Management of Pediatric Forearm Torus Fractures
A Systematic Review and Meta-Analysis

Nan Jiang, MD,† Zhen-hua Cao, MD,*‡ Yun-fei Ma, MD,*† Zhen Lin, MD,§ and Bin Yu, MD*†*

Objectives: Pediatric forearm torus fracture, a frequent reason for emergency department visits, can be immobilized by both rigid cast and nonrigid methods. However, controversy still exists regarding the optimal treatment of the disease. The aim of this study was to compare, in a systematic review, clinical efficacy of rigid cast with nonrigid methods for immobilization of the pediatric forearm torus fractures.

Methods: Literature search was performed of PubMed and Cochrane Library by 2 independent reviewers to identify randomized controlled trials comparing rigid cast with nonrigid methods for pediatric forearm torus fractures from inception to December 31, 2013, without limitation of publication language. Trial quality was assessed using the modified Jadad scale.

Results: Eight randomized controlled trials with a total of 781 participants met all inclusion criteria. The nonrigid methods for immobilization included soft cast, splint, bandage, and slab. Results showed that nonrigid immobilizations had better clinical efficacy than rigid cast regarding functional recovery, treatment cost, and complication rate (relative risk, 3.02; 95% confidence interval, 1.70-5.37; $P = 0.0002$). Compared with rigid cast, more patients would like to choose the nonrigid methods of immobilization for future use. However, discrepant results sill surrounds the pain levels of the patients.

Conclusions: The current study suggests that the nonrigid immobilization methods have more advantages than rigid cast for immobilization of pediatric forearm torus fracture. The former strategies are also safe enough for clinical therapy.

Key Words: torus fractures, buckle fractures, cast, splint, bandage, slab

(*Pediatr Emer Care* 2015;00: 00–00)

Childhood fractures accounted for approximately 20% of all pediatric visits to the emergency department,[1] Seven percent of which involved the forearm and the wrist.[2] Of all forearm and wrist fractures in children, torus fracture is the most frequent type.[2,3] Torus fracture, also named as buckle fracture, is defined as a compression failure of bone and normally occur in the transitional zone between the woven metaphyseal and the cortical lamellar bone.[4] Different from greenstick fracture, which usually refers to the collapse of the cortex caused by a more severe force,[5] torus fracture, which usually occurs from an unexpected fall on an outstretched hand, is an inherently stable injury with a low risk of displacement.[6–8] Because of this characteristic, various management strategies are available for clinical staff.

Cast immobilization was a traditional therapy for the treatment of torus fractures. Although this method can provide a rigid immobilization and thus promote fracture healing, it also has many disadvantages, such as heavy, bulky, and requires a second visit to the hospital for removal. These flaws of cast may bring inconvenience to children as well as their families. In recent years, many pediatric clinicians reported other methods to instead traditionally used cast, including soft cast,[9,10] Futuro wrist splint,[8,11] and double Tubigrip.[11] Although patients that suffered from forearm torus fractures can be immobilized by both rigid cast and nonrigid materials, controversy still exists in the optimal treatment of this fracture.

The aim of this study was to, in a systematic review and meta-analysis, compare clinical efficacy of recently used nonrigid immobilization methods with rigid cast.

METHODS

Study Design and Search Strategy

All published randomized controlled trials (RCTs) comparing clinical efficacy of nonrigid methods with cast immobilization for pediatric forearm torus fractures were searched in PubMed and Cochrane Library by 2 independent reviewers from inception to December 31, 2013. A structured search was performed using the following search string: "torus fractures" or "buckle fractures." There was no limitation of the publication language.

Eligibility Criteria

Only RCTs that comparing rigid cast with nonrigid methods for the immobilization of pediatric torus fractures were taken into consideration. Cohort studies, clinical controlled trials, and case reports were excluded.

Eligibility for participants were children with a definite diagnosis of torus fractures in the forearms (often confirmed by X-ray or ultrasound) and written informed consent.

Study Identification

Two reviewers independently screened titles of all the articles obtained. Any study that was potentially relevant to the topic would be reviewed in its abstract and even in its full text if inadequate information was acquired from the abstract. A third reviewer would be consulted for final decision if any disagreement on eligibility existed between the first 2 reviewers.

