# INTRODUCTION

Peripherally inserted central catheters (PICCs) are frequently used to obtain central venous access for patients in acute care, home care and skilled nursing care. PICCs are a reliable alternative to short-term central venous catheters, with a lower risk of complications. Early assessment of hospitalized patients is essential to assure that individuals who will benefit the most from a PICC receive one as soon as possible in their treatment. However, PICCs are not appropriate for every patient. Indications, contraindications, and potential complications must be considered prior to insertion of a PICC. Nurses caring for patients with PICCs must be properly educated in device use, site care, and catheter maintenance, as well as recognition of complications ***(Bailey, 2000).***

PICCs have become well recognized as reliable central venous access devices (VADs), with lower potential for complications than short-term central venous catheters PICCs first gained popularity in the 1980s, and their use has grown steadily since then. They have grown in popularity because of their reduction in potential complications and costs compared with short-term central venous catheters ***(Wise, 2001).***

For a VAD to be termed a PICC, it must be inserted into the peripheral vasculature. A vein in the arm is the most common point of insertion. Also, to meet the definition, the distal tip of the catheter must terminate in the superior vena

cava, the inferior vena cava, or the proximal right atrium. For infants, the catheter may be inserted in the saphenous vein, with tip termination in the inferior vena cava above the level of the diaphragm. Any tip termination below the level of the diaphragm for lower extremity insertion, or proximal to the superior vena cava for upper extremity insertion, is technically not a PICC but rather a peripheral catheter ***(Wise, 2001).***

# AIM OF THE WORK

Insertion of a Picc line for selected patients and following up the complications prevalence.

# ANATOMY

## Anatomy of The Vein Wall

Veins are the blood vessels which carry the blood from peripheral tissues towards heart. They carry the deoxygenated blood, they're composed of three layers.(**Figure 1)**

### Tunica Adventitia

Composed of connective tissue which provides support for the vein and allows the vein to roll ***(Gilroy, 2008).***

### Tunica Media

Largest layer of the vein composed of elastic and muscle tissue, innervated by the SNS (fight or flight response) - promotes venous constriction or dilation in response to anxiety, temperature, mechanical or chemical irritation. Pain can trigger vasoconstriction ***(Sinnatamby , 2011).***

### Tunica intima

Composed of one layer of smooth and elastic cells. The cells secrete tissue plasminogen activator and heparin to prevent platelet aggregation.

Mechanical injury occurs when the vein wall is injured during insertion or ongoing exposure to the device.

Chemical injury occurs when the vein wall is in contact with solutions or medications having hypo-osmolar,

hyperosmolar properties, medications with pH< 5 or >9, and/or osmolarity >600 (per INS Standards).

Beneath the intima is the subendothelial layer. Damage to this layer causes inflammation and adherence of cells and platelets, which may result in phlebitis, thrombosis, extravasation, and/or infiltration ***(Gilroy, 2008).***

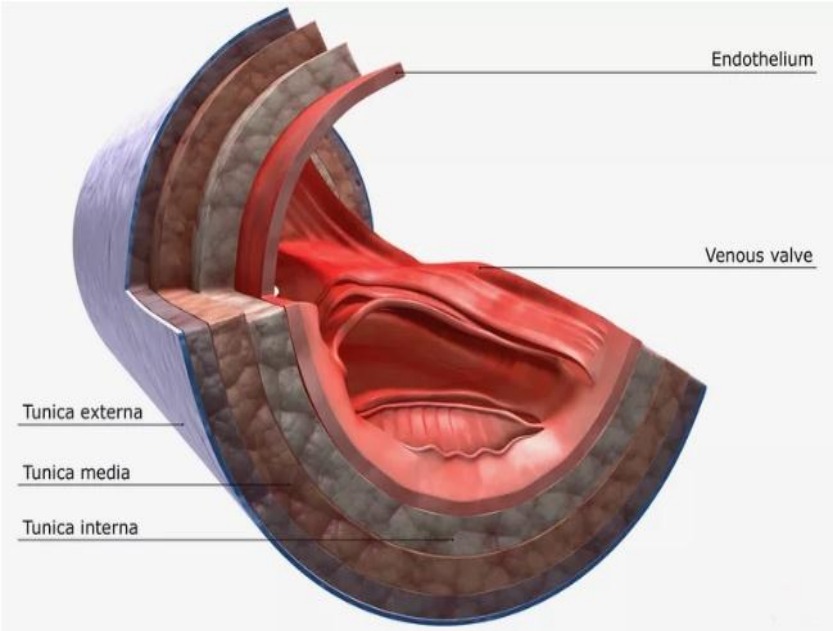


**Figure (1):** Anatomy of the Vein ***(MedicalRF.com / Getty Images).***

## Valves

Allow unidirectional flow of blood back to the heart and prevent pooling in the peripheral circulation.

