Starfish Procedure for Optimizing Function of a Myoelectric Prosthesis in a Patient With Partial Hand Amputation
Omri Ayalon, Amy Danielle Birnbaum¹, Dylan T Lowe, Elaine Crerar, Jacques Henri Hacquebord
¹NYU Langone Orthopedics

Background:
Previously, prosthetic options for individual finger control in patients with partial hand amputations were limited. The starfish procedure is a novel technique, developed by surgeons at the OrthoCarolina Reconstructive Center for Lost Limbs, that transfers the dorsal interosseous muscles to a more superficial location to amplify their electromyographic signals, thus allowing for eventual individually controlled myoelectric digit prostheses. This improved and intuitive functional improvement can make meaningful and real improvements in the lives of the patient with partial hand amputation.

Purpose:
This surgical technique video and case presentation demonstrates a patient who sustained a traumatic partial hand amputation as a result of a meat grinder injury. We performed the reconstruction, including revision amputation of the third and fourth metacarpals with transfers of the third and fourth dorsal interossei, known as the starfish procedure, to allow for improved fit and function of a myoelectric hand prosthesis.

Methods:
Surgical anatomy, indications, and surgical technique are enumerated for dorsal interossei muscle transfers in patients with partial hand amputation. We present the case of a 43-year-old man who sustained prior amputations of the index, middle, ring, and small fingers and experienced neuromatous pain and near-complete loss of function. We review the considerations for the starfish procedure, which in this case included shortening osteotomies of the third and fourth metacarpals, as well as transfer of the third and fourth dorsal interossei muscles to a more superficial location to provide improved electromyographic signal detection by a myoelectric partial hand prosthesis.

Results:
The third and fourth metacarpals were successfully shortened to a level 3 cm proximal to the metacarpophalangeal joint to ensure that the same joint on the myoelectric prosthesis was at the native height and to improve prosthetic fit. The third and fourth dorsal interossei muscles were then released at the insertion site and separated from the volar interossei, and the muscle pedicle was transferred superficially on the dorsum of the third and fourth metacarpals, respectively.

Conclusion:
Dorsal interosseous muscle transfer, or the starfish procedure, allows us to make use of the native interosseous muscle function in the patient with partial hand amputation to improve myoelectric prosthetic hand function—and to meet the goal of providing independent, intuitive digit control to enhance quality of life and function.