



FUNCTIONAL OUTCOME OF PATIENTS WITH CONGENITAL RADIOULNAR SYNOSTOSIS TREATED WITH ROTATIONAL OSTEOTOMY

Orthopaedics

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KEYWORDS

INTRODUCTION

Congenital radio ulnar synostosis (CRUS) is one of the most common congenital disorders affecting the elbow and forearm, with the forearm being fixed in a range of positions usually varying from neutral rotation to severe pronation. The deformity shows a bilateral affection in 60% of cases. The deformity was originally described by Sandifort in 1793. CRUS can be associated with syndromes, chromosomal disorders and other abnormalities of the upper limb. Shoulder and wrist joints usually compensate for any functional deficit in cases of mild deformities, whereas activities of daily living can be severely diminished in fixed pronation deformities of a higher grade or whenever bilateral involvement is present. The deformity is classified on the basis of the presence of an osseous synostosis and the location of the radial head into four categories. The deformity can be managed by either no surgery in cases where the forearm is fixed in a useful, functional position, mobilization surgery, which excises the bar and the created space is filled by a tissue such as fat or fascia, and corrective (rotation) osteotomy, which places the forearm in a more functional position. The latter is currently the most preferred according to the literature. In such cases undergoing osteotomy, there is improvement in functional activities aided by the compensatory action of the shoulder and wrist joints. In contrast, the motion of the forearm after undergoing mobilization surgery is usually around 82 degrees, ranging from 45 to 110 degrees. Kanaya et al. Devised an innovative procedure combining both modalities, with a free vascularized graft placed between the bones after synostosis excision followed by a proximal osteotomy through the synostosis; however, the results of this procedure were rather mediocre and have not been replicated by other studies. Jones et al., however, performing a similar procedure in a case with a posttraumatic synostosis, observed a good result with full forearm motion 3 years postoperatively. In general, osteotomies can be performed proximally at the level of the synostosis, distally in the radius, or as a double-level osteotomy. According to the literature, bone fixation is most often performed using K-wires or plates. Several complications such as loss of correction, nerve palsies and compartment syndrome have been reported.

The aim of this study, apart from a systematic review of all various surgical procedures described for CRUS so far, is to find out the efficacy of two level osteotomy in CRUS with dominant forearm fixed in mid-prone and non- dominant forearm fixed in 30 degree supination in South Indian population.

MATERIALS:

20 Patients with congenital Radioulnar Synostosis with Age less than 12 years, bilateral involvement, Clinical diagnosis is confirmed with X-Rays. Patients with congenital Radioulnar Synostosis with fixed Pronation Deformities with restriction In Activities of Daily Living (ADL) who need surgical deformity correction are taken up for study.

Methodology:

A retrospective study of patients operated in our Institute between 2015 to 2019 with minimum 3 year follow up are taken up for study. First the Deformity is assessed clinically and the degree of fixed pronation is noted, the functional fixed deformity (after to and accounting for compensation by hypermobile wrist joint) is noted, then the amount of correction required is calculated as follows

DOMINANT HAND	NON DOMINANT HAND
90 degree (–) degree of fixed pronation	120-degree supination (–) degree of fixed pronation

Only bilateral cases are included in our study since in unilateral cases the function of uninvolved forearm could significantly affect the postoperative functional score. And all cases had a preoperative functional scoring less than 14 and only patients with poor score were selected for surgery. The Osteotomy is done in ulna at a level just below the synostosis mass and in radius at a level corresponding to the junction of proximal 2/3rd and distal 1/3rd. The final amount of correction required is not corrected at the time of surgery to avoid compartment syndrome. Immobilization is done with POP. After 2 weeks under general anesthesia rotational deformity is corrected fully and cast is applied in the fully corrected position and left for 4 weeks. After 4 weeks cast is removed and union is confirmed with x – rays and the Functional Outcome is assessed using the following parameters

