

Original article

Vascularization of the trapeziometacarpal joint and its clinical importance: Anatomical study

La vascularisation de l'articulation trapézométacarpienne et son importance clinique

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Received 19 June 2011; received in revised form 31 January 2012; accepted 8 February 2012

Abstract

Few studies have investigated the vascular anatomy of the trapeziometacarpal (TM) joint of the thumb. The aim of our study was to describe the supplying arteries of the trapezium and the TM joint since this knowledge is essential for trapezium osteotomies. Ten anatomical dissections in ten different cadavers using two different techniques (four macerations, six classic dissections) were performed. The arteries of the TM joint originated from the radial artery and the princeps pollicis artery. Four important branches were identified. The arteries formed a vascular network around the joint. The dorsoradial surface of the joint contained the richest arterial network. These findings present an important consideration when performing an osteotomy of the trapezium.

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Keywords: Trapeziometacarpal; Vascularisation; Anatomy; Osteotomy; Surgical approach

Résumé

Peu d'études ont analysé la vascularisation anatomique de l'articulation trapézométacarpienne (TM). Le but de l'étude était de décrire les artères nourricières du trapèze et de l'articulation TM. Cela est d'une importance capitale pour les ostéotomies du trapèze. Nous avons réalisé dix dissections anatomiques chez dix cadavres différents en utilisant deux techniques : la macération classique après injection de résine et la dissection classique après injection de bariure. Les artères de l'articulation TM émanent de l'artère radiale ainsi que de l'artère principale du pouce. Nous avons trouvé quatre branches importantes. Les artères forment un réseau autour de l'articulation. La surface dorso-radiale de l'articulation a le réseau le plus riche. Cela a son importance par rapport à la voie d'abord pour une ostéotomie de réorientation de la selle trapézienne.

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Mots clés : Trapézométacarpien ; Vascularisation ; Dissection ; Ostéotomie ; Voie d'abord

1. Introduction

Osteoarthritis is a common degenerative disease of trapeziometacarpal (TM) joint. In some cases, the trapezium is at the origin of the disease, because it is dysplastic [1,2]. During the last decade, different joint sparing surgical procedures have been developed to treat it [1,3–5]. With the spread of these new surgical procedures, the importance of

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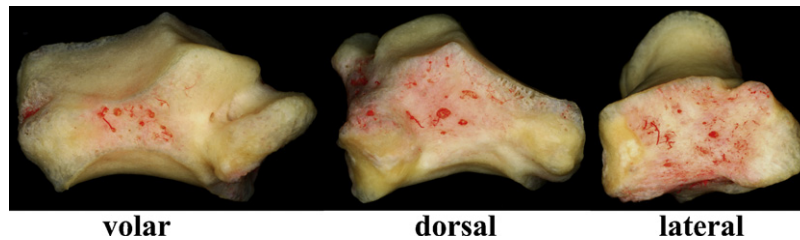


Fig. 1. Dry bone specimens. The nonarticular surfaces of the trapezium and the entrance of their perforating vessels.

knowledge of detailed vascular anatomy is increased. The purpose of our study was to describe more precisely the arterial vascularisation of the TM joint.

2. Materials and methods

We dissected ten hands of both male and female cadavers and used two different methods to demonstrate the arterial vascularisation of the TM joint.

For the first type of preparation, we performed four corrosion cast preparations of the arterial system of the hand. The radial and ulnar arteries were cannulated and injected with colour plastic resin (Duracryl[®], SpofaDental Hungary, Budapest, Hungary). After polymerization of the resin, the tissues were removed with the techniques of warm water maceration and hydrochloric acid maceration.

For the second method, we carried out six classic anatomical dissections. On fresh cadavers, the arteries were injected with radiopaque barium sulfate. The specimens were fixed in formalin. On the formalin-fixed hands, the supplying arteries of the TM joint were meticulously dissected. For the dissections, we used magnifying loupes. The diameter of each of the four important supplying arteries to the TM joint was measured with a calliper at the origin of each of these branches.

