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Axillary Block through Its Anterior Fold- A New Approach

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Abstract:
Back ground: *Absence of abduction or presence of restricted abduction movement of shoulder or presence of infection or space occupying mass in axilla creates difficulties or offers impossibilities to expose axilla for brachial plexus block at the same level.*
Aims: *To introduce axillary block in the presence of axillary infection, mass and restricted movement of the shoulder through anterior fold of the axilla.*
Methods: *Nerve stimulator needle was inserted perpendicularly along the medial side of humerus in supine position of the patient to elicit the distal response of individual muscle and injected 40 ml of local anesthetic solution by multi-injection technique at multiple sites (mid-arm, and wrist block).*
Results: *Brachial plexus block at the level of the axilla through its anterior fold offered satisfactory area of analgesia with motor block for the surgeries on the elbow, forearm, wrist, and hand. Multi-injection technique with the help of nerve stimulator needle contributed 100% success rate.*
Conclusion: *It is an appropriate alternative form of brachial plexus block at the level of the axilla in presence of restricted abduction movement of the shoulder, infection and mass in the axilla.*
Keywords: *anterior fold of the axilla, nerve stimulator needle, brachial plexus, regional anesthesia*.

I. Introduction

The brachial plexus block at the level of the axilla is a popular technique of peripheral nerve blockade and in general, it is advocated the surgeries of elbow, forearm, wrist and hand. Usually, its beneficial effects are utilized as regional anesthesia or as an analgesic in combination with general anesthesia. Traditionally, it is approached through axilla for over a hundred years from its starting period in 1911 by G. Hirschel [1]. Various approaches at interclavicular region [2,3,4,5-11,12,13} are advocated for axillary block since 1973 with differentiation of puncture sites, needle direction, single or multiple neurostimulation, volume of local anesthetic, type of motor response (distal or proximal), and occurrence of complication. Axillary block is also performed through the axilla with or without nerve stimulation. Nevertheless, the presence of the restricted abduction in the shoulder or the presence of infection does not allow the block with this technique of approach. In the search of an alternative way to overcome the above situations, it was hypothesized to block the brachial plexus at the level of the axilla with help of nerve stimulator needle through its anterior fold. Our study was designed to evaluate the advantages and disadvantages of the technique of the anterior approach for blocking the brachial plexus at the level of the axilla.

II. Methods

With approval of medical ethical review board and written informed consent for procedure and study, 30 (thirty) patients, aged between 68 (sixty eight) to 85 (eighty five) years, with ASA physical status score of II and III, undergoing lower limbs' surgeries were included in the study.

All patients were subjected to pre-anesthetic assessment. Patients with the history of Psychological disorders, coronary artery disease, uncontrolled hypertension, intracranial mass, head injury, any abnormality of the spine, cutaneous infection, local cellulitis at the site, coagulation disorders, allergy to local anesthetic, history of opioid dependence, or neurological disorders were excluded from the study. The conditions that contraindicate the surgery or epidural anesthesia were considered at the time of the preoperative visit. The patients were convinced and informed in details about the procedure and technical advantages and disadvantages.

In the O.T, peripheral infusion and non –invasive monitoring were started. Anatomical landmarks were identified. Anterior fold of axilla and medial surface of humerus was marked. The nerve stimulation needle was

inserted along the medial side of the humerus through the anterior fold of the axilla to elicit a response of radial nerve and deposit the local anesthetic. The contraction of triceps muscle indicated the apposition of needle to the radial nerve.

The needle was again inserted more medially to create contraction of biceps muscle due to stimulating musculocutaneous nerve. In similar fashion, the median and unlar nerve were searched for neurostimulation with nerve stimulator needle. The flexor movement of fingers indicated the placement of the needle near to the median nerve. Abolition of pain from fracture sites indicated the successful block. In doubtful cases, the axillary block was potentiated with supplementary mid-arm block or elbow block.

