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Original Research article:

Conservative versus surgical treatment of Gartland type 2 supracondylar humeral fractures: observational study

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Abstract:

Introduction: Supracondylar fractures of the humerus are the most frequent fractures of the pediatric elbow, with a peak incidence at the ages of five to eight years. Extension type fractures represent 97% to 99% of cases. Gartland type II fractures can be gently reduced by pushing anteriorly on the distal fragment as the elbow is flexed to 90 degrees. Gartland type III, and flexion supracondylar fractures are treated with reduction and percutaneous K-wire fixation. Supracondylar humeral fractures are one of the most common elbow fractures among children and adolescents. Herewith we planned to study conservative versus surgical treatment of Gartland type 2 supracondylar humeral fractures in our hospital set up.

Material and methods: The present research was planned and conducted in the Department of Orthopaedics, American International Institute of Medical Sciences, Udaipur, Rajasthan, India from last 2 years retrospective analysis. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. The sample size was estimated with help of expert statistician.

We retrospectively reviewed 60 patients treated with reduction and casting and matched to 30 patients treated with closed reduction and percutaneous pining for Gartland type 2 fractures . Mean follow-up of more than 1 year patients were analyzed by an accurate clinical examination.

Results: There were no statistically significant differences in clinical exam and evaluation scales between groups. However on observational front we found group II results superior.

Conclusion: Supracondylar fracture of the humerus is a very common problem of pediatric age group and one frequently has to deal with such a fracture, with or without complication. A thorough history with a detailed clinical examination is a must. During radiographic evaluation one must not forget to verify three important points pertaining to a normal elbow: (a) On lateral view, the anterior humeral line should intersect the capitellum; (b) The head of radius should point to the capitellum in every view; and (c) Baumann's angle must be in valgus. In treatment, we should remember that a pulseless, poorly perfused hand needs an urgent reduction, not an arteriogram. It is always safer to use K-wires to maintain the reduction in case if more than 90° of flexion is required to keep the fracture reduced as there is risk of developing compartment syndrome in holding reductions beyond 90° of flexion. Even if it is a Type II fracture, when in doubt whether to fix it or not, it is better to fix as it is safe and outcomes are

good. Usage of appropriate use criteria is wise in managing these fractures as it has been quite exhaustively designed. Prognosis in case of complications or possible complications should be explained.

Keywords: supracondylar humeral fractures , Gartland type 2 treatment , Elbow fractures

Introduction:

A supracondylar humerus fracture is a fracture of the distal humerus just above the elbow joint. The fracture is usually transverse or oblique and above the medial and lateral condyles and epicondyles. This fracture pattern is relatively rare in adults, but is the most common type of elbow fracture in children. In children, many of these fractures are non-displaced and can be treated with casting. Some are angulated or displaced and are best treated with surgery. In children, most of these fractures can be treated effectively with expectation for full recovery.[1] Some of these injuries can be complicated by poor healing or by associated blood vessel or nerve injuries with serious complications.

Fractures of supracondylar humerus may be classified in a number of ways as per following:

a) Displaced or undisplaced fractures of supracondylar humerus

b) Open or close fractures of supracondylar humerus.

c) Uncomplicated or complicated fractures of supracondylar humerus (with/without neurological and/or vascular involvement).

d) Extension type (95%) or flexion type (5%).

e) Modified Gartland's staging system(8) is based on the lateral radiograph and widely used for extension type supracondylar fractures to classify further as it can help to guide treatment.

Type I fracture: Undisplaced.

Type II fracture: Displaced with angulation, but maintain with an intact posterior cortex.

II A fracture: Angulation.

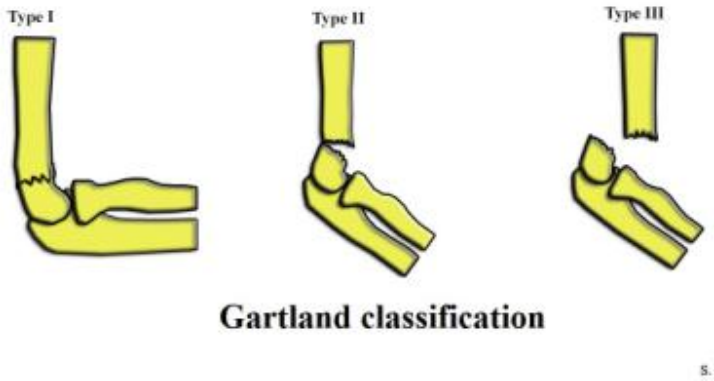
II B fracture: Angulation with rotation.

