

**VARIATION IN THE INTERCOSTOBRACHIAL NERVE AND ITS RELATION WITH
THE AXILLARY LYMPH NODES**Rohini Arathala¹, Vishwajit Ravindra Deshmukh², Nagaraj S³¹Tutor, Department of Anatomy, JIPMER, Karaikal, India.²Assistant Professor, Department of Anatomy, JIPMER, Karaikal, India³Assistant Professor, Department of Anatomy, JIPMER, Karaikal, India.***Corresponding Author: Dr Vishwajit Ravindra Deshmukh**

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ABSTRACT

Variation in the distribution of the Intercostobrachial nerve (ICBN) is not uncommon. Nowadays, ICBN is getting clinically important during the mammary gland surgeries. In the present case report, ICBN is trifurcating to supply the axillary pad of fat, medial and the posterior side of the upper arm. The third intercostal nerve is again bifurcating to supply the posterior axillary fold and a pad of fat. Meticulous dissection was done to preserve the enlarged lymph node to identify the relationship between the branches of the brachial plexus and ICBN. Damage to the ICBN may cause sensory changes in the patient after surgery. Knowledge regarding the variations in the branching pattern of the ICBN is important to classify the axillary lymph nodes during axillary node dissection. Knowing about the variation in the ICBN is clinically important for the axillary surgeons, radiologists and anatomist.

KEYWORDS: Intercostobrachial nerve, Axillary lymph node, Dissection, Surgery.**INTRODUCTION**

The lateral cutaneous branch of the second intercostal nerve, which remains undivided, is termed as intercostobrachial nerve (ICBN), which crosses axilla to innervate upper medial portion of arm, axilla and part of anterior chest wall.^[1]

The location of ICBN is nearly parallel to the axillary vein, at the distance of about 1.5cm.^[2] In the midaxillary line, ICBN pierces the intercostal muscles and the serratus anterior muscle. It crosses the axilla to meet the medial cutaneous nerve of the arm at the medial side of the arm. The ICBN gives off the posterior axillary branch while crossing the axilla and supplies the posterior axillary fold. Further, the ICBN pierces the deep fascia and supplies the skin of the upper half of the medial and posterior part of the arm up to the apex of axilla. Here it is joined with the posterior cutaneous nerve of an arm, which is a branch of the radial nerve.^[3]

The knowledge of the anatomy of the ICBN is important for surgeons who explore the axilla for sentinel lymph nodes or to perform conventional axillary lymph node dissection in patients with breast cancer.^[4] The enlargement of an axillary group of lymph nodes in breast carcinoma may compress the aberrant loops of nerves formed between the intercostobrachial nerve and cause pain in the area of nerve distribution.^[5]

Injury to the intercostobrachial nerve during radical mastectomy is one of the commonest causes of post mastectomy pain syndrome. Hence preservation of ICBN is important to reduce the postoperative skin numbness and loss of feeling in the upper arm.^[6] So it is important to have sound knowledge of ICBN and its branching pattern to avoid injury during axillary node dissection and mastectomy procedures.

CASE REPORT

During the routine dissection classes for the undergraduates, the variation in the branching pattern of the ICBN was identified in the 70-year-old female cadaver on the right upper limb in the department of anatomy, JIPMER, India. The cadaver had been fixed in formalin solution and showed no evidence of previous surgical procedures or gross evident pathology of the axilla or mammary glands. In the present report, two ICBNs (T2, T3) were noted on the right side (Figure 1) and the course on the left side was normal. The 2nd thoracic intercostal nerve (ICBN) entered the axilla from second intercostal space after piercing intercostal muscles and serratus anterior in mid-axillary line. After arising, the right ICBN travelled for a distance of 2.5cm and given off anterior and posterior axillary branches in relation to the axillary lymph node. Anterior axillary branch continued further about at 5cm and divided into two branches. These two branches end by supplying the medial side of the arm and posterior wall of axilla

respectively. Posterior branch of right ICBN also had 5cm forward course inferior to the axillary lymph node and near to its termination at the base of the axilla it was bifurcated and supplied the skin and the axillary pad of fat in the axillary floor. All these cutaneous branches of intercostal nerves run posterior to the lateral thoracic vessels (Figure 1). The second ICBN (T3) divided into two branches like upper and lower branch immediately after emerging out of the third intercostal space. The long upper branch of ICBN travelled laterally and wind around the lateral border of the latissimus dorsi muscle to supply the posterior axillary fold and posterior wall of the axilla. The lower branch of third ICN found to end in the base of the axilla supplying the axillary pad of fat (Figure 2).