Large quantity of local anesthetic is essential to get a successful block without toxic effects of individual drug. For the same reason, a combination of three local anesthetic drugs, well behind their maximum dose was used for this blockade. Precaution was adopted at each time before deposition of local anesthetic to avoid intravascular injection. After completion of the procedure, extent of sensory block was estimated by pinprick and motor block by absence of joints' movement.

The onset time of motor block denotes the time gap between initiation of block and total loss of motor activity of the same limb. The onset time of sensory blockade is considered as the interval between initiation of block to complete loss of sensation of the effected limb. Duration of sensory block is said as the time interval between initiation of block and complete recovery of sensation. Hypotension was defined as a fall in systolic blood pressure below 100 mm of Hg. Data collected with the help of predesigned proforma were submitted for statistical analysis. Supplementary oxygen supply was administered at the rate of 3l/min through nasal route. The entire procedure was conducted under keen supervision of non-invasive monitoring system of blood pressure (BP), heart rate (HR) and oxygen concentration (Spo2).

III. Results

Out of 50 participants, 40 patients developed complete motor and sensory block of arm and fore-arm. Another ten patients needed supplementary mid-arm and elbow block to be suitable for surgery with tolerable tourniquet. Surgery was completed with hemodynamic stability. No incidence of systemic toxicity was noted. No discomfort was reported either by patients or surgeon at the time of surgical procedure. Rapid onset of both motor and sensory block developed.

IV. Discussion

Under direct vision, the first deposition of local anesthetic in axilla to block the brachial plexus was performed by William Halsted in 1884.[14] And after a long time gap, in 1911, first percutaneous administration of local anesthetic was done by G. Herschel to block brachial plexus.[1] Later on, it became most popular and commonly used peripheral nerve block procedure for elbow, forearm and hand surgery in the field of practicing Anesthesia due to its technical simplicity, higher success rate and low incidence of complications. But such beneficial and useful peripheral nerve block procedure is unapproachable in presence of infection, mass in axilla and restricted abduction movement of shoulder joint.

The use of nerve stimulator for the purpose of peripheral nerve block has definite advantages over traditional paraesthesia technique. The essential utility of nerve stimulator is associated to detect the location of nerve to block it by multi-injection technique with contribution of higher success rate[15] The traditional single injection technique is insufficient to have complete block due to lack of complete circumferential spread of local anesthetic[16].

Failure of musculocutaneous and axillary nerve block, restricted abduction of the shoulder joint, and supplementary infiltration of local anesthetic for tolerance of tourniquet are the established limitations of axillary block. Raj introduced new approach of infraclavicular block in the year of 1973 to erase these limitations of axillary block.[3] For similar purpose and to avoid the potential danger of lung injury with its consequent result of pneumothorax, axillary block through anterior fold is introduced.

Individual nerve location and its motor response to neurostimulation by the nerve stimulator are the essential components of a successful block, although proximal motor response is not so relievable and acceptable as distal motor response. The distal motor response like flexion of fingers due to stimulation of the median nerve is highly acceptable for an adequate blockade of individual nerve. It is also necessary to emphasize that the proximal motor response like contraction of triceps by stimulation of radial nerve is acceptable as significant and adequate block for arm and elbow surgery but not for forearm surgery. The extensor movement of thumb is the perfect and relievable motor response of radial nerve stimulation. Another proximal motor response like contraction of biceps by stimulation of musculocutaneous nerve is considered as effective response to achieve a successful block for tolerable use of tourniquet but does not offer guarantee of perfect and effective brachial plexus block. The report of success rate of 44% with acceptance of proximal motor response (musculocutaneous nerve stimulation), compared to 97% success rate with a distal motor response becomes the cause of unsuccessful block.[11 The distal motor response of fingers contributes the best

block.[11] The motor response of deltoid or biceps does not provide adequate block. The motor response of triceps indicates the involvement of radial nerve nerve. The motor response of musculocutaneous nerve stimulation offers inadequate block.[17]

