Original Article

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Langer's Axillary Arch: A rare Phenomenon and Its Clinical Importance

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Abstract:

Objective: Langers axillary arch (LAA) is a muscular slip encountered in the axillary region with various clinical implications. Knowledge about this muscle is important for surgeons because of its proximity to various nerves and axillary structures.

Material and Methods: In this report, we present a case series of patients in whom the LAA was identified during surgical procedures such as axillary dissection, sentinel lymph node biopsy, breast lumpectomy, and breast conservation surgery.

Results: Among the 5 LAA cases identified, 2 were complete and 3 were incomplete. Intraoperatively, all 5 cases were handled well, and prior awareness of this anatomical variation allowed surgeons to identify it immediately, which helped in avoiding any potential complications, both intra- and postoperative. All patients were followed up closely and their post-operative periods were found to be uneventful.

Conclusion: LAA was accurately identified and exposed in all patients during surgery to achieve complete axillary clearance. Early recognition and pre-operative knowledge of such an anomaly assisted us in preventing many unwanted surgical and clinical implications.

Keywords: breast surgery, Langer's axillary arch, latissimus dorsi muscle, axilla, pectoralis muscle

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Introduction

Knowledge of the anatomical differences in the axillary area is essential for conducting surgical procedures such as breast reconstruction, mastectomies, axillary lymphadenectomies, and sentinel node biopsies[1,2]. Continuous attention to axillary anatomical variations during surgery is a must due to the presence of numerous vessels, lymph nodes, lateral branches of axillary nerves, and neurovascular bundles[3]. Identifying and understanding such anatomic variations is a must for every surgeon for better surgical outcomes[1,4].

Historically, this muscle was first observed by Bugnone (1783) and Ramsay (1793)[5]. In 1846, Langer accurately described this muscle in detail and later Testut (1884) coined the term "Langers axillary arch (LAA)[6]". LAA is also known as an axillary arch, arcus axillaris, achselbogen, pectodorsal muscle, muscular axillary arch, and axillopectoral muscle[7–10]

LAA is a muscular slip extending from the lattissimus dorsi to the pectoralis major muscle (Figure 1). LAA anomalous bands were further classified as complete and incomplete types. The complete type stretches from the arch, arising from the latissimus dorsi, and extends to the posterior layer of the pectoralis major tendon located on the humerus. The incomplete type arises from the latissimus dorsi with insertion into variable regions, including the first rib, axillary fascia, coracoid process, teres major, long and short heads of the biceps brachii, coracobrachial fascia, coracobrachialis muscle, and inferior margin of pectoralis minor[1,3,4,6,9,11,12]

