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A Rare Case: The Medial Cord of the Brachial Plexus Sandwiched between the Axillary and Superficial Brachial Arteries

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Abstract: We encountered a rare anomaly in the cadaver of a Japanese woman in which the medial cord of the brachial plexus including the ulnar nerve and the medial root of the median nerve was sandwiched with the axillary and the superficial brachial arteries. The axillary artery passed inferior and dorsal to the medial cord, branching off the subscapular, anterior circumflex humeral arteries, and the common trunk of the posterior circumflex humeral and profunda brachii arteries, and ended as the inferior ulnar collateral artery. The superficial brachial artery descended ventral to the median nerve and divided into the radial and ulnar arteries in the cubital fossa. We discuss the developmental formation of this anomaly.

Key words: Japanese woman, anomaly, axillary artery, superficial brachial artery, development

INTRODUCTION

The axillary artery normally passes between the medial and lateral roots of the median nerve, and continues as the brachial artery. When the axillary artery branches off the superficial brachial artery which crosses over the medial root of the median nerve and divides into the radial and ulnar arteries, it usually passes between the medial and lateral roots of the median nerve and branches off the anterior and posterior circumflex brachial arteries, and the profunda brachii artery (Adachi, 1928; Nakatani et al. 1996a). A case is rarely observed in which, after branching off the superficial brachial artery which crosses the ventral surface of the medial cord including the medial brachial cutaneous, medial antebrachial cutaneous, ulnar, and the medial root of the median nerve, the axillary artery passes to the inferior side of the medial cord instead of to a space between the medial and lateral roots, and then reaches dorsal to the medial cord (Adachi, 1928; Chiba, 1986; Aizawa et al., 1996). We encountered such a case in an anatomical dissecting course for medical students in 1996.

OBSERVATIONS

The cadaver was that of a 69-year-old Japanese woman who had died of cancer in the pancreatic head. The right axillary artery passed ventral to the brachial plexus (Fig. 1a and b). About 2 cm distal to the derivation of the thoracoacromial artery from the axillary artery, the axillary artery branched off the superficial

brachial artery, descended for a short distance, crossed inferior to the medial cord of the brachial plexus including the medial pectoral, medial brachial cutaneous, medial antebrachial cutaneous, ulnar, and the medial root of the median nerve and then passed dorsal to the medial cord of the brachial plexus. The artery branched off the subscapular, anterior circumflex brachial artery, the small posterior circumflex brachial artery which passed through the quadrangle space with the axillary nerve, and the common trunk of profunda brachii and posterior circumflex brachial arteries which passed under the teres major to the back, dividing into each arteries, and finally continued as the inferior ulnar collateral artery. The subscapular artery divided into a circumflex scapular and thoracodorsal artery. The superficial brachial artery passed ventral to the medial cord, descended ventral to the median nerve, crossed the ventral surface of the nerve to the lateral side of the nerve at the proximal fifth of the arm, and then divided into the radial and ulnar arteries in the cubital fossa. A vascular branch to the pectoral muscles was derived from the superficial brachial artery at a distal point about 2 cm from its origin. The medial cord therefore was sandwiched between the axillary and superficial brachial arteries.

Additionally, after branching off the superficial brachial artery at a part proximal to the confluence of the medial and lateral roots of the median nerve, the left axillary artery passed between the roots and reached the dorsal surface of the median nerve. The left superficial brachial artery divided into the radial and ulnar arteries in the cubital fossa.