The axillary block is useful for the provision of anesthesia and postoperative analgesia for the surgery of elbow, forearm, wrist and hand. It is the safest approach for brachial plexus block at the level of the axilla with avoidance of paresis of the phrenic nerve, or the potential dangerous complication like pneumothorax.[18] The ease of performance and relatively high success rate [16] are the reasons behind its common use in practice by anesthetists. The pulsatile and palpable axillary artery is a good guide for perivascular approach for axillary block.[19]

Advantages of the axillary block through its anterior fold with the help of nerve stimulator needle are to block the terminal branches of brachial plexus without disturbing the fracture arm. Abduction of the shoulder joint which is the most important and needful step of conventional axillary block, is not essential criteria of this procedure. The excruciating pain at fracture site and its exaggeration on movement during the abduction of the shoulder to expose the axilla are avoided in the procedure of axillary block through its anterior fold.

It is an optional approach to avoid the axillary route particularly in the presence of infection in the said area. Easily available anatomical landmarks offer technical simplicity even in fatty persons. Difficulties to identify the axillary artery in the presence of fat are easily avoidable in this approach. On the whole, it may be regarded as Complete, reliable, rapid, and safe blockade of the arm which is easily achievable even after changing the route of application.

The axillary approach to the brachial plexus is highly consistent to provide brachial plexus anesthesia for upper extremity surgery specially below elbow surgery. The axillary block approached through anterior axillary fold is executed for the patients of the restricted abduction of the shoulder joint either due to fractured pain or rheumatoid. Overall this anterior approached axillary block is an excellent procedure for the patients of restricted shoulder movement and axillary infection or presence of axillary mass or to avoid the potential danger like lung injury and its consequent effects.

The axillary block is frequently associated with inadequate block due to escape of musculocutaneous nerve that is responsible for motor and sensory supply of biceps, brachialis and coracobrachialis along with the cutaneous supply of forearm. This commonest disadvantage of axillary block can be rectified by individual nerve block technique. The cutaneous supply of medial and posterior aspect of arm and axilla depends on intercostobrachial nerve which is frequently escaped from block resulting in intolerable tourniquet. Subcutaneous infiltration of local anesthetic on the medial surface of the arm converts the situation in favour of tolerable tourniquet.

Anatomical arrangement of nerves of brachial plexus in the axilla indicates that radial, median and unal nerves lie within neurovascular bundle. The median cutaneous nerve of arm and forearm may lie within the sheath or outside the sheath. The musculocutaneous nerve also lies outside the sheath. Individual nerve block technique is essential for this nerve that is frequently done in this study.

Intra-arterial or intravenous injection of local anesthetic is the commonest complication of axillary block leading to systemic toxicity characterized by epileptic seizure, central nervous system depression, and coma. The commonest complication in relation to the cardiovascular system is the cardiovascular instability such as bradycardia, hypotension, cardiac dysrhythmia, cardiac arrest, and death. Infection or bleeding at the site of puncture may complicate the procedure due to disruption of integrity of the skin.

Technical easiness and infrequent, manageable complications with high success rate without abduction movement of the shoulder joint are the most advantageous factors to execute the acceptance of this new approach of brachial plexus block at the level of the axilla. Indeed, it is an acceptable procedure in the presence of infection or mass in axilla and restricted movement of the shoulder joint.

V. Conclusion

Axillary nerve block is a safe and effective regional anesthetic technique suitable for a wide variety of procedures, for both inpatient and outpatient care [8-13] The anterior approach through its anterior fold to brachial plexus is an appropriate alternative form of technique in presence of infection in axilla, presence of mass in axilla, absence of abduction movement of shoulder joint and presence of excruciating pain due to fracture.

References

[1]. Hirschel, G "Die anästhesierung des plexus brachialis fuer die operationen an der oberen extremitat" [Anesthesia of the brachial plexus for operations on the upper extremity]. Munchener Medizinische Wochenschrift (in German)1911; 58: 1555–6.
[2]. Winnie AP. Infraclavicular brachial plexus block–a new approach. Guest discussion. Anesth Analg 1973; 52: 903–4.
[3]. Raj PP, Montgomery SJ, Nettles D, Jenkins MT. Infraclavicular brachial plexus block–a new approach. Anesth Analg 1973; 52: 897–903.
[4]. Rodriguez J, Barcena M, Rodriguez V, Aneiros F, Alvarez J. Infraclavicular brachial plexus block effects on respiratory function and extent of the block. Reg Anesth Pain Med 1998; 23: 564–8.

