



LUNATE – TRIQUETRAL FUSION: A CONGENITAL ANOMALY

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<p>Article Info <i>Received 15/05/2015</i> <i>Revised 27/05/2015</i> <i>Accepted 22/06/2015</i></p> <p>Key words: Congenital fusion of carpal bones, Lunate, Triquetral.</p>	<p>ABSTRACT We report two cases of lunate and triquetral bone fusion presented at our Scarborough General Hospital in Tobago. The purpose of this case is to report anatomical variants of the bones, ligaments, tendons and muscles which are found during the routine imaging of the wrist and hand. Many findings especially changes in the fibrocartilage and the interosseous ligaments are asymptomatic, their incidence is increasing with age, and they are frequently found bilaterally. While bony luno-triquetral coalitions are known to be asymptomatic, fibro-cartilage unions can cause ulnar-sided wrist pain. Unfortunately, no clear biomechanical or developmental explanation is available for this type of carpal coalitions.</p>
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INTRODUCTION

Fusion of various carpal bones is seen in any possible examination. Fusion of carpal bones can occur as an independent entity or in association with congenital syndromes and metabolic disorders. Carpal coalition is usually asymptomatic and often discovered incidentally. Carpal fusions occur as normal variations in about 0.1% of the population. Lunate-triquetral fusion is the most common fusion anomaly of the carpus. This bone anomaly is mostly bilateral, but more common on the left side when unilaterally present. Among the various population groups studied, the highest incidence is seen in people of African descent with a higher female to male ratio (2:1) and a strong familial tendency. The loss of movement between the fused bones leads to a compensatory increase in motion at surrounding joints. This predisposes the person to recurrent sprains causing pain, especially under stressful conditions. Occasionally, this may also result in an overgrowth of bone called carpal bossing [1].

Case Reports

Here we report of two patients who visited to the Accident and Emergency (A&E) Department on two

different occasions, both presented complaining of pain and swelling in the wrist and hand following trauma.

Case 1: A 9 year old male child came with history of fall while playing. Patient did not have any other complaints. No past surgical or medical history apart from similar trauma of two years back. On examination, it was noticed that there was a mild tenderness and swelling of the right wrist. An x-ray was done in order to rule out for any possible bony injuries. A thorough review of the radiograph it was found that there was a widening of the space between lunate and scaphoid. On review of images in PACS, patient found to have x-ray of both hands in past, likely due to previous trauma. The x-rays were reported as fusion of lunate and triquetral in both hands with widened gap between lunate and scaphoid (Figure 1).

Case 2: A 54 year old male presented to the A & E with history of right hand being struck to the door. Patient had past history of hypertension and diabetes, which are well controlled on medications. No past surgical history. On examination, there was tenderness and swelling on the



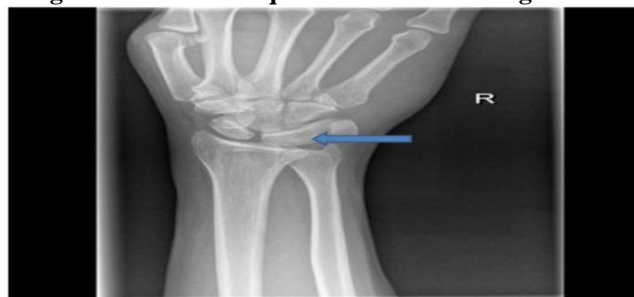
lateral aspect of the right hand. A routine x-ray was taken to rule out for any possible bony injuries. Similarly on review of the radiograph it was noticed that the fusion of

lunate and triquetral with widened gap between lunate and scaphoid (Figure 2).

Figure 1. Lunate-Triquetral fusion



Figure 2. Lunate-Triquetral fusion in the right hand



DISCUSSION

Carpal coalition is usually asymptomatic and often discovered incidentally. Carpal fusions occur as normal variations in about 0.1% of the population. Lunate-triquetral fusion is the most common fusion anomaly of the carpus. This bone anomaly is mostly bilateral, but more common on the left side when unilaterally present. Among the various population groups studied, the highest incidence is seen in people of African descent with a higher female to male ratio (2:1) and a strong familial tendency.

Each carpal bone ossifies from one centre of ossification which appears after birth and the process of ossification is usually completed between 20th to 25th years of life. Carpal bones are cartilaginous at birth, although ossification may have started in the capitate and hamate. The capitate begins to ossify in the second month, the hamate at the end of third month, the triquetral in the third year, the lunate, scaphoid, trapezium and trapezoid in the 4th year in females and fifth year in males. The pisiform begins to ossify in the ninth or tenth year in females, and the twelfth in males. The order varies according to sex, nutrition and, possibly race [2].

