IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 4 Ser. 2 (April. 2026), PP 75-79
www.iosrjournals.org

Pattern Of Innervation Of Coracobrachialis Muscle By Musculocutaneous Nerve: A Cross-Sectional Study

Dr. Rosy Karam[1], Dr. Laishram Meiraba Singh[2], Dr. Leishangthem Jelina[3], Dr. Purnabati Soraisam[4], Dr. Irungbam Deven[5], Dr. Soram Malasana Devi[6]

Post Graduate Trainee, Department Of Anatomy, Regional Institute Of Medical Sciences, Imphal, India
Senior Resident, Department Of Anatomy, Regional Institute Of Medical Sciences, Imphal, India
Post Graduate Trainee, Department Of Anatomy, Regional Institute Of Medical Sciences, Imphal, India
Professor, Department Of Anatomy, Regional Institute Of Medical Sciences, Imphal, India
Professor, Department Of Anatomy, Regional Institute Of Medical Sciences, Imphal, India
Senior Resident, Department Of Anatomy, Regional Institute Of Medical Sciences, Imphal, India

Abstract:
Background*: The musculocutaneous nerve (MCN) typically pierces the coracobrachialis muscle (CBM) and supplies the anterior compartment of the arm. Anatomical variations in its course, branching, and communications with the median nerve have clinical and surgical significance. The present study aims to assess the relationship between the musculocutaneous nerve and the coracobrachialis muscle.*
Materials and Methods*: Forty embalmed adult cadaveric upper limbs were dissected at the Department of Anatomy, RIMS, Imphal (Dec 2023–Dec 2024). The course of MCN relative to CBM, branching pattern, and variations in muscular innervation were recorded. Percentages were calculated.*
Results*: MCN pierced CBM in 36 limbs (90%), did not pierce in 3 limbs (7.5%), and absent in 1 limb (2.5%). Before piercing, branch to coracobrachialis occurred in 70% of limbs; after piercing, branch to coracobrachialis occurred in 20% of limbs; direct lateral cord innervation in 7.5%, and absence of MCN in 2.5%.*
Conclusion: *Anatomical variations of MCN are clinically significant. Awareness of these patterns is critical to prevent iatrogenic injury during upper limb surgery, optimize nerve blocks, and interpret atypical neurological presentations.*
Key Word: *Musculocutaneous nerve, Coracobrachialis muscle, Lateral cord, Anatomical variations.*

Date of Submission: 29-03-2026 Date of Acceptance: 09-04-2026

I. Introduction

The musculocutaneous nerve (MCN) is a mixed peripheral nerve that arises as a terminal branch of the lateral cord (LC) of the brachial plexus. It typically pierces the coracobrachialis muscle (CBM), then descends between the biceps brachii (BB) and brachialis muscles. Along its course, it supplies the coracobrachialis, biceps brachii, and brachialis muscles, and continues distally as the lateral cutaneous nerve of the forearm.[1,2,3] In classical anatomical descriptions, the musculocutaneous nerve follows a constant course without communicating with adjacent nerves; however, numerous variations in its origin, course, branching pattern, and communications have been documented in cadaveric and clinical studies.[4,5]

Variations in the peripheral nervous system are of considerable clinical importance. Aberrant nerve pathways may alter surgical landmarks, predispose to iatrogenic injury, or produce atypical motor or sensory deficits.[6,7] The musculocutaneous nerve, owing to its close relationship with the shoulder joint and anterior compartment of the arm, is particularly vulnerable during procedures such as shoulder arthroscopy, coracoid process transfer, open reduction and internal fixation of humeral fractures, nerve transfer surgeries, and brachial plexus blocks.[8]

Embryologically, such variations may result from alterations in the formation and differentiation of the lateral cord (LC) of the brachial plexus, leading to persistence of primitive neural communications or anomalous branching patterns.[9,10]

Detailed anatomical documentation of the musculocutaneous nerve's variations remains necessary given its functional significance and close association with the coracobrachialis muscle. By enhancing awareness of potential deviations from the classical pattern, regional cadaveric investigations improve surgical safety and provide valuable data.[2,11] The present study aims to assess the relationship between the musculocutaneous nerve and the coracobrachialis muscle.