Veins dilate where the valve attaches, this creates a sinus that allows blood to become stagnant and lead to thrombus formation.

Valves are present in most veins except in the head, vena cava, very small veins. (**Figure 2)**

The longer the vein the more valves it will contain.

Difficulty is encountered when threading the vein passed the valves ***(Sinnatamby , 2011).***

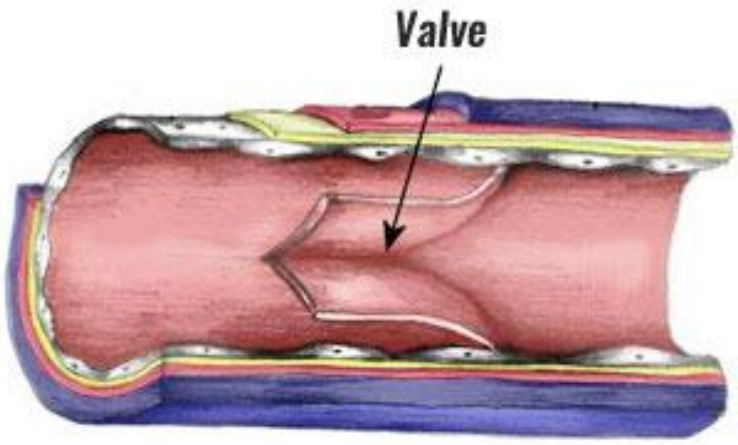


**Figure (2):** Valves of veins ***(teachpe.com).***

Veins of The Upper Limb

## *Basilic vein*

### Origin

The basilic vein arises from the ulnar side of the superficial venous network of the dorsum of the hand ***(Tortora, 2014).***

### Course

From the ulnar aspect of the superficial venous network, the basilic vein ascends posteromedially in the forearm towards the anterior elbow region to pass anterior to the medial epicondyle of the humerus. In the brachium it continues to ascend anteromedially until it penetrates the brachial fascia at the basilic hiatus, halfway between the elbow and axilla. The basilic vein then courses medial to the brachial artery until it unites with the brachial veins in the axilla to form the axillary vein ***(Tortora, 2014).***

### Tributaries

Superficial veins of the upper limb are highly variable and have multiple superficial tributaries which drain into them. Two such variable tributaries of the basilic vein include:

#### The Median Cubital Vein

- Connects the basilic vein to the cephalic vein in the anterior aspect of the cubital fossa.

- It is a common site for venipuncture.

**The Median Antebrachial Vein**

- Arises from the palmer venous plexus on the palms of the hands, which drain the palmer digital veins. It courses anteriorly in the forearm and drains the subcutaneous tissue of the anterior wrist and forearm.
- It terminates into the basilic or median cubital veins.
- In some cases, the median antebrachial vein divides into median cephalic and median basilic veins at the elbow, which then drain into the cephalic and basilic veins respectively.(**Figure 3**)

***(Tortora, 2014)***

## Termination

The basilic vein terminates by uniting with the paired brachial veins to form the axillary vein at the inferior border of the teres major muscle ***(Tortora, 2014).***

## Drainage

The basilic vein drains the medial side of the superficial venous network of the dorsum of the hand, which in turn drains blood from the palm of the hand. As it ascends in the forearm and arm, the basilic veins drains the medial aspect of the upper limbs via numerous superficial veins ***(Gilroy, 2008).***

## *Cephalic Vein*

### Origin

The cephalic vein arises in the anatomical snuffbox from the radial side of the superficial venous network of the dorsum of the hand ***(Tortora, 2014).***

### Course

From the radial aspect of the superficial venous network, the cephalic vein arches around the radial aspect of the forearm to course through the anterolateral forearm. It then passes upwards over the anterior elbow region and ascends through the anterolateral brachium lateral to the biceps muscle in the deltopectoral groove (formed by the borders of the deltoid and pectoralis major muscles). The vein then passes through the anterior wall of the axilla, perforating the clavipectoral fascia to drain into the first part of the axillary vein ***(Tortora, 2014).***