We then prepared four dry bone specimens of the trapezium to demonstrate the nonarticular surfaces of this bone using the technique of warm water maceration.

A detailed photographic record of all procedures was performed throughout the study (camera: Canon EOS 20D, Canon Hungária KFT, Budapest, Hungary).

3. Results

The trapezium has three nonarticular surfaces: a volar, a dorsal and a lateral (Fig. 1) [6,7]. The nutrient arteries enter the trapezium through these nonarticular surfaces. The dorsoradial arterial supply was predominant (Figs. 6 and 7). The dorsoradial arterial network provided more nutrient branches to the trapezium than the volar arterial network.

The radial artery gave off two branches to the TM joint in the anatomical snuff box (Fig. 2). The proximal branch originated from the radial artery at the level of the scaphoid tubercle and ran under the radial scaphotrapezial ligament (Fig. 3). It gave off branches to the scaphoid and the trapezium and terminated with anastomotic branches in the arterial plexus of the TM joint. Its diameter ranged from 0.5 to 1 mm. The distal branch (Braun's branch) [8] originated from the radial artery 6–12 mm

distally to the proximal branch, at the level of the tubercle of trapezium. It ran along the dorsoradial surface of the first metacarpal and – distally to the insertion of the abductor pollicis longus – gave off a recurrent branch to the arterial plexus of the TM joint. It supplied several branches to the dorsal nonarticular surface of the trapezium and to the base of the first metacarpal. Its diameter ranged from 1 to 1.2 mm. In one of our specimens, the proximal branch originated from the distal branch and not directly from the radial artery. In nine of our specimens the arterial network of the TM joint anastomosed with the superficial palmar branch of the radial artery (Fig. 4).

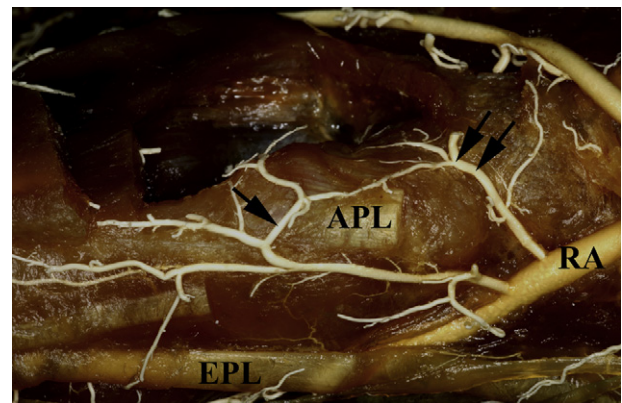


Fig. 2. Radial aspect of the TM joint. The radial proximal (double arrows) and the radial distal (arrow) supplying branches to the TM joint arising from the radial artery. APL: abductor pollicis longus, EPL: extensor pollicis longus, RA: radial artery.

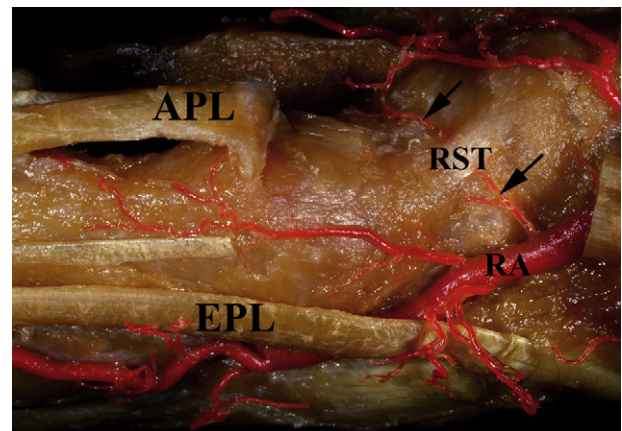


Fig. 3. Radial aspect of the TM joint. The proximal radial supplying branch (arrows) to the TM joint runs under the radial scaphotrapezial ligament. APL: abductor pollicis longus, EPL: extensor pollicis longus, RST: radial scaphotrapezial ligament, RA: radial artery.

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