II. Material And Methods

This descriptive cross-sectional study was conducted in the Department of Anatomy, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, India, from December 2023 to December 2024. A total of 40 embalmed adult cadaveric upper limbs available during the study period were examined.

Study Design: Descriptive cross-sectional study.

Study Duration: December 2023 to December 2024.

Sample Size: 40 cadaveric upper limbs.

Sample size calculation: Calculated using the formula $n = Z^2PQ/d^2$, Where, P = 3.8%, d = 6%, Z = 1.96.[12]

Inclusion criteria: Dissected upper limb specimens used for teaching the MBBS students available during the study period.

Exclusion criteria: Deformed, mutilated specimens.

III. Result

Relation of the Musculocutaneous Nerve with the Coracobrachialis Muscle

MCN pierced CBM in 36 limbs, i.e. 90% (Fig 1 and 2), did not pierce in 3 limbs, i.e. 7.5% (Fig. 3), and absent in 1 limb, i.e. 2.5% (Fig. 4)

Table 1. Relation of the MCN with the Coracobrachialis Muscle.

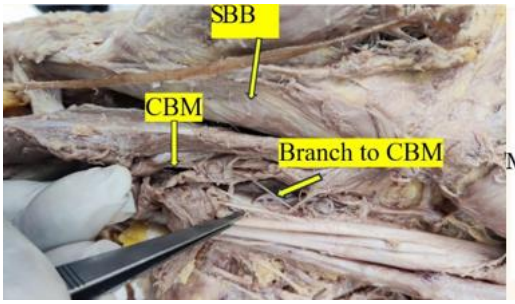
Type	Relation with CBM	No. of Cases	Percentage
I	MCN piercing CBM	36	90%
II	MCN not piercing CBM	3	7.5%
III	MCN absent	1	2.5%

Variations in Innervation of Coracobrachialis Muscle

Four patterns were observed in (Table 2):
Type I: MCN piercing CBM and innervating before piercing (Fig. 1a&b)
Type II: MCN piercing CBM but supplying via branch after piercing (Fig. 2a&b)
Type III: MCN not piercing CBM; supplied by lateral cord twig (Fig. 3a&b)
Type IV: MCN absent; supplied by lateral cord twig (Fig. 4a&b)

Table 2. Patterns of Innervation of Coracobrachialis Muscle

Type	Mode of Innervation	No. of Cases	Percentage
I	MCN piercing CBM and innervating before piercing	28	70%
II	MCN piercing CBM but supplying via branch after piercing	8	20%
III	MCN not piercing CBM; supplied by lateral cord twig	3	7.5%
IV	MCN absent; supplied by lateral cord twig	1	2.5%



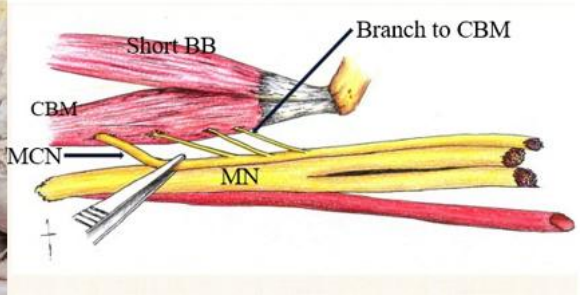
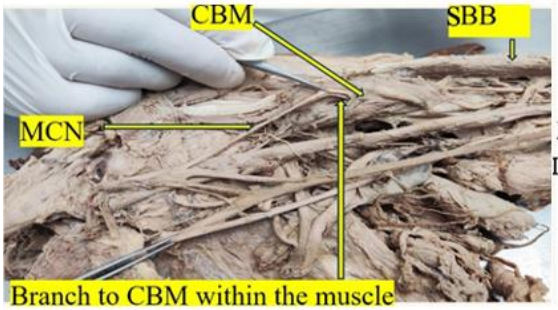


Figure 1a: Branch to CBM (right arm) arising before piercing. SBB – Short head of Bicep Brachii, CBM – Coracobrachialis.
Figure 1b: Schematic illustration of CBM (right arm) arising before piercing. MN – Median Nerve, MCN – Musculocutaneous nerve



