



Chairman: Andrew Howard

Lead: Mr. A. Gladstein

Attendees: Mr. J. Aird, Mr. M. Dodds, Mr. Daniel Perry, Ms. S. Van Dijck, Mr. J. Wright, Mr. U. Narayanan, Mr. A. Howard

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Theme: Management of Gartland type II supracondylar humerus fractures: to pin or not to pin

At our institution, all displaced supracondylar humerus fractures are treated with reduction and pinning. Our fellows and staff used this discussion to perform a critical review of the literature to see how these papers inform practice. Particular attention was paid to the relevance of these papers to different practice scenarios; in a resource-rich environment with no tolerance for unsatisfactory outcomes, in a resource-rich environment with budgetary constraints and an emphasis on cost-cutting, and in a resource-poor environment.

Reviewer: Ms. S. Van Dijck

Hadlow, A. T., et al. A selective treatment approach to supracondylar fracture of the humerus in children. *J Pediatr Orthop* 1996;16:104-106.

Why this paper - At our institution, all displaced supracondylar humerus fractures are treated with reduction and pinning. Our fellows and staff used this discussion to do a critical review of the literature to see how these papers inform practice. Particular attention was paid to the relevance of these papers to different practice scenarios; in a resource-rich environment with no tolerance for unsatisfactory outcomes, in a resource-rich environment with budgetary constraints and an emphasis on cost-cutting, and in a resource-poor environment.

This is a retrospective review of Gartland type II and Type III fractures treated with closed reduction and casting, olecranon traction, closed reduction and percutaneous pinning, or open reduction and pinning. The authors posit that there was a 'selective approach' to management of these fractures, with the assumption that the application of different treatment modalities was guided by patient and fracture characteristics.

Aim

- The authors plan to look back at the results of their approach to displaced supracondylar humerus fractures.
- They intended to show that satisfactory results could be obtained without treating all type II and all type III supracondylar humerus fractures with pinning.

METHODS

- Patients who had been treated for displaced supracondylar humerus fractures between 1983 and 1987 had their records reviewed.
- Outcomes were reviewed based on definitive treatment.
- Range of motion and carrying angle were reviewed.
- Results were graded based on carrying angle and loss of motion.
- Overall rating was based on the lower of these two ratings, and a varus deformity of the elbow was automatically graded as poor.

RESULTS

79 patients had their records reviewed.

Fourteen patients had type II fractures, and 45 had type III fractures.

Fifty-five patients had closed reduction and casting as definitive treatment. Thirty had excellent results, 14 had good results, four had fair results, and seven had poor results.

Seven were treated had closed reduction and percutaneous pinning. Five had excellent results, and 2 had good results.

Twelve were treated with traction. There were 6 excellent, 3 good, 2 fair, and 1 poor results.

Five had open reduction, with 3 excellent and 2 good results.

The authors state that “an initial attempt was made to match each patient’s fracture to an appropriate modality.” Had they pinned all type II and all type III fractures, they would have pinned elbows that would have had good results without surgery. They conclude that a judicious approach to surgical intervention can provide good results for patients, provided that should closed reduction and casting fail, that an alternate modality is pursued.

CRITIQUE

Strengths of the study

They show that there are a cohort of patients who will have good or excellent results with closed reduction and casting for displaced supracondylar humerus fractures.

Methodological concerns

The authors are not very clear on what prompted the change from casting to operative management. They are also not clear on how fractures were matched to the initial treatment modality.

Overall conclusion

Although they show that there is a cohort of patients who will have good or excellent results with closed reduction and casting for displaced supracondylar humerus fractures, their methodology does not allow us insight into which patients these will be. They make the statement that pinning all fractures will result in unnecessary surgery. But they allow no further insight into how a surgeon would be able to select which patients will do well non-operatively. In a resource-rich environment, where even the occasional poor outcome would not be tolerated, this paper does not help guide practice. In an environment with modest budget constraints, this paper is not a convincing argument against pinning all displaced fractures. In a resource poor environment, this paper may lend credence to a more selective approach.

Reviewer: Mr J Aird

Moraleda L, et al. Natural history of unreduced Gartland type-II supracondylar fractures of the humerus in children: a two to thirteen-year follow-up study. *J Bone Joint Surg Am* 2013;95:28-34.

Introduction: This study was based on a retrospective review of notes between 1990 and 2009 at a University hospital in Madrid. Patients who met the inclusion criteria were invited to come in for a clinical examination and radiograph. Inclusion criteria were Gartland type 2 fractures in which no attempt at reduction had been made, with at least two years of follow-up. Clinical and radiographic outcomes were assessed.

