

The experimental functional assessment of peripheral nerve regeneration after end-to-side neurorrhaphy

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Abstract

Background. End-to-side neurorrhaphy is one of the alternative methods for nerve reconstruction when direct terminoterminal nerve repair is impossible. The development of microsurgical techniques and the greater understanding of the neurobiology of the nerve injury and regeneration has resulted in significant improvement in the result of the nerve repair. The direct repair following end-to-end neurorrhaphy is not always possible (large peripheral defects or after tumour extirpation). Although the treatment of these lesions should be the autologous nerve grafting, this technique has some disadvantages such as the morbidity at the donor site and the requirement that the axons should cross two suture sites. The nerve grafting is also impossible when the proximal stump of the nerve is inaccessible after injury or tumour extirpation. If primary repair is impossible, termino-lateral neurorrhaphy may be a reasonable alternative.

Aims. This article investigates the peripheral nerve regeneration after transection and termino-lateral neurorrhaphy with a noninvasive method to evaluate quantitatively the integrated motor recovery in experimental studies.

Methods. The aim of this study is a clinical investigation of the regeneration of the peripheral nerve in rats after injury and termino-lateral neurorrhaphy by using the rats' footprints. The walking track analysis is one of the most used methods to evaluate the functional recovery of the peripheral nerve in the rat. This quantitative method of analyzing hind limb performance by examining footprints, known as the sciatic functional index (SFI), has been widely used to quantify functional recovery from sciatic nerve injury to peroneal and tibial injury.

Results. Recovery after termino-lateral neurorrhaphy is possible and this can be explained through fibers regeneration from the lateral side of the "donor" nerve to the transected stump of the "receptor" nerve. Complete recovery is possible in the peroneal nerve, if adequate reconstruction is made and the contracture in flexion and other complications are seldom observed. Termino-lateral neurorrhaphy is a viable alternative to termino-terminal neurorrhaphy (in peroneal nerve model, SFI was -15,5 for termino-lateral suture and -10,3 for termino-terminal suture; in sciatic nerve model, SFI was -71 for termino-lateral suture and -63,2 for termino-terminal suture).

Conclusions. In peripheral nerve lesions with proximal nerve stump unviable or in major nerve defects, which cannot be repaired with termino-terminal neurorrhaphy or nerve graft, termino-lateral neurorrhaphy is a viable alternative.

Key words: peripheral nerve regeneration, end-to-side neurorrhaphy, walking track analysis, functional nerve recovery, injury in sport.