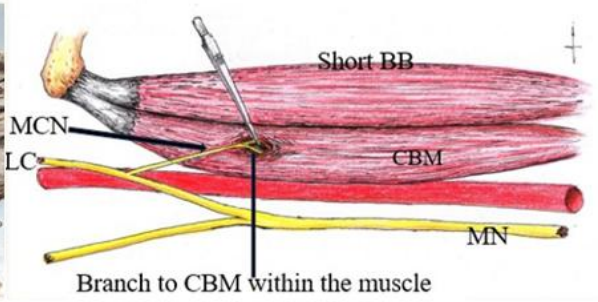
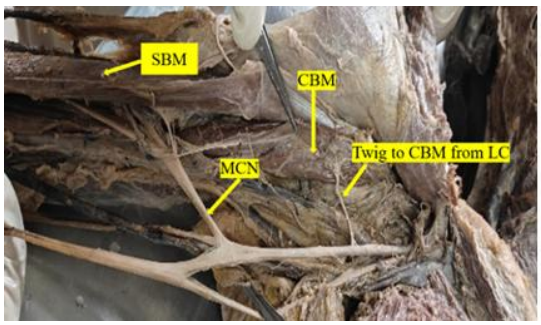


Figure 2a: Branch to CBM (Left arm) within the muscle
Figure 2b: Schematic illustration of branch to CBM (Left arm) within the muscle



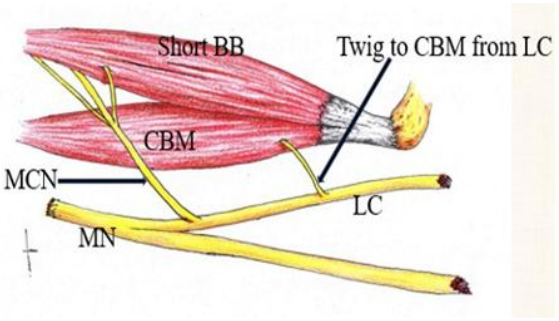
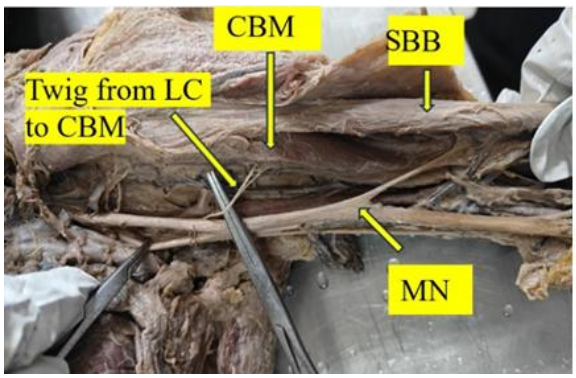


Figure 3a: Branch to CBM (Right arm) arising from LC
Figure 3b: Schematic illustration of branch to CBM (Right arm) arising from LC



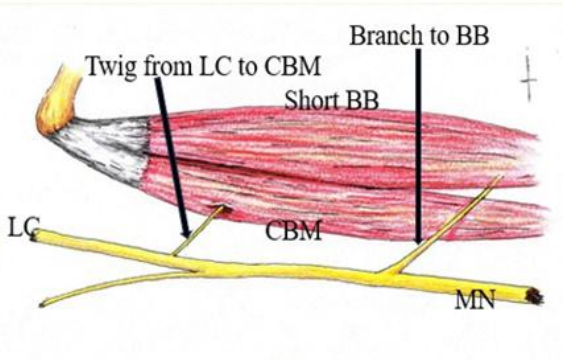


Figure 4a: Absent MCN (Left arm), Twig from LC
Figure 4b: Schematic illustration of absent MCN (Left arm), Twig from LC

IV. Discussion

The present study investigated the anatomical relationship between the musculocutaneous nerve (MCN) and the coracobrachialis muscle (CBM) in 40 adult cadaveric upper limbs. The classical anatomical pattern, in which the musculocutaneous nerve pierces the coracobrachialis muscle was observed in 90% of specimens. A non-piercing pattern was identified in 7.5% of cases, while a complete absence of the musculocutaneous nerve was observed in 2.5% of the specimens.