[5]. Klaastad O, Lilleas FG, Rotnes JS, Breivik H, Fosse E. Magnetic resonance imaging demonstrates lack of precision in needle placement by the infraclavicular brachial plexus block described by Raj et al. Anesth Analg 1999; 88: 593–8.
[6]. Whiffler K. Coracoid block – a safe and easy technique. Br J Anaesth 1981; 53: 845–8.
[7]. Wilson JL, Brown DL, Wong GY, Ehman RL, Cahill DR. Infraclavicular brachial plexus block: parasagittal anatomy important to the coracoid technique. AnesthAnalg 1998; 87: 870–3.
[8]. Kapral S, Jandrasits O, Schabernig C, et al. Lateral infraclavicular plexus block vs. axillary block for hand and forearm surgery. Acta Anaesthesiol Scand 1999; 43: 1047–52.
[9]. Kilka HG, Geiger P, Mehrkens HH. Infraclavicular vertical brachial plexus blockade. A new technique of regional anaesthesia. Anaesthesist 1995; 44: 339–44.
[10]. Salazar CH, Espinosa W. Infraclavicular brachial plexus block: variation in approach and results in 360 cases. Reg Anesth Pain Med 1999; 24: 411–6.
[11]. Borgeat A, Ekatrodamis G, Dumont C. An evaluation ofthe infraclavicular block via a modified approach of the Raj technique. Anesth Analg 2001; 93: 436–41
[12]. Koscielniak-Nielsen ZJ, Rotboll Nielsen P, Risby Mortensen C. A comparison of coracoid and axillary approaches to the brachial plexus. Acta Anaesthesiol Scand 2000; 44: 274–9.
[13]. Mehrkens HH. Peripheral Regional Anaesthesia Tutorial. Ulm Rehabilitation Hospital. 1998: 13–6.
[14]. Halsted ,WS (1885-09-12). "Practical comments on the use and abuse of cocaine; suggested by its invariably successful employment in more than a thousand minor surgical operations". New York Medical Journal 42: 294–5.
[15]. Coventry DM, Barker KF, Thomson M. Comparison of two neurostimulation techniques for axillary brachial plexus blockade. British Journal of Anaesthesia. 2001;86(1):80–83.
[16]. Thompson GE, Rorie DK. Functional anatomy of the brachial plexus sheaths. Anesthesiology. 1983;59(2):117–122.
[17]. Fitzgibbon DR, Debs AD, Erjavec MK. Selective musculocutaneous nerve block and infraclavicular brachial plexus anesthesia. Case report. Reg Anesth 1995; 20: 239–41.
[18]. Macfarlane, A; Brull, R. "Ultrasound guided supraclavicular block". The Journal of New York School of Regional Anesthesia2009; 12: 6–10.
[19]. Winnie, AP (1990). "Perivascular techniques of brachial plexus block". Plexus anesthesia: perivascular techniques of brachial plexus block I (2nd ed.). Philadelphia: W.B. Saunders Company. pp. 126–7.
[20]. De Tran QH, Clemente A, Doan J, Finlayson RJ Brachial plexus blocks: a review of approaches and techniques. Canadian Journal of Anaesthesia 2007: 548): 662–74.

Table No 1 Showing Demographic Profile, Hemographic Profile And Analgesic Profile.

DEMOGRAPHIC PROFILE	
Age (years)	78.38±7.08
Height	158.96±3.67
Weight (Kg)	53.04±2.02
Sex (M:F)	27:23
HEMODYNAMIC PROFILE	
Systolic blood pressure (mmHg)	115.32±7.62
Heart beats (beats/min)	88.82±12.75
Oxygen saturation (%)	98.94±0.89
ANALGESIC PROFILE	
Postoperative analgesic(hours)	16.82±3.34