Royal Australasian College of Surgeons

Pronator quadratus accessorius

Muscular variations occur following aberrations in ontogenesis and may be incidental surgical findings, or cause symptoms via nerve entrapment or mass effect.[1,2] Several anomalous muscles have been described with varying prevalence.[1,2]

Anatomical studies have described the pronator quadratus (PQ) muscle as short and quadrilateral with two distinct heads. The superficial head extends from the dorsoulnar ulnar border to a broad facet on the volar radius – the classic gross anatomical description – whilst the deeper head originates in a similar manner but inserts to the whole of the ulnar border of the distal radius shaft, intimate with the capsule of the distal radioulnar joint and extending dorsally to the interosseous membrane.

Descriptions of anatomical variations involving the PQ are rare. Mochizuki noted rotational restriction due to a likely congenital extension of the deep head through the interosseous space to attach to the dorsal ulna.[3] Cadaveric studies have provided further insights – Hinds reported a double-muscle-bundle morphology in 4 of 25 dissections, whilst Sakamato stated that both heads can have multiple fascicles (up to four) of various morphology.[4,5] Dy detailed the absence of a PQ precluding the use of the anterior interosseous nerve for nerve transfer.[6]

We present a poorly described variant of PQ anatomy and review the literature.

A 56-year-old woman sustained a dorsally angulated distal radial fracture after falling onto her outstretched hand. She underwent stabilization with volar plating via a bed of flexor carpi (FCR) approach. The FCR was retracted ulnarward, and the fascia between the superficial and deep volar compartments divided. The flexor pollicis longus was retracted to reveal the PQ.

An anomalous muscular band was noted emerging from underneath the distal aspect of the PQ fascia (at roughly 45° to the remainder of the muscle) to cross the radiocarpal joint (Fig. 1). Further dissection revealed that the band merged into the superficial

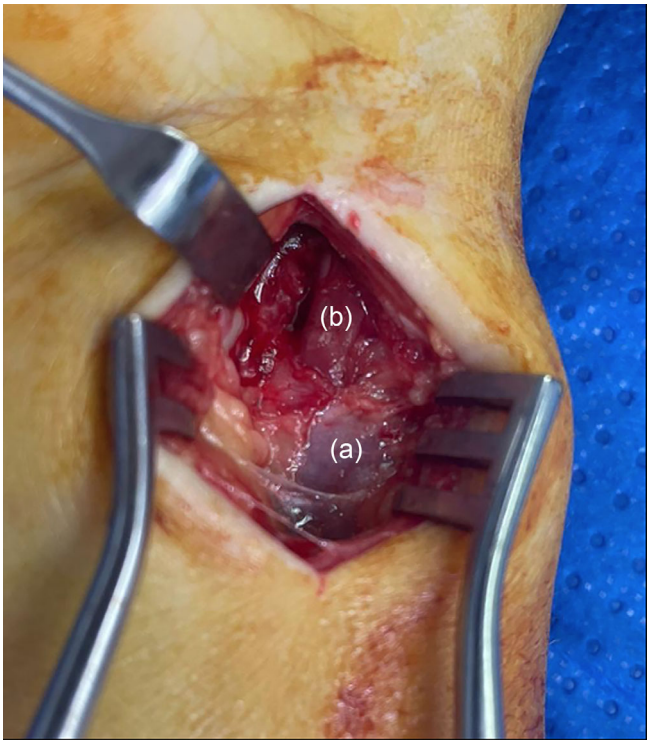

Fig. 1. Clinical photograph of pronator quadratus with flexor pollicis longus retracted. (a) pronator quadratus muscle; (b) anomalous muscular band.

