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Why The Greater Occipital Nerve Is Not Considered For Nerve Grafting?

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Review Article

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ABSTRACT

The commonly used sensory nerves for nerve grafting are the sural, saphenous, great auricular, medial antebrachial, superficial radial (to name a few) which are easily located and have their donor arteries to nourish the epineurium. The greater occipital nerve the thickest cutaneous nerve is never considered as a graft material inspite of it satisfying all the necessary criteria as above. The aim of this article is to review the anatomy of the GON and discuss the eligibility of this nerve as an additional source for nerve grafting, mainly for facial nerve injuries.

INTRODUCTION

When a nerve has been injured, the goal of surgical repair is generally to reapproximate the ends of the injured nerve. Sometimes during repair after a nerve injury, a portion of the injured nerve, called a neuroma, needs to be excised, leaving a gap. When the nerve ends cannot be brought together, then a nerve graft may be necessary.

Nerve grafts are generally portions of a sensory nerve that are harvested from another part of the body to be used as graft material. Once the graft is in place, the regenerating nerve fibers grow from the proximal nerve stump, through the graft, through the distal nerve segment into the target muscles. Thus, patients may recover function in muscles following graft repair of nerve injuries.

Sural nerve, superficial radial sensory, and medial antebrachial cutaneous nerve are common donor nerves for graft material [1].

Some nerve injuries require repair in order to regain sensory or motor function. The primary indications for nerve repair or grafting are 1) an injury or continuity defect in a nerve, as a result of trauma, pathology, surgery, or disease, that cannot regain normal function without surgical intervention and 2) loss of normal neurologic function, resulting in anesthesia, paresthesia, dysesthesia, or paralysis, that cannot be corrected by nonsurgical treatment.

In more severe injuries, there may be significant loss of nerve substance (continuity defect), or a section of nerve may need to be removed to expose normal nerve tissue in preparation for nerve repair. Thus, nerve repair and nerve grafting procedures may be required to provide continuity between the proximal and distal portions of the nerve. When continuity defects are present in the injured nerve or created in preparation of the nerve for repair, a nerve graft procedure may be indicated. Both the sural and great auricular nerves are relatively easy to harvest. Other potential donor nerves include the saphenous dorsal cutaneous branch of the ulnar, medial antebrachial cutaneous, lateral antebrachial cutaneous, superficial branch of the radial, intercostal, and other branches of the cervical plexus. If the nerve graft is significantly smaller in diameter than the proximal host nerve stump, fascicles are lost and a neuroma may form. If the graft is too large at the distal host nerve stump, then some of the regenerating nerve fascicles in the graft will be lost. If the distal portion of the graft is smaller than the distal portion of the host nerve, then a number of the fascicles in the distal portion of the host nerve will not regenerate [2].

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Nerve reconstruction is considered when nerves are so severely damaged they cannot recover on their own. These complex operations can take up to 12 hours. Surgeons reconstruct nerves either by bridging a nerve defect with a nerve graft or by performing a nerve transfer from a nearby healthy nerve to share its function [3].

A nerve graft involves taking a nerve from another part of the body. The nerve is removed from a location where its function is less important, usually the leg, and moved to the damaged area. It is used to bridge the defective gap between two ends of a nerve to restore function." Studies have shown that if nerve reconstruction surgery is done within six months after a nerve is damaged, patients do much better [4].

Schwann cell signals may influence axonal calibre, and they are of crucial importance in the repair of damaged peripheral nerves. The acute Schwann cell response to axonal injury and degeneration involves mitotic division and the elaboration of signals which promote the regrowth of axons. It is also observed that vascular grafts rather than the free grafts yielded better results in cross-face nerve graft [5]. A vascularized nerve graft helps to maintain the Schwann's cell population and prevents endoneurial scarring [6].

DISCUSSION

The greater occipital nerve (GON) represents the posterior primary ramus of the second cervical spinal nerve. It pierces trapezius close to its attachment to the superior nuchal line and ascends to supply the skin of the back of the scalp up to the vertex of the skull [7]. It is the thickest cutaneous nerve in the body. In clinical practice, GON appears for painful reasons as it is commonly involved in entrapment leading to occipital neuralgia.

The greater occipital nerve is located one thumb's breadth (2 cm) lateral to the external occipital protuberance and approximately at the base. of the thumb nail (2 cm inferior to the external occipital protuberance). The mean diameter of GON was 3.5 mm (range 1.8– –5.1 mm). The nerve divided into medial and lateral branches 4 cm superior to the intermastoid line (range 0–2.5 cm) [8]. It is intimately related to the occipital artery and is supplied by it. When the occipital artery could not be detected(by palpation or by Doppler), GON is about 2.5 cm from the external occipital protuberance in women and about 4.0 cm (and not 2.5–3.0 cm) in men [9].

The greater occipital nerve and occipital artery have an anatomical intersection 54 percent of the time. There are two morphologic types of relationships between the structures: a single intersection point and a helical intertwining[10].(FIG)

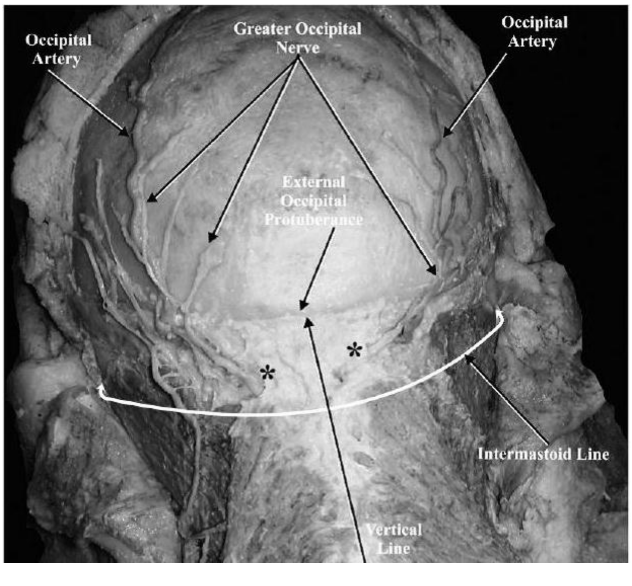

Figure: GON and occipital artery in close relationship on the scalp

Occipital artery is a reliable guide to GON.

Epineurium is a condensation of loose (areolar) connective tissue, and is derived from mesoderm. *As a general rule, the more fasciculi present in a peripheral nerve, the thicker the epineurium.* Epineurium contains fibroblasts, collagen (types I and III), and variable amounts of fat, and it cushions the nerve it surrounds. Loss of this protective layer may be associated with pressure palsies seen in wasted, bedridden patients. The epineurium also contains lymphatics (which probably pass to regional lymph nodes) and blood vessels, the vasa nervorum, which pass across the perineurium to communicate with a network of fine vessels within the endoneurium [7]. With large-diameter recipient nerves, it is preferable to use multiple smaller caliber grafts to bridge fascicular groups in the proximal and distal stumps to increase the surface area that is in contact with the recipient bed. Depending on the size of the injured nerve, multiple grafts may be required to repair the nerve. Longer the nerve graft, less likely that it will be successful [11].

CONCLUSION

GON may not provide the similar lengths of graft tissue like sural and saphenous nerves (which are the favourite graft material for surgeons) but it is thick, easily located and has a donor artery to provide a viable vascular graft. The literature also seems to be lacking about the histological structure and vascular supply of GON which may certainly make this nerve as one of the graft material for facial reanimate.

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