Background

• Complete acute ulnar nerve lacerations occur commonly
• Delayed repairs often necessitate nerve grafting, and carry worse outcomes than acute end to end repairs
• Teachings emphasize the importance of anterior subcutaneous transposition in order to gain length for primary nerve repair
• Little consensus on expected length gained from transposition with reported length gains ranging from 1cm to 13cm

Objective

• To investigate the length gained from subcutaneous and submuscular transposition of the ulnar nerve at the elbow

Methods

• 11 cadaveric complete upper extremity specimens were utilized
• In situ decompression and mobilization of the ulnar nerve at the elbow was performed
• A laceration 2cm distal to the medial epicondyle was created
• Nerves were marked 5mm proximal and distal to the laceration site to simulate clinical nerve end preparation during repair
• Nerve ends were attached to spring gauges set at 100g of tension (strain ≤ 10%) with 5.0 nylon suture (Figure 1)
• Measurements of nerve overlap were obtained in varying degrees of wrist and elbow flexion using an electronic caliper
• Measurements were performed after in situ decompression/ mobilization and repeated after both subcutaneous and submuscular transposition

Results

• Ulnar nerve transposition was found to significantly increase nerve overlap past a threshold of 30 degrees of elbow flexion (Figure 2)
• No difference was seen between subcutaneous and submuscular transpositions at all wrist and elbow positions
• Nerve length gained from wrist flexion was significant in all groups independent of elbow flexion and transposition
• In situ decompression/mobilization alone with application of 100g tension provided an average of 3.5 cm of maximal length gain in independent of elbow flexion and transposition

Conclusions

• Transposition along with clinically reasonable elbow and wrist flexion afforded 5.2 cm of length gained, 2cm more than in situ decompression and mobilization alone
• Length gained with transposition was only significant at elbow flexion greater than 30 degrees
• No statistically significant difference between transposition techniques was seen

References


Figure 1: Photograph of the Experimentation Methodology. Note spring gauge attachment to either nerve end and marking sutures placed 5mm proximal to the laceration site. Glenohumeral joints and scapulae were secured with Steinmann pins, overlap was measured with an electronic caliper, and elbow flexion was measured with a goniometer (top right). Wrist flexion positions were held with prefabricated thermoplastic splints with built in flexion of 0, 30, and 60 degrees.

Figure 2: Average Nerve Overlap within our study's three subgroups (In Situ Decompression, Post Subcutaneous Transposition, and Post Submuscular Transposition) based on elbow flexion angle and with fixed wrist flexion angle of 30 degrees. Nearly equivalent trends were seen with wrist flexion angles of 0 and 60 degrees, although wrist flexion was associated with increased nerve overlap.