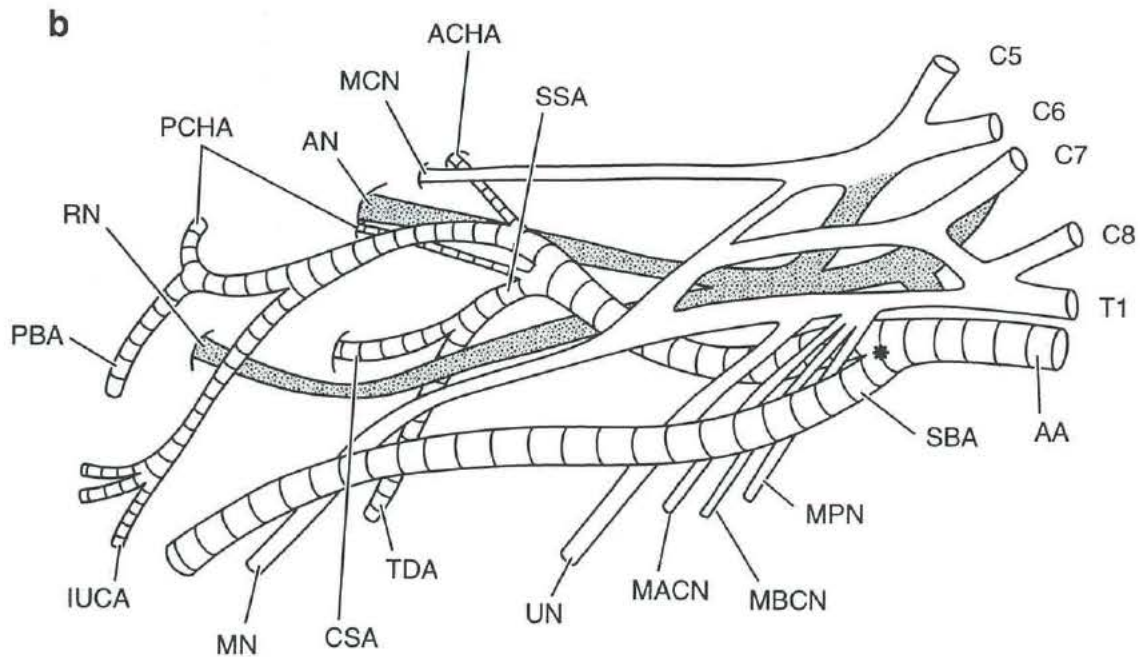
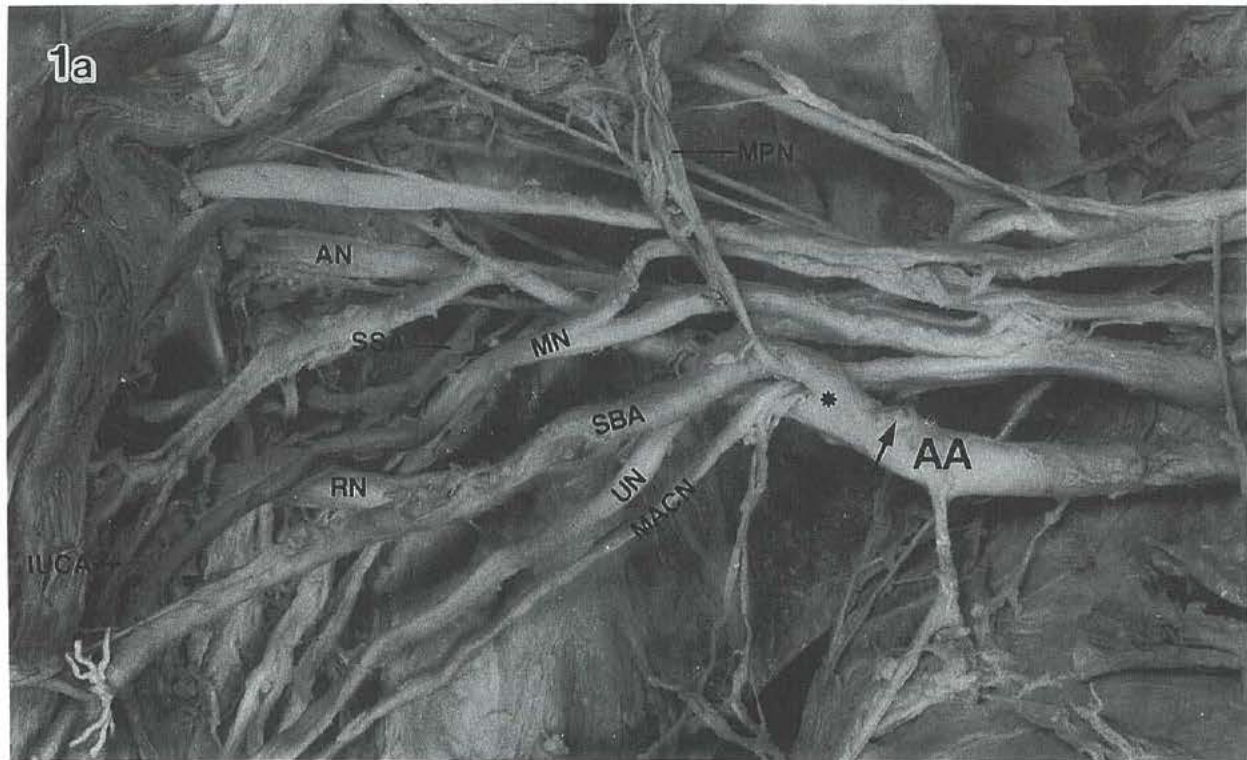


