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### RESEARCH ARTICLE

#### CASE SERIES OF COMPLICATIONS ASSOCIATED WITH WRIST CENTRALIZATION IN RADIAL CLUBHAND.

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#### Manuscript Info

#### Abstract

#### Manuscript History

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#### Introduction:-

Congenital longitudinal deficiency is divided into radial and ulnar deformities. Radial is more common than ulnar. Radial club hand is a congenital deformity of partial or complete absence of radius due to malformation of preaxial border of the upper limb. It is characterized by deviation of radius and short forearm. More than half of radial clubhand occur bilaterally, and the incidence is more in males.

#### Case 1:-



This is a case of 9 year old primii child who was born with bilateral forearm deformity and absence of thumbs. He is a product of uncomplicated spontaneous vaginal delivery with no evidence of prenatal screening.

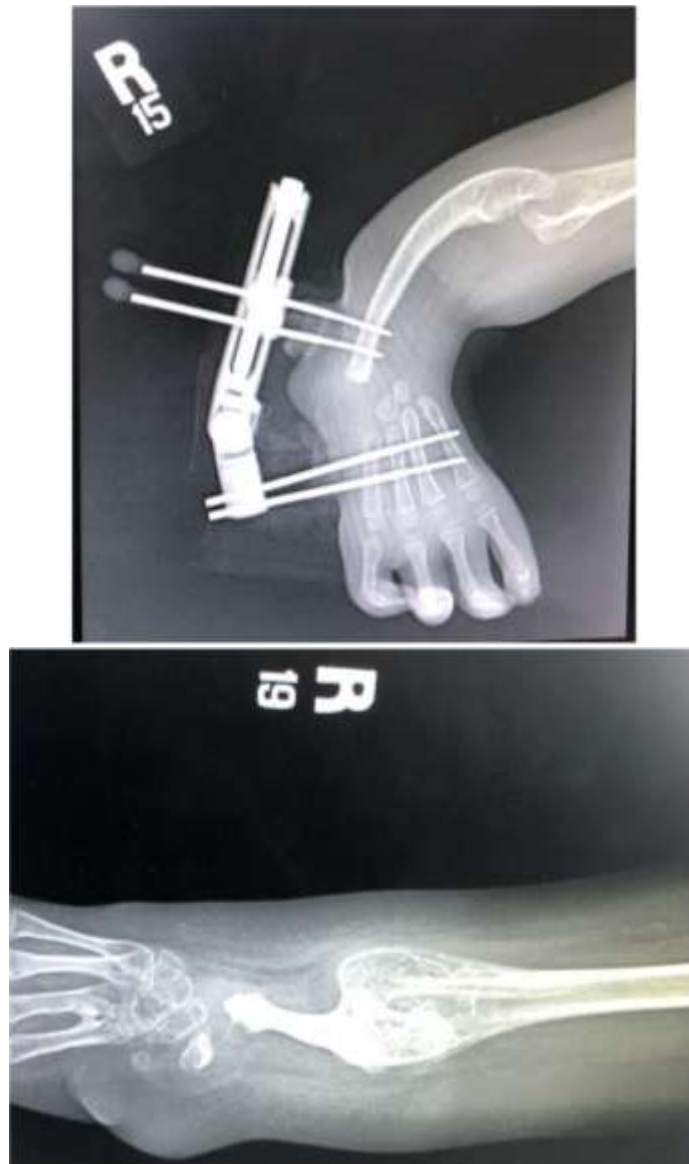
The patient had been thoroughly investigated after birth, for which he had ultrasound of abdomen, he had normal size left ectopic kidney. Also he had echocardiogram that showed small patent ductus arteriosus, and abnormal vertebra at L3. He was 8 month old in his first visit to orthopedic surgery in October/2009.

On examination: No obvious dysmorphic features. He had normal looking face and cervical spine with no abnormal or hair dimples or any clinical scoliosis. His hips were both stable with full range of motion, normal knees, legs and

feet. Local examination of the upper limbs revealed he had bilateral good shoulder and normal contour and movement, but there was obvious bilateral shortening of the forearm and radial deviation of both wrists and bowing of ulna on both sides with complete absence of the thumb on both sides. Forearm x-ray showed revealed he had bilateral complete absence of radius and also bilateral complete absence of the thumb.

Patient was diagnosed with grade IV radial clubhand. The management began immediately with stretching exercises and brace supplementation then centralisation of wrist after 1 year of age. 18 months later, centralisation of the right ulnar bone with the right was done, and the patient tolerated the procedure without complication then he was put on slab postoperatively. Follow-up was 2 months after the date of discharge, and there was migration of K-wire that protruded from the distal part of the wrist. It came from metacarpal bone for which the K-wire was removed under aseptic technique in the clinic. Meanwhile, he was put in splinting because there was 30% of callus formation around the osteotomy part which was done during wrist centralisation. He was seen again in clinic after 8 months, and the follow-up x-ray revealed completely healed bone but the deformity recurred for which the parents were offered to redo centralisation of the right wrist. Surgery was redone in October/2012, and he was put in above right elbow cast and bivalved. Patient was admitted on October/2017 for removal of k-wire of right hand and forearm due to the breakage of k-wire.

#### Case 2:-



15-year-old Saudi female a product of spontaneous delivery, full term birth weight was 2.5 kg. Patient was referred to king Faisal specialist research center from Asir central hospital she was diagnosed at birth with syndromic bilateral club hand. She had type 4 isolated radial club hand. Patient had no family history of same condition. All of her siblings were doing well. Past surgical history tracheoesophageal fistula repair. Patient was born with one kidney. On examination generally she looked good, right upper limb showed shoulder muscle atrophy, but normal joint. Elbow range of motion between 10 to 110 degrees. Supination and pronation 0 and bowing of ulna and shortening. The wrist is subtle and the right thumb is absent.

