

Aberrant Superficial Branch of the Radial Nerve—Radial Forearm Free Flap Considerations

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Summary: The superficial branch of the radial nerve (SBRN) is encountered and must be preserved during the harvest of a radial forearm free flap (RFFF). An abnormal course of the SBRN was encountered during the harvest of an RFFF. The nerve had an abnormal course with two branches—in the proximal forearm, one branch was anterior and the second branch was posterior to the brachioradialis muscle and in the distal forearm, both of these nerves merged together. A review of the literature was performed, with no such documented aberrant course of the SBRN being described previously. Knowledge of the SBRN anatomy and its variations is important to note during the RFFF harvest. (*Plast Reconstr Surg Glob Open* 2019;7:e2191; doi: 10.1097/GOX.0000000000002191; Published online 5 June 2019.)

The radial forearm free flap (RFFF) is one of the workhorse free flaps in the reconstruction of head and neck cancer due to its pliability, long pedicle length, relatively easy dissection, and consistent anatomy. During the harvest, the lateral antebrachial cutaneous nerve (LACN) and superficial branch of the radial nerve (SBRN) are commonly encountered. The LACN, commonly incorporated when harvesting a sensate flap, runs along the cephalic vein in the proximal forearm and provides sensation to the flap.¹ The SBRN runs deep to the brachioradialis (BR) muscle in the proximal forearm and emerges between the two heads of the BR tendons in the distal forearm. It supplies sensation to the dorsum of the hand and should be preserved during the harvest. An injury to the SBRN results in the loss of sensation over the dorsum of the first web space and proximal portion of the lateral 3.5 digits in addition to painful neuromas and paresthesias.

CASE REPORT

During an RFFF harvest for the reconstruction of an oral cavity defect, we encountered an aberrant course of the SBRN. The SBRN had two branches—in the proximal forearm, one branch was anterior and the second branch

was posterior to the BR muscle and in the distal forearm, both of these nerves merged together before branching off again into digital nerves. This aberrant anterior branch of the SBRN was larger in diameter than the usual caliber of the LACN that is normally encountered. Moreover, the LACN was not present and it was not associated with the cephalic vein. There was a branch coming off the anterior SBRN that was innervating the skin paddle and had to be sacrificed. Another branch of the SBRN posterior to the BR muscle was present and exited between the two BR tendons in the distal forearm. These anterior and posterior branches of SBRN then merged together distally before dividing into digital nerves (Fig. 1). The aberrant course could have easily been misidentified as the LACN and sacrificed during the harvest resulting in sensory deficits.

DISCUSSION

The radial nerve and several branches including the lateral cutaneous nerve of the arm and the posterior cutaneous nerve of the forearm supply all the heads of the triceps brachii muscle. The radial nerve then enters the anterior compartment posterior to the BR muscle supplying BR muscle, extensor carpi radialis longus, and extensor carpi radialis brevis muscle before dividing into superficial and deep branches. The deep branch pierces the supinator muscle and supplies the extensor muscles of the forearm, whereas the superficial branch is the terminal branch of the radial nerve. It provides sensation over the first dorsal web space and proximal portion of the lateral 3.5 digits.

The radial artery and the venae run between the flexor carpi radialis and BR muscles. The typical course of the SBRN in the proximal forearm is posterior to the BR muscle and radial to the vascular pedicle. In the distal forearm,

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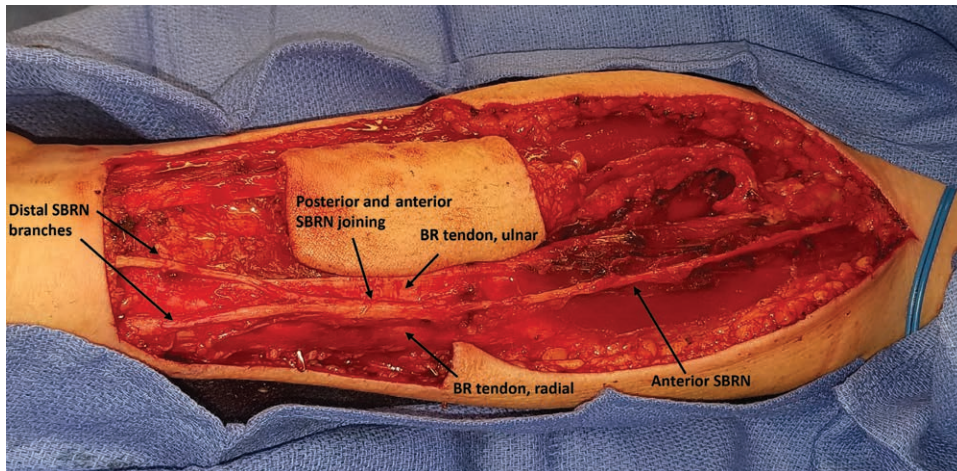


Fig. 1. Aberrant anatomy of the SBRN. Two branches are noted—anterior branch is anterior to the BR muscle in the proximal forearm and the posterior branch runs posterior to the BR muscle emerging between the BR tendons in the distal forearm. The 2 branches join together and then branch off distally again. The LACN is absent in this case.

