

## STUDY OF COMMUNICATIONS BETWEEN MUSCULOCUTANEOUS NERVE AND MEDIAN NERVE IN ADULT CADAVERS

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### ABSTRACT

#### BACKGROUND

Variations of the musculocutaneous nerve and the median nerve, like the communications between the two, may prove valuable in the traumatology of the shoulder joint and upper arm region. These variations are important in the procedure of blocking the brachial plexus and in clinical neurology.

#### MATERIALS AND METHODS

The present study was conducted on 100 upper limbs belonging to 50 cadavers (Right 50 & left 50) obtained from the Department of Anatomy, Kakatiya medical college, Warangal, Telangana. Dissection of the infraclavicular part of the brachial plexus was done. The variations in the origin, course and communications with the median nerve were noted.

#### RESULTS

In 2% of the limbs the nerve was found to give one communicating branch to the median nerve after piercing the coracobrachialis.

#### CONCLUSION

Knowledge of possible variations between musculocutaneous nerve and median nerve is necessary to general surgeons, plastic surgeons, neurologists and orthopaedic surgeons.

#### KEYWORDS

Musculo-Cutaneous Nerve, Median Nerve, Communication.

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#### BACKGROUND

Variations in the formation of brachial plexus and its terminal branches in the upper extremity are very common and have been reported in many literatures.<sup>1</sup> Brachial plexus innervates the muscles, joints and skin of upper limb. The supra and infra clavicular branches of brachial plexus supply the upper limb. The infra clavicular part of brachial plexus is arranged into lateral, medial and posterior cords. The musculocutaneous nerve arises from the lateral cord of brachial plexus. Its fibres are derived from the nerve roots C<sub>5,6,7</sub> opposite the lower border of pectoralis minor muscle. The nerve pierces the coracobrachialis muscle and descends laterally between biceps brachii and brachialis till it reaches the lateral side of tendon of biceps and is continued into the fore arm as lateral cutaneous nerve of forearm. In its course through the arm the musculocutaneous nerve supplies Coracobrachialis, both heads of Biceps Brachii and greater part of Brachialis. The branch to Coracobrachialis leaves the

MCN before it enters the muscle. The branches to Biceps and Brachialis leave the nerve after it pierces the coracobrachialis. The branch to Brachialis also supplies the elbow joint. The nerve also sends a small branch to humerus which enters the bone through nutrient foramen.<sup>2</sup>

#### MATERIALS AND METHODS

The study was conducted on 50 (fifty) cadavers including male and female with 100 upper limb specimens at department of anatomy, Kakatiya Medical College, Warangal, Telangana state. Cadavers with an age variation of 40-80 yrs. are studied during a period of 5 (Five) years. The cadavers were preserved by the injection of formalin base preservative (10% formalin) and stored on 15% formalin tank solution.<sup>3</sup>

Dissection was done based on guidelines of Cunningham's manual. Pectoralis major was cut at its origin and reflected towards its insertion. Contents of the axilla were exposed, removing the loose connective tissue, fat and lymph nodes. The coracobrachialis and short head of biceps were identified and cleaned. Branch of the musculocutaneous nerve to the coracobrachialis was identified with standard procedure. Deep fascia of the anterior surface of the arm was divided up to elbow, and the biceps brachii was uncovered and cleaned. Musculocutaneous nerve running is between biceps and brachialis was identified and the branches to these muscles

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were documented. The emergence of the nerve from beneath the lateral border of the tendon of biceps as the lateral cutaneous nerve of the forearm was recorded. Any variation like origin or branching pattern of musculocutaneous nerve was carefully noted. Inter communication between the musculocutaneous nerve and the median nerve was recorded. The pectoral region, axilla and arm regions of both right and left upper limbs of each cadaver were dissected to observe the musculocutaneous nerve and its branches and the communication of MCN with median nerve and relation to coracobrachialis muscle were observed.<sup>4</sup>

### OBSERVATION AND RESULTS

The communications between the two nerves were observed by following points.

- Whether the formation of two nerves were normal.
- Direction of the communication- from musculocutaneous to median nerve or from the median nerve to musculocutaneous nerve.
- Number of communicating branches.

