Nerve Re-innervations by An End-to-side Neurorrhaphy of Myocutaneous Transplantation in Rats

#1 Chiung-Hsiang CHENG, #1 Yun-Feng KU, 2 Chun-Han HOU, 1 Lih-Seng YEH, *1 Fang-Chia CHANG

1 Department of Veterinary Medicine, School of Veterinary Medicine, National Taiwan University, Taipei 106, Taiwan
2 Department of Orthopaedic Surgery, National Taiwan University Hospital, Taipei 100, Taiwan

(Received: March, 23, 2011. Accepted: May, 04, 2011)

ABSTRACT End-to-side (terminolateral) neurorrhaphy was first documented in the 19th century, but it has not been routinely practiced. The purpose of this study is to evaluate nerve reinnervation after isogeneic or allogeneic end-to-side neurorrhaphy in a novel rat myocutaneous model. The obturator nerve with a gracilis muscle island flap from the donor was sutured end-to-side to the obturator nerve of the recipient through an epineurial window. The obturator nerves of the recipients distal to the neurorrhaphy site were either intact or severed. The evaluation of nerve reinnervation was dependent on the stimuli-induced muscle contraction, the histological and morphological observations, and the counting of nerve axons in a cross section. Results revealed that nerve reinnervation crossing the end-to-side neurorrhaphy sites was significant in all experimental groups. The axon counts of the receiving nerves distal to the neurorrhaphy sites were not statistically different between groups with transection and without transection of the distal nerve, and neither iso-transplantation nor allo-transplantation exhibited difference. Functional recovery could be observed after both iso- and allo-transplantations. In addition, immunosuppression did not affect the end-to-side nerve reinnervation in the allograft group. This result indicates that nerve reinnervation and functional recovery could be restored by the end-to-side neurorrhaphy of receiving either iso- or allo-transplantation. [Cheng CH, Ku YF, Hou CH, Yeh LS, * Chang FC. Nerve Re-innervations by An End-to-side Neurorrhaphy of Myocutaneous Transplantation in Rats. Taiwan Vet J 37 (3): 143-151, 2011. * Corresponding author TEL: 886-2-33663883, FAX: 886-2-23661475, E-mail: fchang@ntu.edu.tw]

Key words: allo-transplantation, end-to-side neurorrhaphy, iso-transplantation

INTRODUCTION

End-to-side (terminolateral) neurorrhaphy was first documented in the 19th century [16]. However, the technique has not been a clinical routine for almost a century. In early 1990s, Viterbo et al. demonstrated successful nerve regeneration and muscle reinnervation in a rat end-to-side neurorrhaphy model [21,22]. Immunocytochemical staining and retrograde nerve tracing confirmed the presence of regenerated axons in the attached nerve [19,24,30]. Previous studies pointed out that the regenerated nerve fibers may be due to the result of collateral sprouting [6,7,10,24,30,32] and mediated by growth factors [2,11,20]. Most