ABSTRACT

Aims: To present an atypical case of flexor carpi radialis brevis (FCRB) and its impact on minimally invasive procedures to the volar distal radius.

Methods: Minimally invasive volar plate fixation was performed on 16 standard embalmed cadaveric forearms in the University of Otago anatomy department. The forearms were then dissected to analyse the effect on the local anatomy and the position of the metalware.

INTRODUCTION

Flexor carpi radialis brevis (FCRB) is a rare anomalous muscle of the wrist. It was first described by this name in the mid-19th Century by John Wood, an anatomy demonstrator at King’s College, London in a report on ‘variations in human Myology’ for the Royal Society (1). In the 21st Century its presence has been described mostly as a coincidental finding during cadaveric and operative dissection, and rarely as a symptomatic painful mass in the forearm (2-4).

FCRB has an estimated incidence of 2.6 - 7.5% (5). It originates from the volar-radial surface of the distal radius, distal to flexor pollicis longs (FPL) and proximal to the insertion of pronator quadratus (PQ). The insertion is typically the index or middle metacarpal base. However, significant variability has been described, including the ring metacarpal base, radial carpals bones, and palmar fascia (6). It is innervated by the anterior interosseous nerve (AIN) and its usual passage past the wrist is neighbouring the tendon of flexor carpi radialis (FCR), through its osteo-fibrous tunnel in the groove of the trapezium (5).

Previous case studies have encountered FCRB during a volar approach for fixation of the distal radius (5). Indeed, Yoon-Min and colleagues indicated the clinical importance of being aware of FCRB due to the trend towards volar plate fixation for distal radius fractures (5). However, there is a further trend towards minimally invasive, tissue preserving techniques through smaller incisions. These approaches are performed based on predicted anatomy and therefore anomalous structures are at risk, and assumed anatomical landmarks can be rendered unreliable.

Therefore, this report aims at describing a case of FCRB and its unique anatomical variation, and discussing its impact on minimally invasive volar plating of the distal radius.

METHODS

Ethics approval was attained from the University of Otago, Human Ethics Committee (H17/065). While alive, all donors gave their informed consent to the donation of their bodies for teaching and research purposes, and experiments were conducted in line with the declaration of Helsinki.

A cadaveric study on 16 New Zealand European upper limbs investigating anatomical variation, and discussing its impact on minimally invasive procedures to the volar distal radius. Surgeons operating on the distal forearm should be aware of this anatomical variation to prevent inadvertent injury.

Key Words: Volar plate; Distal radius; Flexor carpi radialis brevis; FCRB; Tendon

RESULTS

One case of a FCRB was identified, with an atypical split tendon and insertion into the transverse carpal ligament and base of the index and middle metacarpal. The surgical procedure caused radial muscle fibre tearing of the FCRB.

Conclusions: The FCRB is a rare anomalous muscle of the wrist. Its presence has a detrimental effect on minimally invasive procedures to the volar distal radius. Surgeons operating on the distal forearm should be aware of this anatomical variation to prevent inadvertent injury.

Figure 1) Representative photograph illustrating the position of the anomalous flexor carpi radialis brevis (FCRB) in relation to the flexor carpi radialis muscle (FCR). The transverse carpal ligament (TCL) is labelled and both tendons can be seen entering the FCR fibro-osseous tunnel.
With complete dissection, a bipennate muscle with a short tendon originating from the volar surface of the radius, proximal to PQ, was identified. This muscle had a split tendon with a complex insertion into the base of the index and middle metacarpal, as well as a slip of tendon into the transverse carpal ligament (Figure 2).

Innervation was likely attained from a branch of the AIN that arose proximal and superficial to PQ and penetrated the deep surface of the muscle. Its vascular supply was not clear, but primarily arose from the radial artery and superficial to PQ and penetrated the deep surface of the muscle. Its innervation was likely attained from a branch of the AIN that arose proximal to the base of the index and middle metacarpal. The flexor pollicis longus (FPL) running through the carpal tunnel was labeled for orientation.

This case has highlighted the translational importance of this anatomical variation and illustrated that the presence of a FCRB can have a detrimental effect on minimally invasive surgery of the volar distal radius. Surgeons should therefore be aware of this anatomical variation to prevent inadvertent injury during the surgical procedure. If visualization is limited, we would advocate extension of the incision to aid exposure. However, surgeons should recognize this anomalous muscle because the deep landmarks, particularly the identification of flexor pollicis longus (FPL), will be obscured.

Some FCRB muscles have been reported to present as painful forearm masses, however, most remain asymptomatic and incidentally identified (14-15). Although the clinical signs of a FCRB are not described, previous authors have serendipitously identified this anatomical variation intraoperatively and successfully utilized it during a locking reconstruction for first carpo-metacarpal osteoarthritis (10). It has also been recognized on ultrasound and MRI imaging as a normal appearing small muscle arising from the radius and inserting into the trapezium or base of index and middle metacarpals (14-18). However, its relative rarity (1,16) and the lack of higher-level evidence to support its use in hand and wrist reconstruction surgery, we feel negates routine cross-sectional imaging for pre-operative planning.

This study is limited to a single case in a cadaveric study. We would support the intra-operative difficulties in living tissue being described as standard embalmed cadaveric tissue offers limited soft tissue pliability. Unfortunately the contralateral limb was not available for this study and therefore we were unable to determine if this was a symmetrical finding. Further research is also required to render the true incidence of FCRB and its bilaterality in patients. In addition, the ethnic variances are unknown and therefore warrant further investigation.

CONCLUSION

The FCRB is a rare anomalous muscle of the wrist. Its presence has a detrimental effect on minimally invasive procedures to the volar distal radius. Surgeons operating on the distal forearm should be aware of this anatomical variation to prevent inadvertent injury. Some FCRB muscles have been reported to present as painful forearm masses, however, most remain asymptomatic and incidentally identified (14-15). Although the clinical signs of a FCRB are not described, previous authors have serendipitously identified this anatomical variation intraoperatively and successfully utilized it during a locking reconstruction for first carpo-metacarpal osteoarthritis (10). It has also been recognized on ultrasound and MRI imaging as a normal appearing small muscle arising from the radius and inserting into the trapezium or base of index and middle metacarpals (14-18). However, its relative rarity (1,16) and the lack of higher-level evidence to support its use in hand and wrist reconstruction surgery, we feel negates routine cross-sectional imaging for pre-operative planning. This study is limited to a single case in a cadaveric study. We would support the intra-operative difficulties in living tissue being described as standard embalmed cadaveric tissue offers limited soft tissue pliability. Unfortunately the contralateral limb was not available for this study and therefore we were unable to determine if this was a symmetrical finding. Further research is also required to render the true incidence of FCRB and its bilaterality in patients. In addition, the ethnic variances are unknown and therefore warrant further investigation.

REFERENCES

A case of anomalous flexor carpi radialis brevis muscle and its clinical significance