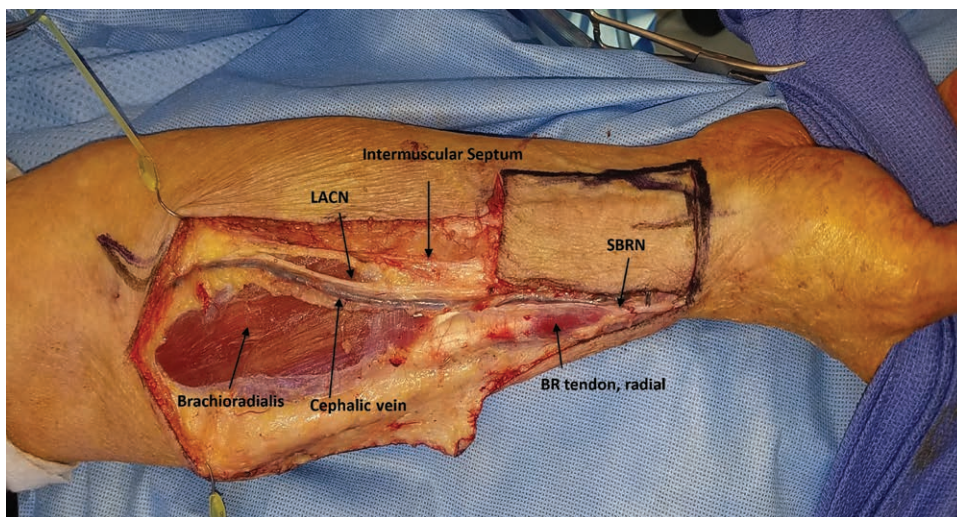


Fig. 2. Normal course of the SBRN. The nerve runs posterior to the BR muscle in the proximal forearm, then emerges between the BR tendons in the distal forearm, and then branches off distally. The LACN can be seen coursing along the cephalic vein.

the SBRN emerges from the posterior aspect of the BR muscle between the 2 BR tendons and then travels anterior to it. It then divides into multiple branches (Fig. 2).²⁻⁴ During the harvest of an RFFF, the SBRN is used as a landmark. Pirela-Cruz and Scher² described 2 distinct types of anatomic patterns of the SBRN—type I was described as 1 main nerve and type II had 2 distinct nerves.

The anatomy of the SBRN has been well studied, and several variations have been reported in terms of the branching pattern.⁴⁻⁷ In our case, the absence of the LACN and its typical course along the cephalic vein was a critical aspect of recognizing aberrant anatomy. Moreover, the caliber of the aberrant SBRN was larger than the typical LACN, which can be helpful in preventing iatrogenic nerve injuries. Lindau and Wax reported an aberrant course of the SBRN in which the nerve was anterior to the BR muscle but never passed

posterior to it.⁸ Shankhdhar et al⁹ also described an anatomic variant of the SBRN, where the nerve was anterior to the BR muscle and ulnar to the BR tendon. Yogesh et al¹⁰ described a case in which the radial nerve supplied all the heads of the triceps brachii muscle and provided cutaneous branches such as lower lateral cutaneous nerve of the arm and posterior cutaneous nerve of forearm in typical fashion. However, the radial nerve ended without continuing further and did not provide its standard innervation. The musculocutaneous nerve supplied the BR, extensor carpi radialis longus, and extensor carpi radialis brevis muscles, and ultimately, it divided terminally into 2 branches, such as superficial and deep. The deep branch of the musculocutaneous nerve corresponded to the usual deep branch of the radial nerve, whereas the superficial branch of the musculocutaneous nerve corresponded to the usual superficial

branch of the radial nerve. In Wartenberg's syndrome, there is compression of the SBRN likely secondary to acute or chronic pressure that most commonly occurs where the nerve exists the BR.¹¹ Another reported anatomic variation occurs when the nerve penetrates through the BR tendons potentially resulting in nerve compression and paresthesia along the radial aspect of the forearm with pronation.¹²

The RFFF has the potential to provide sensory reinnervation with the anastomosis of the LACN and lingual nerve. However, functional outcomes related to speech and swallowing after nerve reconstruction remain unclear. Additionally, some free flaps have spontaneously regained some sensation even without nerve reconstruction.^{13,14}

CONCLUSIONS

The RFFF has become one of the most commonly used free flaps for the reconstruction of head and neck cancers due to its several advantages. The aberrant courses of important anatomic structures are important to understand to avoid injury and subsequent sequelae.

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