Early versus delayed treatment of extension type-3 supracondylar fractures of the humerus in children

M. Sibinski, H. Sharma, G. C. Bennet
From the Royal Hospital for Sick Children, Glasgow, Scotland

We examined differences in the rate of open reduction, operating time, length of hospital stay and outcome between two groups of children with displaced supracondylar fractures of the humerus who underwent surgery either within 12 hours of the injury or later.

There were 77 children with type-3 supracondylar fractures. Of these, in 43 the fracture was reduced and pinned within 12 hours and in 34 more than 12 hours after injury. Both groups were similar in regard to gender, age and length of follow-up. Bivariate and logistical regression analysis showed no statistical difference between the groups. The number of peri-operative complications was low and did not affect the outcome regardless of the timing of treatment.

Our study confirmed that the treatment of uncomplicated displaced supracondylar fractures of the humerus can be early or delayed. In these circumstances operations at night can be avoided.

Displaced supracondylar fractures of the elbow in children are traditionally treated as emergencies. Early anatomical reduction and stable fixation are felt to reduce complications. Within the first few hours treatment is potentially easier with reduced operating time, easier closed reduction, a shortened hospital stay and possibly a better outcome. However, operating at night is not ideal.

Some authors have found no significant difference in complications between patients treated within eight hours of injury and those treated later.1,2 Our aim therefore was to determine if there was a difference in the rate of open reduction, operating time, length of hospital stay and outcome between patients with these fractures who were treated within 12 hours of injury and those treated later.

Patients and Methods
All children with extension type-3 supracondylar fractures of the humerus3 treated between 1999 and 2003 were identified from our departmental database. We excluded 85 patients with incomplete data, a fracture of the ipsilateral upper limb or an open fracture. We obtained full data on 77 children which included age, gender, date and time of admission and details of the operation (Table I). The duration of surgery was taken as the time from induction to leaving the theatre. The neurovascular status was recorded pre- and post-operatively. At follow-up the carrying angle and range of movement were documented. The final clinical results were evaluated according to the criteria of Flynn, Matthews and Benoit.4 A carrying angle greater than 15˚ of valgus or 5˚ of varus or loss of movement of more than 15˚ were considered to be unsatisfactory.

Children who were admitted during the daytime usually had their operation on the same day depending on resources. Those who arrived after 9 pm were admitted, a back slab applied and the arm elevated. They were booked on to the trauma list of the following morning and their operations were thus undertaken more than 12 hours after injury. A pulseless limb, open fracture, progressive neurological deficit or a compartment syndrome were indications for emergency treatment. Open reduction was performed when closed manipulation failed.

Statistical analysis. This was done using the chi-squared test and Student’s t-test (Statistica for Windows 5.1, StatSoft Inc.). Logistic regression analysis was used for multivariate analysis. A p value of 0.05 or less was considered to be statistically significant.

Results
In 57 patients, the fractures were reduced by closed means and in 20 by open reduction. Crossed pinning stabilised 42 of the fractures and two or three lateral pins were used in 35.
The mean operating time was one hour (35 to 140 minutes) and the mean hospital stay 42 hours (16 to 200). Two patients remained for longer than 72 hours for social reasons. Four children who had been treated more than 24 hours after injury, in two by closed and two by open reduction, had satisfactory results. A lesion of the median nerve was found in ten children, and a palsy of the anterior interosseous nerve in eight, of the ulnar nerve in three and of the radial nerve in two.

There were 18 unsatisfactory results in 17 patients, in 16 because of loss of movement of more than 15° and in two due to cubitus varus (one with flexion contracture). One child with cubitus varus later underwent corrective osteotomy. Avascular necrosis or compartment syndrome was not seen.

The mean injury-to-surgery interval was 11 hours (1.5 to 31) and the mean time from admission to surgery 7.5 hours (1 to 21). On this basis, the patients were divided into two groups. The first comprised 43 patients in whom reduction and pinning took place within 12 hours and the other 34 patients who were treated more than 12 hours after injury. Both groups were similar in regard to gender, age and length of follow-up (Table I). Two children underwent emergency surgery at night. One had an absent radial pulse which returned after reduction of the fracture. The other had marked swelling and tented skin which threatened breakdown.

Bivariate analysis of data between fractures treated within 12 hours from injury and those later showed no statistical difference with respect to the length of the operation, the hospital stay, the incidence of open reduction and the outcome (Table I). This was confirmed by logistic regression analysis.

### Discussion

Some authors have advocated early manipulation, claiming that, it makes reduction easier and that success is more likely. However, found no significant difference in the rate of peri-operative complications between patients treated within eight hours of injury and those treated later. However, the groups differed in the severity of displacement. Half of the patients in the delayed treatment group had initial traction and some had closed reduction in the emergency department. Similarly, Lyenag et al had no increased complications in a group of 35 children treated eight hours or more after injury.

We found no significant correlation between the increased time to operation and the need for open reduction. Also, the length of operation, the hospital stay or the rate of unsatisfactory results were not dependent on the delay in treatment. This was confirmed by bivariate and logistic regression analysis. Similar conclusions were drawn by Leet, Frisancho and Ebramzadeh.

In contrast to studies from North America, we used different time criteria. Therefore, we studied two groups of patients with a different timing of operation which fitted more appropriately into UK practice.

Our study confirmed that uncomplicated, displaced supracondylar fractures do not have to be treated at night. A delay to operation of more than 12 hours did not increase the hospital stay, the length of the operation or the incidence of open reduction. The number of peri-operative complications was low and the final outcome unaffected by the timing of treatment.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

### References