DISCUSSION

ICBN, an undivided branch of second intercostal nerve. It supplies sensory innervations to the medial and posterior part of the arm, after communicating with the medial cutaneous nerve of the arm (MCN). ICBN is highly related to axillary lymph nodes. ICBN is the most common nerve to get injured during the mammary gland surgeries. Breast cancer is most common cancer in women of the Indian population. It ranks second to cervical cancer. Anatomy, course and branching pattern of the ICBN are highly variable. Cunnick et al grouped the anatomical variation of this nerve into various subcategories. Type1: ICBN arises from T2 and does not give off any branch. Type 2: Arises from T2 alone and divided into a large main trunk and a much smaller branch. Type3: Arises from T2 alone and divided equally into two branches. Type 5: Arises from two separate T2 radicals to form single nerve, which does not give off any branch in the axilla. Type6: Arises from T2 alone and divided into the large main trunk and at least two smaller branches^[7]

According to the above classification, the present case report belonging to the Type2 with little variation observed in the larger branch, which ends by dividing into two branches. This anomaly that we have reported here, has not been mentioned before in literature. A retrospective study conducted by Satyajeeet.V et al in 42 breast cancer patients found according to the above classification: Type 2 variation was 19.4% and Type 3 variation was only 4.7%.^[8]

ICBN, clinically relevant in relation to axillary node dissection and mammary gland surgeries. Sometimes, infection spreading through cutaneous nerve distribute to a particular dermatome such as varicella zoster. Recent studies have been mainly focused on the preservation of ICBN during mammary gland surgeries. Preservation of ICBN is practical and leads to a significant decrease in pain sensitivity of the arm.^[9] Some studies reported that preservation of ICBN consumes much time during mammary gland surgery but in the postoperative period there is a significant decrease in patients sensory deficits.^[10]

Intercostobrachial nerves may also serve as a good anatomic landmark for dividing the axillary space during the lymph node dissection. According to Li J et al, the axillary space is divided by the ICBN into the lower and upper parts.^[11] If the axillary lymph nodes lying above the ICBN have micro or macro-metastasis then there were metastasis positive nodes under the ICBN and similarly, if no metastasis is seen in lymph nodes under the ICBN, the upper nodes were also metastasis-free.

The embryological basis for the development of accessory or aberrant nerves was not fully understood. Various hypotheses have been proposed including the cell signalling pathways. During the fifth week of development, budding axons of the nerves grow distally to make contact with the limb buds. The required and necessary growth factors for the proper growth and directions of the nerves are known as chemo attractants such as netrins and some are repellants such as semaphorins and ephrins. Any imbalance among these growth factors may result in the formation of accessory or aberrant nerves.^[12]

This anomaly that we have reported here, has not been mentioned before in literature, even in the studies related to the anatomy of the ICBN and the axillary nodes. We believe that knowledge of this anomaly may be important to a surgeon during dissection of the axilla and would decrease postoperative morbidity for the patient.

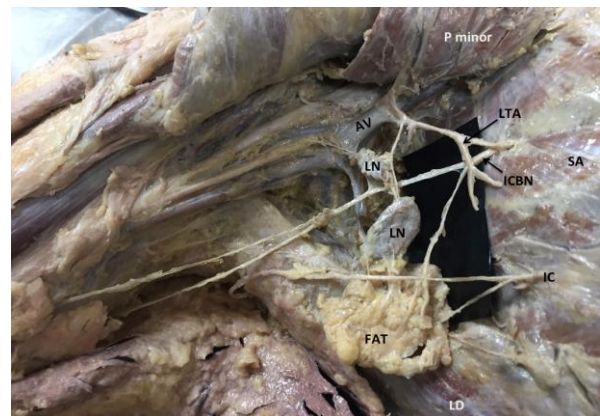


Figure 1: Photograph showing the branching pattern of the ICBN in relation to the enlarged axillary lymph node. Lymph node (LN), Axillary vein (AV), Long thoracic artery (LTA), Latissimus Dorsi (LD), Serratus anterior (SA), Intercostal nerve (IC).

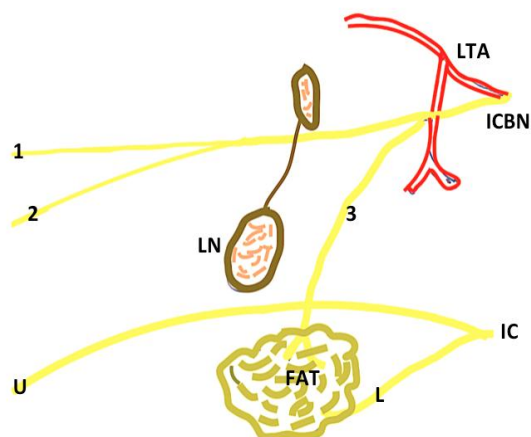


Figure 2: Schematic diagram representing the trifurcation of the ICBN and the bifurcation of the 3rd intercostal nerve (IC) in the upper and lower branch. Lateral Thoracic artery (LTA), Lymph node (LN).

CONCLUSION

One of the most common complications of axillary node dissection during mastectomy is damage to the ICBN with resulting pain and paresthesia. Thus, the surgeon should have an awareness of these anatomical variations in the ICBN while performing axillary surgery to minimize the patient's morbidity and enhance the reliable post-operative life.

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