Methodological Quality Appraisal

Study methodological assessment was conducted using the modified Jadad scale.[12] This is an 8-item scale designed to assess randomization, blinding, withdrawals and dropouts, inclusion and exclusion criteria, adverse effects, and statistical analysis (Table 1). The score for each trial ranges from 0 (lowest quality) to 8 (highest quality). Scores of 4 to 8 denote good to excellent (high quality) and 0 to 3, poor or low quality. The critical appraisal was conducted by 2 independent reviewers, and discrepancy was solved by discussion.

Outcome Measures

Main outcome measures included functional recovery (physical and social functions), complications or problems, patient satisfaction

From the *Department of Orthopaedics and Traumatology, †Guangdong Provincial Key Laboratory of Bone and Cartilage Regenerative Medicine, Nanfang Hospital, Southern Medical University, Guangzhou; ‡Department of Minimally Invasive Spine Surgery, Second Affiliated Hospital to Inner Mongolia Medical University, Hohhot; and §Department of Spine Surgery, Nanfang Hospital, Southern Medical University, Guangzhou, P.R. China.

Disclosure: The authors declare no conflict of interest.

Reprints: Bin Yu, MD, Department of Orthopaedics and Traumatology, Nanfang Hospital, No. 1838, Guangzhou Ave., North, Baiyun District, Guangzhou, 510515, P.R. China (e-mail: nanfanghot@126.com).

ISSN: 0749-5161

TABLE 1. Modified Jadad Scale With 8 Items

Item assessed	Response	Score
Was the study described as randomized?	Yes	+1
	No	0
Was the method of randomization appropriate?	Yes	+1
	no	−1
	Not described	0
Was the study described as blinded?[a]	Yes	+1
	No	0
Was the method of blinding appropriate?	Yes	+1
	No	−1
	Not described	0
Was there a description of withdrawals and dropouts?	Yes	+1
	No	0
Was there a clear description of the inclusion/exclusion criteria?	Yes	+1
	No	0
Was the method used to assess adverse effects described?	Yes	+1
	No	0
Was the method of statistical analysis described?	Yes	+1
	No	0

[a] Double-blind RCTs 1 score; single-blind RCTs 0.5 score.

or preference, and future choice. Secondary outcomes were treatment costs, efficacy of home versus hospital management.

Statistical Analysis

Statistical heterogeneity was evaluated using I^2 statistics, complying with Quality of Reporting of Meta-Analyses guidelines,[13] which describe the percentage of total variation across studies that is due to heterogeneity rather than chance. I^2 can be readily calculated from basic results obtained from a typical meta-analysis as $I^2 = 100\% \times (Q - df)/Q$, where Q is Cochrane heterogeneity statistic, and df is the degrees of freedom.[14] Substantial heterogeneity exists when I^2 is greater than 50%. For outcomes, when P is greater than 0.05, a fixed-effects model was used in the meta-analysis. Otherwise, a random-effects model was adopted for P of 0.05 or less. Dichotomous data were presented as relative risk and continuous variables as mean difference, both with 95% confidence intervals. The meta-analysis was performed by *Review Manager 5.3* software (Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014). A P value of 0.05 or less was considered statistically significant.

RESULTS

Study Selection and Characteristics

The search procedures and search outcomes were listed in Figure 1. Altogether, 8 published RCTs[5,6,8,10,11,15–17] with a total of 781 patients met all inclusion criteria. An RCT[6] that compared efficacy of home and hospital managements was also included in current study for analysis. Information on general characteristics of studies and participants was listed in Table 2. The nonrigid immobilization methods included soft cast, splint, bandage, and slab.

Methodological Quality Assessment

Detailed scores of the included RCTs were shown in Table 3, indicating that more than half of included studies achieved high quality by the current rating system. However, the main problem reflected in nearly all studies was the neglect of blinding method for assessment as well as the method for adverse effects evaluation, which may cause biases. In addition, there was no detailed information on withdrawals and dropouts in the 2 reports.[5,10]

Primary Outcomes

Functional Recovery

West et al[5] reported that bandage-treated patients had a better recovery of wrist motion (in both flexion and extension) than those with plaster cast at 4 weeks (median range, 162° vs 126°) ($P < 0.0001$). Plint et al[15] observed that more children in the splint group resumed normal activities than those in the cast group by days 20 ($P = 0.031$) and 28 ($P = 0.008$) after injuries. The authors also indicated that splint-immobilized children had significantly less difficulty with bathing and showering at days 7, 14, and 20 after injuries than cast-immobilized children ($P < 0.001$). In addition, splinted children had less difficulty with printing or writing ($P = 0.005$), drawing ($P = 0.005$), and grooming ($P = 0.023$) at day 20. Oakley et al[16] found that more encircling casted patients could return to normal activities than the volar slabed ones at 2 weeks (40 of 42 vs 28 of 42, $P = 0.001$). In a recent RCT, Pountos et al[11] compared the clinical efficacy among Futuro wrist splint, cast and double Tubigrip. Results showed that patients in the double Tubigrip group obtained the optimal results in Pediatric Disability Score, grip score, and range of lost movement in wrist. Nonetheless, no significant difference was identified regarding the residual deformities among the 3 groups.

