Anatomy of the anterior interosseous artery and the pronator quadratus muscle: contribution to distal radius

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Introduction

The vascularity of the radius and the union in distal radius fractures has been associated with injury of the blood supply with the surgical approach and/or techniques of osteosynthesis. This study aimed to describe the role of the Pronator Quadratus (PQ) muscle and the Anterior Interosseous Artery (AIA) in the vascularity of the distal radius and its relationship with the union in distal radius fractures (Figures 1, 2).

Materials and methods

Sixteen adult hands from fresh cadavers were dissected. There were 8 male and 8 female with a mean age 72 years (range, 50-91 years). The specimens were injected through the brachial artery with Ward’s latex. Dissections were performed using magnifying loupes and vascular anatomy was studied. Hands were processed using soft tissue digestion and bone clearing using Spalteholz technique (Figure 3).

Results

The PQ muscle originates from the ulna by a strong aponeurosis. The muscle is attached to the flexor surface of the distal radius and also on its medial triangular area, proximal to the sigmoid fossa. The distal border of the muscle covered the distal radioulnar joint and is on average 14 mm (11-18 mm) from the lower articulating surface of the radius. The AIA is a terminal branch of the common interosseous artery (IA), but it occasionally arises from the ulnar artery. The AIA is accompanied by its venae comitantes and the anterior interosseous nerve, all of which lie on the flexor surface of the interosseous membrane, deep to the PQ muscle. The artery, along its course gives a series of perforating branches at intervals of 15 mm (Figure 4). The distal radius was supplied by three main vascular systems: epiphyseal, metaphyseal and diaphyseal. The palmar epiphyseal vessels branched from the radial artery, palmar carpal arch and anterior branch of the AIA. These vessels entered the bone through the radial styloid process, Lister’s tubercle and sigmoid notch (Figure 5). Every specimen studied had one or more palmar metaphyseal arch that coursed through the PQ. Its proximal source was either the anterior division of the AIA (95%) or the AIA itself (5%). These branches provided the main supply to the distal radius. Vessels perforated the bone and formed an anastomotic network. In the diaphyseal area only the nutrient vessel provided intraosseous vascularity in the distal radius.

Conclusions

Numerous metaphyseal branches arise from the deep PQ muscle and the AIA course towards the distal radius. These branches allow the union of the distal radius fractures and they make that the nonunion be an uncommon complication. The main vascular contribution takes place by deep fibers of the PQ, so that the superficial fibers can be surgically approached for a plate with a minimum risk of injury to the vascularity.

References