In the present study, out of 100 upper limbs, communication between MCN and median nerve was observed in 2 upper limbs (2%) one in right (Figure 1) and other in left (Figure 2) upper limb.

In these cases communicating branch was originated from MCN and running towards the median nerve distal to the coracobrachialis.



**Figure 1. (Right)- MCN Communicating with the Median Nerve Distal to the Coracobrachialis**



**Figure 2. (Left)- MCN Communicating with the Median Nerve Distal to the Coracobrachialis**

### DISCUSSION

Musculocutaneous nerve is a mixed variety of peripheral nerve which supplies muscles of anterior compartment of arm and continues as lateral cutaneous nerve of forearm.<sup>2</sup> In present study it is observed that musculocutaneous nerve gave a communicating branch to median nerve distal to coracobrachialis muscle.

Eman Glazab Beheiry has observed 60 upper limbs and found communicating branch between the musculocutaneous nerve and median nerve in the left arm of 55 yrs. old male cadaver. The communicating branch originated from MCN after piercing the coracobrachialis muscle 7 cm distal to acromion process, it joined the MN 17.5 cm distal to acromion process.<sup>5</sup>

Kosugi et al reported same finding in 43 out of 75 limbs.<sup>6</sup> Sergio Ricardo Rios Nascimento et al reported a variation in which the union of MCN with median nerve distal to coracobrachialis muscle.<sup>7</sup> S Lokanadham et al noticed a communicating branch arising from MCN to median nerve distal to coracobrachialis in upper 1/3 of arm along with the normal muscular branches of nerve.<sup>8</sup>

Chauhan. R & Roy. T.S have observed a communicating branch between MCN and median nerve 12.3 cm distal to the tip of coracoid process, below the level of insertion of coracobrachialis muscle.<sup>9</sup>

Preksha Sharma et al also noticed same findings, a communication between MCN and MN distal to coracobrachialis muscle.<sup>10</sup>

Ramya K et al observed an anomalous communication between musculocutaneous nerve and median nerve in both upper limbs of a 72 yrs. old male cadaver. The communicating branch arise from the MCN at a distance of 12.6 cm from tip of coracoids process on right and left side and joins the MN at 16.2 cm from coracoid process.<sup>11</sup>

Eggleston and Goldman have noticed inter communicating branch between MCN and MN in 36% of dissections.<sup>12</sup>

In the year 1998, Venieratos. D and Aagnostopoulous studied 79 cadavers and found communications between MCN and MN in 22 cadavers and they classified the communicating in relation to the muscle coracobrachialis in to 3 types. Type 1- the communication is proximal to coracobrachialis muscle (9/22). Type 2- the communication is distal to coracobrachialis (10/22). Type 3- the MCN as well as communicating branch did not pierce the muscle (3/22).<sup>13</sup>

Our present study coincides with type 2 category of Venieratos.D and Aagnostopoulous classification and also coincides with above studies.

In the year 2002, Choi D et al studied 138 cadavers (276 arms) and described the communication between MCN and MN into 3 groups. Group I- fusion of nerves (14 arms 19.2%), group II- one connecting branch between the nerves (53 arms 72.6%), group III- two connecting branches between the two nerves (5 arms 6.8%).<sup>14</sup>

Our present study coincides with the group II of Choi classification.

Luis Ernest Ballesteros et al have studied 106 upper limbs in 17% of cases, there was MCN and MN

communication in which the communicating branch was seen leaving MCN after piercing the coracobrachialis.<sup>15</sup>

El falougy H et al observed the communication between MCN & MN in 2 cases. The communicating branch was situated in the lower third of the arm and distal to the nerve penetration through coracobrachialis.<sup>16</sup>

Santosh Kumar Sahu et al noticed in left upper limb of a female cadaver of 34 yrs. that the communicating branches after originating from the MCN joined the MN in the middle 1/3<sup>rd</sup> of the arm.<sup>17</sup>

Loukas M et al classified the communicating patterns as type I, II, III and IV. After dissecting 129 formalin fixed cadavers, 119 communications were found. Type I- communication was proximal to the point of entry of MCN into CB (54 communications 45%). Type II- the communications were distal to the point of entry of MCN into CB (42 communications 35%). Type III – the MCN did not pierce CB but communicates with MN (11 communications 8%). Type VI- the communications were both proximal and distal to the point of entry of MCN into CB.<sup>18</sup>

