

MULTIPLE INTERCOSTOBRACHIAL NERVESPulipati Anil Kumar¹, Devi Reddy Krishna Reddy², Puttagunta Bapuji³**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: Usually the lateral cutaneous branch of second intercostal nerve is called as intercostobrachial nerve. The variations of intercostobrachial nerves are most common. We observed the variations in the number and branching of intercostobrachial nerves and their union with the branches of brachial plexus on each side in 11 cases during routine dissection of 40 adult embalmed cadavers. The knowledge of these various anatomical variations is of important for surgeons and radiologists, to avoid post-operative complications.

KEYWORDS: Lateral cutaneous branch of second intercostal nerve, Intercostobrachial nerves, axillary lymph nodes.

INTRODUCTION: Normally the undivided lateral cutaneous branch of second intercostal nerve leaves the second intercostal space by piercing the lateral thoracic wall at midaxillary plane, passes along the base of axilla within the central group of axillary lymph nodes, reaches the upper and medial part of arm where it joins with medial cutaneous nerve of arm to form intercostobrachial nerve to supply the skin of upper and medial parts of arm.¹⁻⁸ The lymph nodes which receive lymph from the breast cancer are called sentinel lymph nodes. They are confirmed by injecting a radioactive substance into the affected area of breast.⁷ Enlargement of these central group of lymph nodes, such as occurs in cancer, may, by pressure on this nerve cause pain in the area of distribution of nerve along the inner border of arm.⁷ This nerve along with nerve to serratus anterior and nerve to latissimus dorsi are preserved during modified radical mastectomy⁸ to prevent the complications like loss of sensibility or dysesthesia in the upper part of arm. A second intercostobrachial nerve often branches off from the anterior part of third lateral cutaneous nerve supplying the axilla and medial side of arm.⁹

MATERIALS AND METHODS: On routine dissection of pectoral, axillary and arm regions of 40 adult embalmed cadavers in the dissection hall, department of the Anatomy, Alluri Sitaramaraju Academy of Medical Sciences, Eluru, Andhra Pradesh during 2013–2014, two intercostobrachial nerves in eight cadavers, three intercostobrachial nerves in two cadavers and four intercostobrachial nerves in one cadaver were observed and photographed.

RESULTS: We observed the following variations in the number of intercostobrachial nerves in 11 cases out of 40 adult embalmed cadavers during routine dissection in the dissection hall in the department of anatomy, Alluri sitaramaraju academy of medical sciences, Eluru, West Godavari district, Andhra Pradesh.

We found the undivided lateral cutaneous branch of 2nd intercostal nerve piercing the second intercostal space at midaxillary plane, running along the base of axilla to reach the upper and medial part of arm where they join with medial cutaneous nerve of arm on each side in 29 cadavers out of 40 adult embalmed cadavers.

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In 8 cadavers, the lateral cutaneous branch of 2nd intercostal nerve (1st intercostobrachial nerve) was seen originating as two branches (upper and lower) and piercing the second intercostal space anterior to midaxillary plane. The upper branch passed along the base of axilla, then left the axilla by passing through lower triangular space and finally joined with posterior cutaneous nerve of arm on each side whereas the lower branch passed along the base of axilla to reach the upper and medial part of arm where they join with medial cutaneous nerve of arm on each side. The undivided lateral cutaneous branch of 3rd intercostal nerve (2nd intercostobrachial nerve) was seen piercing third intercostal space anterior to midaxillary plane, passed along the base of axilla to reach the upper and medial part of arm where they joined with medial cutaneous nerve of arm on each side (Fig.1).

In 2 cadavers, it is observed that the lateral cutaneous branch of 2nd and 3rd intercostal nerves (1st and 2nd intercostobrachial nerves) were seen originating as two branches (upper and lower) and piercing the second and third intercostal spaces anterior to midaxillary plane. The upper branch of 1st intercostobrachial nerve passed along the base of axilla, then left the axilla by passing through lower triangular space and finally joined with posterior cutaneous nerve of arm on each side whereas the lower branch passed along the base of axilla to reach the upper and medial part of arm where they join with medial cutaneous nerve of arm on each side. The two branches of 2nd intercostobrachial nerve united together to form a single trunk before this nerve joined with medial cutaneous nerve of arm. The undivided lateral cutaneous branch of 4th intercostal nerve (3rd intercostobrachial nerve) was seen piercing fourth intercostal space anterior to midaxillary plane, passed along the base of axilla to reach the upper and medial part of arm where they joined with medial cutaneous nerve of arm on each side (Fig.2).

