Case Report

Peripheral communications of intercostobrachial nerve Peripheral communications of the intercostobrachial nerve in relation to the alar thoracic artery

Shaifaly Madan Rustagi, Mona Sharma, Nidhi Singh, Vandana Mehta, Rajesh K Suri, Gayatri Rath

Department of Anatomy, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, India

Abstract

The intercostobrachial nerve (ICBN) is often encountered during axillary dissection for axillary lymph node dissection (ALND) for diagnostic and therapeutic surgery for mastectomy. The present report is a case observed in the Department of Anatomy at Vardhman Mahavir Medical College, Delhi during routine dissection of the upper extremity of a male cadaver for first year undergraduate medical students. On the right side, the medial cord of brachial plexus gave two medial cutaneous nerves of arm. Both the nerves were seen communicating with the branches of the ICBN. The ICBN and one of its branches were surrounding the termination of an alar thoracic artery. These peripheral neural connections of the ICBN with the branches of the medial cord can be a cause of sensory impairment during axillary procedures done for mastectomy or exploration of long thoracic nerves. The alar thoracic artery found in relation to the ICBN could further be a cause of vascular complications during such procedures.

Key Words: Alar thoracic artery, anatomy, axillary lymph node dissection, intercostobrachial nerve, medial cutaneous nerve of arm

Address for correspondence:
Dr. Shaifaly M Rustagi, Department of Anatomy, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, India.
E-mail: shaifalyrustagi@yahoo.co.in
Received: 25.02.2014, **Accepted:** 26.07.2014

INTRODUCTION

The lateral cutaneous branch of the second intercostal nerve is called the intercostobrachial nerve. (ICBN)[1-3] It pierces the intercostal muscles and the serratus anterior muscle in the midaxillary line, crosses the axilla to the medial side of the arm and joins with a filament from the medial cutaneous nerve of arm. While crossing the axilla the nerve gives off the posterior axillary branch which supplies the posterior axillary fold. Thereafter the ICBN pierces the deep fascia and supplies the skin of the upper half of the medial and posterior part of the arm,[4] connecting with the posterior cutaneous branch of the radial nerve. Its size is in inverse proportion to the size of the medial cutaneous nerve. An intercostobrachial branch can sometimes arise from the anterior branch of third lateral cutaneous supply the axilla and the medial side of arm.[1-3]

The ICBN can penetrate the pectoralis major and minor muscles without supplying them.[5]

It may supply the pectoral muscles via a medial pectoral branch.[6]

Access this article online	
Quick Response Code:	Website: www.advbiores.net
	DOI: 10.4103/2277-9175.151555

How to cite this article: Rustagi SM, Sharma M, Singh N, Mehta V, Suri RK, Rath G. Peripheral communications of intercostobrachial nerve Peripheral communications of the intercostobrachial nerve in relation to the alar thoracic artery. Adv Biomed Res 2015;4:51.

The ICBN is encountered during sentinel lymph node biopsy and axillary lymph node dissection (ALND) done for breast cancer surgery which require the removal of the axillary lymph nodes. It is frequently damaged with consequent pain and paresthesia post mastectomy.[7-10] Thus, ICBN preservation is of concern during surgical procedures for breast carcinoma.

The alar thoracic artery (ATA) is a variable branch from the second part of the axillary artery supplying the fat and lymph nodes of the axilla.[11] It has been described as present bilaterally.[12] It has been reported as a variable branch from the third part of the axillary artery and supplying the fasciae and lymph nodes of axilla.[13] Surgical procedures on the axillary region and pectoral region can be complicated by the presence of an ATA.

CASE REPORT

During routine undergraduate medical teaching program of the upper extremity a variable pattern of neural communication was observed in the axillary region in an adult male cadaver.