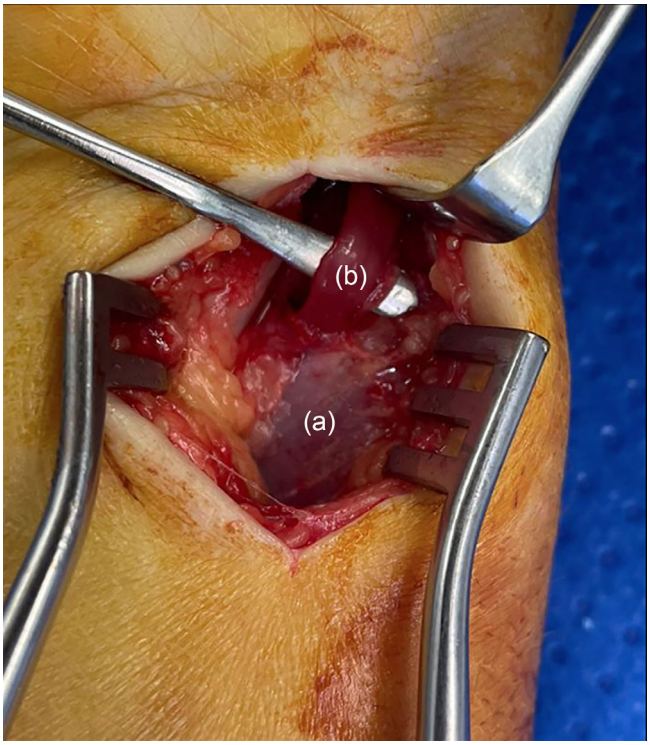

Fig. 2. Freer elevator under anomalous muscular band. (a) pronator quadratus muscle; (b) anomalous muscular band.

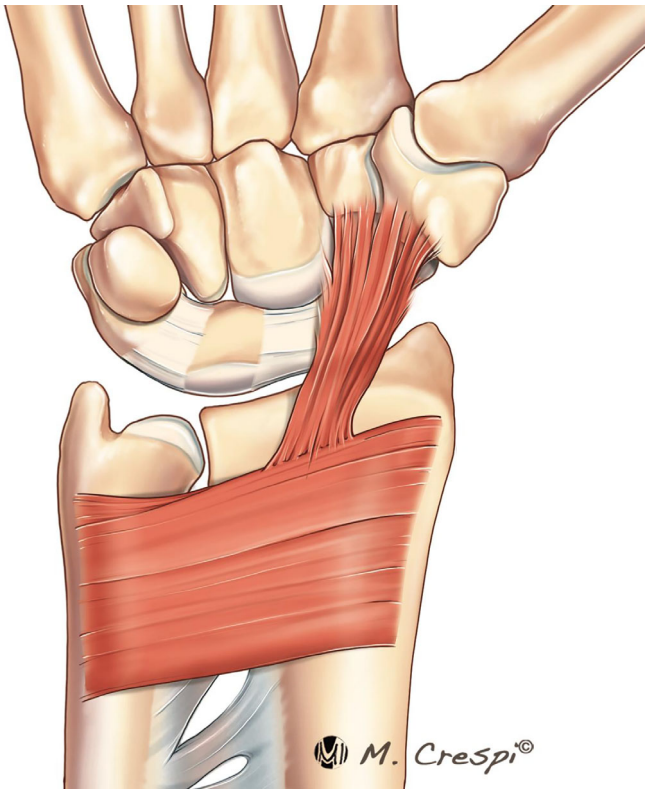

Fig. 3. Illustration of pronator quadratus accessorius.

head of the PQ proximally and inserted onto the capsule over the scapho-trapezial-trapezoid joint distally (Figs. 2 and 3). The band was divided, the remainder of the muscle dissected off the volar radius, and the operation completed as planned.