Complications or Problems

Plint et al[15] found that more patients had problems in the cast group than those in the splint group (5 vs 0). Khan et al[10] reported that more children experienced problems in the rigid cast group than those in the soft cast group (5 of 48 vs 1 of 69, $P = 0.035$). Likewise, Oakley et al[16] reported that more children in the encircling cast group had plaster problems than those in volar slab group (23/42 vs 10/42, $P = 0.004$). Result of the forest plot based on pooled outcomes of problems showed that cast-immobilized patients had more problems than those by other nonrigid methods (relative risk, 3.02; 95% CI, 1.70-5.37; $P = 0.0002$) (Fig. 2). With respect to the information regarding the incidence of repeat fractures, Plint et al[15] indicated that no children were reported of refractures at 6 months follow-up time, neither in the splint group,

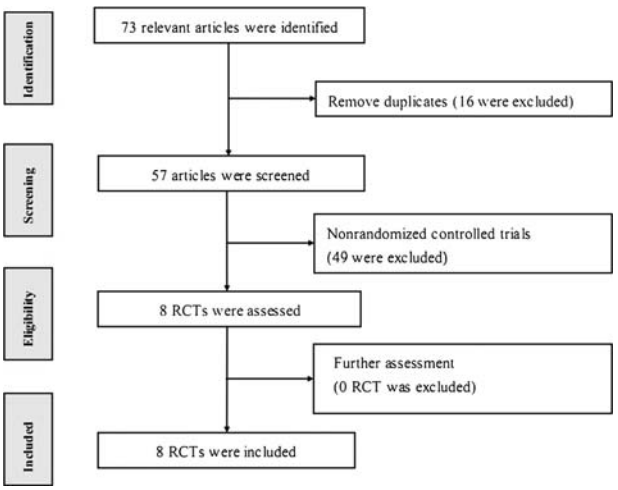

FIGURE 1. Flow chart of eligibility selection.

TABLE 2. Characteristics of Included Studies

Author, Time and Country	Immobilization Methods	No. Cases	Sex Ratio (M/F)	Mean age (range)(yrs)	Injury side (L/R)	Main Outcomes Measures	Main Conclusions
Davidson et al[8] 2001, England	Standard plaster-of-Paris cast versus Futura-type splint	Splint: 98 Cast: 81	107/94	8.9 (2–15)	119/82	Cost-benefit analysis	Splint can be used for the fracture and further follow up is unnecessary.
Symons,[6] 2001, England	Below-elbow short-arm backslab (hospital versus home)	Home: 38 Hospital: 42	47/33	Home/hospital =9.4/9.1	Not mentioned	Wrist deformity, functional recovery; complications or problems; future choice	It is clinically safe to manage children with buckle fractures within the community.
West et al,[5] 2005, United Kingdom	Soft bandage versus plaster cast (below- elbow polymer cast)	Bandage: 18 Cast : 21	Not mentioned	Distribution: <5y:5–10y: >10y = 1: 26 :12	Not mentioned	Comfort; pain; convenience; parental concern; range of wrist movement.	The authors would suggest bandage in treatment policy for torus fractures.
Plint et al[15] 2006, Canada	Below-elbow short arm plaster cast versus plaster splint	Splint: 42 Cast :45	57/30	Splint: 9.48 (5.12–14.17) Cast: 9.94 (5.87–13.65)	Not mentioned	ASKp, VAS, return to normal activities; refractures, problems; future choice	Splint-treated patients have better physical functioning and less difficulty with activities than those treated with a cast.
Khan et al[10] 2007, Ireland	Soft cast vs. rigid cast	Soft cast: 69 Rigid cast: 48	68/49	5 (2 to 12)	65/52	Problems or complications, future choice, parental satisfaction	Torus fractures can be treated with a soft cast without the need for more than one fracture clinic appointment.
Oakley et al,[16] 2008, Australia	Plaster-of-Paris cast versus fiberglass volar slab	Cast: 42 Slab: 42	54/30	Cast: Slab = 8:9	49/35	Pain, VAS, resume to normal work, time off work, problems, future choice.	Use of a slab may increase the duration of pain, especially in patients who had more severe pain at presentation.
Pountos et al,[11] 2010, United Kingdom	Futuro splint versus plaster cast versus double Tubigrip	Splint: 26 Cast: 24 Tubigrip: 29	47/32	9 (2–16)	Not mentioned	Pain scores, pediatric disability score, deformity, grip strength, range of lost movement.	Treating torus fractures with functional nonrigid devices (Tubigrip) results in improved function without increased discomfort or deformity.
Williams et al,[17] 2013, USA	Short-arm cast versus prefabricated wrist splint	Cast: 51 Splint: 43	51/43	Median age: Cast: 9 (2–16) Splint: 9.5 (2–16)	61/33	Satisfaction and convenience, preference, pain, resource utilization, splint removal, treatment concerns.	Splinting is preferable to casting for the treatment of distal radial buckle fractures.