On the right side, the medial cord was seen to give off two medial cutaneous nerves of arm. The cranial medial cutaneous nerve (MCNA 1) was seen to arise just proximal to medial root of the median nerve [Figure 1]. The caudal medial cutaneous nerve of arm (MCNA 2) emerged 1.5 cm distal to MCNA 1 0.9 cm proximal to the union of the two roots of median nerve. The MCNA 2 was seen passing medial to the axillary vein. A thick ICBN was seen emerging as usual from the second intercostal space. In addition to the ICBN two nerves ICBN1 and ICBN2 were found emerging as usual from the second intercostal space which traversed toward the medial aspect of arm [Figure 1]. The MCNA 1 was seen to communicate with the ICBN2 7.2 cm distal to its origin. The ICBN 2 was running posteriorly and terminated by supplying the floor of axilla.

The MCNA 2 was seen to communicate with ICBN1 5.6 cm distal to its origin. The ICBN and the ICBN1 coursed toward the posterior axillary fold and innervated the medial aspect of arm.

The ATA branched off the axillary artery, 0.2 cm distal to the origin of the thoracoacromial artery [Figure 1]. The ATA measured 6.1 cm in length. This vessel passed along the lateral thoracic wall between the ICBN and ICBN2 and terminated thereafter [Figure 2]. A branch of the ATA (Br ATA) was seen to bifurcate from the main vessel 0.9 cm distal to its origin and enter deep into the axilla.

The ICBN on the left side emerged as a single trunk from the second intercostal space and coursed towars the axilla. In the axilla it gave off a branch to the posterior axillary region and terminated by communicating with the medial cutaneous nerve of arm. No vessel corresponding to the ATA on the right side was observed on the left side from the three parts of the axillary artery.

DISCUSSION

The ICBN is encountered during diagnostic procedures like sentinel lymph node biopsy for staging of breast

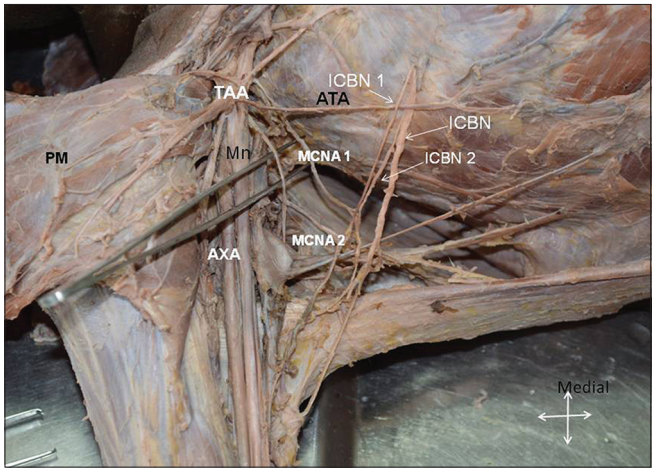

Figure 1: Right side axillary region showing Mn = Median nerve, MCNA1 = Cranial medial cutaneous nerve of arm, MCNA2 = Caudal medial cutaneous nerve of arm, ICBN = Main trunk of the intercostobrachial nerve, ICBN 1 = Upper communicating branch of the intercostobrachial nerve, ICBN2 = Lower communicating branch of the intercostobrachial nerve, AXA = Axillary artery, TAA = Thoracoacromial artery, ATA = Alar thoaracic artery, Pm = Pectoralis major

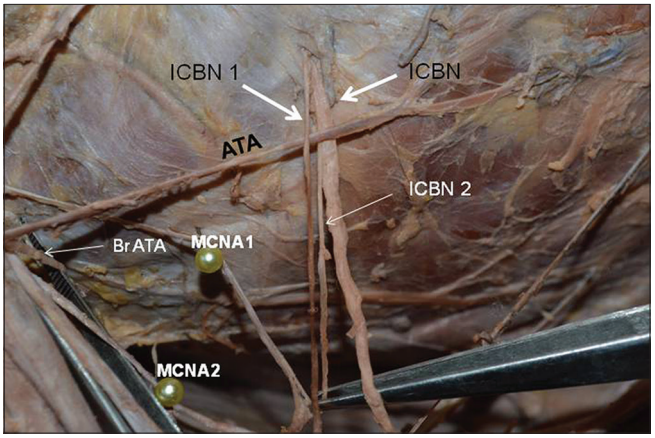

Figure 2: Right side axillary and lateral thoracic region showing MCNA1 = Cranial medial cutaneous nerve of arm, MCNA2 = Caudal medial cutaneous nerve of arm, ICBN = Main trunk of the intercostobrachial nerve, ICBN 1 = Upper communicating branch of the intercostobrachial nerve, ICBN2 = Lower communicating branch of the intercostobrachial nerve, ATA = Alar thoracic artery, Br ATA = Branch of the alar thoracic artery

carcinoma[14] and therapeutic procedures e.g. axillary lymph node dissection (ALND) performed with partial or radical mastectomy performed on the axilla.[15,16]