Type III fracture: Completely displaced and lack meaningful cortical contact, but have a periosteal hinge (either medial/ lateral) intact.

III A fracture: Medial periosteal hinge intact. Distal fragment goes posteromedially.

III B fracture: Lateral periosteal hinge intact. Distal fragment goes posterolaterally.

Type IV fracture: Have no periosteal hinge and are unstable both in flexion and extension i.e., they have multidirectional instability.



Gartland Type II fractures require close reduction(9). Further, these may become stable after closed reduction and casting at 90° of flexion but if more than 90° of flexion is needed to maintain reduction, then in order to minimize risks of complications associated with the increased elbow flexion, stabilization of the fracture with percutaneous pinning should be performed. In the largest reported series by Skaggs et al., in management of Type II fractures(10), they reported an extremely low rates of complication after closed reduction and percutaneous pinning; secondary operations were also uncommon (0.5%). This series demonstrated a high probability of satisfactory outcome after operative treatment of Type II fractures compared to previous studies of children treated by closed reduction without pinning(10).

Gartland type II fractures can be gently reduced by pushing anteriorly on the distal fragment as the elbow is flexed to 90 degrees. Gartland type III, and flexion supracondylar fractures are treated with reduction and percutaneous K-wire fixation.. Supracondylar humeral fractures are one of most common elbow fractures seen among children and adolescents, being about 85% of all elbow fractures.[1]Their incidence is about 177 cases per 100000 persons/year[1] and frequently affect children between 4 and 9 years of age.[2]In 97–98% of cases extension type fractures are observed[4] and a correlation between these injuries and the use of monkey bars and trampolines has been recently described.[3]

Herewith we planned to study conservative versus surgical treatment of Gartland type 2 supracondylar humeral fractures in our hospital set up.

Material and methods:

The present research was planned and conducted in the Department of Orthopaedics, American International Institute of Medical Sciences, Udaipur, Rajasthan, India from last 2 years retrospective analysis. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. The sample size was estimated with help of expert statistician.

We retrospectively reviewed 60 patients treated with reduction and casting and matched to 30 patients treated with closed reduction and percutaneous pining for Gartland type 2 fractures . Mean follow-up of more than 1 year patients were analyzed by an accurate clinical examination.

Clinical evaluation included ROM measurement (extension, flexion, total arc of movement, pronation and supination) with a goniometer of both injured and unaffected arm; hyperextension was indicated with positive values, while negative values were used for lack of extension recovery.

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Preoperative images of Gartland type 2 fracture.

Post reduction images

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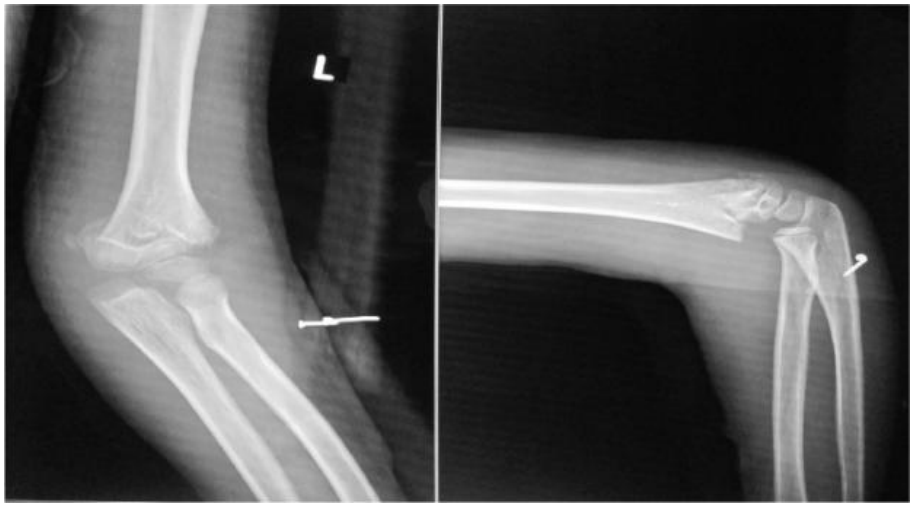

Preoperative images of Gartland type 2 fracture

Post-operative images in AP and Lateral view – Percutaneous K-wire fixation.

