

## Original Article

### Complications of Supraclavicular Block of Brachial plexus using Compound Classic and Perivascular Techniques

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#### Abstract

**Objectives:** To determine the incidence of complications occurring during Supraclavicular block of brachial plexus in our hospital.

**Materials and Methods:** In this prospective, clinical trial, three-hundred twenty patients (228 males and 92 females) 17-70 years of age (average 38 years) underwent supraclavicular block for upper extremity surgery, from October 2003 to October 2005 in Shohada hospital, Tabriz Iran. The supraclavicular block was performed by combination of classic and perivascular techniques. All patients received 40 mL of 1% lidocaine (400 mg). Probable complications were surveyed by a questionnaire. The data were analyzed using SPSS software.

**Results:** Complications occurred in 45.3% of patients. The most common complications was Horner's syndrome (34%), hematoma (8.8%) and vascular injuries (2.5%). The rate of hematoma formation was directly related to the number of needle punctures ( $P = 0/000$ ) and it was fourteen times more common in multiple puncture than in single puncture.

**Conclusion:** Combining classic and perivascular techniques was more efficient and the rate of failure and complications were fewer. With attention to the entrance point and avoidance of excessive needle advancement after the beginning of paresthesia and slow injection of drug, the rate of failure and complication can be reduced. (Rawal Med J 2007;32:60-62)

**Key words:** Supraclavicular Block, Brachial plexus, Complications, Nerve Block.

## INTRODUCTION

Brachial plexus is formed by combination of anterior roots of inferior cervical spinal nerves (C5-C8) and the first thoracic nerve (T1), which extend anterolaterally and inferiorly after leaving the intervertebral foramina and is placed between anterior and middle scalenus

muscles and then combine with each other to form three trunks that descend along the lateral border of the first rib and posterior of middle portion of clavicle to enter axilla.<sup>1-3</sup> Brachial plexus blocking can be performed in interscalenous region over roots and in supraclavicular and infraclavicular regions, over trunks, and in axillary's region over branches by injecting local anesthetic drugs such as lidocaine. By blocking in supraclavicular region with patient's arm in any position, effective, rapid and reliable anesthesia for carrying out operations over upper limb can be performed.<sup>1,2,4</sup> There are multiple methods including conventional supraclavicular block, supraclavicular perivascular block, supraclavicular para vascular block, classic technique and plumb bob technique that have been used.<sup>1,5</sup>

In perivascular technique, subclavian artery pulse in the level of about 1 cm behind of interscalenous sulcus crossing over midclavicular point is used in which region the needle is inserted postero inferomedially and the local anesthetic drug is injected.<sup>5</sup>

In classic technique, the needle is inserted from posterior border of sternocleidomastoid muscle at the end of interscalenous sulcus about 1cm above the midclavicular point with posteroinferomedial angle for anesthesia; and palpation of artery is helpful in this point.<sup>1,5</sup> In conventional method the needle is inserted with posteroinferomedial angle from beside the lateral border of sternocleidomastoid muscle attachment to the clavicle. In plumb bob technique the needle is inserted with posterior angle from lateral border of sternocleidomastoid muscle attachment to the clavicle. In this method, the patient's head is not turned to opposite side. In mixed technique used in this study, the needle is inserted by classic method and the location of insertion determined by perivascular method.

Supraclavicular block is associated with complications some of which depends completely to physician experience. Reported complications include pneumothorax, vascular damage, hematoma, nerve damage, phrenic nerve block, Horner's syndrome, recurrent laryngeal nerve block and drug toxicity.<sup>5</sup> Drug toxicity and nerve damage are two common complications in all peripheral nerve blocking. Except for pneumothorax, other complications appear rapidly after blocking and disappear spontaneously after end of drug effect.<sup>1,5</sup> The drug toxicity is infrequent (1.4% to 2%)<sup>6,7</sup> and nerve injury have been reported to vary from 1.9%- 2.2%.<sup>8,9</sup> Pneumothorax rarely requires placement of chest tube.<sup>1,10</sup> Horner's syndrome, phrenic nerve block and recurrent nerve blocks reverse when the drug effect disappears. Vascular injury occurs due to perforation of subclavian artery causing to hematoma formation.<sup>1</sup> The aim of this study was to determine the incidence of complications occurring during supraclavicular block of brachial plexus in our hospital.