Researchers have discussed the benefits and risks of ICBN preservation. The neural connections as observed in the current study may be responsible for post-operative sensory complications in spite of adequate preservation of the ICBN. Owing to the distribution of the nerve its injury causes sensory deficit in the medial aspect of upper arm and sensory deficits below the elbow and posterior axillary fold.[9,15,16]

Abdullah *et al*. reported that ICBN preservation was possible in most cases thereby reducing the incidence of sensory deficit in patients with axillary node clearance.[7]

Freeman *et al*. have also stated that although preservation of ICBN increases the duration of the operative maneuver but is nevertheless advisable owing to reduced incidence of post-operative sensory benefits.[15] In another study Toressan *et al*. agreed with the above view but also reported that the duration of surgery is unaffected.[16]

Cunnick *et al*. explained the intercostal origins of the nerve in the six cases though the communicating branches were not discussed.[5] O'Rourke *et al*. observed the ICBN originated from the second intercostal space in 28 specimens and a constant posterior axillary branch was observed in all the cases. In 36% cases the ICBN had a connection to medial cord but in 18% of cases to MCNA.[17] In our case we have also observed the ICBN and ICBN1 to separate early and supply the posterior axilla. The sectioning of the posterior branch causes pain or discomfort or a sensation of fluid in axilla.[17] The main branch is responsible for sensory supply to the posteromedial aspect of arm. These communications could be the reason for sensory disturbances despite preservation of the main trunk of ICBN.

Loukas *et al*. studied the extra thoracic course of the ICBN and described the different arrangements of the nerve as Type I to Type VIII. They have described the most common type as type I (45% of their specimens) where the ICBN exhibited two communications, one with MCNA and the other with MCNFA.[18] However, we have observed a dual communication with two medial cutaneous nerves of arm, respectively. The advancements in neurotization and nerve grafting procedures make it imperative for us to know about these communicating peripheral nerves. The branches of the ICBN in our case were related to the ATA. Constantin Rusu has reported a bilateral ATA, on the right side originating from the third part of axillary artery but on the left side from a high radial artery. On both the sides the vessels were coursing through the axilla and finally terminating by supplying the pectoral region.[12] Kogan and Lewinson have reported a thoracoepigastric branch from the axillary artery which anastomosed with the superficial epigastric artery.[19]

Majumdar *et al*. in their study of branching pattern of the axillary artery on the West Bengal population in 70 cadavers reported the ATA in two cases (of the two cases one was a male and one was a female) arising from the third part of axillary artery.[20] Reddy *et al*. have also reported an ATA arising from the second part of the axillary artery recently.[21] We have observed it to be a branch from the second part of the axillary artery. The ATA in our case is dividing into a branch supplying the axilla and the main vessel itself. The main vessel is surrounded by the branches of the ICBN close to its termination and sends by supplying the pectoral region. During sectioning of the ICBN this has to be kept in mind as hemorrhage can occur if an ATA is encountered. Therefore, it is mandatory that surgeons be aware of the site of an ATA as well as rare neural connections in the axillary regions to avoid post-operative complications.

CONCLUSION

The communications between the brachial plexus and ICBN need to be thoroughly explored and variations of branches of ICBN and medial cutaneous nerves borne in mind while trying to preserve the ICBN in axillary procedures. We as anatomists opine that additional nerves emerging from the second intercostal space in the present investigation could be utilized for nerve grafting procedures. Further awareness about vessels like the ATA is relevant for avoiding vascular complications.