### Tributaries

Accessory cephalic veins can arise from either a venous plexus on the dorsum of the forearm or from the medial aspect of the dorsal venous network of the hands. These accessory veins then unite with the cephalic vein just inferior to the elbow. It may also receive blood from the variable median cubital vein ***(Gilroy, 2008).***

## Termination

The cephalic vein terminates by draining into the first part of the axillary vein. (**Figure 3)**

## Drainage

The cephalic vein drains the lateral side of the superficial venous network of the dorsum, which in turn drains blood from the palm of the hand. As it ascends, the cephalic vein drains bloods from the lateral aspect of the upper limbs via small superficial veins ***(Gilroy, 2008).***

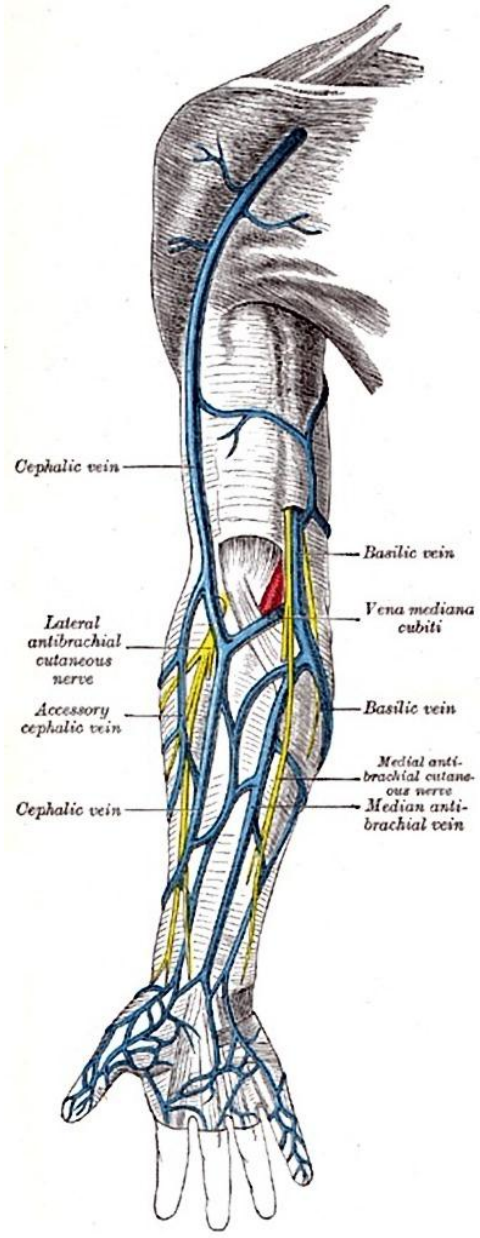


**Figure (3):** Superficial veins of the upper limb ***(Gray's, 1918).***

## *Brachial Vein*

The brachial vein is a component of the deep venous system of the upper limb. After forming from the radial and ulnar veins, the brachial vein travels from the cubital fossa superiorly to become the axillary vein ***(Gilroy, 2008).***

### Origin

Union of the ulnar and radial veins in the cubital fossa.

### Location

Courses superiorly in the upper arm, often in close proximity to the brachial artery.

### Drainage

Deep and superficial palmar venous arches.

### Termination

Union of the brachial and basilic veins at the inferior border of teres major forms the axillary vein. **(Figure 4)**