M/F indicates males/females; L/R, left/right; ASKp, activities scales for kids performance version; VAS, Visual Analogue Scale.

nor in the cast group. In addition, they also reported that no refractures were identified for all of the enrolled patients at 6 months.

Patient Comfort and Future Choice

Davidson et al[8] indicated that both splint and cast treated patients were well tolerated, but parents would like to choose the splint as they could remove it for bathing. West et al[5] reported that more bandage-treated patients felt comfortable or very comfortable than those managed by cast (83.3% vs 0%; $P = 0.01$). Williams et al[17] observed that convenience was rated significantly higher by patients in the splint group than those in the cast group on days 1, 3, 7, and 21 after injury. In addition, satisfaction was also rated significantly higher in the splint group on days 1, 3, and 21 after injury.

With respect to the pain duration, West et al[5] indicated that patients in bandage group suffered shorter time of pain duration than those in cast group (4 patients, 1–2 days versus 10 patients, 2–3 days; and 5 patients, 4–5 days). In addition, a significantly

TABLE 3. Methodological Assessment of Eligible Studies Using Modified Jadad Scale

Item assessed	Davidson et al, 2001	Symons et al, 2001	West et al, 2005	Plint et al, 2006	Khan, 2007	Oakley et al, 2008	Pountos et al, 2010	Williams et al, 2013
Was the study described as randomized?	√	√	√	√	√	√	√	√
Was the method of randomization appropriate?	?	√	?	√	?	√	√	√
Was the study described as blinded?	x	x	x	x	x	x	√	x
Was the method of blinding appropriate?	?	?	?	?	?	?	√	?
Was there a description of withdrawals and dropouts?	√	√	×	√	x	√	√	√
Was there a clear description of the inclusion/exclusion criteria?	x	√	√	√	x	√	√	√
Was the method used to assess adverse effects described?	x	x	x	x	x	x	x	x
Was the method of statistical analysis described?	x	√	x	√	√	√	√	√
Total score	2	5	2	5	2	5	6.5	5

√ indicates yes; x, no; ?, not described

higher percentage of patient convenience was found in bandage group (94.44% vs 14.29%, $P = 0.0004$).

Plint et al[15] indicated that no significant difference was identified between the splint and cast groups in visual analogue score at any time during the study. Similarly, Oakley et al[16] recorded that no statistical difference was found between the cast and slab groups regarding visual analogue score (50.0 vs 65.0; $P = 0.06$). However, they observed that slab-treated patients had a longer median time of pain duration than those in the cast group (6.0 vs 3.0 days; $P = 0.009$). Pountos et al[11] indicated that no significant differences were observed regarding the pain scores among the splint group, cast group, and Tubigrip group (3.1 versus 2.9 versus 2.3). Although Williams et al[17] indicated patients in the splint group had a higher median pain score than those in the cast group on days 1, 3, 7, 21 after trauma, no statistical differences were identified between the 2 groups.

With respect to the future choice, Plint et al[15] claimed that both children and their parents would more likely to choose the splint for future use if they had torus fractures again, which was supported by Khan et al[10] and Williams et al.[17] However, Oakley et al[16] reported that no significant difference was identified between the cast group and slab group (30 of 42 vs 31 of 42, $P = 0.81$).

