# Management of Congenital Radio-Ulnar Synostosis

A Systematic Review

*Submitted For Partial Fulfillment of Master Degree in Orthopaedic Surgery*

By


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*This work is dedicated to my family.*

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## Abstract

Congenital radioulnar synostosis is functionally disabling disease. It is thought to be caused by a failure of longitudinal segmentation with persistence of the cartilaginous anlage between the radius and ulna during the seventh week of development. The aetiology is unknown but a genetic basis has been suggested through the association with a positive family history. Different methods of management of congenital radioulnar synostosis were described; one is the mobilization to separate the radioulnar synostosis. Other is rotational osteotomies to place the forearm in more functional position. This systematic review of English literature was done to assess the different ways of management of congenital radioulnar synostosis by analyzing them through the study of case series of fifteen different research group.

## Keywords

**T**he keywords used for these searches combines forearm" with "synostosis", "management", "radio-ulnar", "osteotomies" and "congenital

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# AIM OF THE WORK

The aim of this work is to highlight the results of management of congenital radio-ulnar synostosis through a systematic article review of literature.

# REVIEW OF LITERATURE

## Functional anatomy of the forearm

The upper limb is an articulated structure, intended to position the hand in space. The shoulder allows the hand to reach any point arranged on a circle centered on the scapula-humeral joint. Pronation-supination assists to rotate the hand, so that it is optimally located for the different functional tasks.(1)

The anatomy of the forearm is consisting of several structures that change position with forearm rotation including proximal radio-ulnar joint and distal radio-ulnar joint. There are three structures provide the stability to proximal radio-ulnar joint, the annular and quadrate ligaments and the oblique cord. The annular ligament is a strong band that forms four fifths of a ring that encircles the radial head. The quadrate ligament extends from the inferior edge of the ulna’s radial notch to insert in the neck of the radius. The oblique cord is a flat, fascial band on the ventral forearm that extends from an attachment just inferior to the radial notch on the ulna to insert just below the bicipital tuberosity on the radius **(Figure 1).**(2)

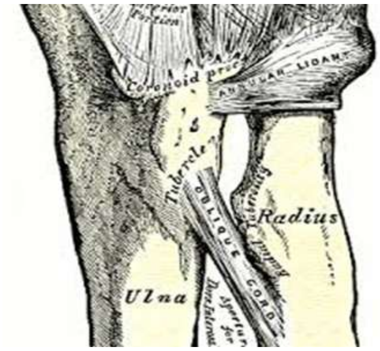


**Figure (1):** Anatomy of proximal radioulnar joint. [2]

Radio-ulnar desmosis formed of the interosseous membrane "slim sheet of fibrous tissue" attaches along whole length of radius and ulna. The proximal and distal extremes of the interosseous membrane are thin and membranous. The central band is a stout ligamentous structure which originates distal to the articular surface of the radial head and inserted distal to the tip of olecranon **(Figure 2),** this membrane assist forearm supination and pronation and permits force transmission from the ulna to the radius on axial loading through wrist joint and gives attachment for several muscles in the forearm**.**[3]

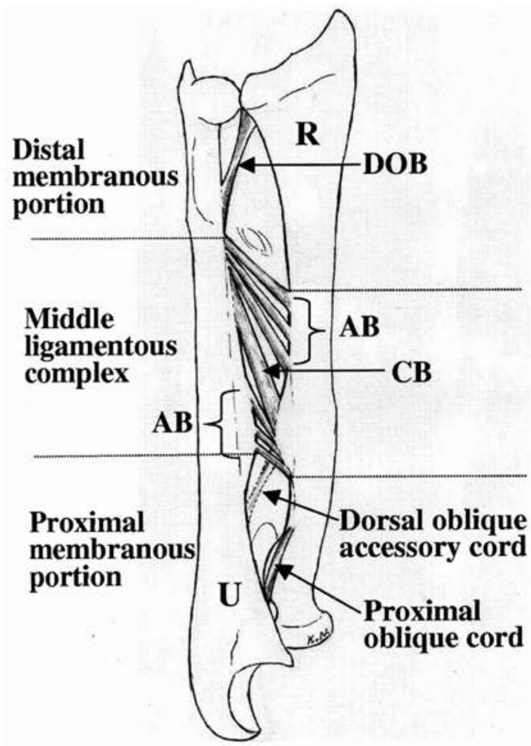


**Figure (2):** Diagrammatic representation of the interosseous membrane (Right forearm, anterior aspect). Key features include the distal oblique cord (DOB) that lies within the distal membranous portion and the proximal oblique cord that lies on the anterior surface proximally. The middle ligamentous complex contains the central band (CB) and accessory bands (AB).[3]

The neurovascular structures of the forearm formed of the median, anterior interosseous, ulnar, posterior interosseous and superficial radial nerves and two main arteries radial and ulnar. The radial nerve terminates into superficial branch and deep branch just lateral to biceps tendon which pierces the supinator muscle then pass through the posterior compartment of the forearm and passes along interosseous membrane as posterior interosseous nerve.[4]

The radial artery found at the radial side of the forearm beneath the brachioradialis muscle until it reaches the distal forearm it has many perforators almost 120 in number,more than half the perforators are detected within 50 mm proximal to the distal wrist crease, at least two of them are found within 2 cm proximal to the styloid and cover a large volar cutaneous area, which is important in pedicle adipofascial flaps, all these structures are at risk during surgical dissection.[5]

## Kinematics of the forearm

The rotation of the radius, which is connected to the hand, occurs around a single axis. This axis roughly intersects the center of the radial head and the base of the ulnar styloid process, at the center of the ulnar head cylinder. During supination and pronation this axis intersects a protuberance on the interosseous edge of the radius referred to as the interosseous tubercle of the radius. This tubercle is of major importance as it corresponds to the insertion of the IOM's central band **(Figure 3)**.[6]

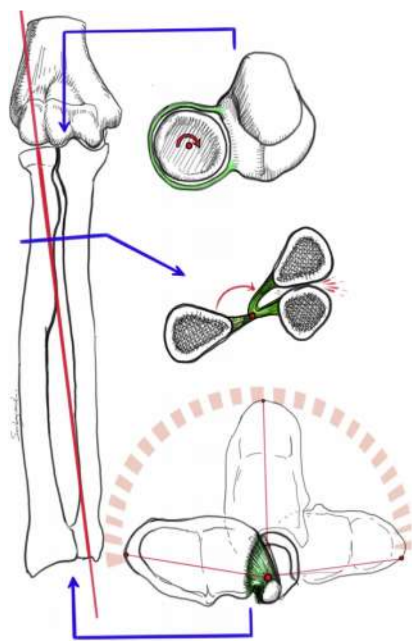

**Figure (3):** The forearm's rotational axis.[6]

According to ***Hollister et al.***[7] ***and Nakamura et al.***[8], the central band is isometric during forearm rotation. Others noticed increased strain. During forearm rotation the central band does not stretch much which is logical as the insertion of the central band on the ulna is in the same location with the axis of forearm rotation. Indeed ***Moritomo et al.***[9] found the central band, the accessory bands and the distal oblique bundle which inserted on the ulna coexist with axis of forearm rotation, and all of these structures are isometric concurrently with forearm rotation**.**

The distal part of the interosseous membrane- the membranous portion according to ***Nakamura et al.*** – is not isometric: this part of the interosseous ligament complex is tight in neutral and slight supination, and distorted in full pronation and full supination when the pronator quadratus muscle contracted. As regard anatomy the proximal oblique cord could act to prevent excessive pronation as it becomes taut while the dorsal oblique accessory cord would prevent excessive supination.[9]