.67±67.25

It was evident from the table that the time required for onset of sensory and motor action was nearly same in TS and IS group. The mean duration of onset of sensory action was 8.93±3.09 and 8.67±1.78 in TS and IS group respectively whereas mean duration of motor action was 19.39±5.97 and 21.15±4.27 min in TS and IS group respectively. The difference observed in onset of sensory and motor action was not statically significant in TS and IS group. The mean duration of sensory and motor block in TS and IS group was nearly same and the difference was also statistically insignificant in both the groups.

Table 4: Complication and success rate in both the groups

		TS Group	IS Group
Complication	Horner syndrome	0	1 (3.33%)
	Vocal cord palsy	0	1 (3.33%)
Success rate	Complete	26 (86.67%)	24 (80%)
	Partial (required supplementation)	2 (6.67%)	3 (10%)
	General anesthesia	2 (6.67%)	3 (10%)

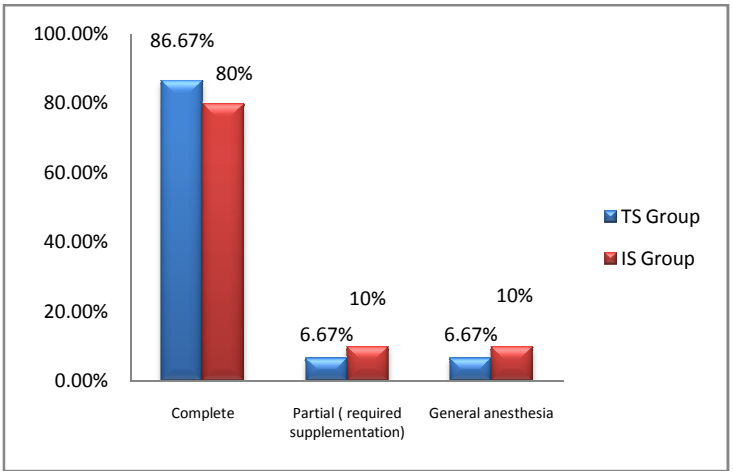

Figure 2: Success rate in both the groups

In TS group no complication was observed had whereas in IS one patient had vocal cord palsy and one had Horner syndrome. The success rate of block In TS group was 86.67% whereas in IS group was 80%. Two patients in TS group and three patients in IS group required general anesthesia with endotracheal tube. Two patients in TS group and three patients in IS group required i.v. ketamine Supplementation. Thus both the groups had a comparable success rate; therefore it is not statistically significant.

DISCUSSION

In the present study we had selected transscalene approach to brachial plexus block. As Interscalene approach for brachial plexus block is widely employed regional nerve block to provide anaesthesia and analgesia for the upper extremity surgery. Interscalene approach block provides a rapid, dense and predictable anaesthesia of the upper extremity. However since the block is performed in the neck region there is high incidence of inadvertent intravascular injectable local anaesthetic toxicity, ipsilateral phrenic nerve palsy, ipsilateral vocal cord paralysis, pneumothorax, Horner's syndrome etc. Also rarely one may have total spinal / epidural injection while performing interscalene block[8,9,10]. Thus in the present prospective randomized study we have compared the safety and the efficacy of the interscalene approach versus transscalene approach for the block of brachial

plexus, in patients undergoing upper limb surgeries. For this purpose the study comprised of two groups with 30 patients in each group viz. Transscalene approach (TS group) and Conventional Interscalene approach (IS group). The age and sexwise distribution showed no statistically significant difference in both ethe groups. Thus the two groups were comparable. It was seen that in 56.67% patients of TS group the block was established in first attempt whereas in 43.33% patients, second attempt was required. In IS group in no patients block was established in first attempt. 36.67% required two attempts and 56.67% required three attempts. There was statistically significant was observed in the two two group by using the Chi Square test with a P value of < 0.0001. Ignace Sandefo M.D. Gabriella Iohom M.D[5] studied clinical efficacy of the brachial Plexus Block via the Posterior Approach and observed that the block was established in 85% of patients in first attempt. However in the present study we required one attempt in 56% patients. This may be because of that our block is performed by inexperienced person and their by experienced person. The mean time taken for the procedure in TS group was 4.41 ± 1.20 min whereas IS group was 7.41 ± 1.49min. and the difference observed was statistically significant. Harald C. Rettig M.D. Mathieu J.M[6] also observed similar findings in their study. Thus Transscalene approach has taken less time to perform brachial plexus block than interscalene approach. With brachial plexus stimulation, the mean time of onset of sensory block was 8.92 ± 3.09 min in TS Group and 8.66 ± 1.77min in IS Group. The Onset of motor block was 19.39 ± 5.97 min in TS Group and 21.14 ± 4.26 min in IS Group. The mean duration time of motor block was 336.57 ± 57.95 min in TS Group and 336.66± 67.25 min in IS Group. The mean duration time of sensory block was 400.35 ± 70.21min in TS Group and 393.70±76.11 min in IS Group. This was found to be statistically not significant using the Mann-Whitney W test with a P-value of 0.741. The difference observed in onset of sensory and motor action was not statically significant in TS and IS group. The mean duration of sensory and motor block in TS and IS group was nearly same and the difference was also statistically insignificant in both the groups. Thus the two groups were comparable statistically in terms of onset and duration of sensory and motor block as we had taken the same drug volume and amount. Harald C. Rettig M.D. Mathieu J.M[6] also observed similar findings in their study. No complication due to block was observed in TS Group. Whereas in IS group Horner's syndrome and Vocal cord palsy was observed in one case each. In a study done by Hoang C. Nguyen[7] on Transscalene Brachial Plexus Block (TBPB) none of the patients undergoing a TBPB experienced respiratory distress or a decrease in oxygen saturation after the plexus block. There were no vascular punctures or persistent pain at the insertion sites. Two patients (7.4%) experienced an ipsilateral reversible recurrent laryngeal nerve blockade, whereas one patient (3.7%) experienced a reversible Horner syndrome. Both of those side effects were temporary and resolved completely. No additional serious regional or systemic side effects or complications were observed. Ignace Sandefo M.D. Gabriella Iohom M.D[5] found dysphonia and Horner's syndrome in 7% and 6% patients respectively via posterior approach. One patient had documented hemidiaphragmatic paresis. Overall success rate was 86.67% in TS group and 80.0% in IS group. Two patients in TS group and three patients in IS group required general anesthesia with endotracheal tube. Two patients in TS group and three patients in IS group required intravenous ketamine Supplementation. When both the groups were compared using the Chi-Square and the difference was found to be not significant with a P value of 0.786. In the study done by Hoang C. Nguyen *et al.*[7] on transscalene brachial plexus block the success rate was 85.2% which was consistent with the present study. Harald C. Rettig M.D. Mathieu J.M[6] found the success rate by posterior approach (90%) and the lateral approach (83%).They found both the approach were comparable regarding clinical efficacy for anesthesia of the shoulder and upper arm. Thus in the summary we could state that the new transscalene approach when compared to the interscalene approach for the brachial plexus block required less number of attempts and time to perform block, had a comparable success rate and less number of complications, however it was not statistically supported.

CONCLUSION

Transscalene approach is safe and effective approach for brachial plexus block as it takes less number of attempts, less time to perform, comparable success rate, comparable onset and duration of motor block and sensory analgesia when compared with interscalene approach in patients undergoing upper limb surgeries.

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