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Patient Reported Outcome Measures for Toe-to-Hand Transfer: a Prospective Longitudinal Study

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Microvascular toe-to-hand transfers are being performed with increasing frequency worldwide. Techniques have evolved to permit the treatment of multiple digit amputations, dystrophic nails and pulps, and traumatized joints – almost any ablative deformity of a digit can be reconstructed with some form of toe transfer. Outcome evaluation after toe-to-hand transfer is often based on viability and objective measurements, including range of motion, strength, and 2-point discrimination. This definition, however, is limited in that it does not include an important criterion of success – patient satisfaction.

Tsai et al used three, validated patient reported outcome measures (PROM) to demonstrate the value of toe-to-hand transfer in 23 patients¹. During the 4 year study period, all patients undergoing toe-to-hand transfers at Chang Gung Memorial Hospital completed the Michigan Hand Outcomes Questionnaire (MHQ), Short Form-36 (SF-36), and the Lower Limb Functional Questionnaire (LFQ) on pre-operative evaluation, then again at least one year post-operatively. The data show improvement in patient-perceived hand function, aesthetics, and physical and emotional wellbeing after toe transfer, without significant donor site morbidity. The study design is prospective and longitudinal, promoting direct comparison of functional and psychological improvement for each patient, and strengthening the salutary effect of this procedure.

Amputations have a profound impact on quality of life (QOL), social functioning, and a patient's ability to return to work. Biomechanical changes in the hand after toe transfer have been well documented^{2–4}. Satisfaction after toe transfer is often reported as high, but few studies use standardized measures to systematically evaluate outcomes. This study is well executed; it uses validated PROM to provide insight into health-related QOL after toe transfer. Although no reconstruction can replace a missing digit, toe transfer appears to be a useful technique.

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The main weakness of this paper is the heterogeneity of the patient group – it includes thumb reconstructions, single-digit reconstructions, multi-digit reconstructions, and complex metacarpal hand injuries. One line in the results section mentions reattachment at level of carpus and proximal metacarpal bones, but no other detail is provided on the level of injury or any remaining joints in the stumps. Consequently, the authors performed subgroup analysis comparing thumb reconstructions (+/- fingers) with finger reconstructions alone. They show no statistically significant differences in MHQ or SF-36 scores, but, as the authors mentioned, this study may lack the power to detect small differences. Significant heterogeneity in injury severity remains within these subgroups.

Differences in hand dominance were also investigated. Improvements in hand function, aesthetics, and patient satisfaction are noted for toe transfers to both dominant and non-dominant hands; however, differences did not reach statistical significance for non-dominant hands. This leads the authors to conclude that toe transfers to dominant hands may be a stronger indication. For bimanual activities, an uninjured dominant hand will tend to be used preferentially than the reconstructed non-dominant hand. We are currently undertaking a study to place electrodes on brachial plexus injury patients to assess how much the patients actually use their reconstructed limbs in daily activities to supplement the PRO data for a comprehensive assessment of functional outcomes.

Toe-to-thumb transfer is an established procedure with well documented benefits. The novelty in this study is the high percentage of toe-to-finger transfers which are not performed commonly. Toe-to-finger transfers have been criticized for poor appearance, limited motion, and length discrepancies, particularly when other fingers remain intact^{3,5}. Appropriateness of toe transfer for finger reconstruction is highly individualized; the clearest indication is to create an ulnar post for thumb opposition in a proximal four-finger amputee. Transfers for less severe injuries are described but are more controversial. Advantages may include restoration of tripod pinch, enhanced stability for hook grip, widened hand span for grasping larger objects, better overall hand precision, and improved aesthetic acceptability³. This study illuminates the fact that patients motivated to undergo toe-to-finger transfer, for any reason, will likely be satisfied with the result.

Surgeons have an imperfect understanding of the effects injuries and treatments have on patients⁶. PROM can be used to narrow the gap between a surgeon's and patient's view of clinical reality and help tailor treatment plans to meet patients' needs. This study provides strong evidence that patients who undergo toe-to-hand transfer have better health-related QOL post-operatively. Patient-perceived gains in hand function appear to far outweigh donor site morbidity. That said, the decision to proceed with toe-to-hand transfer remains highly individualized.

The Chang Gung team has pushed the limits of upper limb reconstruction using microsurgical techniques to establish novel applications of toe transfer procedures. As evidenced by this study, we continue to benefit from their unparalleled clinical experience and scientific inquiry.

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