Case Report

Short Axillary Vein and an Axillary Venous Ladder Formed by Basilic and Brachial Veins – An Anatomical and Clinical Perspective

Satheesha Nayak B, Srinivasa RS (✉), Ashwini AP, Naveen K, Swamy RS, Deepthinath R, Surekha DS, Prakashchandra S

Department of Anatomy, Melaka Manipal Medical College (Manipal Campus), Manipal University, 576104 Manipal, Karnataka State, India.

Abstract

Knowledge of anatomic variants of veins in the arm and axilla play a key role in planning of successful venous access. Possible anatomic variants of axillary vein, brachial vein and basilic vein and their clinical implications have been well described in the literature. We report a rare case of formation of a short axillary vein associated with complex venous communications between the basilic and brachial veins forming a venous ladder in the axilla, in formalin embalmed male cadaver. Axillary vein was formed in the upper part of the axilla by the fusion of basilic vein and unpaired brachial vein, and it was about 3cm in length. The higher-up confluence of basilic and brachial veins was also associated with presence of three communicating veins between the basilic and brachial veins in the axilla. Knowledge of reported venous variations is very useful during preoperative venous mapping and also for planning and execution of various surgical invasive procedures involving these veins.

Keywords: Axillary vein, basilic vein, brachial vein, confluence, communication

Correspondence:

Srinivasa Rao Sirasanagandla, Department of Anatomy, Melaka Manipal Medical College (Manipal Campus), Manipal University, 576104 Manipal, Karnataka State, India. Tel: 9886310652 Fax: 91-8202571905 Email: seenaih.anat@gmail.com

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Introduction

Axillary vein (AV) is formed at the lower border of teres major muscle by the joining of basilic vein and brachial veins. However, some authors consider AV as a continuation of basilic vein at the lower border of axilla, which receives two brachial veins at the level of subscapularis muscle (1). AV usually runs on the medial side of the axillary artery and ends at the outer border of first rib by continuing as subclavian vein. It drains the tributaries which follow the branches of the axillary artery. AV variations are rarely reported in the literature. Perforation by the branches of brachial plexus or by the axillary artery or its branches is the reported variations of the AV (2,3,4). A detailed study on anatomical variations in the formation of AV has also been conducted (5). Knowledge of AV variations is clinically important as it is frequently used for various invasive procedures.

Basilic vein is formed on the medial aspect of the dorsal venous plexus. After formation, it ascends on the medial side of the forearm, in the superficial fascia. At about middle of the arm, it pierces the deep fascia and continues as AV. Brachial veins are the venae comitantes of the brachial artery, usually two in number. They terminate by joining with basilic vein or directly draining into AV. Absence of basilic vein (6) and unusual position of confluence of basilic and brachial veins (7,8) are the reported variations of these veins. Awareness of anatomical variations of brachial and basilic veins is crucial during arterio-venous fistula creation and vascular access planning (7,8). We report a higher-up confluence of basilic and brachial veins resulting in a short axillary vein and discuss its clinical importance.

Case Report

During regular laboratory dissection classes for first year medical undergraduate students, we came across a rare anatomical variation in the formation of AV. It was observed in an approximately 60-year-old male cadaver of Indian origin. AV was formed higher up in the axilla, close to the first rib, by the union of basilic and brachial veins. AV was very short, and it was about 3cm in length. There was only one brachial vein accompanying the brachial artery. Both basilic vein and unpaired brachial vein were connected with each other by three communicating veins. First communicating vein passed behind the second part of the axillary artery. Second communicating vein was found passing deep to the third part of axillary artery. Third vein passed superficial to the third part of the axillary artery. Thus, an axillary venous ladder was formed by brachial and basilic veins in relation to the axillary artery. Anterior circumflex humeral artery originated from the third part of the axillary artery, and it perforated through the brachial vein before reaching the neck of the humerus (Fig. 1 and 2).

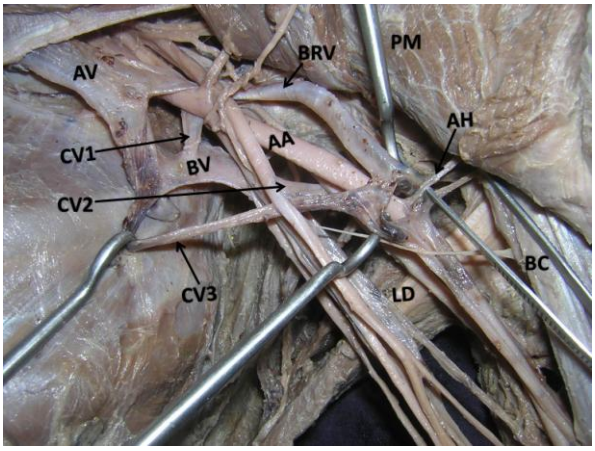

Figure 1: Dissection of left axilla shows the higher-up union of basilic vein (BV) and brachial vein (BRV) forming the axillary vein (AV). Note the first communicating vein (CV1), second communicating vein (CV2) and third communicating vein (CV3) between the basilic and brachial veins. (AA – axillary artery; LD – latissimus dorsi; AH – anterior circumflex humoral artery; BC – biceps brachii; PM – pectoralis major)

