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Soft cast versus rigid cast for treatment of distal radius buckle fractures in children

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ABSTRACT

Introduction: Buckle fractures are extremely common and their optimum management is still under debate. This study aimed to ascertain whether buckle fractures of the distal radius can be safely and effectively treated in soft cast with only a single orthopaedic outpatient clinic appointment.
Methods: A total of 232 children with buckle fractures of the distal radius were included in the study. 111 children with 112 distal radius fractures were treated in full rigid cast and 121 children with 123 fractures were treated with soft cast. The rigid cast children attended outpatient clinic for removal of cast at 3 weeks. Soft casts were removed by parents unwinding the cast at home after 3 weeks. Follow-up was conducted prospectively by telephone questionnaire at an average of 6 weeks post-injury.
Results: Outcome data were available for 117 children treated in soft cast and for 102 children treated in rigid cast. The most common mechanism of injury was a fall sustained from standing or running, followed by falls from bikes and then trampoline accidents. Overall, both groups recovered well. Overall satisfaction with the outcome of treatment was 97.4% in soft cast and 95.2% in rigid cast. Casts were reported as comfortable by 95.7% in soft cast and 93.3% in rigid cast. Cast changes were required for 6.8% of soft casts and 11.5% of rigid casts. The most frequent cause for changing rigid casts was getting the cast wet. None of the improved scores seen in the soft cast group were statistically significant. No re-fractures were seen in either group. Nearly all (94.9%) children in soft cast did bathe, shower or swim in their cast. Parents of both groups preferred treatment with soft cast ($p < 0.001$). Reasons given for preferring the soft cast included the ability to get the cast wet, avoidance of the plaster saw and not having to take time off work to attend a follow-up visit for cast removal.
Conclusion: Buckle fractures of the distal radius can be safely and effectively treated in soft cast with only a single orthopaedic outpatient clinic appointment.

Buckle or torus fractures are the most common forearm fractures in children.[1] Buckle fractures are stable fractures where the bone fails on the compression side. The fracture usually occurs in the transition zone between woven metaphyseal bone and lamellar diaphyseal bone.[2] They represent a significant proportion of the workload of a typical accident & emergency (A&E) department and also of the orthopaedic outpatient clinic.[3]

Treatment of buckle fractures varies from hospital to hospital. Traditional practice has been to place children in a rigid full below elbow cast for between 2 and 4 weeks. Other options used include removable pre-fabricated splints, backslabs, bandages and soft cast. A recent Cochrane review[4] has suggested that treatment of these stable fractures with removable splints could be equally effective as treatment in full plaster cast. It also states that home-removable plaster casts removed by parents did not result in significant differences in outcome but were strongly favoured by parents. In addition, other authors have stated that parents feel more confident if fractures are treated with full cast rather than bandages.[5] There has also been some concern among doctors about increased pain and re-fractures occurring in children treated without immobilisation.[6]

The aim of our study was to ascertain whether buckle fractures of the distal radius can be safely and effectively treated in soft cast with only a single orthopaedic outpatient clinic appointment. This study contains the largest reported number of children treated in soft cast for buckle fractures. We compared the outcomes of children treated in soft cast with those treated using the traditional method of 3 weeks in a rigid full below elbow cast.

Materials and methods

A total of 232 children with distal radius buckle fractures were included in this study. All attended A&E with a fracture between August 2010 and August 2011. In A&E, they were placed into a below elbow backslab and booked into the next orthopaedic outpatient appointment, which was attended between 1 and 3

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days after the A&E visit. In clinic, they were seen by an orthopaedic registrar or consultant and the radiographs were reviewed. Those attending between August 2010 and February 2011 were treated with a traditional rigid cast. Those attending A&E between February 2011 and August 2011 were treated with soft cast. Both rigid casts and soft casts were applied in the orthopaedic outpatient clinic by our orthopaedic practitioner or plaster technician. The stable nature of buckle fractures was explained to the parents in clinic and verbal instructions on cast care and removal were given. In addition, an information leaflet was provided for all parents. It was made clear that children in soft cast would not need a routine clinic follow-up visit and that the child would not be seeing the doctor again. We gave contact details for the plaster room to all parents and asked them to phone if they had any concerns. Children with rigid casts attended outpatient clinic at 3 weeks for removal of cast. Soft casts were removed at home by the parents unwinding the cast after 3 weeks.

No children were excluded from the rigid cast group. However, we did exclude children with eczema, psoriasis, skin cuts and abrasions from the soft cast group. In addition, one child with a supracondylar fracture as well as a buckle fracture in the same arm was excluded. This gave a total of 111 children with 112 distal radius fractures treated with rigid cast and 121 children with 123 distal radius fractures treated with soft cast.