Secondary Outcomes

Treatment Costs

Davidson et al[8] reported that the total cost of a splint treatment was lower than that of a cast immobilization (65.75 vs 116.98). Although West at al[5] did not provide medical costs, they believed that the cost of a bandage was certainly far below that of a plaster cast, a Futura-type splint, or a molded polymer cast. However, Khan et al[10] said that soft immobilization might be more expensive than the rigid cast treatment. However, it was worthwhile because probably existed negative effects were minimized (eg, less time off school for children, less time off work for parents, released clinic spaces for other patients).

Home Versus Hospital Management

Symons et al[6] compared clinical efficacy of patients treated at home or in hospital. Results showed that no significant differences were identified regarding the functional recovery and problem risks. However, patients treated at home group won more preference than those in the hospital ($P < 0.001$).

DISCUSSION

Results of the present study with all retrieved RCTs indicated that nonrigid immobilization methods have more advantages than rigid cast regarding better functional recovery, lower incidence of complications or problems, and mostly lower medical costs. These superiorities of these methods naturally won more satisfactions and future choices.

Some basic epidemiological information can be derived from Table 2. First, most of the patients were in their 5 to 10 age periods (especially around 9 years), which is probably due to the imbalance between increased physical activities and immature bones

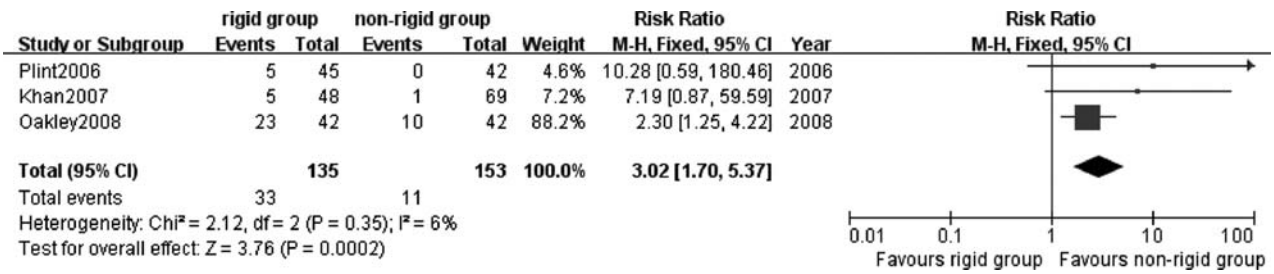

FIGURE 2. Incidence of complications between the rigid cast and nonrigid immobilizations.

during this period. Second, boys accounted for 58.09% (431 of 742, according to 7 RCTs) of all patients. Boy dominance (1.38:1) of this injury is closely related to the fact boys are more piquant than girls. Third, more patients occurred on the left side of the body (294 vs 202, from 4 RCTs[8,10,16,17]), which may be the result from anatomy difference between the two sides. Lastly, radius is the most frequently affected bone, which is probably as a consequence of the functional role it acts in the forearm.

Primary outcomes of the functional recovery revealed that most patients treated by non-rigid methods had better clinical efficacy than rigid cast in both physical and social functions. We considered it mainly because patients in the nonrigid group can move their limbs at a much earlier time and thus avoid many adverse effects of fractures. However, Oakley et al[16] found that more rigid cast-treated patients could resume normal activities than those in the slab group at 2 weeks. We inferred the outcome may be associated with different pain durations between the 2 groups.

Because the nonrigid treatment had a shorter immobilization time than the cast, clinicians may worry whether short immobilization time increases the incidence of complications. In addition, previous study indicated that an approximately 7% of the patients suffering from torus fractures had subsequent displacements[18] and 2% had refractures.[19] However, results of the present study indicated it was unnecessary to worry about the problems mentioned. On the contrary, most studies reported that the risks of adverse effects or problems during nonrigid immobilization were much lower than those of rigid cast immobilization. With regard to patient preference and future choice, although no agreement was reached, most patients showed their predilections to nonrigid immobilization, which was probably because of 2 reasons. First, flexible characteristic of the nonrigid materials makes patients more comfortable and more convenient to remove. Second, nonrigid immobilization reveals a much lower adverse effects or problems than rigid cast immobilization.