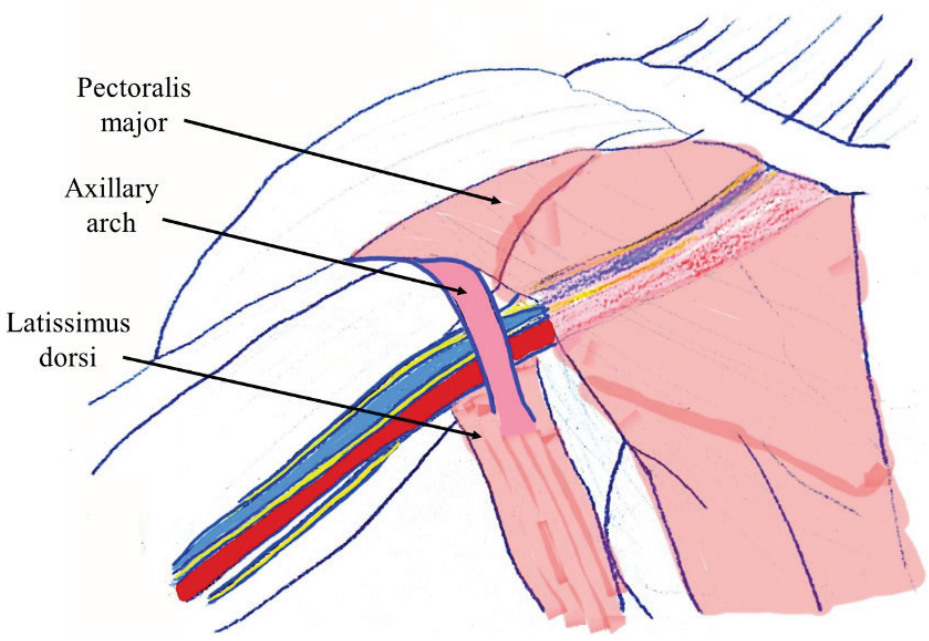

Figure 1 Anatomy of the Langer's axillary arch

LAA receives its nerve supply from the thoracodorsal, medial pectoral, and intercostobrachial or lateral pectoral nerves, whereas blood is supplied from the lateral thoracic vessels[1]. The presence of such accessory muscles also exerts pressure on the lymph routes or neighboring neurovascular bundles, which may lead to secondary conditions, such as potential neurovascular entrapment, deep vein thrombosis of the upper limb, and axillary vein compression[8].

In many instances, LAA was mistaken for a swollen lymph node or tumor. In certain rare local neoplasms, it may also obscure access to the lymph nodes[13]. Due to its low overall (5.3%) and surgical (2.1%) prevalence, it may not always be clinically apparent[6]. Knowledge and awareness of such LAA variation in the axillary region for the surgeons performing the axillary surgery and breast reconstruction surgery can help them avoid the many neurovascular complications associated with it. Encountering such rare anomalies and the surgeon's inability to recognize them may cause disorientation during axillary dissection, which may result in inadequate clearance, with implications of inaccurate staging and regional disease recurrence. To curtail any such instances, it is essential to report such rare case encounters, especially when observed during axillary dissections.

This is a one-of-a-kind first study report from India, where all the cases are non-cadaveric. In the present study, we are presenting the data of such rare cases of LAA that we have encountered in a span of 3 years (2020-2023) while performing axillary dissection for breast cancer surgery.

Material and Methods

This retrospective review of our data was conducted to identify all patients who underwent axillary procedures between 2020 and 2023 at our cancer centre. A total of 5 patients were reported to have had this unique anatomic anomaly in the form of LAA. All the procedures were performed by a breast surgeon and his team with over 10 years' experience. Preservation or cutting of the LAA was solely decided by the surgical team based on the clinical conditions at the time of the procedure. All the patients were observed and evaluated for any potential complications and clinical events during the follow-up clinical examinations.

Results

All the patients were female with a median age of 45 years. Patient characteristics and other details are included in Table 1. On mammography and ultrasound, 4 patients were reported to have breast imaging reporting and data system (BI-RADS) 4 lesions, and another BI-RADS 5 lesions. The type of anomaly was complete in 2 patients and incomplete in 3 patients (Figure 2). Biopsy revealed invasive ductal carcinoma in all the patients. Of the 5 patients, 3 had early-stage breast cancer and underwent breast conservation surgery, while 2 had locally advanced breast cancer and underwent mastectomy. The ICG single-agent technique was employed for sentinel lymph node biopsy (SLNB). The number of lymph nodes removed after MRM in both patients was as follows: one patient had 2/20 lymph nodes positive, corresponding to a PN1 stage, while the other had 8/20 positive, corresponding to a PN2 stage. The condition of the axillary lymph nodes and their confirmation prior to treatment were done as per the histopathology examination report. Post-operative: all our patients underwent 4 cycles of adjuvant therapy consisting of Adriamycin-cyclophosphamide, followed by paclitaxel. The peri/post-operative period was uneventful. The axillary arch was well preserved in all the patients who were followed up regularly, with no signs of recurrence.

