Abstract: Congenital radioulnar synostosis is a rare congenital anomaly involving radius and ulna, most commonly the proximal ends. The movements between radius and ulna are restricted and the forearm is fixed. It is mostly bilateral with familial predisposition. There are two groups of surgical procedures described for treating this condition. One group comprises surgical procedures which are aimed at mobility of the forearm and other group includes procedure with an aim to improve the fixed position of forearm rotation to a functional one. We present two cases for which excision of Synostosis mass with Interposition of Distally based Pedicled Fat Graft done. It provides forearm rotation ranging from 50 to 80 degrees. In one of our cases this procedure restores 20 of supination to 60 degrees of pronation from preoperative fixed 10 degrees of supination of forearm. We found that use of a pedicled fat graft as an interpositional material provides useful range of rotation of forearm in cases where the position of fixed rotation is minimal (less than 20 degrees).

Keyword: radioulnar synostosis, Pedicled Fat Graft

Introduction: Congenital radioulnar synostosis is a rare anomaly when failure of segmentation of the radius and ulna results in a fixed position of the forearm. There is delay in diagnosis due to hypermobility of radiocarpal and midcarpal joints which disguises the disability.

There are two groups of surgical procedures described for treating this condition. One group comprises surgical procedures which are aimed at mobility of the forearm and other group includes procedure with an aim to improve the fixed position of forearm rotation to a functional one.

Materials & Methods:

We present two cases treated with Excision of Synostosis mass with Interposition of Distally based Pedicled Fat Graft aiming mobility of the forearm. The inclusion criteria is deformity of the forearm less than 20 degrees of supination or pronation with functional deficit and age less than 12 years.

Surgical technique: Through Posterolateral incision, along the subcutaneous border of ulna, extending obliquely and proximally for about 5 cm over the posterolateral aspect of arm. The anconeus was detached from the ulna and reflected proximally. An area of synostosis was identified and resection of synostosis was completed. Then a rectangular local fat flap around 4x5 cm bases on distally bases pedicle was reflected. The fat graft was brought to the distal part of the incision and interposed at the excised area of synostosis. The interposed fat graft was retained in position by stitches taken through the graft and drill holes in radius and ulna using 2-0 vicryl. Wound closed in layers and sterile dressing applied.
3. Excision of synostosis mass

4. Harvesting distally based pedicled fat graft

5. Interposition into the defect & retention of graft by sutures taken through drill holes in the bone.
   
   Post operative follow up:
   Elbow immobilized in POP cast for 3 weeks. Then POP removed and mobilization exercises started. Patients were followed up every 3 months and range of motion regained recorded and radiographs taken to look for maintenance of interosseous space.
   
   Case 1: 8 years old girl
   Pre op radiograph:

   Radioulnar synostosis: Wilkie type 1 - Forearm fixed in 10 degrees of supination

   6 months follow up pictures:

   20 degrees supination

   60 degrees pronation

   Maintenance of gap between proximal radius and ulna

   Case 2: 6 years old boy
   Pre op Radiographs:

   Synostosis mass: Wilkie type 1 - AP view

   Lat view
   Post op radiographs:

   Excised Synostosis mass: AP view

   Lat view
Results: First patient presented with fixed forearm rotation of left hand in 10 degrees of supination preoperatively with difficulty in using the hand for personal hygiene. Postoperatively she regained an active range of movement from 20 degrees of supination and 60 degrees of pronation at 6 months follow up.

Second patient presented with fixed 20 degrees of pronation of right forearm with difficulty in writing and taking the hand to mouth preoperatively. This patient underwent the same procedure, and the patient is in post operative followup and undergoing physiotherapy and the results are awaited.

Discussion:
Congenital proximal radioulnar synostosis is a rare congenital anomaly. Sachar et al. noted approximately 350 cases in the literature. 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 7th week of development. The resultant bridge may be fibrous or bony.

Wilkie classified this condition into two types. Type 1, a true bony fusion in which the radius and ulna are smoothly joined proximally for a variable distance and type 2 in which there is congenital dislocation of the radial head with the synostosis just distal to the proximal radial epiphysis.

Two groups of surgical procedures have been described for this condition. One group consists of surgical procedure with an aim to restore forearm rotation. These procedures include Interposition of swivel prosthesis by Kelikian and Doumanian which has disappointing results, Osteotomy & interposition of soft tissues like silastic membrane (Tajima), Anconeus muscle (Mahmoud) and vascularised fascio-fat graft (Kanaya).

The other group includes surgical procedure aimed to improve the fixed position. The options are Derotational osteotomy through the forearm bones, Osteotomy at the synostosis and Ilizarov correction. Disadvantages of derotation osteotomy through the forearm bones are greater soft tissue restriction, Loss of correction during cast immobilization, Delayed bony union in late childhood cases and risk of vascular compromise. Advantages of osteotomy at synostosis mass are less soft tissue restriction while correction, extensive osteotomy site for easy fixation, good cooptation of divided ends and absence of severe postoperative complications.

Gill et al. found that pedicle fat graft was better than the free fat graft not only for the prevention of scar-tissue formation but also for the prevention of the bony formation in cases of laminectomy. This has been quoted in the Kanaya et al study, who used the free vascularized fat grafts as the interposing tissues to prevent recurrent ankylosis. Muneaki ABE et al study on mobilization of congenital radioulnar synostosis with interposition of pedicled local fat graft on 2 adults and 7 children with congenital radioulnar synostosis showed a preoperative ankylosed forearm in pronation in all patients obtained arc of rotation of avg 64° (supination 20° and pronation 43°) at an average followup of 5 years. There was no re-ankylosis between the separated radius and ulna radiographically. They concluded that interposition of pedicled local fat graft would be a simple and useful procedure for keeping the space after separation of congenital radioulnar synostosis.

Fuminori KANAYA et al in his study on mobilization of a congenital radioulnar synostosis with a free or a pedicle vascularized fascio-fat graft on 51 forearms of 48 patients (26 free, 25 pedicled) showed preoperative ankylosed forearm obtained average rotation of 81.6° (supination 20.7° and pronation 60.9°) in free graft patients and obtained average rotation of 75.4° (supination 25.4° and pronation 50.0°) in pedicled graft patients with 3 cases of re-ankylosis. They concluded that the mobilization procedure prevented re-ankylosis after separation and provided the ability to rotate the forearm which improved the child’s daily activities. We used distally based pedicle fat graft based on posterior interosseous recurrent vessels to fill the space created by separation of the radioulnar synostosis and to avoid recurrent ankylosis and scar formation. The results of our cases correlated well with the above mentioned studies.

Conclusion:
In summary, we found that separation of the radioulnar synostosis with use of a pedicled fat graft as an interpositional material provides useful range of rotation of forearm in cases where the position of fixed rotation is minimal (less than 20 degrees).

References: