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RESEARCH ARTICLE

CONVENTIONAL ANATOMICAL LANDMARK TECHNIQUE AND ITS COMPARISON WITH ULTRASOUND TECHNIQUE FOR SUPRACLAVICULAR BRACHIAL PLEXUS NERVE BLOCK IN PATIENTS UNDERGOING UPPER LIMB SURGERIES

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Abstract

Background: Brachial plexus blockade is a well known anesthetic technique for upper limb surgeries.The advantage with supraclavicular block is that it has a rapid action which is predictable and complete for the entire upper extremity.This technique is also called as spinal of upper limb. Earlier, the Landmark technique has been traditionally used for performing this block. But blind technique often requires multiple needle attempts, resulting in increase in procedure time, more patient discomfort and complications likepneumothorax. Ultrasound being a relatively new technique in our country is increasingly being used for performing nerve blocks for limb surgeries. **Objective:** This study was done to evaluate safety and comfort of ultrasound technology for supraclavicular brachial plexus blocks.

Methods: We included 60 adult patients of either sex undergoing surgeries for fracture of elbow region or fracture of the forearm bones. Patients were divided into two groups. In one group, anatomical landmark technique was used while in other group,supraclavicularnerve block was performed using ultrasound technique by double injection technique. All patients received 10 ml each of 1% lidocaine, 20 ml 0.5% Ropivacaine and 10 ml of saline. Surgery was started after confirming adequacy of block. Patients having ineffective blocks were excluded from the study and converted into general anaesthesia.

Results: Supraclavicular plexus nerve block was placed in all 60 patients. Block failure was seen in 6 patients in landmark technique group and in twopatient in USG group. The time for onset of sensory and motor block was shorter in USG group than the landmark technique group. Intra-op addition of analgesic was required in 6patients in blind group and only 3 patients in USG group. The duration of post-op analgesia was more the in USG guided group as compared to blind group.

Conclusion: Ultrasound guidance is a clinical boon forsupraclavicular brachial plexus block.USG allows direct real time visualization of underlying structures and predictable spread of local anesthetic and

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therefore making the procedure faster and safer without much complications.

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Introduction:-

The first blind Supraclavicular nerve block was performed by Kullenkamff in 1911. It is an ideal for procedures of surgeries of upper arm down to the hand. At the level of trunks, the brachial plexus is most compact and has the least surface area, so blockade here has the greatest success rate. The proximity of the brachial plexus to pleura at this place has however resulted in higher incidences of

pneumothorax (0.4% to 5 %.), a concern especially for blind technique.[1]The introduction of USG has rejuvenated this technique and the complications has been significantly reduced .[2] This study was done to compare the safety profile and usefulness of ultrasound technique for supraclavicular brachial plexus blocks in comparison to anatomical landmark based technique.

Methods:-

A total of 60 adult patients of either sex, aged 18-60, ASA score I and II with fracture lower end of humerus or both bone forearm were included in the study.

Exclusion Criteria:

1. Patients with cardiac or respiratory disease
2. History of allergy to local anesthetic agents
3. 3.Patients having limb weakness or peripheral neuropathy
4. 4.Patientsrecieving anticoagulant therapy.

Informed consent was taken explaining the procedure to patient. Patients were kept fasting for 6 hours prior to surgery.In the premedication room, 16 guage i.v line was started and 1 mg of midazolam as premedication was given intravenous before the procedure. Local site asepsis was done and part was draped. Supraclavicular block was performed with patient in supine position and head turned to opposite side. Patients were randomly divided in two groups. 30 ml of drug {Lidocaine 2% with adrenaline (1:200000) 10 ml, Bupivacaine (0.5%) 10 ml and Normal Saline 10 ml} was used for the block.

Anatomical Landmark technique group:

Just around 1 cm above the middle of supraclavicular margin, the subclavian artery was palpated and immediately lateral to it, a subcutaneous wheal was raised with 1% lignocaine using a 23 G needle. A 21 G needle was then inserted through the skin wheal in a backward, inward, and downward direction. Once theparesthesia was elicited, the drug was injected. In case no paresthesia was elicited, the drug was injected on the first rib by walk over technique.

The Ultrasound group:

A Sonosite type M-Turbo ultrasound with high frequency 16 MHz broadband linear probe was used for the block while using a sterile tegaderm sleeve to ensure sterlity. Water based jelly was used as a coupling agent. The USG probe was placed in the oblique plane over lateral half of supraclavicularfossa and subclavian artery was identified. Subclavian artery is seen as ahypodense, pulsatile, anechoic and round structure.The artery is further confirmed by color Doppler. Brachial plexus appears as a bunch of “grape-like”hypoechoic structures. Supraclavicular nerve block was performed under ultrasound guidance by the double injection technique. Using the In plane technique,a23 g spinal needle was inserted under ultrasound visualization. 15 ml of drug was injected between pulsating subclavian artery and first rib after negative aspiration ensuring to block the lower trunk of brachial plexus. Then needle direction was changed and drug was injected superior-lateral to subclavian artery to block upper trunk. Deposition of 12 - 15 ml local anesthetic between artery and rib, lifted the subclavian artery and made subsequent injection easier. Onset of nerve blockade was judged by sensory blockade i.e, pin-prick, temperature and motor blockade (push, pull, pinch). The surgery was started after confirmingthe adequacy of the block. Ineffective blocks were replaced with general anesthesia and insufficient pain control during surgery was supplemented with i.vfentanyl.

