Supercharged end-to-side anterior interosseous nerve transfer to the motor branch of ulnar nerve in high ulnar nerve injuries

Thesis

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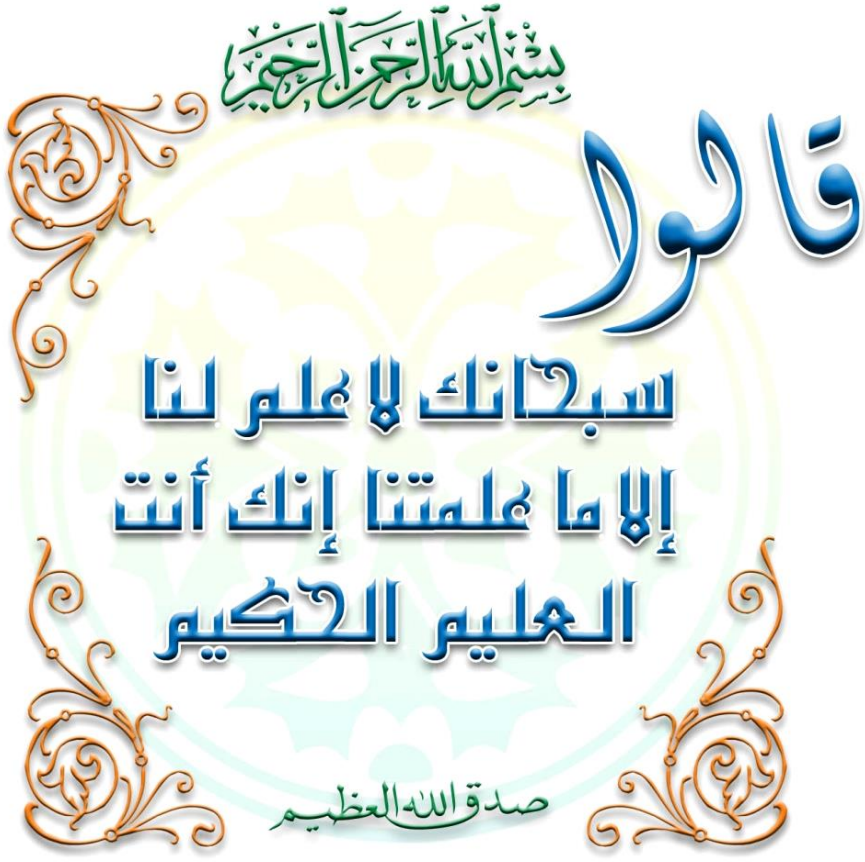

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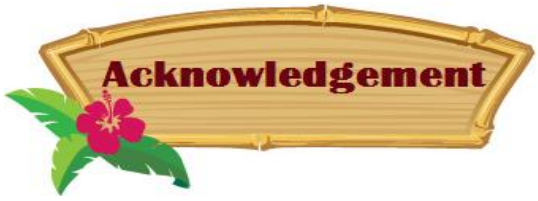

I would like to begin by thanking ***ALLAH*** for his guidance and protection, may this blessing always guide us.

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Contents

List of Abbreviations

AIN	Anterior interosseous nerve
DASH	Disability of arm, shoulder and hand
DBUN	Deep branch of ulnar nerve
EMG	Electromyography
ETE	End to end
ETS	End to side
FCU	Flexor carpi ulnaris
FDP	Flexor digitorum profundus
IUR	Isolated ulnar nerve repair
M	Medical research council grade
NCV	Nerve conduction velocity
P value	Probability value
PQ	Pronator quadratus
ROM	Range of motion
SD	Standard deviation
SETS	Supercharged end to side
SPSS	Statistical program for social science

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Introduction

Introduction

Ulnar nerve injury results in denervation of the intrinsic musculature of the hand which results in significant functional deficit, including weakness in grip power and key pinch. Despite the advances in microsurgical repair, the prognosis of a high level ulnar nerve injury is usually considered poor in terms of potential for motor recovery of the distal muscles of the hand. [1]

Most of the series reported only 20% of M4 muscle power when the repair is performed in a position around the level of the elbow, irrespective of the use of grafts. [2-3] Due to these limited results obtained with the nerve repair, it has been recommended that distal tendon transfers should be offered as the first-choice surgical intervention for such cases, discouraging the nerve surgery. [4-5] However, tendon transfers in this situation are considered secondary salvage procedures and have been found to give only limited results. [6,7]

With such a poor recovery potential, consideration can be given to a nerve transfer from the terminal branch of the anterior interosseous nerve to the deep motor branch of the ulnar nerve. This provides an expendable donor within close

proximity to the target muscles that can be directly coapted to the motor branch without the need for an interposition graft. [8]

Nerve transfers are based on the theory that it converts the proximal nerve injury into a distal nerve injury by transferring an unimportant nerve to the more critical or important nerve. [9]

This procedure was first performed in 1997 by Wang and Zhu, who demonstrated transfer of the anterior interosseous nerve to the ulnar motor branch in cadavers and clinically in an end to end fashion. [10]

This procedure allows early reinnervation to motor end-plate which is useful to preserve the function of Schwann cells and prevent muscle atrophy, allowing better functional recovery after ulnar nerve injury. [8]

The results of end to end transfer provide some improvement to prevent clawing, improve pinch strength, and obviate the need for tendon transfers. However, in this conventional nerve transfer, the target organs are totally innervated by the transferred nerve and not by the ulnar nerve so that the original nerve reinnervation is abandoned totally. These factors lead to incomplete functional recovery

where the best result gain was not more than grade 3 recovery of muscle strength by medical research council scale. (11)

Recent studies have demonstrated that nerve transfer can be done in end to side fashion where the donor nerve could sprout through the epineurial window of the damaged recipient nerve, establish axon end plate connections at early time and doubly innervate target organs by both a donor and original nerve. (12)

Utilizing this idea, a supercharged end-to-side (SETS) nerve transfer technique can use the anterior interosseous nerve to supplement, or "supercharge," the motor fascicles of the ulnar nerve, which involves diverting the normal-functioning median nerve motor fibers to the motor group of the ulnar nerve in the distal forearm augmenting the injured recipient nerve with additional motor axons at an early stage, while leaving the proximal ulnar nerve free for potential regeneration. This technique might be the potential effective treatment choice for the functional recovery of high ulnar nerve injury. (13)

Aim of the Work