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The anatomy of the pectoral nerves and its significance in breast augmentation, axillary dissection and pectoral muscle flaps

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Summary *Background:* In many plastic surgeries, a detailed understanding of the pectoral nerve anatomy is often required. However, the information available on the anatomy of pectoral nerves is sparse and unclear. The purpose of this study is to provide detailed anatomical information on the pectoral nerves to allow for their easy intra-operative localisation and to improve the understanding of the pectoral muscle innervation.

Methods: We dissected 26 brachial plexuses from 15 fresh cadavers. The origins, locations, courses and branches of the pectoral nerves were recorded.

Results: We found three constant branches of the pectoral nerve. The superior branch travelled in a straight course to the pectoralis major to innervate the clavicular aspect. The middle branch coursed on the under-surface of the pectoralis major near the pectoral branch of the thoraco-acromial artery to innervate the muscle's sternal aspect. The inferior branch passed beneath the pectoralis minor muscle to innervate the pectoralis minor muscle and the costal aspect of the pectoralis major muscle.

Conclusions: Knowing the pectoral nerves' origins, courses and connections, in addition to understanding the functional consequences of iatrogenically severing these nerves, leads to a better understanding of the pectoral muscle's innervation. Precise anatomical data on the pectoral nerve allow for its easy localisation during axillary breast augmentation, axillary dissection, removal of the pectoralis minor muscle and harvesting the pectoralis major muscle island flap.

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in many plastic surgeries, a detailed understanding of the pectoral nerve anatomy is often required, for example, during axillary breast augmentation, axillary dissection, harvesting the pectoralis major muscle island flap and removal or harvesting the pectoralis minor muscle.^{1–6} In those procedures, damage to the pectoral nerves can occur, leading to the denervation of the pectoralis major muscle and subsequent atrophy.

However, the necessary understanding of this nerve to avoid damaging the innervation of the pectoralis major muscle remains unclear. Indeed, recent studies on the courses and branches of the pectoral nerves contradict the classic description of the pectoral nerves.^{2,4,7–12} In the classic anatomic descriptions, the pectoralis major muscle is innervated by two pectoral nerves, but recent studies found that the pectoralis major muscle is innervated by three nerves.^{10–13}

The purpose of this study was to provide detailed anatomical information on the pectoral nerves to improve the understanding of pectoral muscle innervation and to allow for easy intra-operative localisation of these nerves during the previously mentioned procedures.

Materials and methods

We dissected 26 brachial plexuses from 15 fresh cadavers. The dissecting procedure was as follows. We removed the skin and subcutaneous fat from the entire supraclavicular, infraclavicular and axillary areas. An axillary dissection was performed to identify the inferior branch of the pectoral nerve (medial pectoral nerve) and its relationship with the pectoralis major muscle. Then, a supraclavicular dissection was performed, and the brachial plexus was dissected carefully from the roots to the clavicle. Finally, an infraclavicular dissection was performed. The pectoralis major muscle was reflected medially to allow for the dissection of the superior and middle branches of the pectoral nerves (lateral pectoral nerve). The pectoralis minor muscle was released from the coracoid process to follow the course of the inferior branch of the pectoral nerves (medial pectoral nerve).

The clavicle was removed and the brachial plexus was completely dissected to precisely determine the origin of each branch of the pectoral nerves. The origins, locations, courses and branches of the pectoral nerves were recorded.

We photographed and illustrated our findings in schematic drawings.

Results

In all dissections, we found three constant branches of the pectoral nerves (Figures 1 and 2). The origin and the relationship of these three branches were variable, especially the superior and middle branches. In 77% (20 cases) of the dissections, the superior and the middle branches arose separately at trunk level, but in 23% (six cases) of the dissections, the superior and the middle branches arose from the same origin. To clarify the relationship between the superior and middle branches, we classified them based on their origins and connections (Figure 3).

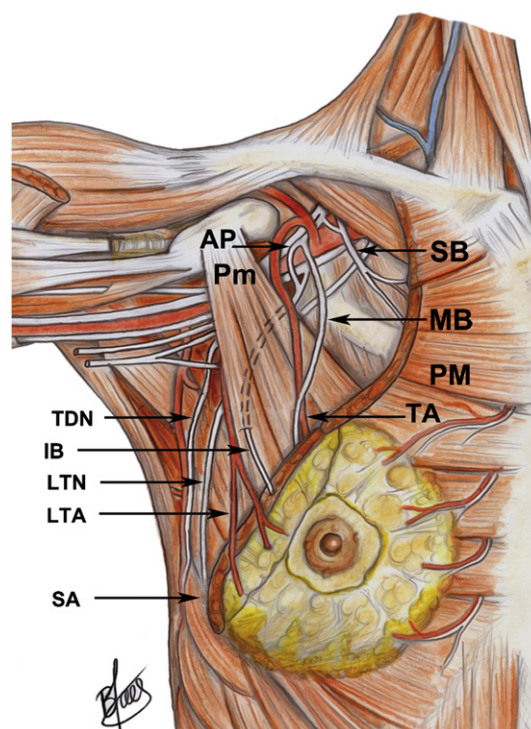


Figure 1 Schematic drawing of right brachial plexus showing the 3 branches of the pectoral nerves. SB, superior branch of the pectoral nerves; MB, middle branch of the pectoral nerves; IB, inferior branch of the pectoral nerves; AP, ansa pectoralis; Pm, pectoralis minor; PM, pectoralis major; TA, pectoral branch of the thoraco-acromial artery; LTA, lateral thoracic artery; TDN, thoraco-dorsal nerve; long thoracic nerve; SA, serratus anterior.

In subtype A1, present in 62% (16 cases) of dissections, the superior branch and the middle branch arose separately at the trunk level and were connected by an ansa from the middle branch to the superior branch. In subtype A2, present in 15% (four cases) of dissections, the superior and the middle branches both arose from the lateral cord and were not connected. In type B, present in 23% (six cases) of dissections, the superior and the middle branches arose from the same origin.

The superior branch arose either from the anterior division of the superior trunk or the lateral cord (roots C5–C6). It appeared at the inferior border of the clavicle, lateral to the axillary artery, and travelled straight to enter the clavicular portion of the pectoralis major, usually with three branches.

The middle branch arose either from the anterior division of the middle trunk or the lateral cord (root C7). The middle branch appeared next to the superior branch, crossed the axillary artery anteriorly and pierced the coracoclavicular fascia. It travelled on the under-surface of the pectoralis major near the pectoral branch of the thoraco-acromial artery and entered into the pectoralis major distally to innervate its sternal aspect, usually with two branches (80% of cases). We found an ansa pectoralis derived from the middle branch and connected to the inferior branch in all dissections (Figure 4).

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