We observed that the undivided lateral cutaneous branch of 1st, 2nd, 3rd and 4th intercostal nerves (1st, 2nd, 3rd and 4th intercostobrachial nerves) were seen originating as single trunks and piercing the first, second, third and fourth intercostal spaces anterior to midaxillary plane. The 1st intercostobrachial nerve joined with 2nd one to form a single trunk which passed along the base of axilla and reached the upper and medial part of arm to join with medial cutaneous nerve of arm on each side. The 3rd and 4th intercostobrachial nerves joined with medial cutaneous nerve of arm separately in one cadaver (Fig.3) out of 40 cadavers.

DISCUSSION: According to Henry Gray,⁹ The second lateral cutaneous nerve is the intercostobrachial nerve. It crosses the axilla to the medial side of arm, joins with a branch of medial cutaneous nerve of arm, pierces the deep fascia and supplies the skin of upper half of the posterior and medial aspects of arm and connecting with the posterior cutaneous nerve of radial nerve. Its size is inverse proportion to the size of medial cutaneous nerve of arm. A second intercostobrachial nerve often branches off from the anterior part of third lateral cutaneous nerve supplying the axilla and medial side of arm.

O'Rourke MG et al¹⁰ found that in all twenty-eight axillary dissections, the nerve originated from the second intercostal space, with contributions from the first and third intercostal nerves each on one occasion. The posterior axillary branch was constant but may branch early, simulating a second nerve. The ICBN had a variable relationship to the lateral thoracic vein: anterior, posterior or wrapping around it. In 36%, there was a connection to the medial cord of the brachial plexus in the axilla. In the upper arm, the nerve lies in the subcutaneous fat; in the majority, it supplied at least the

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proximal half of the arm and in one-third, it reached the level of the elbow joint. In 18%, there was a connection to the medial cutaneous nerve of the arm.

Loukas M. et al¹¹ dissected 100 adult human formalin-fixed cadavers (200 axillae). In all the cadavers, the ICBN was present with variant contributions from intercostal nerves T1, T2, T3, and T4. The arrangements of the ICBN were typed as I through VIII. The components of Type I (45% or 90 of our specimens) included a branch to the posterior antebrachial cutaneous nerve, a branch to the anterior and lateral parts of the axilla, a branch to the medial side of the arm, and a branch to the medial antebrachial cutaneous nerve. Type II (25%) describes the ICBN arising from T2 and giving off a branch to the brachial plexus. In Type III (10%), lateral cutaneous branches of T2 and T3 fuse as a common trunk and then split immediately after exiting the intercostal space to form an ICBN. In type IV (5%), T2 and T3 join distally to form an ICBN that ends as its terminal branches. Type V (5%): T3 joins T2 from the same intercostal space proximally, with Type VI (3%) showing a very proximal branching of the sensory terminal nerves. Type VII (5%) displayed a contribution from T3 and a branch to the brachial plexus with multiple terminating branches. A contribution from T3 and T4 and a branch to the brachial plexus with multiple branches of termination comprised Type VIII (2%).

In the present study, the intercostobrachial nerve originated from the second intercostal space was accompanied by the intercostobrachial nerves from first, third and fourth intercostal spaces of both sides.

In 8 cadavers, two intercostobrachial nerves (T2 and T3) were seen bilaterally. The first one (T2) divided into upper and lower branches to join with posterior cutaneous nerve of arm and medial cutaneous nerve of arm respectively whereas the second one (T3) originated as a single trunk and joined with medial cutaneous nerve of arm (Fig.1). This present study nearly coincides with the study of H.Gray.⁹

In 2 cadavers, three intercostobrachial nerves (T2, T3 and T4) were noted bilaterally. The first one (T2) divided into upper and lower branches to join with posterior cutaneous nerve of arm and medial cutaneous nerve of arm respectively. The second one (T3) divided into two branches which united to form a single trunk before joining the medial cutaneous nerve whereas the third one (T4) originated as a single trunk and joined with medial cutaneous nerve of arm (Fig.2).

Four intercostobrachial nerves (T1, T2, T3 and T4) were noted as single trunks on each side in one cadaver. The first intercostobrachial nerve (T1) united with second one (T2) to form a single trunk before it joined with medial cutaneous nerve of arm whereas third and fourth nerves joined with medial cutaneous branch of arm separately (Fig.3). We found one intercostobrachial nerve on each side in 29 cadavers (72.5%), two intercostobrachial nerves on each side in 8 cadavers (20%), three intercostobrachial nerves on each side in two cadavers (5%) and four intercostobrachial nerves on each side in one cadaver (2.5%) out of 40 cadavers. Variations in number of intercostobrachial nerves are most common. Knowledge of the anatomical variations is essential for surgeons and radiologists to prevent complications during diagnostic and therapeutic procedures.