There are few previous descriptions of similar anatomy. In 1870, Macalister reported an entire PQ muscle converging onto a central tendon which crossed the wrist joint and sent slips to the scaphoid, trapezium and base of the first metacarpal on a cadaver.[7] More recently, Surekha noted a single example of the entire superficial head inserting onto the carpus (in particular, the scaphoid and lunate) during a dissection of 60 specimens.[8]

The current description differs from previous reports in that the aberrant insertion was not tendinous in nature, nor did it constitute an entire head of the PQ. Rather, it seemed a separate muscular arm of the superficial head, emerging from underneath the fascia with fibres at an angle discrete to that of the main muscle. Although this patient did not report any preoperative discrepancies in motion, anomalous insertions crossing the volar aspect of the wrist may result in restricted sagittal plane motion (particularly extension). An understanding of anatomical variations is important when interpreting three-dimensional imaging; aberrant PQ anatomy may also contribute to the development of anterior interosseous syndrome or PQ myofascial syndrome.[8]

Acknowledgement

Open access publishing facilitated by The University of Sydney, as part of the Wiley - The University of Sydney agreement via the Council of Australian University Librarians.

References

1. Andring N, Kennedy SA, Iannuzzi NP. Anomalous forearm muscles and their clinical relevance. *J. Hand Surg. Am.* 2018; **43**: 455–63.
2. Kim RG, Graham DJ, Lawson RD, Sivakumar BS. An accessory extensor pollicis longus tendon: an anatomical variant. *ANZ J. Surg.* 2023; **93**: 2505–7.
3. Mochizuki Y, Sawaizumi T, Tsunoda R, Horiguchi G, Matsui S, Takai S. A case of rotational restriction of the forearm due to abnormal configuration of pronator quadratus muscle. *Hand Surg.* 2013; **18**: 247–50.
4. Hinds RM, Gottschalk MB, Capo JT. The pronator quadratus and distal anterior interosseous nerve: a cadaveric study. *J. Wrist Surg.* 2015; **4**: 183–7.
5. Sakamoto K, Nasu H, Nimura A, Hamada J, Akita K. An anatomic study of the structure and innervation of the pronator quadratus muscle. *Anat. Sci. Int.* 2014; **90**: 82–8.
6. Dy CJ, Brogan DM, Colorado BS. Absence of the pronator quadratus muscle precluding distal nerve transfer. *J. Hand Surg. Am.* 2019; **44**: 523.e1–523.e5.
7. Macalister A. The varieties of the pronator quadratus. *J. Anat. Physiol.* 1870; **5**: 32–4.
8. Surekha J, Shilpa G, Balbhim Z. Morphology of pronator quadratus muscle: a cadaveric study. *Int. J. Med. Res. Health Sci.* 2014; **3**: 876–9.

Brahman S. Sivakumar,*†‡§¶ MBBS, BSci (Med), MS, MSc
Michael Symes,‖** B Phty, MBBS
Haren Nandapalan,††† MBBS
Richard D. Lawson,* MBBS
David J. Graham,¶‡‡§§ B Phty, MBBS

**Department of Hand & Peripheral Nerve Surgery, Royal North Shore Hospital, St Leonards, New South Wales, Australia, †Department of Orthopaedic Surgery, Nepean Hospital, Kingswood, New South Wales, Australia, ‡Department of Orthopaedic Surgery, Hornsby Ku-ring-gai Hospital, Hornsby, New South Wales, Australia, §Faculty of Medicine and Health, Sydney Medical School, the University of Sydney, Camperdown, New South Wales, Australia, ¶Australian Research Collaboration on Hands (ARCH), Mudgeeraba, Queensland, Australia, ‖Department of Orthopaedics and Trauma Surgery, Royal North Shore Hospital, Sydney, New South Wales, Australia, **Department of Orthopaedic Surgery, St George Hospital, Kogarah, New South Wales, Australia, ††Department of Orthopaedic Surgery, Hawkesbury Hospital, Windsor, New South Wales, Australia, ‡‡Department of Musculoskeletal Services, Gold Coast University Hospital, Southport, Queensland, Australia and §§School of Medicine and Dentistry, Griffith University, Southport, Queensland, Australia*

doi: 10.1111/ans.19126