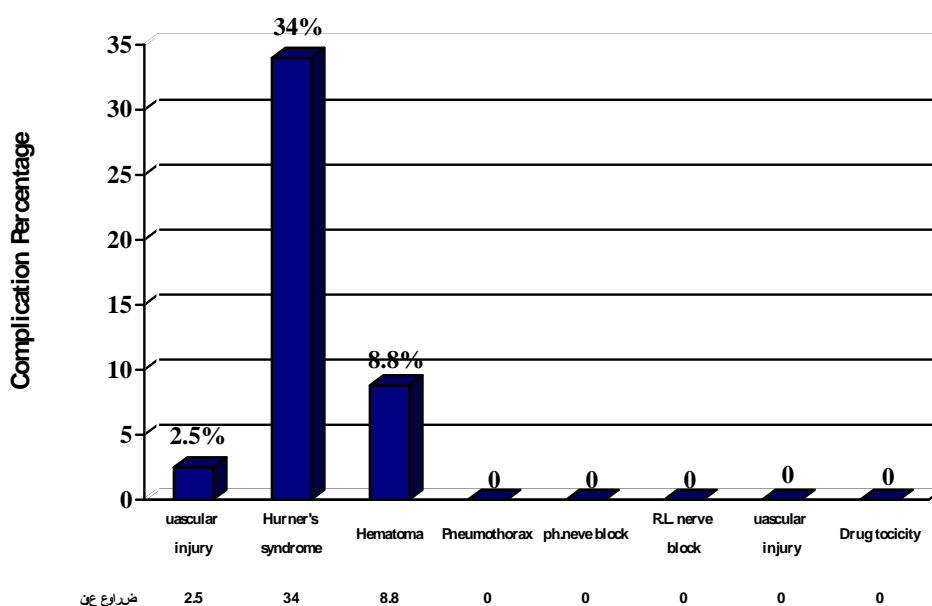
## **MATERIALS AND METHODS**

After obtaining of informed consent of participants and approval by ethics committee of the Tabriz University of Medical Sciences, this study was performed. In this prospective, clinical trial, three-hundred twenty patients (228 males and 92 females) 17-70 years of age (average 38 years) underwent supraclavicular block for upper extremity surgery (supracondillar and double fractures of forearm), from October 2003 to October 2005 in Shohada hospital, Tabriz Iran. Patients with pulmonary disease, excessive obesity, history of coagulation and neurovascular disorders, children and unwilling to cooperate were excluded from the study. The supraclavicular block was performed in all patients by combination of classic and perivascular techniques, by using classic method for insertion of needle and perivascular method for determining the needle site insertion. All patients received 40 mL of 1% lidocaine (400 mg). Data was collected using a questionnaire. We assessed variables including block sufficiency for operation, need for general anesthesia, need for sedation, times of needle insertion, incidence of vascular injury, hematoma, drug toxicity, phrenic nerve block, Horner's syndrome, and pneumothorax. Pneumothorax was assessed by chest x ray 12 and 24h after block. The data were analyzed by SPSS software using chi-squar test.

## RESULTS

A total of 45.3% patients had complications, such Horner's syndrome (34%), vascular injury (2.5%) and hematoma (8.8%) and none had pneumothorax, symptomatic phrenic nerve block, recurrent nerve block, nerve injury or drug toxicity (fig.1).

**Fig 1. Complications of supraclavicular block (N=320).**



The block wasn't sufficient in 48 patients for completion of operation, and general anesthesia was performed in 2 patients, and remaining (46 patients) received sedation for completion of operation. Hematoma prevalence ratio in multiple insertions to single insertion was 14:1 and there was significant relationship between times of insertion and hematoma development ( $p=0.000$ ). There was higher probability of multiple insertions in obese patients and this relationship was significant between the patient's weight and numbers of insertions ( $p=0.000$ ). The correlation between age, sex, and incidence of complications was not significant.

## DISCUSSION

The frequency of Horner's syndrome was 34% which occurs due to leakage of the drug into sympathetic chain. In various studies by conventional technique of supraclavicular block, this complication had been reported to vary from 70%-90%. In our study, using the combination of classic and perivascular techniques, the frequency of Horner's syndrome was low indicating the preference of this method to conventional supraclavicular block technique. Obese patients did not have this ( $p=0.065$ ), probably because of absorption of the drug by peri sheath fat and lack of its distribution to sympathetic chain.<sup>1,2,4,5</sup> In our study, there was no pneumothorax. The incidence of pneumothorax, more recently, has been reported to vary from 0.5-25%,<sup>1</sup> but with the use of nervestimulator clinical pneumothorax has been reported to be <1%.<sup>10</sup> In our study, there was no observed drug toxicity, although it has been reported to be 1.4%<sup>12</sup> to 2%.<sup>7,12</sup>

No case of nerve injury occurred in our study. It has been reported as 1.9%<sup>8</sup> and 2.2%.<sup>12</sup> According to the various reports, this complication is rare and can be prevented by precision and carefulness in blocking. There was no symptomatic phrenic nerve block in our study. This complication had been to occur in 2% patients.<sup>1-5</sup> In conclusion, combination technique of classic and perivascular supraclavicular block of brachial plexus used in our study was effective and associated with less failure and complications with Horner's syndrome as the most common complication. Precision in needle insertion, avoiding excessive insertion of needle resulting in vascular injury, slow injection with controlled pressure allow high likelihood of sufficient block in addition to decreased complications.

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