Bratschi HU, Haller U (1990)¹² found the significance of the intercostobrachial nerve in axillary lymph node excision and followed up 101 modified radical mastectomies with axillary dissection. 53 cases (52.5%) had no sensory disturbance of intercostobrachial nerves, 48 (47.5%) had either a loss of sensibility or dysesthesia.

This loss of sensibility or dysesthesia often occurs following surgeries for breast cancer and axillary lymphadenectomy. Less frequently it can be due to anesthesia for procedures in the arm, compression by tourniquet or mechanical pressure therapy devices, entrapment, nerve traction,

neoplastic compression or invasion, radiotherapy according to Joao E. Magalhaes et al (2009)¹³ and Wood KM (1978).¹⁴

REFERENCES:

1. A. K. Datta. Essentials of Human Anatomy, Superior and inferior extremities part III, 2nd edition, Current Books International, Calcutta, Chennai, Mumbai, 2000: p46.
2. Romanes G J. Cunningham's Practical Anatomy Thorax and Abdomen Vol.2, 15th edition, ELBS oxford university press, Walton street, Oxford ox2 6DP, 1987: p14, 76.
3. T. S. Ranganathan. A Text Book of Human Anatomy, 3rd edition, S. Chand & Company (Pvt) Ltd, Ram Nagar, New Delhi-110055, 1987: p.386.
4. Vishram Singh. Anatomy of upper limb and thorax, 1st edition, Elsevier, A division of Reed Elsevier India private limited, New Delhi.2011: p.55, 58.
5. S. Poddar, Ajay Bhagat. Anatomy of central nervous system(including the peripheral nerves), 9th edition, Scientific Book Company, Ashok Rajpath, opp. Patna medical college,Patna-800004, 2007: p48.
6. B. D. Chaurasia. Human Anatomy, upper limb and thorax Vol.1,6th edition, CBS Publishers and distributors Pvt Ltd. Bangalore, Chennai, Kochi, Pune, Hyderabad, Mumbai, Nagpur, Patna. 2013: p. 76.
7. Lee McGregor. Synopsis of Surgical Anatomy,12th edition, Indian edition, K. M. Verghese company, Post box 7119, Bombay-400031, 1986: p.166.
8. Neeta V Kulkarni. Clinical Anatomy for students, problem solving approach,1st edition, Jaypee Brothers, Medical publishers (p) LTD, New Delhi. 2007: p. 13-14.
9. Henry Gray. Gray's Anatomy, the anatomical basis of medicine and surgery, 38th edition, Churchill Livingstone, Edinburgh, London, New York, Toronto; 2000: p.1275.
10. O'Rourke MG, Tang TS, Allison SI, Wood W. The anatomy of the extrathoracic intercostobrachial nerve. Aust N Z J Surg 1999 Dec, 69 (12): 860-4. Pub Med PMID 10613285.
11. Loukas M, Hullett J, Louis RG Jr, Holdman S, Holdman D. The gross anatomy of the extrathoracic course of the intercostobrachial nerve. Clin Anat. 2006 Mar; 19 (2): 106-11Pub Med PMID 16470542.
12. Bratschi HU, Haller U. Significance of the intercostobrachial nerve in axillary lymph node excision. Geburtshi Frauerbeilkd 1990 Sep; 50 (9): 689-93. Pub Med PMID 2272434.
13. Joao E Magalhaes, Alexandre M S Janua rio, Ota vio G Lins. Clinical Neurophysiology Service, Department of Neuropsychiatry, Hospital das Clínicas da Universidade Federal de Pernambuco, Recife, Brazil, February 2009 in Wiley Interscience (www.interscience.wiley.com). DOI 10.1002/mus.21205.
14. Wood KM. Intercostobrachial nerve entrapment syndrome. South Med J. jun1978; 71(6):662-663. Pub Med PMID 663696.

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Table:

Sl. No.	Total number of intercostobrachial nerves on each side	No. of adult cadavers which contain the total number of intercostobrachial nerves on each side (out of 40 cadavers dissected)	Total percentage of occurrence of intercostobrachial nerves
1	1	29	72.5%
2	2	8	20%
3	3	2	5%
4	4	1	2.5%

