

# Radial Artery Forearm Flap Anomaly: A Rare Anomaly and the Importance of the Proximal Exploratory Incision

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## Abstract

During a free radial forearm flap harvest, we encountered a variant anatomy of the arterial system. The brachial artery was found to travel with the median nerve and bifurcate 10 cm below the antecubital fossa, under cover of the pronator teres. The radial artery then emerged from the pronator and continued on its usual path. This anomaly has been reported only once thus far. We report this case to highlight our practice of always starting with a proximal exploratory incision to identify the anatomy before raising the flap, which is what enabled us to adapt to this variation with a satisfactory outcome.

## Keywords

- ▶ radial artery
- ▶ free flap
- ▶ variation
- ▶ microsurgery

## Introduction

Anatomical variations in the radial forearm flap have been reported. We report one such variation and highlight our policy of preferential proximal exploratory incision, which enabled us to adapt to the variant anatomy.

## Case Report

A 56-year-old male patient presented with a right-sided buccal SCC-T2N1M0 lesion, which was planned for wide local excision with marginal mandibulectomy. A free radial forearm flap from the right upper limb was planned. Allen test showed good ulnar collateral flow and radial pulse was also normal. The flap was planned over the volar aspect of the forearm, approximately 12 cm proximal to the wrist crease.

As practiced in our unit, we began with a proximal exploratory incision. However, the radial artery was not found between the brachioradialis and pronator teres (not found overlying the pronator teres tendon) in the proximal forearm. More proximally, we identified the brachial artery under the bicipital aponeuroses, but could not visualize its

bifurcation (▶ Fig. 1). The brachial artery was followed distally travelling with the median nerve between the two heads of the pronator teres. The brachial artery was found to be bifurcating under the cover of the pronator teres 10 cm distal to the cubital fossa. The radial artery then emerged through the pronator teres, and came to lie between the brachioradialis and flexor carpi radialis (▶ Fig. 2).

Consequently, the skin paddle had to be relocated more distally (by ~8 cm) than initially planned, where adequate perforators were found (▶ Fig. 3). The pedicle length was also shorter than expected. The flap was transferred, and it survived completely (▶ Fig. 4).

## Discussion

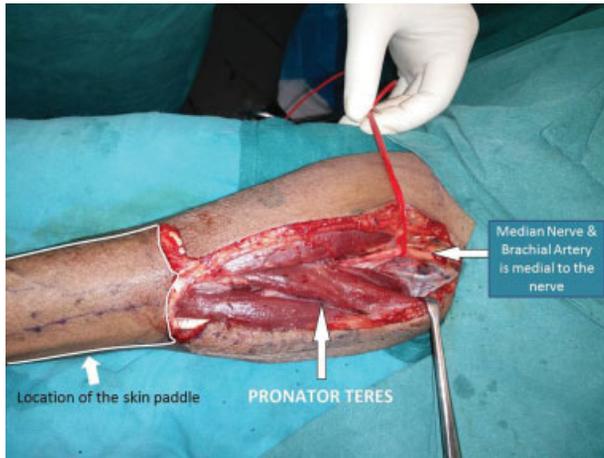
Most textbooks advocate incising the flap margins first and raising the flap in a distal to proximal manner.<sup>1</sup> In our unit, however, our practice has been to take a proximal exploratory incision first, identify and confirm the anatomy of the radial artery, and then commit to the flap margins.

An important reason for this (before this case) was that, there have been confusing recommendations in textbooks, regarding the venous drainage. Some suggesting the vena

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**Fig. 1** Brachial artery found not bifurcating at the usual location.



**Fig. 3** Skin paddle moved distally, flap harvest completed.

comitantes and the other the cephalic vein. Proximally, there is often (63%) a communication between the vena comitantes and the medial cubital vein<sup>2</sup> capturing this confluence solves this dilemma, since, both the systems are captured.

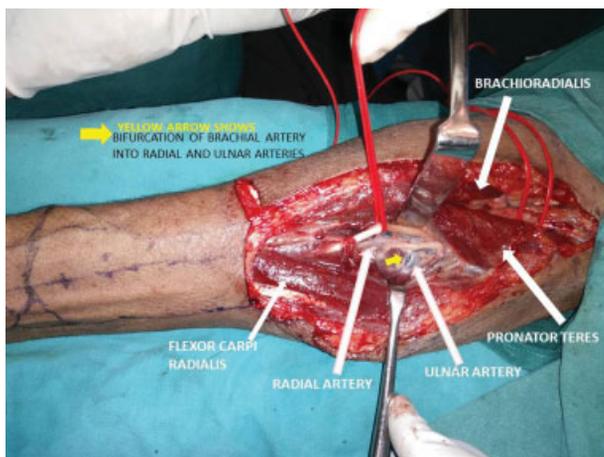
In this particular instance, this policy enabled us to adapt to the variable anatomy by shifting the skin paddle distally than originally planned. If we had taken the flap margin incision first, we would have ended up with a very short pedicle necessitating a vein graft. In a worst case scenario, there might not have been any communication from the distally arising radial artery and the skin paddle, necessitating abandonment.

The brachial artery usually bifurcates 1 cm distal to the antecubital fossa. The proximal part of the radial artery runs superficial to pronator teres under the brachioradialis and then comes to lie between brachioradialis and flexor carpi radialis. Several variations from this anatomy have been described. The radial artery can arise high in the arm in up to 9% of cases.<sup>3</sup> Persistent median artery has been often

described, which may arise proximally or from the radial artery, in which case its origin should be preserved to prevent hand ischemia.<sup>4,5</sup> These are the two most common variations. Other less common ones include duplication of the artery,<sup>6</sup> hypoplasia of radial artery,<sup>7</sup> and superficial dorsal antebrachial artery.<sup>8</sup>

We encountered a low bifurcation of the brachial artery with the radial artery travelling between the two heads of the pronator teres. A similar anomaly has been reported twice by Small and Millar in 1985<sup>9</sup> and by Funk et al in 1995.<sup>10</sup> The significance of this anomaly includes the fact that the skin paddle must be designed in the distal part of the forearm to include septocutaneous vessels, and the final pedicle length will be shorter than normally possible.

Hence, we report this case to highlight on the third known instance of this aberrant anatomy and to emphasize the importance of the proximal exploratory incision, in such cases, when pedicle length needed is critical. So far, this has not received due mention in the literature.



**Fig. 2** Radial artery arising below pronator teres and traveling with median nerve. Also, the distal bifurcation of the brachial artery.



**Fig. 4** Final outcome without any complications.

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