Fig. 1. A photograph (a) and drawing (b) of the right axilla. The arm is in slight abduction and elevated position. The thoracoacromial artery (arrow in the photograph) is cut. Note that the medial and lateral roots of the median nerve (MN) are formed, although no artery penetrates between the roots. An asterisk indicates a fork in the axillary artery (AA). The ulnar (UN), medial brachial cutaneous (MBCN) and medial antebrachial cutaneous (MACN) nerves, and the medial pectoral nerve (MPN) are sandwiched between the axillary artery and superficial brachial artery (SBA). C, cervical nerve; ACHA, anterior circumflex humeral artery; AN, axillary nerve; CSA, circumflex scapular artery; IUCA, inferior ulnar collateral artery; MCN, musculocutaneous nerve; PBA, profunda brachii artery; PCHA, posterior circumflex humeral artery; RN, radial nerve; SSA, subscapular artery; T, thoracic nerve; TDA, thoracodorsal artery.

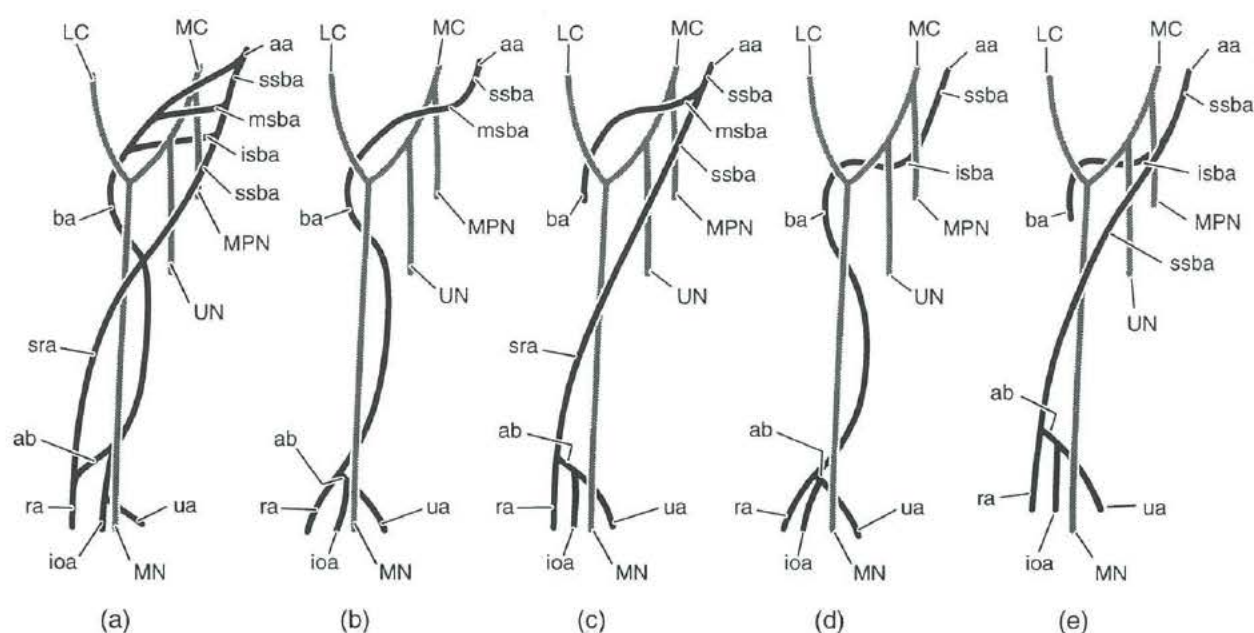


Fig. 2. Drawing showing one possible formation sequence of major anomalous arm arteries. (a) This is an adaptation of the embryonic arterial pattern expostulated by Müller (1903) and Singer (1933). The axillary artery (aa) penetrates the ventral plexus of the brachial plexus and becomes the brachial artery (ba), which continues as the interosseous artery (ioa). The superior superficial brachial artery (ssba) originates from the axillary artery ventral to the brachial plexus and connects to the brachial artery. It splits off two branches on the way: these are the medial superficial brachial artery (msba), which passes between the medial and lateral cords (MC and LC, respectively), and anastomoses with the ba, and the inferior superficial brachial artery (isba), which passes under the medial cord, anastomosing with the ba. The superficial radial artery (sra) arising from the brachial artery connects with the brachial artery via an anastomotic branch (ab). The anastomotic branch and the distal part of the superficial brachial artery normally form the radial artery (ra). MN, median nerve; MPN, medial pectoral nerve; ua, ulnar artery; UN, ulnar nerve. (b) The normal artery in the arm shown as a solid line. (c) The superficial brachial artery and a remaining proximal part of the normal axillary artery shown as a solid line. The former descends ventral to the median nerve. (d) The anomalous course of the axillary artery, shown as a solid line, which does not penetrate the median nerve and divides into the radial and ulnar arteries. (e) The present anomalous artery shown as a solid line.

DISCUSSION

