Distal radioulnar joint stability: the role of pronator quadratus

Educational article - English edition

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Source article: Mesplié G. Stabilité de l'articulation radio-ulnaire distale : rôle du carré pronateur. Kinésithérapie la Revue, 2007.

The article offers a modern reassessment of the role of pronator quadratus in distal radioulnar joint (DRUJ) stability. Traditionally regarded as a simple accessory pronator, it is presented here as an essential active stabiliser whose contribution to joint coaptation is greater than its contribution to pronation itself.

The DRUJ is a relatively incongruent joint subjected to substantial demands during weight bearing, gripping, ballistic movements and sport. Its stability depends on passive structures-principally the TFCC, radioulnar ligaments and interosseous membrane-and dynamic muscular control. However, passive structures rapidly reach their limits under transverse loading and dynamic effort.

The muscles traditionally described as active stabilisers, including ECU and FCU, have a predominantly longitudinal orientation, limiting their effectiveness against forces separating the radius and ulna. The author therefore highlights pronator quadratus as the principal transverse stabiliser of the DRUJ.

Anatomical analysis shows two heads: a superficial head with a predominantly movement-producing role, and a thicker, oblique deep head with substantial stabilising potential. The deep head partially blends with the DRUJ capsule, suggesting true capsulomuscular continuity. Experimental studies also show that division of pronator quadratus causes substantial radioulnar instability even without muscle contraction.

Biomechanical and electromyographic analyses support this hypothesis. The deep head remains active throughout forearm rotation, including supination, indicating a sustained tonic function. Its orientation provides a strong coapting component that counters separation forces at the DRUJ. Its activity also increases during gripping and destabilising situations, acting synergistically with other stabilising muscles.

The article then develops the central concept of an "active ligament". Through its proximity to the joint, reflex activity and coapting function, pronator quadratus may contribute to dynamic and anticipatory DRUJ stabilisation, particularly through feedforward mechanisms and neuromuscular control.

These concepts have important implications for rehabilitation. As pronator quadratus is described as a tonic muscle with limited cortical representation, training should emphasise dynamic stabilisation, proprioception, co-contraction and functional exercises reproducing real-world loading. Progression moves from isolated work towards integrated and sporting exercises, with particular attention to activities producing substantial radioulnar stresses, such as tennis.

Illustrations from the original resource

Figure 1



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