Huban R Thomas et al observed a variation of MCN in right upper limb of middle aged Indian male cadaver. After piercing CB the MCN divide into 2 divisions, one lateral cutaneous nerve of forearm and another branch that joins the median nerve below the insertion of CB.<sup>19</sup>

Master Neeraj and Gupta Deepa studied 56 upper limbs belonging to 28 embalmed cadavers. In 6 upper limbs MCN and MN showed communicating rami below coracobrachialis.<sup>20</sup>

NBS Parimala studied 90 upper limbs from 45 cadavers. Communication between musculocutaneous nerve and median nerve was observed in 19 out of 90 upper limbs and complete fusion of musculocutaneous nerve and median nerve was observed in 8 out of 90 upper limbs.<sup>21</sup>

Namath S Hussain observed a unilateral communication between the MCN and MN during a cadaveric study of brachial plexus. The communication was found in the left arm branching off from the MCN after piercing the CB, distal to both the insertion of CB and origin of brachialis muscles. The communication was 6 inches from the coracoids process and 4 inches from the elbow flexion crease.<sup>22</sup>

R Chitra studied 50 upper limb specimens from 25 embalmed cadavers. The communications between the two nerves were found in 13 arms distal to CB.<sup>23</sup>

Sharadkumar et al conducted the study in 100 upper limbs of 50 donated embalmed cadavers. Out of 100 specimens they found the variations between MCN and MN in 30% specimens. Out of 30, 4 specimens showed the communication between MCN and median nerve in the middle of arm.<sup>24</sup>

Leng L, Huaying Liu et al<sup>25</sup> observed a total of 160 upper limbs from 80 adult cadavers and classified the variations of MCN into 5 groups depending on origin of MCN. Group I- classic description found in text books (142 arms -88.75%). Group II- multi branch type –2 or 3 branches originating from the lateral cord (3 arms-1.87%). Group III- mixed type- lateral cord of brachial plexus and median nerve sending branches to constitute MCN respectively (1arm

0.63%). Group VI-absence type- MCN originating from MN directly (5 arms 3.12%). Group V combining type- MCN originated from lateral cord of brachial plexus and gave branches to muscles in the arm and then finally joins with the MN (9 arms 5.63%).

There is lot of dissimilarity in the description of variations of communication of musculocutaneous nerve with median nerve among different authors. In standard text books it is simply described that if the lateral root of median nerve is small, the musculocutaneous nerve (C5, 6, 7) connects with the median nerve in the arm but the incidence was not stated.<sup>2</sup>

The observations in the present study find the incidence of communication of musculocutaneous nerve with median nerve as 2% of 100 specimens.

## CONCLUSION

The musculocutaneous nerve, being in close proximity to the shoulder and arm, is frequently involved in injuries and surgical procedures in this region, especially if there is an unexpected variation. Good knowledge of the course, branching pattern and variations of the musculocutaneous nerve and its possible communications with the median nerve is valuable in traumatology of the shoulder joint.

Knowledge of possible variations between musculocutaneous nerve and median nerve is necessary to general surgeons, plastic surgeons, neurologists and orthopaedic surgeons to avoid injury to nerve and complications during surgical procedures like repair of fractures of humerus, in arthroscopy of shoulder joint and post traumatic evaluations, exploring procedures, flap dissections etc.

Communications between median nerve and musculocutaneous nerve are not infrequent and awareness of such type of variations is essential clinically to avoid misinterpretation of the scenario in case of nerve injuries. The MCN injury proximal to the MCN-MN communication can lead to an unexpected weakness of the forearm flexor muscles and thenar muscles with clinical signs seen similar to MN injury at the level of the arm. Furthermore, the MN injury proximal to the MN-MCN communication can lead to a clinical presentation characterized by functional preservation of forearm and hand muscles innervated by MN.<sup>21</sup>

**ABBREVIATIONS-** MCN-musculocutaneous nerve, MN- median nerve, CB- coracobrachialis.

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