These findings are broadly consistent with previous anatomical investigations although variations in prevalence have been reported across different populations and sample sizes. Most studies indicate that the classical pattern of the musculocutaneous nerve piercing the coracobrachialis muscle predominates, usually ranging from approximately 84% to 96% of cases.[7,9,10,13,14,15]

The prevalence of the classical piercing pattern observed in the present study (90%) falls within the range reported in earlier investigations. Loukas and Aqueelah reported a high prevalence of 95.4%, while Chitra and Sobana documented 96.25% of specimens and Master and Gupta (94.62%) showing the typical piercing pattern. [7,16,17] Similarly, Maeda et al reported a prevalence of 96%, supporting the predominance of the classical anatomical configuration.[18] In contrast, relatively lower frequency was reported by Jayanthi and Arunkumar (84.2%) and Guerri-Guttenberg & Ingolotti (85.2%).[11,15] Comparative findings are summarized in Table 3.

Table 3. Comparative prevalence of musculocutaneous nerve variations reported in previous studies

Author	Sample Size (Upper Limbs)	MCN Piercing CB (%)	MCN Not Piercing CB (%)	Absence of MCN (%)
Loukas & Aqueelah[16]	258	95.4	4.3	0.4
Guerri-Guttenberg & Ingolotti[11]	56	85.2	11.1	3.7
Chitra & Sobana[7]	80	96.25	1.25	2.5
Jayanthi & Arunkumar[15]	264	84.2	12.4	3.4
Jamuna & Amudha[3]	50	88	6	6
Master & Gupta[17]	56	94.6	1.8	3.6
Maeda et al[18]	453	96	2.2	1.8
Badawoud[19]	54	92.6	5.6	1.8
Present Study	40	90	7.5	2.5

The incidence of absence of the musculocutaneous nerve observed in the present study (2.5%) corresponds to the lower end of the range reported in earlier studies. Several authors have documented this variation in approximately 2–6% of cases as shown in Table. No. 3. The lowest incidence of MCN absence was reported by Loukas & Aqueelah (0.4%), whereas the highest by Jamuna & Amudha (6%).[3,16] In such situations, the median nerve may assume the motor supply to the muscles of the anterior compartment of the arm, which has important implications for clinical examination, nerve conduction studies, and surgical procedures involving the brachial plexus.[19]

The present study also demonstrated variability in the pattern of innervation of the coracobrachialis muscle. In 20% of specimens, the musculocutaneous nerve supplied the coracobrachialis muscle before piercing it, whereas in 7.5% of cases the muscle received direct innervation from a twig arising from the lateral cord of the brachial plexus. Similar variations in the innervation of the coracobrachialis muscle have been described by El-Naggar, who reported morphological diversity in the branching pattern of the musculocutaneous nerve.[14]

Guerri-Guttenberg and Ingolotti proposed a classification suggesting that the relationship between the musculocutaneous and median nerves represents a continuum of anatomical variations rather than discrete anomalies.[11] According to this concept, many of the observed patterns may represent transitional forms resulting from developmental modifications of the brachial plexus.

Embryologically, both the musculocutaneous and median nerves originate from the lateral cord of the brachial plexus. During limb bud development, motor axons extend toward the developing muscle masses under the influence of molecular guidance signals. Variations in nerve formation may arise from altered segmentation of the brachial plexus, incomplete separation of nerve fascicles, or persistence of embryonic neural communications between the musculocutaneous and median nerves.[9,10] Additionally, developmental variations in the coracobrachialis muscle may influence the final anatomical course of the musculocutaneous nerve.[20]

V. Conclusion

The musculocutaneous nerve exhibits notable anatomical variations in its course, branching pattern, and mode of innervation of the coracobrachialis muscle. Awareness of these variations is essential for anatomists, surgeons, and anesthesiologists to minimize the risk of iatrogenic injury during shoulder and arm procedures, optimize brachial plexus blocks, and interpret atypical neurological presentations. Detailed knowledge of these patterns contributes to safer surgical planning, improved patient outcomes, and enhanced understanding of upper limb neuroanatomy.

