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RESEARCH ARTICLE

CLINICAL OUTCOME OF DOME OSTEOTOMY IN CUBITUS VARUS DEFORMITY DUE TO S/C HUMERUS FRACTURE

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ABSTRACT

Cubitus varus (gunstock deformity) is the most common complication of supracondylar fracture of the humerus. Several osteotomies and various fixation techniques are described for its correction. The most commonly used is the lateral closing-wedge osteotomy, also known as French osteotomy with variable results. Persistent lateral condyle prominence leads to cosmetically unacceptable appearance and poor patient satisfaction. To avoid this problem, dome osteotomy is performed. We have evaluated results of dome osteotomy in our population. **Material and Method:** This was a retrospective study carried out in our institute. Ten patients with cubitus varus treated by dome osteotomy were evaluated at 24 months. All patients were operated by triceps-splitting approach. Pre- and postoperative carrying angle of elbow range of motion, and lateral condyle prominence index were compared according to Banerjee criteria.**Results:** Ten patients with average age of 9.1 years were followed up for 2 years. mean gap between injury and surgery was 15 months. Postoperative improvement in carrying angle and lateral condylar prominence index was significant. One case developed ulnar neuropraxia, which recovered fully within 2 weeks. Pin tract infection was seen in three cases and skin infections in two cases. **Conclusion:** Dome osteotomy is a technically demanding surgery. The functional and cosmetic correction is better compared to that for French osteotomy.

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INTRODUCTION

Cubitus varus or "gunstock deformity" is a common long-term complication of supracondylar fracture of humerus in children. It is a triplanar deformity due to medial rotation, medial angulation, and hyperextension of distal fragment. The deformity is usually static in case of pure metaphyseal injury. whereas it is progressive due to medial physeal arrest. Lateral condyle prominence (LCP) of distal humerus is the main cosmetic concern of the patient undergoing surgery for cubitus varus. Several surgical techniques such as lateral close wedge. medial open wedge, and step-cut osteotomies are performed with variable results. (Kumar, 2014; Gwark, 2016; Kanaujia, 1988; Akhtar, 2015; Kumar,. 2000; Wong, 1990; Davids *et al*., 2011; Pankaj *et al*., 2006; Raney *et al*., 2012; North *et al*., 2016). The correction of LPC is inadequate in wedge ostgeotomies. (Raney *et al*., 2012; Cho *et al*., 2009), Several authors evaluated the results of dome osteotomy and reported good results (Verka *et al*., 2017; Kumar, 2014; Gwark, 2016; Kanaujia, 1988; Akhtar, 2015), (Pankaj *et al*., 2006; North *et al*., 2016; Banerjee *et al*., 2012). We conducted the present study to evaluate the results of fixation technique in dome osteotomy.

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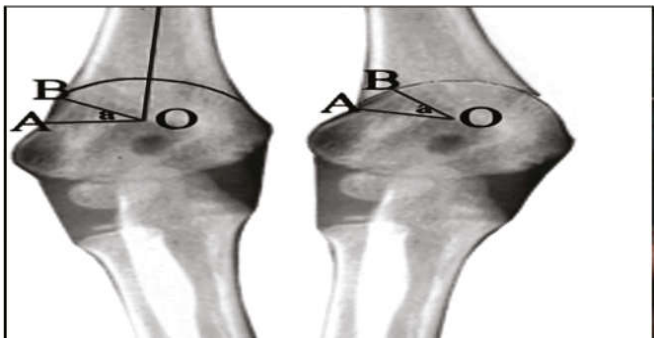
MATERIALS AND METHODS

This was a retrospective study conducted in a tertiary level teaching hospital for 3 years. Ten children of more 5 years of age with nonprogressive cubitus varus were included. Patients with congenital deformity. sepsis around elbow joint , multiple injuries, neurological disorder, and metabolic disorders were excluded. The patients were clinically examined for carrying angle . range of motion, and neurological status of the limb. The radiological assessment was performed by measuring carrying angle and lateral condyle prominence index (LCP) was measured as described by wongetal. Banerjee scoring criteria was used for evaluation of results . preoperative planning was carried out with X-rays, anteroposterior and lateral view, of both elbows. in all patients, humerus-elbow-wrist angle was measured on both the sides and the correction needed was calculated.



