

# Muscular Variations During Axillary Dissection: A Clinical Study in Fifty Patients

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## ABSTRACT

**Aim:** The present study was conducted to detect the musculature variations during axillary dissection for breast cancer surgery. **Methods:** The anatomy of axilla regarding muscular variations was studied in 50 patients who had an axillary dissection for the staging and treatment of invasive primary breast cancer over one year. **Results:** In a period of one year, two patients (4%) with axillary arch and one patient (2%) with absent pectoralis major and minor muscles among fifty patients undergoing axillary surgery for breast cancer were identified. **Conclusions:** Axillary arch when present should always be identified and formally divided to allow adequate exposure of axillary contents, in order to achieve a complete lymphatic dissection. Complete absence of pectoralis major and minor muscles precludes the insertion of breast implants and worsens the prognosis of breast cancer.

**KEY WORDS:** Axillae, Pectoralis major muscle, Pectoralis minor muscle, Breast surgery, muscle variations, Dissection, Langer's Arch

## INTRODUCTION

During the past two centuries, the anatomical variations of the axilla have been described in both textbook of human anatomy and more recently in those of operative surgery.<sup>[1]</sup> Additional muscle bundles in the axillary region have often been reported. A muscle extending from the latissimus dorsi to the pectoralis major muscle has been called axillary arch or Langer's axillary arch. This occurs in at least 7% of different populations but may not always be clinically apparent.<sup>[2]</sup>

Among the muscles congenitally absent, pectoralis major muscle is the most frequently involved.<sup>[3,4]</sup> Complete absence of the pectoralis major muscle is rare. The usual lesion is absence of the sternocostal portion, with or without absence of the pectoralis minor muscle.<sup>[5]</sup>

In a period of one year, we identified two patients (4%) with axillary arch and one patient (2%) with absent pectoralis major and minor muscle among fifty subjects which undergoing axillary dissection for breast cancer surgery.

## MATERIALS AND METHODS

The anatomy of axilla regarding muscular variations was studied in 50 patients who had an axillary dissection for the

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staging and treatment of invasive primary breast cancer over one year. The axillary dissection was performed in continuity with a mastectomy. The axillary vein was identified and all fatty and lymphatic tissue was removed inferior to the axillary vein, between the anterior border of latissimus dorsi muscle laterally and the lateral border of the pectoralis minor muscle (level of first rib) medially. During the procedure, two individuals with axillary arch muscle and one individual with absent pectoralis major and minor muscles were identified.

## RESULTS

Of the 50 patients, 3 had a variation from the anatomy described in the standard textbooks of anatomy and operative surgery.

There were two patients who had an abnormal band of muscle arising from the latissimus dorsi muscle and crossed the axilla medially towards pectoralis major muscle, pectoralis minor muscle and the coracoid process, without interruption by any type of tendinous fibres. The axillary arch muscle crossed anteriorly over the axillary vein [Figure 1]. The mastectomy along with axillary dissection was completed uneventfully.

There was left sided absence of pectoralis major and minor muscles in a 45 years old woman operated for left sided carcinoma of breast [Figure 2]. The tumor was lying directly over the chest wall. The mastectomy was completed uneventfully.

## DISCUSSION

Axillary arch was first identified by Alexander Ramsay in 1795. There was little interest in Ramsay's description until Langer, in 1846, described the muscle more accurately and it became known as "Langer's arch".<sup>[1,6]</sup> The embryological derivation of Langer's arch remains unknown, but the most reliable theory supports its origin from the "panniculus carnosus", which is an embryologic remnant of skin-associated musculature, lying at the junction between the superficial fascia and the subcutaneous fat.<sup>[7]</sup> In lower mammals the panniculus carnosus is highly developed to form the pectoral group of muscles. However, in man it has regressed because its functional importance decreased during evolution in favour of wide upper limb mobility.<sup>[8]</sup>

Langer's arch is usually asymptomatic and its main importance is the confusion it can cause during routine axillary surgery for breast cancer. An axillary arch may be palpable in living subjects and should be borne in mind during clinical examination of the axilla as it may be mistaken for a tumor. The presence of axillary arch can impede adequate exposure of the true axillary fat and in particular may limit access to the lower lateral group of lymph nodes, thus resulting in an incomplete clearance of the axilla.<sup>[1]</sup> Because of its close proximity with neurovascular and lymphatic structures within the axilla, as the axillary arch crosses the vessels and nerves, it may present with axillary vein obstruction. The axillary arch may lead the surgeon one level above the axillary vein and as a result the neurovascular bundle of the axilla may be injured.<sup>[9]</sup>