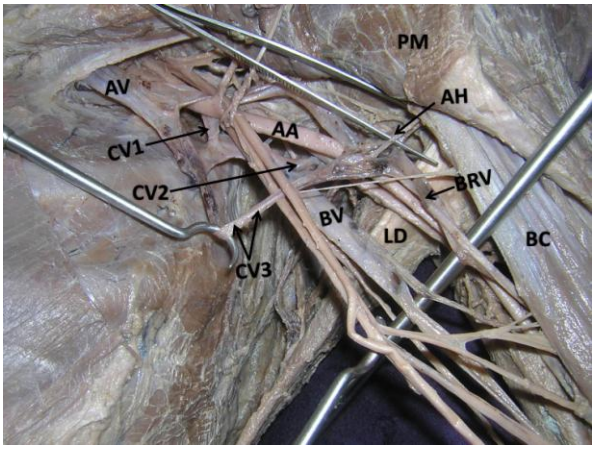

Figure 2: Closer view of left axilla showing the short axillary vein (AV) formed by basilic vein (BV) and brachial vein (BRV). (CV1 – first communicating vein; CV2 – second communicating vein; CV3 – third communicating vein; AA – axillary artery; LD – latissimus dorsi; AH – anterior circumflex humoral artery; BC – biceps brachii; PM – pectoralis major)

Discussion

Axillary vein often shows variations in its formation and tributaries. Yang et al. (5) have studied various possible patterns of formation of AV and classified them into two types. In type 1, the two brachial veins separately drain into either basilic vein or AV. In type 2, two brachial veins join to form a common vein before draining into the basilic vein or AV (5). Contrary to their study; we observed a rare type in which there was only one brachial vein which joined the basilic vein to form the AV. Union of veins occurred at high level in the axilla, thus AV is found to be very short (3cm). Knowledge of location of AV is clinically important in surgical procedures of axillary lymph node dissection and breast augmentation (9). AV is frequently used to access the central vein, in burned patients (10). In heart failure patients, AV puncture is routinely used for the implantation of lead defibrillator or pacemakers (11). Catheter is usually introduced into the AV by puncturing the axillary base (10). AV approach through the axillary base in cases like the current case may not be appropriate, as it was positioned at higher level in the axilla.

Position of junction of basilic vein and brachial vein is not always constant. Anaya-Ayala et al. (8) have studied the variant anatomy of the basilic and brachial veins and classified them into three types. In type 1 (66%), basilic vein joins with the brachial vein at the proximal part of the arm, close to the axilla to form the AV. In type 2 (17%), junction of basilic and brachial veins is situated at the mid arm or lower part of the arm; where the basilic vein joins one of the brachial veins and the brachial veins are still paired above the level of junction. Type 3 (17%) is similar to type 2 but brachial vein persist as unpaired vein above level of junction (8). In the present case, we report a rare type in which junction of basilic-brachial veins was situated very high up in the axilla. Further, there were three communicating veins between the basilic and brachial veins, forming a venous ladder in the axilla around the brachial plexus. In our literature search, we did not come across any reports on such communicating veins

in the axilla. Awareness of variant anatomy of basilic-brachial vein junction is quite important during brachiobasilic arteriovenous fistula creations (7,8). Kaiser et al. (7) have reported a case of complications of basilic vein transposition due to lack of prior knowledge about the early confluence of basilic-brachial veins, in the lower part of the arm. It is encouraged to use brachial vein as an autogenous vein while creating the fistula (12). Ultrasound guided vein mapping should be performed before surgery to rule out the variations of targeted veins (8). During embryonic development, hemodynamic factors determine the formation or regression of anastomotic channels between the superficial and deep vessels and subsequently to form the adult pattern of the vessels. Persistence of some anastomotic channels between the basilic and brachial veins which otherwise disappear could be the reason for the complex patterns of vessels observed in the present case.

Based on existing literature, it is the first report which documents the higher-up confluence of basilic-brachial vein forming short AV. Further, associated complex venous communications between the basilic and brachial veins adds significant importance to the reported observation. Knowledge of the anatomic variants of the AV, brachial and basilic veins reported here is very important to vascular surgeons, general surgeons and radiologists to avoid intra and postoperative complications as well as for the successful invasive venous accesses.

During limb development, blood from the capillary plexus reaches the body via a marginal vein. Later, the marginal vein forms both superficial and deep veins. Formation of deep veins involves the fusion and/or disappearance of smaller veins along the arteries (13). Unusual venous communications observed in the present case could be due to the persistence of some of the vein which are otherwise to disappear to result in normal development.

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