Table 1 Patient characteristics

Patient	Gender	Age, years	Side	Quadrant	Type of anomaly	Mammography and ultrasound	Biopsy	Disease stage	Type of surgery	Peri-operative complications	Axillary arch Tx
1	Female	42	left	upper outer	complete	BIRADS 4 lesion	Invasive ductal carcinoma	EBC	BCS	None	preserved
2	Female	45	Right	lower outer	incomplete	BIRADS 4 lesion	Invasive ductal carcinoma	EBC	BCS	None	preserved
3	Female	38	Right	upper outer	incomplete	BIRADS 5 lesion	Invasive ductal carcinoma	EBC	BCS	None	preserved
4	Female	48	Left	upper inner	incomplete	BIRADS 4 lesion	Invasive ductal carcinoma	LABC	MRM	None	preserved
5	Female	46	Left	central	complete	BIRADS 4 lesion	Invasive ductal carcinoma	LABC	MRM	None	preserved

BIRADS=breast imaging-reporting and data system, IDC=invasive ductal carcinoma, BCS=breast conserving surgery, MRM=modified radical mastectomy, Tx=treatment, EBC= early breast cancer, LABC=locally advanced breast cancer.

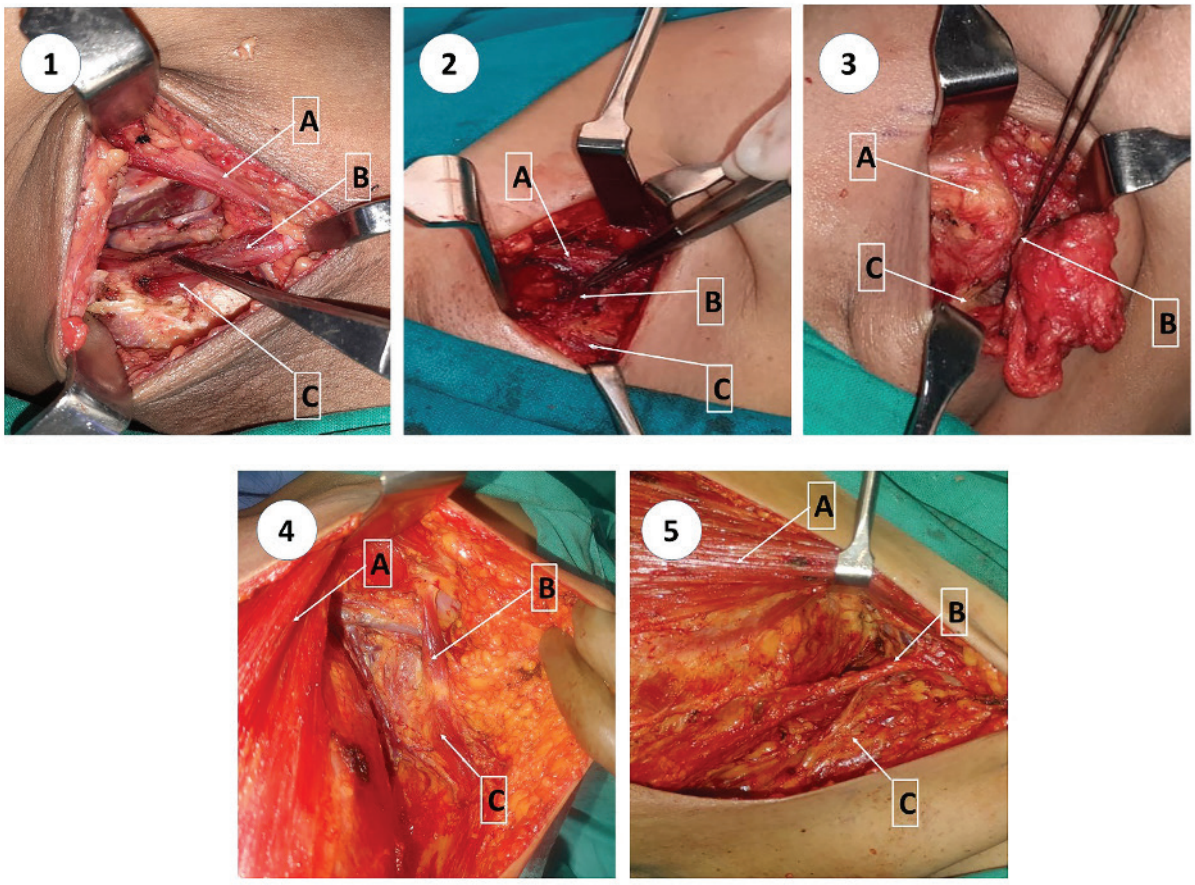

Figure 2 Dissected axilla showing pectoralis major (A) Langer's axillary arch, (B) and latisimus dorsi (C). Pictures 4 and 5 show incomplete and complete anomalies.