HYGEINE AND SELF CARE (5 variables)	FEEDING (5 variables)	ENVIRONMENTAL FUNCTIONS (4 variables)
1. Face washing 2. Brushing 3. Toileting 4. Fastening Shirt buttons 5. Wearing Pants and zipping	1. Drinking Liquids with a Tumbler 2. Using a knife 3. Holding a Bowl 4. Using spoon 5. Eating with Right hand (Taking Food to mouth)	1. Using Mobile phones 2. Writing 3. Turning Book Pages 4. Riding Bicycle
Assessment: 0 - not able to perform the function 1 - Able to perform with minimal difficulty 2- Able to perform with ease		
Outcome Grading: 21-28 : Excellent 14-20: Good Less than 14 : Poor		

RESULTS:

The maximum achievable functional score in our study is 28. The average age at surgery is 3.8 years ranging from 3 to 8 years. The average degree of deformity is 70 degree of fixed pronation. All cases achieved good union at the end of 6 weeks there are no cases with nonunion. Malunion occurred in all our cases since we did not use k-wire for internal fixation, but good remodeling was seen in the cases with more than 5 years follow up. There were no cases with surgical site infection. 80 percentage of our cases (16 cases) had excellent functional outcome and 10 % had good results and remaining 10 % had poor outcome.

DISCUSSION:

If the forearm is fixed in pronation, accessory movements of the shoulder do little to bring the hand into a position of functional supination. Surgery is desirable for any forearm that has a fixed pronation deformity of more than 60°. The ideal position in which to place the forearm for surgical correction of radioulnar synostosis has been the to of much discussion. Custom and culture will also influence the optimal forearm position. In Western countries, for example, knives and forks are used for eating, and full supination of the forearm

is unnecessary for this, whereas in Asian countries, the rice bowl is held with the nondominant hand in a supinated position, and chopsticks are used with the dominant hand in a supinated position. If, however, an individual grasps the rice bowl in a pronated position, this behavior is considered bad manners. An important factor to be considered in the choice of forearm and hand position is the relationship of shoulder motion to the hand. A hand in supination can perform most tasks that require supination, and yet, when in a forward working position with a flexed elbow, it can attain a degree of functional pronation by controlled amounts of internal rotation, flexion, and abduction at the shoulder.

Conversely, if the hand is in pronation in the forward working position, substitution of shoulder motion is of little help for placing the hand in a position of functional supination. Because we consider it very important for an individual to have the ability to wash the face or scoop up water with both hands using full supination in daily life, the south Indian population have clear distinct functions for the right and left hand. The right hand is used predominantly for

1. Eating
2. Holding a tumbler to drink
3. Writing
4. Turning pages
5. Receiving
6. Grooming Things

The Left hand is mainly used for Toileting purposes and in bimanual Functions Like buttoning the shirt, zipping pants, driving and cooking purposes. the literature recommendation ns of optimal positioning available till date are mainly based on the needs and customs of western population the varying customs demanded further investigations for optimal positioning based on local population and their needs.

In our study 80% had excellent results and 10 % had good results. Their activities of daily living improved by an average of score 8. The poor results in 2 patients is attributed to loss of fixation Surgery was done and again they had good functional outcome. Xinjian Pei and Jiuhui Han reported the overall complication rate as 9.7%, they performed osteotomy at synostosis site and used locking plates for fixation. In our study avoiding hardware for fixation led to less operative time and massive reduction in complication rates related to pin tract infection and plate (Nerve palsy, compartment syndrome). The malunion that was originally seen gradually remodeled after 5 years.

Liverpool elbow score, QDASH and Failla scoring systems were used to gauge the results, which showed statistically significant improvement post-surgery. In our study we designed a specific scoring system based on the functional needs and customs of south Indian Population. We suggest that this scoring system can help in better assessment of outcomes after surgery in south Indian Population

1. Degree of correction required
2. Technique of osteotomy
3. Hardware usage
4. Functional improvement
5. Degree of correction and final corrected position required in Indian population

CONCLUSION:

Double level Osteotomy without internal fixation with the dominant Forearm fixed in Midprone and Non-dominant forearm fixed in 30degree supination gave a good functional outcome. We recommend our scoring system to assess the functional outcome after surgery in South Indian population.

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