Fusion or synostosis of various carpal bones is possible in different combinations. The number of carpal bones may be increased or decreased by the fact of anatomical variants or true congenital anomalies. Numerical increment arises from additional or from split bones. Additional carpal bones usually result from a failure of fusion of their ossification centres. A carpus with only

seven bones results from the congenital absence of a normal bone, which mainly affects the scaphoid, lunate and triquetral, or from a synostosis between two carpal bones, usually the lunate and triquetral. Congenital fusions originate from an absence of joint cavitation into the embryo and chondrification of the joint interzone. These anomalies are detectable on plain radiographs of the wrist, but CT-scan and MR-Imaging are useful to differentiate bipartite and accessory bones from carpal fractures or posttraumatic injuries, carpal fusions having to be distinguished from bony ankyloses [3].

Carpal fusions are relatively common, can occur as isolated abnormalities or as a part of generalised syndromic manifestation. Isolated fusions usually present involvement of the same carpal row, while syndrome related fusions affect bones in different rows. Capitate-hamate coalitions although reported are extremely rare. Bilateral and unilateral capitate-hamate fusions have been noted as a part of foetal-alcohol syndrome. Trapezium-trapezoid and pisiform-hamate fusions are also rare. Triquetro-lunate fusions are the most common and occur in 0.1 to 1.6 % of the general population, more frequently in males, and in blacks. Capitate-hamate fusion has been noted to be a finding in Kabuki make-up syndrome. McCredie noted carpal fusions along with other congenital fusion of bones as a recurrent feature in thalidomide embryopathy. Clinicians should recognize that capitate-hamate coalitions (or carpal coalitions in general) could be a part of syndromic manifestations. Isolated capitate-



hamate coalition although generally asymptomatic, may present with sequelae of neuropathy or arthritis. Multiple radiographs may be required for proper definition. Treatment is usually symptom based [4].

Fusion of carpal bones is mostly asymptomatic and thus usually a chance finding discovered on radiographs taken for unrelated reasons these may be associated with symptoms due to loss of movement between the fused bones. Stretching of the surrounding soft tissues leads to sprain causing pain, fractures are common and at times carpal bossing may also occur. Anthropological significance of this fusion anomaly cannot be ignored which may be considered a step towards specialization of hand or an attempt to stabilize the postaxial border of hand. Any two-ossification centre's lying adjacent may exhibit fusion those on the ulnar side and occupying the same row are more commonly involved. Fusion of carpal bones is hereditary and the trait is transmitted as Mendelian dominant factor, which is not sex-linked. Complete or incomplete coalition of the carpus normally does not interfere with the external appearance or function of wrist. Multiple bone fusion may involve any number of carpals or all carpals appearing as a single mass. It is a common feature present in syndrome-associated fusions such as Ellis van Creveld syndrome, arthrogryposis, symphalangia, diastrophic dwarfism, Turner's syndrome.

With movement lost between the fused bones, compensatory increase in motion at surrounding joints along with stretching of soft tissue restraints predisposes to recurrent sprains causing pain under stressful conditions. Occasionally this may also result in carpal bossing – “an overgrowth of bone in response to stress”. A fused bone is also more exposed to the risk of fracture with subsequent cyst formation and pseudo arthrosis. Persistence of grooves, notches and cavities at the site of fusion appears to be a factor contributing towards fracture [5].

Coalition among the various carpal bones is seen in any possible combination occurring either as an independent entity or in association with syndromes and metabolic disorders. An absence of joint cavitation in the embryo and chondrification of the joint inter-zone leads to

this phenomenon of carpal synostosis. A wide geographic variation in the incidence of carpal fusion is seen underlining the involvement of genetic factors, the trait being transmitted as Mendelian dominant factor (not sex linked). Though mostly asymptomatic and thus usually a chance finding discovered on radiographs taken for unrelated reasons these may be associated with symptoms due to loss of movement between the fused bones. Stretching of the surrounding soft tissues leads to sprain causing pain, fractures are common and at times carpal bossing may also occur [6].

Stanley M Garn et. al. in their study found that fusion of the centres of the triquetral and lunate was observed in 1.6% of 7,543 subjects primarily of African origin as compared with 0.1% of 11,663 persons of European origin. The fusion was twice as common in females as in males, multifactorial inheritance was suggested in the lineages studied, and a possible selective disadvantage was postulated after comparison with West African fusion frequencies. Fusion of the os triquetrum and the os lunatum is not associated with other fusions, other carpal-metacarpal phalangeal abnormalities nor size reductions, though such associations may be observed in other single-gene substitutions, chromosomal abnormalities and in dysmorphogenesis [7].

CONCLUSION

Our patient's pattern of coalition represents a unique case, being especially in a healthy individual and not as part of a syndrome. Lunate - triquetral fusion is mostly an asymptomatic condition. It may present symptoms by virtue of alteration of the normal biomechanics of the wrist or developmental abnormality, thus predisposing the contributing joints and the surrounding soft tissues to abnormal stress. As a result of fusion widened gap between the lunate and scaphoid may be seen, which is a normal variant and should be confused with scapho-lunate instability. Treatment is rarely required for the asymptomatic cases. Clinicians should recognize this coalitions (or carpal coalitions in general) could be a part of syndromic manifestations. Multiple radiographs may be required for proper diagnosis.

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