Journal of Plastic, Reconstructive & Aesthetic Surgery (2017) 70, 659—665

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

Objective sensory and functional outcomes at the donor site following endoscopic-assisted sural nerve harvest

Daniel P. Butler*, **Kavan S. Johal**, **Catherine E. Wicks**, **Adriaan O. Grobbelaar**

Department of Plastic and Reconstructive Surgery, The Royal Free Hospital, Pond Street, London NW3 2QG, UK

Received 21 November 2016; accepted 17 February 2017

KEYWORDS
Sural nerve;
Nerve graft;
Donor site;
Outcome

Summary *Background:* The sural nerve is a common choice for a nerve graft. Understanding the potential morbidity associated with its harvest is important. In this study, we describe the objective sensory and functional outcomes associated with endoscopic sural nerve harvest from a combined paediatric and adult population.
Methods: Data were collected prospectively from patients attending for follow-up between August 2015 and January 2016, who had previously undergone an endoscopic sural nerve graft harvest. Sensory loss was evaluated using a 5.07 Semmes-Weinstein monofilament. The lower extremity functional scale was used to evaluate the patients' lower limb function. Statistical comparison was made using the Student's t-test.
Results: The outcomes from 46 sural nerve grafts were evaluated. The mean age of the patients was 18.1 years (range 4—45 years old). The mean time since surgery was 4.3 years. Those aged $\leq$18 years had a significantly smaller area of sensory loss ($p = 0.003$), which was not related to a difference in foot size. Those who had undergone surgery >6 months previously had a significantly smaller area of sensory loss than those who had undergone surgery <6 months ago ($p = 0.0002$). The mean lower extremity functional scale score was 78.7/80.
Conclusion: We demonstrated a significantly reduced post-harvest sensory deficit among a paediatric population compared to that seen in adults. Furthermore, sensory loss reduces with time. Despite the sensory loss resulting from sural nerve graft harvest, there is minimal loss of function. As such, the sural nerve continues to be an excellent donor for a nerve graft procedure.

* Corresponding author. Department of Plastic and Reconstructive Surgery, The Royal Free Hospital, Pond Street, London NW3 2QG, UK.
E-mail address: danielbutler@nhs.net (D.P. Butler).

http://dx.doi.org/10.1016/j.bjps.2017.02.022

Introduction

Nerve grafts serve a number of reconstructive purposes ranging from post-traumatic defects to serve as adjuncts in facial reanimation surgery. A common donor nerve is the sural nerve in the lower leg as it provides a long graft length and ease of harvest.[1] A further suggested benefit is the minimal donor site morbidity experienced by the patient.[2–11]

The sural nerve is most commonly formed from the medial sural cutaneous nerve arising from the tibial nerve and a peroneal communicating branch that can arise from the lateral sural cutaneous nerve or the common peroneal nerve directly.[12] However, in 27% of cadaveric dissections, the anatomy differed, and five separate variants have been described.[12] The function of the sural nerve is purely sensory, supplying a territory over the posterolateral lower limb and lateral aspect of the foot.

Given the frequency with which the sural nerve is utilised as a donor nerve, a detailed understanding of the morbidity associated with its harvest is important. The existing literature has demonstrated that sensory loss reduces with time and that morbidity associated with pain, cold intolerance and hypersensitivity are minimal.[3–9,13] Many, however, have made this evaluation using non-validated patient questionnaires.[3,5,7,8] Furthermore, a comparison between outcomes in a paediatric and an adult population has not been made. Finally, an assessment of the outcomes associated with endoscopic sural nerve harvest has not been reported.

In this study, we describe the objective sensory, morbidity and functional outcomes associated with endoscopic-assisted sural nerve harvest from a combined paediatric and adult population.

Materials and methods

Data were collected prospectively from consecutive patients attending for follow-up between August 2015 and January 2016 who had undergone a sural nerve graft as part of a two-stage facial reanimation procedure. For inclusion in the study, patients must have undergone sural nerve harvest using a minimally invasive technique introduced in the department in 2006. Patients were excluded if nerve graft harvest had been <6 months previously, if there had been any other previous surgery to the leg or if they had a systemic disease that could affect the neurological function.

Data in five key domains were collected during routine follow-up outpatient clinical appointments, comprising both clinician- and patient-reported outcomes.

Patient and surgical features

The first section gathered information on patient demographics, assessment date, surgical site (right or left) and date of nerve harvest.

Sensory loss

The loss of sensation was established using a Semmes-Weinstein monofilament examination.[14] A 5.07/10 g Semmes-Weinstein monofilament was chosen, as adult studies have demonstrated that inability to sense touch at this calibre suggests a loss of protective sensation in the foot.[15,16] However, no existing studies demonstrate the appropriate Semmes-Weinstein monofilament to evaluate protective sensation in a paediatric population. Lapid et al.[9] demonstrated in a control paediatric population that 100% of the volunteers could sense a 3.61 Semmes-Weinstein monofilament or less. Therefore, it was believed that using a 5.07 Semmes-Weinstein in the paediatric patients included in this study was appropriate, given this calibre produces more load on the skin and, in the instance of normal foot sensation, should be felt by the child.

After removing the patient's shoes and socks and ensuring the lower leg was exposed, the patient was asked to respond positively ('yes') when they felt the monofilament press against their skin. A demonstration was performed on the patient's arm prior to commencing the sensory examination of the leg. All patients were instructed to keep their eyes closed throughout the examination. The tip of the monofilament was pressed against the skin until the filament buckled and was then held there for 1 s. An area of sensory loss was mapped out along the lateral aspect of the foot and lower leg. The length and height of this identified area were used to calculate the total area of sensory loss. In children, intermittent testing of the medial aspect of the foot was confirmed so that they were continuing to produce reliable results during the sensory examination.

Pain

Patients were asked to use a visual analogue scale of 0 (no pain) to 10 (severe pain) to ascertain pain related to the nerve donor site at the time of review.

Scar

The patient's Fitzpatrick skin type and length of both proximal and distal scars were recorded. The quality of the scarring was assessed using the Patient and Observer Scar Assessment scale.[17]

Function

Lower limb function was assessed using the lower extremity functional scale.[18] This score contains 20 patient-reported questions that assess the patient's ability to perform everyday activities involving the lower limbs. A maximum score of 80 is possible, with a lower score demonstrating a reduced level of function. This score was chosen considering the excellent test–retest reliability and the responsiveness previously demonstrated.[19]

Surgical technique

All nerve graft harvests were performed by the senior surgeon (A.O.G.). A minimally invasive sural nerve graft harvest technique was used,[20] and all harvested nerves were used as a cross-facial nerve graft during a first-stage facial