***(Tortora, 2014)***

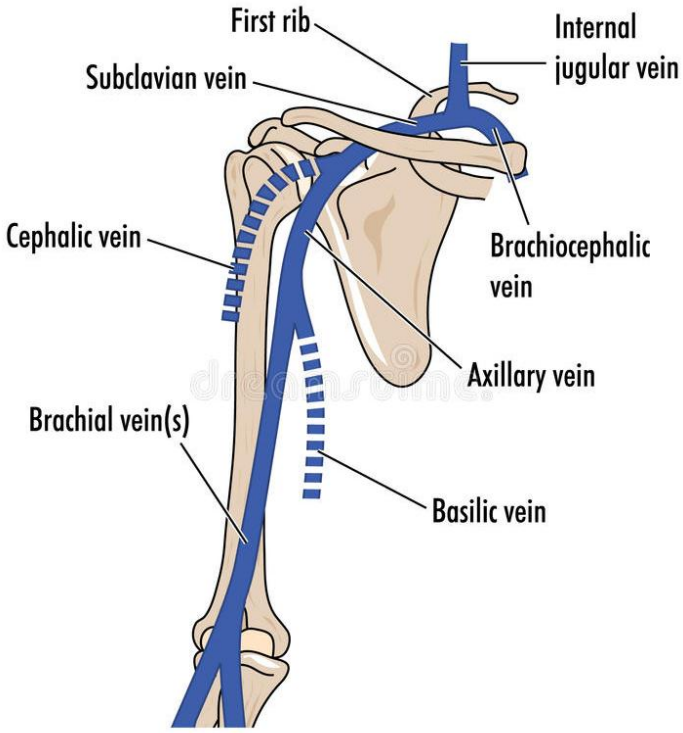


**Figure (4):** Anatomy of Brachial Vein.

## *Axillary Vein*

### Origin

The axillary vein is formed at the inferior border of the axilla by the union of the paired brachial veins (venae comitantes of the brachial artery) and the basilic vein ***(Gilroy, 2008)***.

### Course

The axillary vein arises at the inferior border of the teres major muscle at the inferior border of the axilla. The vein ascends through the axilla medial to the axillary artery and then

courses anterior to the subclavian artery to leave the axilla at its apex. It then passes in front of the scalenus anterior, where it becomes continuous with the subclavian vein at the lateral border of the first rib ***( Gilroy, 2008)***.

## Divisions

As with the axillary artery, the axillary vein can be divided into three parts by its relation to the pectoralis minor (above, behind or below) ***(Gilroy, 2008).***

## Tributaries

The second and third parts of the axillary vein have tributaries that correspond with the branches of the axillary artery. These include the thoracoacromial vein, lateral thoracic vein, ubscapular vein, anterior circumflex humeral vein and posterior circumflex humeral vein. (**Figure 5)**

The cephalic vein is a tributary of the first part of the axillary vein (above the pectoralis minor) and enters the vein after piercing the clavipectoral fascia.

***(Gilroy, 2008)***

## Termination

The axillary vein terminates by becoming continuous with the subclavian vein at the lateral border of the first rib.

## Drainage

The axillary vein drains deoxygenated blood from the arm, axilla and superolateral chest wall. It also receives contributions from the thoracoepigastric vein of the anterolateral abdominal wall ***(Sinnatamby , 2011).***

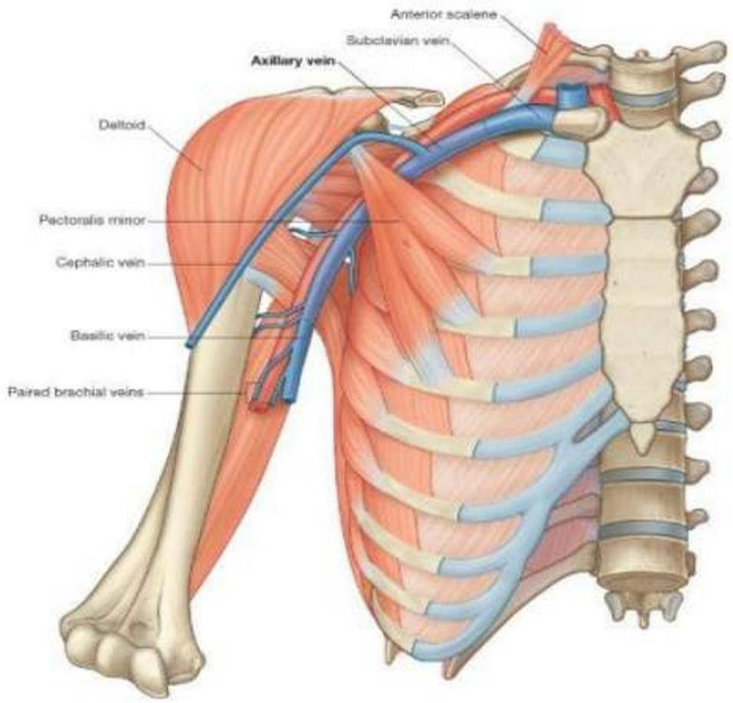


**Figure (5):** Axillary Vein.