The soft cast used was manufactured by 3M Heath Care Limited (Loughborough, UK). The soft cast is a semi-rigid, synthetic casting material. It is more secure than splints, backslabs and bandages. There is no under-cast padding, which allows the cast to conform to the shape of the limb and allows optimal support of the fracture. In addition, this means that the cast is always the correct size for the patient, rather than requiring a choice between set sizes of splint. The soft cast allows micro-motion and therefore helps reduce the muscle wasting associated with full plaster casts. The stockinet under the cast is water repellent, thereby allowing children to bathe, shower and swim in the cast for a recommended time of up to 30 min. After removal from water, the cast dries out without retaining moisture. At the end of the treatment period, the cast is unwound by the parents at home. There is no need to use a plaster saw or scissors and no need for an outpatient clinic visit.

After treatment had finished, the parents were contacted prospectively by telephone at an average of 6 weeks post-injury to complete a questionnaire. The primary outcome measure was whether the parents and child were happy with the outcome of treatment. Secondary outcome measures were the comfort of the cast, necessity of changing the cast and ease of removing the cast. We also recorded whether the children bathed, showered or swam in their casts, if the children or parents would rather be treated in rigid or soft cast in the future, and if the parents were happy with the information leaflet provided. Other information recorded retrospectively by radiograph and case-note review included sex, age, left- or right-sided fracture, mechanism of injury and 6 month re-fracture rate.

Results

Demographics and mechanism of injury

Patient demographics are displayed in Table 1 and the mechanism of injury in Table 2. The soft cast group contained 121 patients with 123 distal radius buckle fractures. Nearly two-thirds (64.5%) were boys and about one-third (35.5%) girls. The mean age was 8 years and 8 months with a range of 17 months to 14 years and 10 months. There were 62 (51.2%) left-sided, 57 (47.1%) right-sided and two (1.7%) bilateral distal radius buckle fractures. The mechanisms of injury were 85 (70.2%) falls sustained standing or running, 12 (9.9%) falls from bikes and scooters, nine (7.4%) trampolining accidents, four (3.3%) falls off walls, two (1.7%) falls from a tree, two falls down stairs, two ice-skating, two catching a football, one (0.9%) fall from monkey-bars, one fall from a swing and one child ran into a brick wall.

Table 1
Demographics of children treated with soft cast and rigid cast for buckle fractures of the distal radius.

Demographic	Soft cast	Rigid cast
Total number of children	121	111
Available for follow-up	117 (96.7%)	104 (93.7%)
Boys	64.5%	55.8%
Girls	35.5%	44.2%
Mean age	8 years 8 months	8 years 10 months
Age range	17 months to 14 years 10 months	20 months to 14 years 8 months
Left	51.2%	52.3%
Right	47.1%	46.8%
Bilateral	1.7%	0.9%

The rigid cast group contained 111 patients with 112 distal radius buckle fractures. About one-half (56%) were boys and 44% girls. The mean age was 8 years and 10 months with a range of 20 months to 14 years and 8 months. There were 58 (52.3%) left-sided, 52 (46.8%) right-sided and one (0.9%) bilateral distal radius buckle fractures. The mechanisms of injury were 75 (67.6%) falls sustained standing or running, 10 (9.0%) falls from bikes and scooters, eight (7.2%) trampolining accidents, four (3.6%) falls down stairs, three (2.7%) ice-skating, three falls from monkey-bars, two (1.8%) falls off walls, two falls from a swing, two falls from bunk beds, one (0.9%) fall from a tree and one child fell off a horse.

In the soft cast group, four sets of parents were not contactable by telephone to complete the outcome questionnaire. Therefore, results were available for 117 of the 121 children (96.7%). In the rigid cast group, seven sets of parents were not contactable. Therefore, results were available for 104 of 111 children (93.7%).

Primary outcome results

These are displayed in Fig. 1. There was no statistically significant difference between soft cast and rigid cast ($p = 0.480$). In the soft cast group, 114/117 (97.4%) were happy with the outcome of treatment. The three dissatisfied patients included two patients who were placed into rigid casts due to pain that unfortunately did not resolve. One additional parent was unhappy with the treatment because she found the soft cast difficult to remove. She tried to remove it with scissors as she had

Table 2
Mechanism of injury in children with buckle fractures of the distal radius.

Mechanism of injury	Soft cast	Rigid cast
Fall from standing or running	70.2	67.6
Fall from bike or scooter	9.9	9.0
Trampolining	7.4	7.2
Fall off wall	3.3	1.8
Fall from tree	1.7	0.9
Fall down stairs	1.7	3.6
Fall ice-skating	1.7	2.7
Fall from monkey bars	0.9	2.7
Fall from swing	0.9	1.8
Catching football	1.7	0
Fall from bunk bed	0	1.8
Fall off horse	0	0.9
Running into brick wall	0.9	0

Numbers are given as percentages.