References

[1]. Lambert S. Shoulder Girdle And Arm. In: Standring S, Et Al. Gray's Anatomy: The Anatomical Basis Of Clinical Practice. 42nd Ed. Amsterdam: Elsevier; 2021. P. 890-929.
[2]. Saeed M, Rufai AA. Median And Musculocutaneous Nerves: Variant Formation And Distribution. Clin Anat. 2003;16(5):453-7.
[3]. Jamuna M, Amudha G. A Cadaveric Study On The Anatomic Variations Of The Musculocutaneous Nerve In The Infraclavicular Part Of The Brachial Plexus. J Clin Diagn Res. 2011;5(6):1144-7.
[4]. Nasrabadi HT, Abedelahi A, Shoorei H, Shokoohi M, Salimnejad R, Dolatkhah MA, Et Al. A Variation Of Musculocutaneous Nerve Without Piercing The Coracobrachialis Muscle While Communicating With The Median Nerve: A Case Report And Literature Review. Int J Surg Case Rep. 2017;41:453-55.
[5]. Gayathri J, Bharatha Devi M, Anandhi V. A Study On Variations Of The Musculocutaneous Nerve In Relation To The Coracobrachialis Muscle. Medpulse Int J Anat. 2019;12(1):22-4.
[6]. Bhowmik K, Sarkar A. Clinically Significant Unilateral Variation Of Musculocutaneous Nerve. Int J Curr Res Rev. 2014;6(6):75-8.
[7]. Chitra PS, Sobana M. Anatomical Study Of Variations Of Musculocutaneous Nerve. Natl J Clin Anat. 2016;5(3):143-7.
[8]. Cambon-Binder A, Leclercq C. Anatomical Study Of The Musculocutaneous Nerve Branching Pattern: Application For Selective Neurectomy In The Treatment Of Elbow Flexor Spasticity. Surg Radiol Anat. 2015;37(4):341-8.
[9]. Yamamoto M, Takayama T, Takata H, Shiraishi Y, Tomita N, Sakanaka K, Et Al. Coracobrachialis Muscle And The Musculocutaneous Nerve: A Study Using Human Embryonic Sections. Okajimas Folia Anat Jpn. 2016;93(1):15-20.
[10]. Kopuz C, İçten N. The Musculocutaneous Nerve Completely Fused With Lateral Root, Partially With Median Nerve While Not Perforating Coracobrachialis Muscle: Its Embryological Basis And Literature Review. Int J Cadaveric Stud Anat Var. 2021;2(2):29-36.
[11]. Guerri-Guttenberg RA And Ingolotti M. Classifying Musculocutaneous Nerve Variations. Clin Anat. 2009;22(6):671-83.

[12]. Ballesteros-Larrotta DR, Forero-Porras PL, Ballesteros- Acuña LE. Anatomic Variations In Relation To The Origin Of The Musculocutaneous Nerve: Absence And Non-Perforation Of The Coracobrachialis Muscle. Anatomical Study And Clinical Significance. Int J Morphol. 2018;36(2):425-9.
[13]. Yang ZX, Pho RW, Kour AK, Pereira BP. The Musculocutaneous Nerve And Its Branches To The Biceps And Brachialis Muscles. J Hand Surg Br. 1995;20(4):671-5.
[14]. El-Naggar MM. A Study On The Morphology Of The Coracobrachialis Muscle And Its Relationship With The Musculocutaneous Nerve. Folia Morphol (Warsz). 2001;60(3):217-20.
[15]. Jayanthi AA, Arunkumar KG. Variations In The Course And Branching Pattern Of Musculocutaneous Nerve. Natl J Clin Anat. 2013;2(4):195-9.
[16]. Loukas M, Aqueelah H. Musculocutaneous And Median Nerve Connections Within, Proximal And Distal To The Coracobrachialis Muscle. Folia Morphol (Warsz). 2005;64(2):101-8.
[17]. Master NT, Gupta DS. Analysis Of The Morphological Variations Between Musculocutaneous Nerve And Median Nerve: A Cadaveric Study. Indian J Clin Anat Physiol. 2016;3(3):326-31.
[18]. Maeda S, Kawai K, Koizumi M, Ide J, Tokiyoshi A, Mizuta H. Anatomical Study Of Musculocutaneous Nerve Variations And Their Relationship With The Coracobrachialis Muscle. Clin Anat. 2009;22(3):337-42.
[19]. Badawoud MH. Anatomical Variations Of The Musculocutaneous Nerve. Neurosciences (Riyadh). 2003;8(4):218-21.
[20]. Geethanjali BS, Shivacharan PV, Archana K, Mokhasi V, Shamkuwar S, Agaammarmurthuza. Variations In The Course Of Musculocutaneous Nerve In Relation With Coracobrachialis And Median Nerve With Its Surgical Importance. Int J Health Sci Res. 2015;5(11):148-52.