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Case Report

Heterotopic ossification in the interosseous membrane of right forearm bones

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Sulabha H. DESHPANDE ✦
Shankreppa D. DESAI
Vijayendra N. KULKARNI
Ravi S. BULAGOUDA

Department of Anatomy BLDEU'S Shri. B. M. Patil Medical College, Bijapur, Karnataka, INDIA.

✦ Dr. Sulabha H. Deshpande
Assistant Professor
Department of Anatomy
BLDEU'S Shri B. M. Patil
Medical College
Bijapur, Karnataka, INDIA.
☎ +91 8352-262770
✉ vikas750@gmail.com

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Abstract

Interosseous membrane is a broad thin collagenous sheet whose fibers slant distomedially between the radial and ulnar interosseous borders. Its distal part is attached to the posterior division of the radial border. Its fibers help in transmission of forces that act proximally from the hand to the radius, hence to the ulna and humerus. The posterior relations near the carpus are the anterior interosseous artery and posterior interosseous nerve. Heterotopic ossification resulting in radio-ulnar cross union occurs in 2% of all forearm injuries. During the routine undergraduate demonstration classes in the department of Anatomy at BLDEU's Shri B. M. Patil Medical College, Bijapur, we found an unusual piece of bone at the site of distal one-third of interosseous membrane of right radius and ulna, which indicates the heterotopic ossification resulting in the fusion near the distal ends of radius and ulna. The ossified part measured 1.27 cm x 2.1 cm x 1.63 cm, using spreading calipers. Factors resulting in heterotopic ossification include open fractures, hematoma formation, infection, callus formation. Complications include loss of forearm supination and pronation, which impairs the function of entire upper limb. Also one would expect compression over the anterior interosseous artery and posterior interosseous nerve. It is of importance for the orthopedists while dealing with compound fractures and their management such as internal fixation.

Key words [heterotopic ossification] [interosseous membrane] [forearm bones]

Introduction

Interosseous membrane is a broad thin collagenous sheet whose fibers slant distomedially between the radial and ulnar interosseous borders. The distal part of the membrane is attached to the posterior division of the radial border. The membrane gives attachment to muscles. Its fibers help in transmission of forces which act proximally from the hand to the radius, hence to the ulna and humerus. The posterior relations near the carpus are the anterior interosseous artery and posterior interosseous nerve [1]. Heterotopic ossification is the abnormal formation of true bone within extra skeletal soft tissues such as muscles, fascial planes, tendons, other mesenchymal soft tissues [2]. It is seen in 2% of all forearm injuries leading to ossification of interosseous membrane and causes significant functional impairment [3].

Case Report

During routine osteology demonstration classes for the 1st year MBBS students in the Department of Anatomy, BLDEU's Shri B. M. Patil Medical College, Bijapur, we observed an abnormal piece of bone at the site of distal part of interosseous membrane of right radius and ulna. This piece of bone was the heterotopic ossification in the interosseous membrane hence resulting in fusion near the distal ends of right radius and ulna (Figure 1). The anterior surface was rough and posterior surface was smooth as shown in Figures 2 and 3. The inferior radio-ulnar joint was normal.

The measurements were taken using spreading caliper (Table 1).

Table 1. Measurements of the case.

Length of ulna	26.77 cm
Length of radius	21.07 cm
Length of ossified part	3.77 cm
Thickness of ossified part	1.27 cm – upper end 2.10 cm – midregion 1.63 cm – lower end

Discussion

Heterotopic ossification leading to cross union between forearm bones was first described by Gross in 1864. Although it is more common with fractures of proximal and middle third, the distal forearm is not entirely spared of this troublesome complication [4]. Reidel in 1883, Dejerne and Ceillier in 1918

Figure 1. Anterior view of right *radius (**R**)* and *ulna (**U**).*

Figure 2. Anterior view of right *radius (**R**)* and *ulna (**U**)*. ***Asterisk*** shows *ossified part* at the lower end anteriorly.

reported that this condition occurred among soldiers who had experienced spinal cord trauma as combatants in world war [5]. Vince and Muller reviewed 2381 reported forearm fractures in the literature and identified a combined incidence of 2%. Incidence is higher in monteggia fracture, particularly those involving both forearm bones along with dislocation of radial head [4].

Previous studies have put forward a number of etiological factors for heterotopic ossification: high energy trauma with open fractures, infection, delayed internal fixation, spinal cord injury, traumatic brain injury [6], retinoid induced, other causes of neurologic compromise including tetanus, poliomyelitis, Guillain-Barré syndrome, prolonged pharmacologic paralysis during mechanical ventilation [7].

Less common factors include non-anatomic reduction with narrowing of interosseous space, on lay bone-grafting, use of screws that are too long and cross the interosseous membrane [4].

In the present case of interosseous membrane in right forearm showed extensive heterotopic ossification. Probably fracture in the distal part of radius or ulna is the etiology. It would have led to hematoma formation, infection, callus formation leading to heterotopic ossification. The osteoprogenitor stem cells lying dormant within the interosseous membrane, with proper stimulus, differentiate into osteoblasts. These begin the process of osteoid formation, eventually leading to mature heterotopic bone. In such a condition the complications include loss of forearm supination and pronation which impairs the function of entire upper limb, particularly of right side provided the person is right-handed. Also one would expect compression over the anterior interosseous artery and posterior interosseous nerve leading to neurovascular symptoms around the wrist and hand.

Conclusion

Knowledge of such rare condition is very important for neurophysicians and orthopedists during the management of complication around the wrist. Such a condition can be prevented by prophylactic radiotherapy and these trials have been proved successful in hipbone fractures and tried in forearm bones fracture.

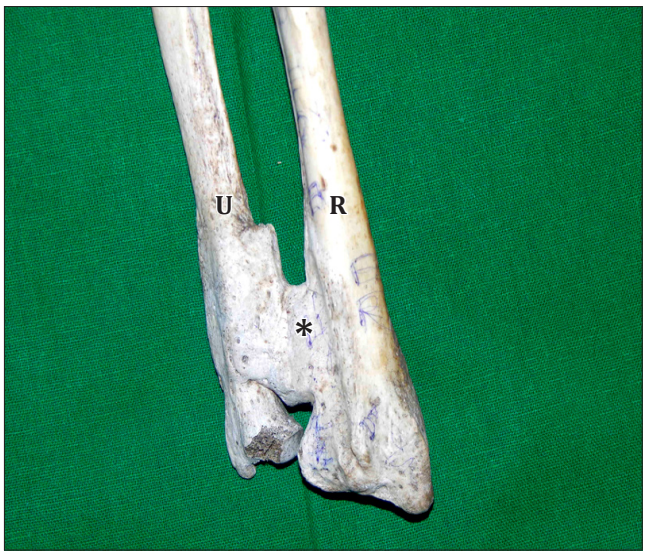

Figure 3. Posterior view of right *radius (**R**)* and *ulna (**U**)*. ***Asterisk*** shows *ossified part* at the lower end posteriorly.

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