Aim

- The purpose of this study was to evaluate the clinical and radiographic outcomes of patients with type 2 supracondylar humerus fractures who were treated without reduction.
- The authors sought to determine the fate of the elbows treated in this manner both radiographically and clinically.

METHODS

- There was no protocol as to what treatment was applied to patients.
- Individual surgeons chose management.
- Physical exam and interviews were undertaken at time of last follow-up.
- Radiographic review was done as well.
- Clinical outcome measures included the QuickDASH score, the Flynn score, and the Mayo Elbow Performance Score.
- Range of motion and carrying angle were assessed as well.
- Baumann angle and humerocapitellar angle, and carrying angle were measured on follow-up radiographs.

RESULTS

42 patients were reviewed.

15% of patients had elbow pain at the time of follow-up.

6.5% of patients had elbow instability.

Flynn criteria were excellent or good in 80% of patients, and fair or poor in 20%.

Statistically significant differences were observed for all radiographic parameters measured.

The authors conclude that although functional results are excellent in a majority of patients treated with immobilization without closed reduction, with the use of criteria employed in the study, 36.9% of patients had unsatisfactory results when radiographic and clinical factors were combined.

CRITIQUE

Strengths of the study

There is good long term follow-up in the study.

Methodology concerns

There is significant selection bias inherent in the study design. Without knowing how patients were selected for immobilization without reduction, it is impossible to generalize these results for decision making in clinical practice.

Overall conclusion

Assuming the validity of the algorithm used in this paper, a 36.9% rate unsatisfactory result seems unacceptably high to justify this treatment method. Given, however, the lack of either a comparative group or an explanation of how this treatment was chosen, it is difficult to interpret this study in terms of guiding practice. If anything, it makes a case for pinning all type II fractures to avoid unsatisfactory results. Interpretation is complicated, however, when considering the good functional results in a majority of these patients.

Reviewer: Mr. D. Perry

Skaggs DL et al. How safe is the operative treatment of Gartland type 2 supracondylar humerus fractures in children? *J Pediatr Orthop* 2008;28:139-141.

Introduction: The authors examined the safety and efficacy of closed reduction and percutaneous pinning of type II supracondylar humerus fractures. They reviewed charts and radiographs of patients with operatively treated fractures over a six-year period. They looked for complications of surgery as well as loss of reduction. They found a very low complication rate and a very low reoperation rate.

Aim

- Evaluate the safety of closed reduction and pinning of type II fractures in order to further the case for pinning all displaced fractures by showing this to be a very low-risk procedure.

METHODS

- Patients who had complete medical records and at least 6 weeks of follow-up were included.
- Radiographs and charts were reviewed for adverse events, as well as ultimate outcome based on cosmetic and functional factors.

RESULTS

All fractures healed.

There were no nerve palsies, loss of reduction, or reoperation for change in alignment.

181 patients had excellent results, 6 had good results, and 2 had fair results.

4 patients had pin site infections, with only 1 returning to the operating room for irrigation and debridement.

The authors conclude that closed reduction and pinning is safe, and leads to satisfactory outcomes in the vast majority of cases without increased complications compared to non-operative management.

CRITIQUE

Strengths of the study

This paper is about immediate perioperative outcomes, and shows that if done well in a specialized setting, that there are good immediate post-operative outcomes.

Methodological concerns

The 8-week average follow-up makes it impossible to infer any conclusion as to the long-term outcomes of these patients. However, the aim of assessing perioperative safety is reasonably demonstrated here.

Overall conclusion

Although the paper shows safety in a single-centre setting, it may not be generalisable to settings in which general anaesthesia is not as safe for children. It may not even be generalisable to a modern hospital without specialised paediatric anaesthesiologists. In a resource-rich setting, it helps promote the routine operative management of these fractures. It has less of a bearing in an intermediate-resource setting, although it still makes a good case as to the safety of this method of treatment. In a resource-poor setting without specialized paediatric anaesthesiologists, it is difficult to infer a message from this paper that would lead to implementation of its recommendations.

Reviewer: Mr M Dodds

Parikh, SN et al. (2004). Displaced type II extension supracondylar humerus fractures: do they all need pinning? *J Pediatr Orthop* 2004;24:380-384.

