

American Society for Peripheral Nerve:
“Bridging The Hemispheres”
Cancun, Mexico, January 12-13, 2002
Podium Presentation Abstract

Scientific Session D

Pisiform Arthrokinematics and Carpal Tunnel Syndrome

G.R. Williams, BSOT; G.M. Cuka, MD, MBA, MS

Normal volar force carpal translation is 5-7 pounds during co-contraction of the fingers and thumb in extension. In carpal tunnel patients, force transducer measurements indicate deformation forces between 20-30 pounds of volar force translation, resulting in shear forces to carpal ligaments. This translational force applies in insidious, low load force that alters carpal arthrokinematics through remodeling of ligamentous structures. The altered carpal environment changes the moment arm of the pisiform. Concomitantly, dysfunctional pisotriquetral arthrokinematics by transmission forces of the flexor carpi ulnaris via the pisiform continues and perpetuates the progression of deformation of the carpal tunnel resulting in increased intra-carpal pressure.

Pisotriquetral behavior is critical to coordinating intrinsic and extrinsic power functions of the hand. The purpose of this study is to define normal and abnormal pisiform arthrokinematics relating to carpal tunnel syndrome in three distinct variations: immobility of the pisiform proximal (Type I), distal (Type II), and proximal/distal (Type III).

Table 1: Normal and 3 Variations of Abnormal Pisiform Behavior

| | Contraction | Co-Contraction |
|----------|-----------------------|-----------------------|
| Normal | Distal excursion | Proximal excursion |
| Type I | Limited/Nil excursion | Proximal excursion |
| Type II | Distal excursion | Limited/Nil excursion |
| Type III | Limited/Nil | Limited/Nil |

Co-contraction as defined in this study is variable positioning of the fingers and thumb until some form of resistance occurs against these motions. When resistance is absent, end range exertion in extension of the fingers and thumb results in co-contraction that requires inter-muscle communication. Co-contraction is maintained throughout the arc of motion in flexion or extension until resistance is encountered. Excessive contraction or co-contraction alters pisotriquetral function.

Type I (contraction): Pisotriquetral dysfunction occurs with remodeled pisohamate and pisometacarpal ligaments, producing lack of distal pisiform gliding during grasp. The pisiform does not track distal during composite fistng.

Type II (co-contraction): Pisotriquetral dysfunction is characterized by a lack of proximal gliding of the pisiform during co-contraction as the flexor carpi ulnaris moves the pisiform proximally. Attenuation of the pisometacarpal and pisohamate ligaments promotes proximal position of the pisiform. The FCU shortens and further perpetuates deforming forces.

Type III (contraction/co-contraction): Presentation is characterized by an almost unpalpable pisiform. These individuals have greater dorsal translation force, decreased ROM, periarticular fibrosis, and more taunt FCU insertion.

Improved arthrokinematics of the pisiform are consistent with complete relief of carpal tunnel symptoms in 60% of patients treated. A new method of testing carpal translation is defined and treatment described.

- Reprinted in the Journal of Reconstructive Microsurgery, Volume 18, Number 7, October, 2002;645