The increasing trend in the surgical management of children’s fractures

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Childhood fractures are common and are estimated to account for up to 25% of all paediatric injuries\(^1\). In the United Kingdom (UK), the peak incidence of paediatric fractures is younger in girls (11 years) than boys (14 years). This difference may be related to the discrepancy between height gain and bone mineralisation during puberty\(^2\).

In addition, in children injured in road traffic accidents the rate of extremity fractures is higher in the obese, when compared to the non-obese\(^10\). A number of reasons for this increased fracture rate have been proposed, including the momentum effect of a greater body mass during injury, serum leptin levels and differences in gait and balance\(^11,12,13\).

In addition to the increased risk of fractures, there is concern with regard to the increase in complication rates in the obese. There is a higher incidence of decubitus ulcers and deep vein thrombosis following trauma in obese children\(^14\).

Therefore, with the potential for obese children to sustain more fractures with more potential complications, operative intervention to stabilise the fracture and allow earlier mobilisation is attractive. Unfortunately, several studies have demonstrated higher complication rates and poorer outcomes using elastic stable intra-medullary nails in children over the weight of 50kg\(^15,16\).

Litigation

A UK study\(^17\) into cases of paediatric orthopaedic trauma that resulted in litigation against the surgeon or National Health Service (NHS) Trust, identified that the most commonly mistreated/ misdiagnosed,
were injuries around the elbow, including supracondylar humeral fractures. These injuries comprised 13% of all the litigation cases. A further 3% of litigation cases resulted from intra-operative error during supracondylar fracture fixation. Wrist and forearm fractures and poor plastering or plaster removal techniques, resulting in ulceration or skin lacerations, were also common source of litigation.

Although the overall number of claims is falling, compensation resulting from litigation has increased in the NHS. It could be argued that this litigious environment may affect management decisions in children’s fractures in general, and wrist and supracondylar fractures in particular.

Operative Treatment

A population-based study from Finland between 1997 and 2006, reported that the incidence of fractures leading to hospitalisation had increased by 13.5%. This was associated with a 20% increase in fracture surgery. The majority of this increase was accounted for by the increase in upper limb surgery. Over a 10-year period, Cheng et al reported that the percutaneous pinning rates of distal radius fractures increased from 9% to 39% and from 4% to 40% in supracondylar fractures of the humerus. This trend towards increasing surgical intervention has also been seen in the management of femoral shaft fractures over a similar time period.

Management of specific fractures

We have selected three specific fractures, in which controversies in management have been identified, specifically the conservative versus surgical management.

1) Supracondylar humeral fracture (Figures 1 a & b)

Colton and Monsell have considered controversies in the management of this common injury in detail elsewhere in this issue. General observations include that there is a trend towards wire fixation. This may be a consequence of the perceived poor results from historical studies which described the treatment of supracondylar fractures by traction.

There are also clear socio-economic benefits with use of wire fixation compared to traction. Wire fixation has become the treatment of choice and in experienced hands, complication rates after surgery are low and the benefit of a short in-patient stay, make it attractive.

The ulnar nerve is particularly vulnerable during insertion of a medial wire for fixation. A mini-open approach is therefore often used, reducing the risk of direct injury. The rate of iatrogenic ulnar injury is in the region of 3.3% with use of a medial wire.

Pin site infections are uncommon (0.7% to 2.5%) in large series and usually resolve with oral antibiotics and pin removal. Wire fixation is not, however, mandatory and alternative management strategies are discussed in Colton and Monsell’s article (Page 46).

2) Diaphyseal Forearm Fractures (Figures 2 a & b)

Although satisfactory management of many forearm fractures can be achieved with closed reduction and application of a cast, re-displacement can occur in more than 30% of cases. These may require further intervention.

The incidence of forearm fractures is increasing with a trend towards surgical stabilisation of diaphyseal forearm fractures. This trend is likely to be due, at least in part, to the lower risks of re-displacement. Other relative indications for surgical stabilisation include a shorter period of cast immobilisation with a less frequent clinic follow up. With children’s trauma services becoming more centralised, patients may have to travel some distance. Close supervision of a conservatively managed fracture with frequent clinic attendances could add a significant impact on the family.
3) Femoral shaft fractures (Figures 3 a & b)

Pavlik harnesses, for the under 18 month old, and hip spicas, for the under five year olds, form the mainstay of treatment. Some surgeons use skin traction prior to definitive cast treatment when there is more than 2cm of shortening. Use of a hip spica cast can result in a number of complications including leg length discrepancy and angular and rotational malunion.

With improvements in surgical techniques and the increasing availability of a variety of orthopaedic implants, femoral shaft fractures are generally managed operatively in children over the age of five years. Age, size of child, fracture location and pattern are factors that govern the choice of technique for operative management. The choices include elastic intramedullary nails, internal fixation, either through a traditional open approach or a minimally invasive approach, external fixation and rigid intramedullary fixation.

The choice of surgical management of femoral shaft fractures in children in the over fives has undoubtedly been influenced by socio-economic factors. The shorter hospital stay is thought to have psychological, educational, social and economic advantages. An epidemiological study from Sweden demonstrated the changing trends in treatment, from traction to surgical stabilisation. The length of hospital stay reduced over the study period from an average of 26 days in 1987 to five days in 2005.

Conclusion

Fractures in childhood are common and although the incidence has been shown to be decreasing in some population studies, there has been an increasing trend towards the surgical stabilisation of fractures, in particular of the distal humerus, forearm and femoral shaft. The reasons for this increasing trend are multifactorial. Society expects a perfect result, and there is an increasing tendency to early litigation. This is perhaps best illustrated by the management of supracondylar fractures.

The surgical management of forearm fractures is also increasing and may be influenced by a desire to avoid plaster casts, which require closer clinical surveillance, are more labour intensive and are also associated with the spectre of litigation.

Surgical stabilisation of femoral shaft fractures in children over the age of five years enables the child to mobilise earlier and therefore reduces the length of hospital stay. This is beneficial to the child’s social, educational and psychological needs as well as the economic health of society as a whole.

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References can be found online at www.boa.ac.uk/publications/JTO or by scanning the QR Code.
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