Discussion

LAA is considered a vestigial structure and a remnant of the panniculus carnosus muscle with no great significance in terms of its functionality. It is largely differentiated in origin, morphology, composition, size, and insertion. The incidence and prevalence of LAA also very widely and were observed to be more predominant in the Asian population (~11%) than the European population (~4%). It was also witnessed more in females than males[5,14,15]; such inconsistency may be attributed to the genetic variation in the population and the number of patients studied.

In a meta-analysis conducted by Taterra et al.,[15] data from 29 studies (10,222 axillas) were pooled, and LAA was found in only 5.3% of patients. It was also observed that most of the available literature related to LAA has come from cadaveric studies, followed by surgical, imaging, and physical examination[15]. The incidence of LAA was also found to be low in surgical cases compared to cadaveric studies (7%–8%). This difference might be due to the dissection of a cadaver on both sides for exploration, which is uncommon in surgical procedures. The difference in anatomical and surgical incidence reflects a failure to recognize and report

such rare anomalies during surgery, which can also be a possible reason for a small percentage of surgical cases over anatomical cases[1,3,11]. Often, surgical studies fail to report the complete in and out of LAA because, in many cases, surgeons conduct a targeted surgery and report only its presence.

LAA origin and insertion points were highly different from case to case. To avoid any origin and distal insertion point confusion, Jelev et al. proposed dividing the LAA into either deep or superficial types[16]. Reports from 17 studies have also confirmed that LAA is predominantly unilateral (61.6%) and found to be more on the left side (52.5%) of patients[15]. In the present study, LAA was also found to be predominant on the left side. During surgery, the LAAs of three patients were preserved, while in two patients, the LAAs were divided. In many cases, the intra-operative division of the LAA was recommended for better visibility, clearance of lymph nodes, and to reduce the potential oncological complications and other known sequelae. The division is also recommended when a latissimus dorsi flap reconstruction is planned[6]. Due to the LAA's ability to conceal level I lymph nodes in the axilla, there is a high chance of surgeons performing an erroneous super-axillary dissection. This might be due to confusion created by the LAA; in many instances, it was mistaken for the true lateral margins of the latissimus dorsi muscle. This will make the surgeon dissect in a plane above the axillary vein, increasing the risk of injury to the brachial plexus and axillary artery[17]. During SLNB, caution must be exercised, as the LAA can complicate the procedure by stretching in the hyperabducted position, causing the nodes to shift higher, as we observed in one of our patients[4].

Complications associated with LAA are common during surgery due to its intimate location and entrapment of neurovascular structures in the axilla[11]. Understanding the anatomy of LAA plays a key role, which will further help in its division during surgical procedures without much complication. It will also help the surgeon prepare to handle such anomalies before performing breast surgeries, sentinel lymph node biopsy, and breast flap reconstruction surgeries. Knowledge of this variation may also help during the catheterization of axillary vessels, cannulization, radical mastectomy, lymphadenectomy, lymph node staging, and while treating shoulder displacement and limitations in shoulder movement[2]. Prior identification also helps the surgeon prevent unforeseen lymphatic disruption, nerve damage, and bleeding. Imaging techniques (mammography, dynamic ultrasonography, magnetic resonance imaging, etc.) can play a crucial role in these situations in diagnosing and revealing such anomalies before surgeries[15].

To summarize, familiarity and early identification of this muscle variant in clinical practice are of great clinical importance, as they can assist in avoiding many complications and also help in pre- and post-operative planning. However, in the end, it is the clinician's call to spare or dissect the identified LAA during axillary dissection. In dissected cases, regular clinical follow-up is warranted.

Conclusion

LAA is a common anatomic variation, which is identified during axillary dissection surgeries. In the present study, LAA in all patients was accurately identified and exposed during surgery to achieve complete axillary clearance. Early recognition and pre-operative knowledge of such anomalies have helped us prevent numerous unwanted surgical and clinical implications.

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Conflict of interest

The authors declare no conflicts of interest.

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