Results:

Mean age was 5.8 years (range 3–10 years) in group A and 5.6 years (range 4–11 years) in group B; in group A there were 51.90% males and 48.10 % females and the dominant arm was affected in 18%of cases. In group B there were 61.32% boys and 37.78 %girls and dominant arm was injured in 41.22% patients.

Mean follow-up was 12 months in conservative group and 16 months in surgical group.

There were no lesions of vascular and nervous structures and no compartment syndromes in both groups.

Overall no clinical statistically significant values noted in following parameters.

S.NO.	Parameter	P Value	Results
1	mean elbow extension	P>0.05	No significant
2	mean total arch of movement	P>0.05	No significant
3	Extension	P>0.05	No significant
4	Flexion	P>0.05	No significant
5	Pronation	P>0.05	No significant
6	supination	P>0.05	No significant

Table 1) Evaluation criteria used as prognostic indicator

In our patient sample there were no vascular and nervous lesion, as well as no compartment syndrome and no loss of reduction was observed.

Discussion:

A supracondylar humerus fracture is a fracture of the distal humerus just above the elbow joint. The fracture is usually transverse or oblique and above the medial and lateral condyles and epicondyles. This fracture pattern is relatively rare in adults, but is the most common type of elbow fracture in children. In children, many of these fractures are non-displaced and can be treated with casting. Some are angulated or displaced and are best treated with surgery. In children, most of these fractures can be treated effectively with expectation for full recovery.[1] Some of these injuries can be complicated by poor healing or by associated blood vessel or nerve injuries with serious complications.[5,6]

A supracondylar fracture occurs through the thin part of the distal humerus above the level of the growth plate. Supracondylar fractures are initially divided into two types, depending on the direction of displacement of the distal fragment: Flexion-type (rare) - distal fragment is displaced anteriorly.[7]

The present study was done in our hospital set up from last 4 years retrospective analysis. The sample size was estimated with help of expert statistician.

We retrospectively reviewed 60 patients treated with reduction and casting and matched to 30 patients treated with closed reduction and percutaneous pining for Gartland type 2 fractures . Mean follow-up of more than 4 years patients were analyzed by an accurate clinical examination.

Clinical evaluation included ROM measurement (extension, flexion, total arc of movement, pronation and supination) with a goniometer of both injured and unaffected arm; hyperextension was indicated with positive values, while negative values were used for lack of extension recovery.

Gartland type II **fractures** can be gently reduced by pushing anteriorly on the distal fragment as the elbow is flexed to 90 degrees. Gartland type III, and flexion **supracondylar fractures** are treated with reduction and percutaneous K-wire fixation.

Mean age was 5.8 years (range 3–10 years) in group A and 5.6 years (range 4–11 years) in group B; in group A there were 51.90% males and 48.10 % females and the dominant arm was affected in 18%of cases. In group B there were 61.32% boys and 37.78 %girls and dominant arm was injured in 41.22% patients.

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Mean follow-up was 12 months in conservative group and 16 months in surgical group.
There were no lesions of vascular and nervous structures and no compartment syndromes in both groups.

Conclusion:

Supracondylar fracture of the humerus is a very common problem of pediatric age group and one frequently has to deal with such a fracture, with or without complication. A thorough history with a detailed clinical examination is a must. During radiographic evaluation one must not forget to verify three important points pertaining to a normal elbow: (a) On lateral view, the anterior humeral line should intersect the capitellum; (b) The head of radius should point to the capitellum in every view; and (c) Baumann's angle must be in valgus. In treatment, we should remember that a pulseless, poorly perfused hand needs an urgent reduction, not an arteriogram. It is always safer to use K-wires to maintain the reduction in case if more than 90° of flexion is required to keep the fracture reduced as there is risk of developing compartment syndrome in holding reductions beyond 90° of flexion. Even if it is a Type II fracture, when in doubt whether to fix it or not, it is better to fix as it is safe and outcomes are good. Usage of appropriate use criteria is wise in managing these fractures as it has been quite exhaustively designed. Prognosis in case of complications or possible complications should be explained.

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