In the present anomaly, the axillary artery passes from inferior to dorsal to the medial cord of the brachial plexus and ends in the brachium, and the superficial brachial artery originating from the axillary artery, descends ventral to the medial cord and the median nerve, and divides into the radial and ulnar arteries in the cubital fossa. The course of the axillary artery and the origin and course of the subscapular artery in the present case correspond to that of the type-1 AxC and those of the I-type Sbs system by Aizawa et al. (1995, 1996), respectively. Adachi (1928) and Kodama (1987) reported that this anomaly was present in 2 of 410 arms and 1 of 355 arms, respectively. Additionally, Chiba (1986) and Aizawa et al. (1996) reported 4 and 7 cases, respectively. We observed the anomaly in only 1 of 152 arms studied between 1995 and 1996. Thus, the incidence is about 0.25% to 0.98%.

Although it is unclear whether clinical symptoms are produced by the present anomaly or not, it is possi-

ble that compression of the medial cord including the ulnar nerve due to the sandwiching between the axillary and superficial brachial arteries could cause paralysis of the arm.

Based on the development of the arteries of the arm as articulated by Müller (1903) and Singer (1933), normal development of the axillary and brachial arteries seem to include the persistence of the following arteries: the axillary, superior superficial brachial, brachial, radial and ulnar arteries (Fig. 2a, b). If the axillary, superior superficial brachial, superficial radial, radial and ulnar arteries, and moreover the medial superficial brachial artery, a proximal part of the brachial artery are persistent, the superficial brachial artery can be formed (Fig. 2c). This anomaly is relatively common (Nakatani et al., 1996a). If the axillary, superior and inferior superficial brachial, brachial, radial and ulnar arteries are persistent, the axillary artery not passing between the medial and lateral roots of the median nerve can be formed (Fig. 2d). This type is relatively rare (Nakatani et al., 1996b). Thus it is possible that the unusual course of the axillary artery

and the appearance of the superficial brachial artery, such as described herein, are derived from the axillary, superior and inferior superficial brachial arteries, a proximal part of the brachial artery, and at the same time a distal part of superior superficial brachial artery issuing from the origin of the inferior superficial brachial artery, the superficial radial, radial and ulnar arteries (Fig. 2e).

We show in this study that the developmental pro-

cess of major arteries in the arm proposed by Müller (1903) and Singer (1933) is important in explaining the formation of anomalies of major arteries in the arm.

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