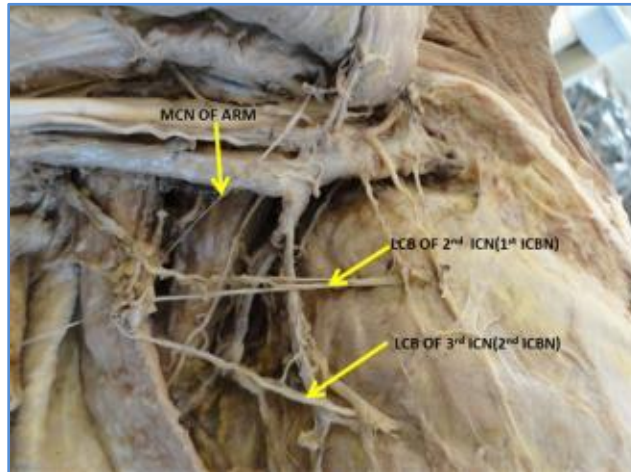


Fig. 1: Two intercostobrachial nerves

MCN OF ARM – MEDIAL CUTANEOUS NERVE OF ARM. LCB OF 2nd ICN (1st ICBN) – LATERAL CUTANEOUS BRANCH OF SECOND INTERCOSTAL NERVE (FIRST INTERCOSTOBRACHIAL NERVE). LCB OF 3rd ICN (2nd ICBN) – LATERAL CUTANEOUS BRANCH OF THIRD INTERCOSTAL NERVE (SECOND INTERCOSTOBRACHIAL NERVE)

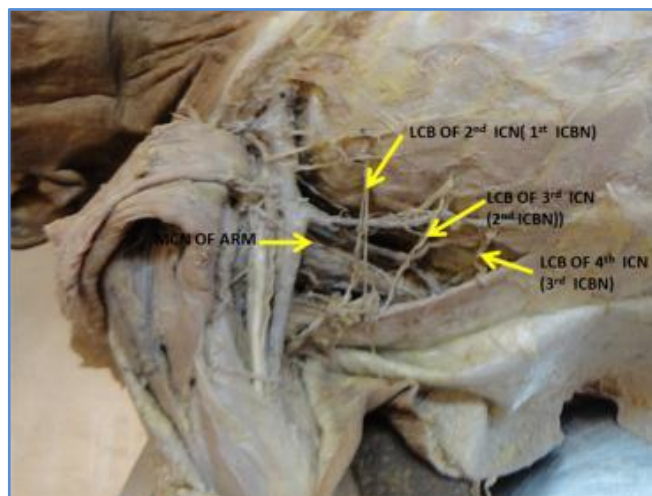


Fig. 2: Three intercostobrachial nerves

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MCN OF ARM – MEDIAL CUTANEOUS NERVE OF ARM. LCB OF 2nd ICN (1st ICBN) – LATERAL CUTANEOUS BRANCH OF SECOND INTERCOSTAL NERVE (FIRST INTERCOSTOBRACHIAL NERVE). LCB OF 3rd ICN (2nd ICBN) – LATERAL CUTANEOUS BRANCH OF THIRD INTERCOSTAL NERVE (SECOND INTERCOSTOBRACHIAL NERVE). LCB OF 4th ICN (3rd ICBN) – LATERAL CUTANEOUS BRANCH OF FOURTH INTERCOSTAL NERVE (THIRD INTERCOSTOBRACHIAL NERVE)

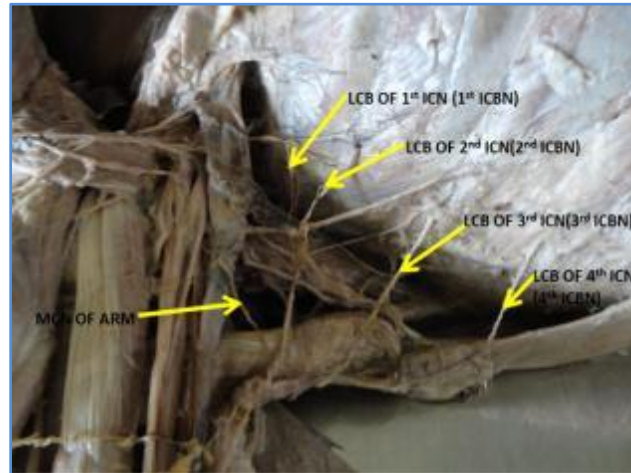


Fig. 3: Four intercostobrachial nerves

MCN OF ARM – MEDIAL CUTANEOUS NERVE OF ARM. LCB OF 1st ICN (1st ICBN) – LATERAL CUTANEOUS BRANCH OF FIRST INTERCOSTAL NERVE (FIRST INTERCOSTOBRACHIAL NERVE). LCB OF 2nd ICN (2nd ICBN) – LATERAL CUTANEOUS BRANCH OF SECOND INTERCOSTAL NERVE (SECOND INTERCOSTOBRACHIAL NERVE). LCB OF 3rd ICN (3rd ICBN)–LATERAL CUTANEOUS BRANCH OF THIRD INTERCOSTAL NERVE (THIRD INTERCOSTOBRACHIAL NERVE). LCB OF 4th ICN (4th ICBN) – LATERAL CUTANEOUS BRANCH OF FOURTH INTERCOSTAL NERVE (FOURTH INTERCOSTOBRACHIAL NERVE)

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