Results:-

The two groups were comparable in their demographic profile (Table 1). In the anatomical landmark technique group, 10 patients had Fracture lower end humerus, 17 had fracture of both boneforearm (BBFA) and 3 had fracture of lower end humerus and BBFA. In USG group, 14 patients had Fracture lower end humerus, 12 had fracture of Both bone forearm (BBFA) and 4 had fracture of Lower end humerusand BBFA (Table 2). Supraclavicular block was placed in all 60 patients. Failure of block was seen in 7 patients in landmark technique group and in one patient in USG group. Significantly,the onset time for sensory and motor block was shorter in USG group than landmark technique group (Table 3). Intra-operative analgesic (fentanyl 100 mg) was required in 6/20 patients in blind group and 2/20 patients in USG group.The mean duration of surgery was less than 2 hours (40-155 min). as compared to the blind group, the post operative duration of analgesia was more in USG group.One complication of pneumothoraxpneumothorax was noted in blind group while no such complications were noted in USG group (Table 3).

Table 1:- Demographic Profile.

Sex	**Land mark Technique SCB**	**USG guided SCB**
Male	13	18
Female	17	12

Table 2:- Site of fracture.

Fracture Site	Land mark Technique	USG Technique
Lower end humerous	10	14
Lower end humerous and BBFA	3	4
Both bones forearm	17	12

Table 3:- Block properties comparison.

Group	Land mark (n = 30)	USG (n = 30)
Onset Time(sensory block) in min*	15.89 ± 4.15	11.50 ± 4.90
Onset Time (motor block) in min*	20.74 ± 8.17	16.10 ± 6.90
Block Failure	6	1
Suplemental analgesia	5	3
Duration of analgesia*	234 ± 40	315 ± 55
Pneumothorax	1	0
Blood aspiration	5	0

P≤ 0.05*

Discussion:-

Often called the "spinal of the arm, the supraclavicular block produces dense and complete block of the upper limb"[3] the main reason for this is that the supraclavicular area is a point where the brachial plexus is compact and all the trunks of the plexus lie here in close approximation and thus its very easy block all the nerves with a relatively less amount of drug. An additional advantage is that the block can also be performed with the patient's arm in any position. It can be done using surface landmarks alone or with nerve stimulator. A real danger with the landmark technique is that it is associated with high failure rate and complications like pneumothorax.[2] It was because of this reason that the use of supraclavicular brachial plexus fell out of favour. With introduction of ultrasound imaging for regional nerve block, this technique has seen resurgence in recent years. The supraclavicular region was infact one of the first use of ultrasound application for regional anaesthesia .[1]

In our study,a successful block for surgery was achieved in 96% patients in USG group and 82% patient in landmark technique. A study done by Chan et al reported a very good success rate ofn95% success rate using ultrasonic guidance for supraclavicular block.[5] They also found that the block success rate was higher in US guided group (82.8%) than NS guided group (62.9%) for axillary brachial plexus block.[7] It was also demonstrated by Hopkins PM an improved success rate using USG guidance for any regional anesthesia technique.(6)Wealso found in our study an earlier onset of sensory and motor block in USG group as compared to other group. USG guided technique attributes its higher success rateto the precise deposition of local anesthetic drug to the brachial plexus resulting in faster and complete block of nerve. The

twaao injection technique used by us provided complete block of the brachial plexus as compared to single injection technique.[8-9] The reason for this successes is the septae or a tight muscular membrane between the scalene muscles which separates roots of the plexus and as a result injection into a single location may not result in the spread of the injected drug into all the compartments.In our study, one case ofpneumothorax was detected in landmark technique group. A similar finding was seen by Kapralet al. as they also observed no complications such as pneumothorax, blood vessel or nerve injury in the study of US guided supraclavicular approach brachial plexus blockade.This is possible because of the visualization of underlying anatomical structures and needle underneath. Pleura and first rib are easily visualized with ultrasound and pneumothorax can be avoided by not entering in this 'No Fly Zone'. Thus Real time ultrasonography has made supraclavicular very safe and useful method for regional anaesthesia of upper limb.

We included only 60 patients were included in our study and that was a limitation. A study involving large number of patients would have given us more idea about the incidence of complications like pneumothorax or vascular injury, which are less common with use of ultrasound technique.

Conclusion:-

Ultrasound guidance is a real boon for the use of regional anaesthesia technique, be it forforsupraclavicular brachial plexus block or any other block.. It allows real time visualization of the structures and has more patient acceptance and satistaction.

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