Use of sleeve neurorrhaphy at the brainstem for facial nerve reconstruction

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INTRODUCTION

Neurorrhaphy at the brainstem for reconstruction of the facial nerve presents a technical challenge. Traditional suture techniques prove increasingly difficult with the tendency towards minimally invasive approaches and when resection of the nerve extends proximally close to the brainstem. Additionally, the nerve may be damaged by the surgical exposure. A method for secure approximation of the proximal end of the remaining nerve and the graft not requiring the placement of suture would be beneficial in these difficult cases.

Methods: Case report.

Results: A 30 year old man was found to have a facial nerve schwannoma upon workup for asymmetric sensorineural hearing loss and elected for surgical resection. Following removal of the tumor via translabyrinthine approach the nerve was deficient several millimeters from the brainstem to the second genu of the mastoid. Devitalized cadaveric allograft (Avance Nerve Graft; AloGen, Inc., Alachua, FL, USA) was placed and sutured to the distal end of the nerve. Given the limited remaining proximal portion at the brainstem and the anatomical constraints it was elected to perform a sleeve neurorrhaphy to secure the graft to the remaining nerve. The graft and remaining nerve were approximated and wrapped with commercially available porcine submucosa extracellular matrix (AxoGuard Nerve Protector; AloGen, Inc., Alachua, FL, USA). Gelfilm was then placed between the repair and the brainstem, the dura was closed around the graft and the mastoid defect filled with fat.

Discussion: Suture neurorrhaphy remains a technical challenge especially at the brainstem and the cerebellopontine angle. The depth of repair, anatomical constraints of the cranial cavity, and generally limited length of proximal remaining nerve add to the difficulty of placing sutures using traditional techniques. The use of a wrap to secure the ends of the nerve and graft to each other also acts to protect the microenvironment which may promote growth of the axons. This case report describes the use of such a wrap to approximate and secure the residual stump of facial nerve at the brainstem with devitalized cadaveric nerve graft.

Conclusion: The use of sleeve neurorrhaphy provides an alternative to traditional sutures for reconstruction of the facial nerve at the brainstem. This report serves as a technical description and long term follow up of a larger cohort of patients will be required to adequately compare this technique with the current suture technique.

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CONCLUSION

Suture neurorrhaphy remains a technical challenge especially at the brainstem and the cerebellopontine angle. As described by Brackman in 1992. This anastomosis is technically difficult since the intracranial facial nerve has no epineurium, the proximal nerve stump is generally very short and traumatic on the side of the anastomosis. The technique must be performed at the medial limit of the surgical incision.

Because of these challenges, several methods for securing the nerve without the need for placing a suture have been investigated. In the same manuscript, Brackman also described the use of a microfibrillar collagen wrap around the anastomosis in place of a suture, supported by fat. They reported no significant difference in facial nerve outcomes between the microfibrillar collagen group and the suture group.

Others have advocated for the use of fibrin glue to secure the ends of the graft. In this technique a temporalis fascia graft is placed on the brainstem to receive the graft and is wrapped around the anastomosis following placement of the fibrin glue. The ends of the wrap are then secured with fibrin glue. Additionally, the use of laser tissue welding has been described as a minimal model in the peripheral facial nerve, however this technique has not been studied in humans, or in the intracranial space.

This report expands on the technique utilizing a porcine submucosa extracellular matrix wrap in place of the microfibrillar collagen to secure the ends of the nerve and graft to each other with the added benefits of protecting the microenvironment which may promote growth of the axons. The stiffness and shape memory of the wrap held the cut ends of the remaining nerve and graft securely without the addition of glue or suture. This case report describes the use of such a wrap to approximate and secure the residual stump of facial nerve at the brainstem with devitalized cadaveric nerve graft.

Theoretical advantages of a sutureless anastomosis technique include reduced foreign body reaction at the site of anastomosis that might affect neural regeneration, and avoidance of the direct trauma induced by the suture and needle passage through the nerve. The main potential disadvantage is the lack of a physical link between the ends of the nerves with the potential for them to be pulled apart or translated. This may be avoided, however, by ensuring adequate length of the graft to ensure there is no tension, and by performing the distal anastomosis first to minimize manipulation of the graft after the anastomosis is in place.

REFERENCES