Introduction: A retrospective review of a series of patients who were treated conservatively for type II supracondylar humerus fractures. Treatment was conscious sedation with closed manipulation and cast application. The study was retrospective.

Aim

- To look at patients initially treated non-operatively, and to determine their overall course as well as clinical outcomes at 1 year

METHODS

- Patients treated with closed manipulation and casting were reviewed at one year of follow-up for range of motion and carrying angle.
- Their clinical and radiographic courses were also reviewed.

RESULTS

24 patients were identified whose initial treatment was closed reduction and casting.

Average age was 4 years, with average follow-up greater than 1 year.

30% of patients were brought to theatre for pinning after failure of closed reduction.

Results were good following pinning.

30% of patients failed pinning. Those who were pinned, were pinned early.

They concluded that this supports closed reduction and casting as an acceptable treatment.

CRITIQUE

Strengths of the study

There was good follow-up time in the study. It seems like there was uniform clinic follow-up for these patients in the immediate post-reduction period. Range of motion and carrying angles were measured by an observer blinded to the side of injury.

Methodological concerns

This is a very thoroughly-selected group of patients, which likely would have not have had rotationally unstable fractures. They claim that it is feasible to treat patients with closed reduction and pinning three weeks out from fracture, but do not supply any supporting evidence.

Overall conclusion

This paper gives overall marginal evidence that closed reduction with close follow-up is a good alternative to uniformly operative treatment. Patients were followed weekly for 3 weeks, which can be labour-intensive.

One third of patients ended up being treated operatively despite initial non-operative management. One might surmise that these patients were carefully selected for non-operative management based on assessment by the treating surgeons.

That renders this paper less generalisable to overall practice, as it does nothing to shed light on how those patients were selected.

Reviewer: Mr A Gladstein

Camus T et al. Extension type II pediatric supracondylar humerus fractures: a radiographic outcomes study of closed reduction and cast immobilization. *J Pediatr Orthop* 2011;31:366-371.

Introduction

This was a radiographic review of the radiographs of patients treated with closed reduction and casting for type II supracondylar humerus fractures.

Aim

- The purpose of this study was to look at the final follow-up films of patients treated non-operatively for type II supracondylar fractures.
- The authors sought to use the follow-up films to show the results of this treatment method.

METHODS

- Pre-reduction, post-reduction, and follow-up films were reviewed.
- Anterior humeral line, humero-capitellar angle, Baumann's angle, the Gordon index, and the Griffet index were measured.

RESULTS

80% of patients had extension deformity.

Mean humero-capitellar angle was 23 degrees.

The mean Baumann's angle was 80 degrees.

The mean Gordon index was 4.6%, and 56% of patients had a Griffet index greater than 3, which indicates rotational deformity.

Non-operative treatment of type II supracondylar humerus fractures resulted in radiographic evidence of sagittal plane, coronal plane, and rotational deformities in a large number of patients.

CRITIQUE

Strengths of the study

There was an extensive analysis of radiographic parameters in this study.

Methodology concerns

Radiographic imperfection may not correspond to clinical or functional imperfection. Therefore, it is difficult to interpret these results as they pertain to clinical practice. In addition, it is difficult to glean

practical lessons from this study as it does not allow insight into predicting which patients will have poor radiographic outcomes.

Overall conclusion

The clinical significance of the data presented is impossible to interpret. Analysis is strictly radiographic, with unknown clinical association. The study only analyzes of one treatment, which may have been selected over others due to factors not evaluated the way the study is constructed. This makes it difficult to apply the study results toward clinical decision-making.

There are additional local factors not discussed in these papers that would influence the decision to treat these type of fractures operatively or non-operatively. These would include local resources/budget constraints, expertise in orthopedics, expertise in anesthesia, cost of operative intervention, cost of poor outcomes, and acceptance of poor outcomes.

The risk of the procedure in an environment without expert pediatric anesthesia, may alter the risk benefit profile significantly.

CRITICAL REVIEW OF LITERATURE SUMMARY

In a resource-rich environment, universal pinning of type II fractures would be practiced by all journal club participants.

In a resource-limited environment, universal pinning of type II fractures would be practiced by the majority of participants, but two advocated selective pinning as well, as there was no compelling evidence presented at journal club that a reliably good outcome could be predicted for a patient with a type II fracture unless treated operatively.

In a resource-poor environment, a case could be made for non-operative treatment of type II fractures treated with closed reduction, with the understanding that a percentage of patients would likely have unsatisfactory radiological outcome but as a result of this treatment method.