The pectoral musculature is derived from dorsal limb bud masses which arise from myoblasts that migrate out of last five cervical and first thoracic myotomes into developing limb buds during fifth week of development.<sup>[10]</sup> The pectoral muscles assume their final form through a combination of migration, fusion and apoptosis of muscle cell precursors.<sup>[11]</sup> Absence of one or more skeletal muscles is more common than is generally recognised; common examples are the sternocostal head of

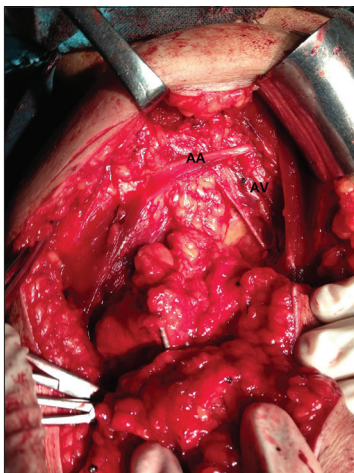
the pectoralis major, the Palmaris longus, trapezius, serratus anterior and quadrates femoris. Usually only a single muscle is absent on one side of the body, or only part of the muscle fails to develop. Occasionally the same muscle or muscles may be absent on both sides of the body.<sup>[12]</sup> Three possibilities have been suggested regarding the congenital absence of pectoral muscles.<sup>[13]</sup>

1. These structures fail to develop in the embryo.
2. The muscles develop partly, fail to attach to the bone and subsequently atrophy.
3. The premuscle mass, which in normal development goes to form the pectoralis minor and two portions of the pectoralis major, fails to differentiate into its separate parts.

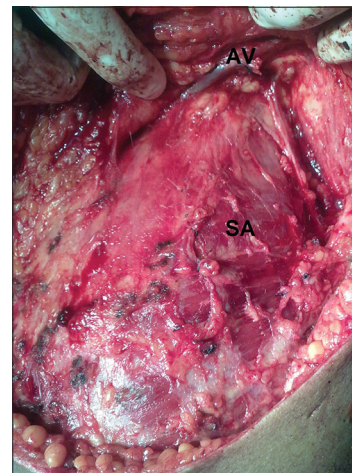
In one study, pectoralis major was absent in three of 15,000 cases and in another study, the muscle was absent in five of 54,000 cases. On average, the muscle was absent in about 0.01% or one in 10,000 individuals.<sup>[14]</sup>

Paraskevas George noted that anomalies of the pectoralis major muscle are of prominent interest for plastic surgeons because that muscle is harvested during total, segmental or turn over flap graft removal for coverage of major sternal wound infections after cardiac surgery, breast reconstruction, or local mediastinal wounds and may serve as treatment for a paralytic elbow. Furthermore, the pectoralis minor muscle is useful as a free flap in cases of facial palsy.<sup>[15]</sup>

Clinical detection of this muscle is difficult; however, it is possible to detect the presence of the axillary arch on performing computed tomography scan or magnetic resonance imaging of the axillary region.<sup>[16]</sup> Caution should be exercised while performing FNAC, core needle or tru cut biopsy of breast lesions in patients with Poland syndrome. The procedure should be preferably performed under image guidance in such patients in order to minimize the risk of complication of pneumothorax. The reported incidence of this complication varies between 3 in 100 and 1 in 10,000.<sup>[17]</sup>



**Figure 1:** Axillary Arch (AA) muscle crossing anteriorly over right axillary vein (AV)



**Figure 2:** Absent pectoralis major and minor muscles. Serrations of left serratus anterior are seen

## CONCLUSION

When present, axillary arch should always be accurately identified and formally divided to allow adequate exposure of axillary contents in order to achieve a complete lymphatic dissection. Axillary arch can easily cause difficulty for the inexperienced surgeon if, by following the band, the dissection is carried higher than normal, into the region of the axillary artery and brachial plexus.

The defects of pectorals usually cause little or no functional disability and often go unnoticed by the patients or relatives. However an understanding of the spectrum and complexity of this anatomical variation may be of benefit to the surgeon and pathologists while performing FNAC, core needle or tru cut biopsy. Complete absence of the pectoralis major also precludes the insertion of breast implants. Absence of these muscles may increase the chances of direct spread of cancer breast through chest wall into cavity, which can worsen the prognosis.

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