

# Ultrasound Appearance of the Cutaneous Nerves of the Upper Limb: A Novel Description in Pain Management

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In recent years ultrasound has become the standard technique to locate peripheral nerves. These can be useful to block, so we can obtain pain relief during or after operative procedures. It can also be used in chronic pain management to treat long standing painful situations or as part of the armamentarium to neurolyze small nerves or neuromas. Most of the nerves described up to now are commonly used by regional anesthetist in daily practice but the cutaneous sensory nerves have been left aside for two reasons: They are very small and superficial and classically they were difficult to locate because the technique used was nerve stimulation. Based on our experience with ultrasound of approximately 10 years we will describe in this article how to locate the sensory nerves of the upper limb [1]. These nerves play a vital role during common operations like Du Puy Trent, carpal tunnel release or many more reconstructive hand surgery techniques. A brief description of the brachial plexus is imperative. It's originated by the anterior ramus of the spinal nerves from C5 to T1 and the main nerves derived from those spinal nerves are the musculocutaneous, median, radial,

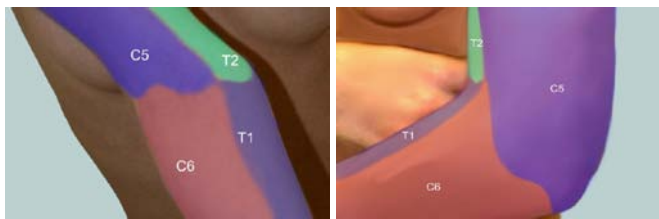


Figure 1: Dermatomes at elbow level showing their distribution.

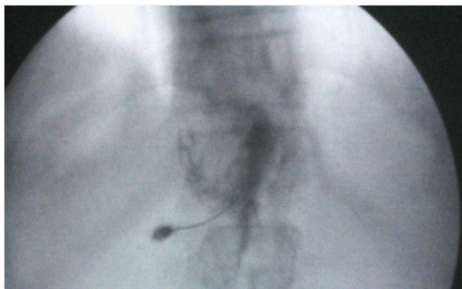


Figure 2: Position to locate the laterocutaneous nerve of the forearm.



Figure 3: Lateral cutaneous nerve of the forearm (lcnf) next to the cephalic vein (cv).



Figure 4: With all the cutaneous nerve is very useful to apply zoom because the nerves are very small.



Figure 5: Medial cutaneous nerve of the arm (bcn) in the medial aspect of the arm and very superficial inside a fat pocket. Notice its relationships with other nerves: medial cutaneous nerve of the forearm (mcf), ulnar nerve (un), median nerve (mn), axillary artery (aa) together with biceps and triceps muscles

axillary, circumflex, ulnar, cutaneous nerve of the arm and cutaneous nerve of the forearm. The dermatomes are the part of the skin supplied by a specific spinal nerve (in this case C5-T1). From the sensitive point of view, any nerve injury will affect those areas and will cause different alterations from paresthesias to dysesthesia (Figure 1). In this paper and for the first time published we will describe the most common location of the sensitive nerves in the upper limb [2]. The main upper limb sensitive nerves are five: lateral cutaneous nerve of the forearm, median cutaneous nerve of the arm, median cutaneous nerve of the forearm, posterior cutaneous nerve of the arm and posterior cutaneous nerve of the forearm.

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## Lateral Cutaneous Nerve of the Forearm (C5-C7)

It is the terminal branch of the musculocutaneous nerve. At the distal third of the forearm is located over the brachioradialis muscle. Under ultrasound guidance it can be track down from the musculocutaneous nerve when it becomes superficial after the biceps muscle fades away. An important sono landmark is the cephalic vein that runs in close proximity to this nerve in most of his path. This cutaneous nerve, like the others, runs in a fascial [3], subcutaneous compartment, between the skin and the muscle (Figure 2-4).

## Medial Cutaneous Nerve of the Arm (C8,T1,T2)

It is the smallest nerve of the brachial plexus. It follows a path at subcutaneous level just underneath the fascia brachialis medial to the axillary artery and vein. It will communicate at a later stage with the medial cutaneous nerve of the forearm (Figure 5,6).

## Medial Cutaneous Nerve of the Forearm (C8,T1)

It is found in the medial aspect of the forearm at subcutaneous level next to the basilic vein becoming more superficial as we go distal in



Figure 9: Same relationships but with the zoom function applied.



Figure 10: Probe position to locate the posterior cutaneous nerve of the arm and forearm.



Figure 6: Same relationship but using the zoom function. Axillary vein (av) not collapsed.



Figure 11: Sonogram showing the posterior cutaneous nerve of the arm (pcna) next to the posterior cutaneous nerve of the arm (pcna), in between triceps and biceps muscles.



Figure 7: Probe position to locate the cutaneous nerves in the medial aspect of the forearm.



Figure 12: Same relationship using the zoom function.



Figure 8: Relationship of the medial cutaneous nerve of the forearm (mcnf) with the basilic vein (bv). Next to it we can also locate the median nerve (mn) and the ulnar nerve (cn).

the forearm. It will give off anteriorly an intermediate branch running above pronator teres muscle (Figure 7-9).

## Posterior Cutaneous Nerve of the Arm (C5-C8)

It is one the posterior branches of the radial nerve. It is located in a fat pocket above the lateral head of the triceps muscle in the posterior side of the arm (Figure 10-12).



Figure 13: Another sonogram showing the posterior cutaneous nerve of the forearm (pcnf).



Figure 14: Same pic with the zoom function applied.

## Posterior Cutaneous Nerve of the Forearm (C5-C8)

It is another posterior branch of the radial nerve (Figure 13,14). It is located in a fat pocket above the long head of the triceps muscle in the posterior side of the arm, distal third. Along the forearm will be found above the extensor digitorum muscle.

## Summary

The sensory nerves are very small and they are the ones involved when the surgeon or we perform a subcutaneous infiltration. With good anatomy knowledge we will be able to track them up into their main trunks so smaller and more precise amounts of local anesthetic can be delivered. In situations of lasting dysesthesias we will be able to perform successful chronic pain techniques very easily.

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