This patient underwent external fixator application for traction at the right forearm on June 2006. She was discharged. After that patient underwent removal of external fixators and centralization of the right wrist on September/2007. Postoperatively patient was doing well no complications. She had a follow up after 6 weeks. This procedure failed to reach full correction due to distal circulation compromise.

Patient had recurrent deformity because the k-wire was accidentally removed and the progress was lost. Patient was admitted on October/2007 for a redo of her right radial clubhand. She was doing well postoperatively. Patient was put on full cast above the elbow at 90 degrees. Patient was admitted electively for k-wire removal of right hand on March/2010. Patient developed malunion of the ulna bone and no further treatment was done for her.

### Discussion:-

Radial clubhand is a congenital deformity of partial or complete absence of radius due to malformation of preaxial border of the upper limb, and characterized by deviation of radius and short upperlimbs<sup>12</sup>. Half of radial clubhand occur bilaterally<sup>3</sup>. Radial clubhand is considered as the most common longitudinal malformation, although it is a rare condition. It occurs once in every 20,000 livebirths, and it is slightly more common in males<sup>4</sup>. The deformities can be either associated with multiple congenital defects or syndromes such as VACTERL, or sporadic and less commonly inherited<sup>5</sup>.

Radial clubhand deformity was classified by Bayne into four grades according to the radiological findings: grade I: short radius with the presence of the distal growth plate; grade II: hypoplastic radius with absence of the distal growth plate; grade III: partial absence of the radius, and the most severe grade IV: complete absence of the radius with abnormal ulnar curvature<sup>6</sup>.

Selection of treatment modality of radial clubhand is based on the severity of the deformity, and the age. For type I and II, which considered mild types, treatment modality bone lengthening with temporary external fixation of the wrist, or conservatively by splinting<sup>7</sup>.

Surgical correction by hand centralisation is the treatment of choice for radial clubhand in type III and IV<sup>8</sup>. It is usually done after 1 year of age, and delaying the intervention will make it more complex and challenging to correct<sup>9</sup>. Prior to surgery, muscle stretching is beneficial in correction of ulnar malalignment for successful centralisation, starting immediately after birth then splinting after maturity of the forearm, but conservative treatment is not helpful in late presentation or after two to three years of age<sup>10</sup>. Unfortunately, more than 45% of

<sup>1</sup>James MA, Green HD, McCarroll HR, Jr, Manske PR. The association of radial deficiency with thumb hypoplasia. *J Bone Joint Surg Am.* 2004;86(10):2196–2205.

<sup>2</sup>Walia JPS, Singh R, Sareen S et al. Radial club hand: a case report. *Indian J Orthop* 2006;40:267–8 doi:10.4103/0019-5413.34511

<sup>3</sup>Louis S, David W, Selvadurai N. *Systems of orthopedics and fractures*. 9th edn Hodder Arnold, Hatchet UK Company, 2010:386–8.

<sup>4</sup>Eklom AG, Laurell T, Arner M. Epidemiology of congenital upper limb anomalies in 562 children born in 1997 to 2007: a total population study from Stockholm, Sweden. *J Hand Surg Am.* 2010;35(11):1742–1754.

<sup>5</sup>Radial Clubhand Treatment & Management. **Medscape**, 2015. <http://emedicine.medscape.com/article/1243998-treatment> (accessed 30 Jan 2018).

<sup>6</sup>Bayne LG, Klug MS. Long-term review of the surgical treatment of radial deficiencies. *J Hand Surg Am.* 1987;12(2):169–179.

<sup>7</sup>Lamb DW. Radial club hand: a continuing study of sixty-eight patients with one hundred and seventeen club hands. *J Bone Joint Surg Am.* 1977;59(1):1–13.

<sup>8</sup>Manske PR, McCarroll HR, Jr, Swanson K. Centralization of the radial club hand: an ulnar surgical approach. *J Hand Surg Am.* 1981;6(5):423–433.

<sup>9</sup>Golfarb CA, Manske PR, Busa R et al. Upper extremity phocomelia reexamined: a longitudinal dysplasia. *J Bone Joint Surg Am* 2005;87:2639–48 doi:10.2106/JBJS.D.02011

cases are prone to recurrence after surgical correction<sup>11</sup>. In addition, centralisation procedures result in physeal injuries that can worsen it is proved that patients who underwent centralisation grew almost half of the normal ulnar length, while 64% of normal ulnar length<sup>1213</sup>. With these challenges and difficulties in treatment of radial clubhand, seeking other alternative treatment choices with less complications is necessary today.

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<sup>10</sup>Kotwal PP, Varshney MK, Soral A. Comparison of surgical option and non operative management for radial longitudinal deficiency. J of Hand SurgEur Vol2012;37:161–9 doi:10.1177/1753193411413070

<sup>11</sup>Shariatzadeh H, Jafari D, Taheri H, Mazhar FN. Recurrence rate after radial club hand surgery in long term follow up. J Res Med Sci. 2009;14(3):179–186.

<sup>12</sup>Heikel HV. Aplasia and hypoplasia of the radius: studies on 64 cases and on epiphyseal transplantation in rabbits with the imitated defect. Acta OrthopScand Suppl. 1959;39:1–155.

<sup>13</sup>Sestero AM, Van Heest A, Agel J. Ulnar growth patterns in radial longitudinal deficiency. J Hand Surg Am. 2006;31(6):960–967.