Surgical Procedure: After preoperative planning, informed consent, and pre anaesthetics check-up fitness, surgery was planned under general anesthesia. The patient was placed in lateral position with arm supported with sandbag and forearm hanging with elbow at 90^0 flexion. Pneumatic tourniquets were used midline posterior incision was given, and triceps-splitting approach was used in all cases. Ulnar nerve was identified, exposed, proximally, and protected with wet gauze during the operation. the perichondrium-periosteum junction was identified, which is present just above the lateral condyhlar cartilaginous area in the distal humerus. Thick portion of periosteum was deatached carefully to avoid trauma to perichondrium and physis. Preoperatively, angle to be corrected was measured by goniometer and template was made by (stainless steel) s-s wire and autoclaved. preoperatively drawn template of s-s wire was placed over the posterior aspect of the humerus to match OA line with the periosteum-perichondrium junction of the distal humerus of lateral side. Point "A" Point "B" and the dome of the osteotomy were then marked with help of cautery. During the osteotomy. the neurovascular bundles in the anterior cubital fossa wrere protected carefully. Multiple drill holes were made along. The marked osteotomy site by drilling through the anterior and posterior cortices of the humerus. and osteotomy was completed with a narrow osteotome. Distal fragment was then rotated along the arc till points "A" and "B" overlapped, Clinically, the elbow was assessed for correction. osteotomy site was fixed with 3.5 mm narrow DCP, recon plate or K-wires.

Follow-up: At 3 weeks plaster slab and stitches were removed, and gentile active elbow movement was encouraged. K- wire were removed after 6 weeks. Clinical and radiological assessments were done at 6 weeks, 12 weeks, 6 months, 12 months, 18 months, and 24 months

RESULTS

Ten children (seven males, three females) with cubitus varus were enrolled for the study. Average age was 9.1 years (range,6-15years) Left elbow was involved in six (60%) and right elbow in four (40D%) children. Mean time gap between injury and surgery was 15 months (range. 10-20 months). Preoperative carrying angle of normal side ranged from 8" to 14" (mean,10.4^0) and affected side ranged from -24^0 to -15^0 (mean, -20.1^0) Postoperative carrying angle was 6^0 -10^0 (mean $+8.2^0$) Preoperative LCPI ranged from 2.5% to 4.5% (mean, 3.5%). Postoperative LCPI was 2%-2.7% (mean, 2.3%) There was no loss of range of motion postoperatively. One case had ulnar neuropraxia in the early postoperative period, which recovered fully within 2 weeks. Pin tract infection was seen in three cases and skin infection in two cases. The lesion healed with oral antibiotics and dressing. As per Banerjee criteria, all patients showed excellent to good results. No patients had poor outcome.

DISCUSSION

Cubitus varus is a common delayed complication of supracondylar fracture of humerus in childhood . Untreated cubitus varus has no effect on the function of elbow; hence, it is usually ignored.

However, it has a definitive impact on cosmetic apperance. Males are mostly affected as seen in the present study, though some studies have an equal incidence in males and females (5),(6) it may be due to more outdoor activity in males. In the present study. majority (70%) of the cases were from rural areas. Most of these patients were treated conservatively in rural setup due to late reporting and poor financial condition. This leads to high incidence of cubitus varus in patients from rural areas. in the present study, left side was more commonly involed as compared to right side. This is in accordance with the reported classical feature of the supracondylar fractures that mostly occure on nondominat limb. Owing to cosmetic concern, several types of osteotomies are described for correction. (Verka *et al*., 2017; Kumar, 2014; Gwark, 2016; Kanaujia, 1988; Akhtar, 2015; Kumar,. 2000; Wong, 1990;

Davids *et al*., 2011; Pankaj *et al*., 2006; Raney *et al*., 2012; North *et al*., 2016; Cho, 2009; Banerjee, 2012). Most commonly performed is lateral closing-wedge osteotomy. The results of closing wedge have been variable as seen in literature (Raney, 2012; North, 2016) most common problem with lateral closing-wedge osteotomy was persistent LCP (Wong, 1990) This was first quantified by. Wong *et al*. (1990)

Because the axis of correction should pass through the center of rotation of angulation (CORA) for realignment of distal and proximal mechanical axis after the osteotomy, geometrically unsound correction leads to lazy s deformity. This is usually seen in case of lateral closing-wedge osteotomy. In dome osteotomy, the correction is performed from CORA, hence complete correction is achieved and LCP is less evident, (Kanaujia, 1988). Several types of dome ostotomies were described with similar results (Verka, 2017; Kanaujia *et al*., 1988; Akhtar, 2015; Pankaj, 2006; Banerjee, 2012), the technical difficulties in operation and triceps splitting are the main concerns in dome osteotomy compared to lateral closing-wedge osteotomy, (Banerjee, 2012) But proper preoperative planning and stable fixation lead to better results in dome osteotomy compared to closed wedge osteotomy (Kumar, 2014; Gwark, 2016), in our study, both K-wires and plate were used the results were better in K-wire cases, which may be due to longer osteotomy area that provides stability even with k-wires and less soft-tissue dissection. The limitations of the present study are small number of subjects, random allocation of K-wire and plate fixation and retrospective analysis, Poor reporting is the main reason for less number of cases. Compared to previous studies, the results are same except fixation method that was not studied earlier. Our study focused on fixation technique and the results were favourable for K-wire.

Conclusion

Dome osteotomy is a simple, safe, and technically better procedure for cubitus varus correction . The chance of LCP is less and yields a near-normal cosmetic outcome. K wire is the better fixation technique compared to plate fixation in dome osteotomy.

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