REFERENCES

1. Clemente CD. Ventral primarydivisions of the spinal nerves. In: Clemente CD, editor. Gray's Anatomy. 30th ed. Baltimore: William and Wilkins; 1985. p. 1223-5.
2. McMinn RM. Upper limb. In: McMinn RM, editor. Last's Anatomy Regional and Applied. 9th ed. Edinburgh: Churchill Livingstone; 1994. p. 82.
3. Williams PL, Warwick R, Dyson M. Bannister LH. Gray's Anatomy. 37th ed. London: Churchill Livingstone; 1989. p. 756-8.
4. Baker RJ, Fischer JE. Segmental mastectomy and axillary dissection. In: Baker RJ, Fischer JE, editors. Master of Surgery. 4th ed. Vol. 1. Philadelphia: Lippincott, William and Wilkins; 2001. p. 591-3.
5. Cunnick GH, Upponi S, Wishart GC. Anatomical variants of the intercostobrachial nerve encountered during axillary dissection. Breast 2001;10:160-2.
6. Loukas M, Louis RG Jr, Fogg QA, Hallner B, Gupta AA. An unusual

innervation of pectoralis minor and major muscles from a branch of the intercostobrachial nerve. Clin Anat 2006;19:347-9.
7. Abdullah TI, Iddon J, Barr L, Baildam AD, Bundred NJ. Prospective randomized controlled trial of preservation of the intercostobrachial nerve during axillary node clearance for breast cancer. Br J Surg 1998;85:1443-5.
8. Carpenter JS, Sloan P, Andrykowski MA, McGrath P, Sloan D, Rexford T, *et al.* Risk factors for pain after mastectomy/lumpectomy. Cancer Pract 1999;7:66-70.
9. Vecht CJ, Van de Brand HJ, Wajer OJ. Post-axillary dissection pain in breast cancer due to a lesion of the intercostobrachial nerve. Pain 1989;38:171-6.
10. Paredes JP, Puente JL, Potel J. Variations in sensitivity after sectioning the intercostobrachial nerve. Am J Surg 1990;160:525-8.
11. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, *et al*. Gray's anatomy. In: Gabella G, editor. Arteries of the Limbs and Cardiovascular System. 38th ed. London: Churchill Livingstone; 1999. p. 1537-9.
12. Rusu MC. Bilateral alar thoracic artery. Folia Morphol (Warsz) 2005;64:59-64.
13. Patnaik VV, Kalsey G, Singla Rajan K. Branching pattern of axillary artery-A morphological study. J Anat Soc India 2000;49:127-32.
14. Li J, Jia S, Zhang W, Zhang Y, Qiu F, Xue J, *et al.* A new technique that complements sentinel lymph node biopsy: Lymph node dissection under the intercostobrachial nerves in early-stage breast cancer. Clin Breast Cancer 2013;13:212-8.
15. Freeman SR, Washington SJ, Pritchard T, Barr L, Baildam AD, Bundred NJ. Long term results of a randomized prospective study of preservation of the intercostobrachial nerve. Eur J Surg Oncol 2003;29:213-5.
16. Torresan RZ, Cabello C, Conde DM, Brenelli HB. Impact of the preservation of the intercostobrachial nerve in axillary lymphadenectomy due to breast cancer. Breast J 2003;9:389-92.
17. O'Rourke MG, Tang TS, Allison SI, Wood W. The anatomy of the extrathoracic intercostobrachial nerve. ANZ J Surg 1999;69:860-4.
18. 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;19:106-11.
19. Kogan I, Lewinson D. Variation in the branching pattern of the axillary artery. A description of a rare case. Acta Anat (Basel) 1998;162:238-40.
20. Majumdar S, Bhattacharya S, Chatterjee A, Dasgupta H, Bhattacharya K. A study on axillary artery and its branching pattern among the population of West Bengal, India. Ital J Anat Embryol 2013;118:159-71.
21. Reddy MR, Jena SK, Vamsi A, Sharma MV. A case report on alar thoracic artery seen in a cadaver of a medical college of coastal Andhra Pradesh. Int J Contemp Med 2014;2:188-90.

Source of Support: Nil, **Conflict of Interest:** None declared.