Most previous studies reported that the patients in the nonrigid immobilization group spent less than those in rigid cast group, which had 2 meanings. On one hand, the price of some materials is lower than the cast, such as bandage and splint. On the other hand, although some materials are more expensive than the cast (eg, soft cast and semirigid cast), the total cost is worthwhile. As Khan et al[10] and Taranu et al[9] indicated, using these kinds of nonrigid immobilization minimized the negative effects. Patients with nonrigid immobilization can remove their devices at home, which not only means a saving for a second visit to the hospital, but also a saving for medical resources. An RCT performed by Davidson et al[8] concluded similar efficacy between hospital and home cares, which may imply that hospital treatment for torus fractures is unnecessary. However, cautious attitude should be taken as the conclusion was just based on a single study.

Although we found that rigid cast immobilization has a lot of disadvantages, this never means that nonrigid immobilization methods have no defects. Nonrigid immobilizations are apt to become loose during treatment and often require reinforcement. Additionally, as children and the parents can remove the devices by themselves, adequate explanations and instructions should be informed regarding the removal time and how to deal with the potentially existing problems.

Up till today, unresolved queries still exist regarding many aspects of torus fractures. Initially, some authors[2,20] stated that the final aim of torus fracture immobilization is just for pain relief, whereas others believed not. Additionally, although most previous studies recommended immobilization for at least 2 to 4 weeks, several studies[5,8,9] also showed fine efficacy after immobilization of less than 2 weeks. Moreover, some clinicians[7,21,22] said that a second follow-up to the clinic and 1 more X-ray examination are unnecessary. Therefore, whether adequate follow-up is essential requires more studies to testify. Finally, even 1 study[23] reported that no adverse effects were identified after subacute treatment and concluded urgent treatment was not a must. Is it really unnecessary? In a word, although several studies discussed the abovementioned problems, most of them are single reports or respective analyses. Future more RCTs should be performed to solve these queries.

The main limitation of the present study was the still limited number of eligible RCTs, which may cause biases. Additionally, different kind of materials used in the nonrigid immobilization as well as the lack of the consistent assessment systems may also affect the outcomes. Therefore, cautious attitudes should be taken towards the conclusions.

CONCLUSIONS

In summary, the current study suggests that nonrigid immobilization methods including soft cast, splint, bandage and slab, have more advantages than traditionally rigid cast for the treatment of pediatric forearm torus fractures. These techniques promise to be new options for clinical treatment of pediatric forearm torus fractures.

REFERENCES

1. Hart ES, Albright MB, Rebello GN, et al. Broken bones: common pediatric fractures—part I. *Orthop Nurs*. 2006;25:251–256.
2. Plint A, Clifford T, Perry J, et al. Wrist buckle fractures: a survey of current practice patterns and attitudes toward immobilization. *CJEM*. 2003;5: 95–100.
3. Connolly J. *Fractures and Dislocations—Closed Management*. Philadelphia: Saunders; 1995;192.
4. Light TR, Ogden DA, Ogden JA. The anatomy of metaphyseal torus fractures. *Clin Orthop Relat Res*. 1984;188:103–111.
5. West S, Andrews J, Bebbington A, et al. Buckle fractures of the distal radius are safely treated in a soft bandage: a randomized prospective trial of bandage versus plaster cast. *J Pediatr Orthop*. 2005;25:322–325.
6. Symons S, Rowsell M, Bhowal B, et al. Hospital versus home management of children with buckle fractures of the distal radius. A prospective, randomised trial. *J Bone Joint Surg Br*. 2001;83:556–560.
7. Solan MC, Rees R, Daly K. Current management of torus fractures of the distal radius. *Injury*. 2002;33:503–505.
8. Davidson JS, Brown DJ, Barnes SN, et al. Simple treatment for torus fractures of the distal radius. *J Bone Joint Surg Br*. 2001;83:1173–1175.
9. Taranu R, Webb J, Forth M, et al. Using semi-rigid casts in the management of buckle fractures. *Paediatr Nurs*. 2011;23:25–28.
10. Khan KS, Grufferty A, Gallagher O, et al. A randomized trial of 'soft cast' for distal radius buckle fractures in children. *Acta Orthop Belg*. 2007;73:594–597.
11. Pountos I, Clegg J, Siddiqui A. Diagnosis and treatment of greenstick and torus fractures of the distal radius in children: a prospective randomised single blind study. *J Child Orthop*. 2010;4:321–326.
12. Oremus M, Wolfson C, Perrault A, et al. Interrater reliability of the modified Jadad quality scale for systematic reviews of Alzheimer's disease drug trials. *Dement Geriatr Cogn Disord*. 2001;12:232–236.
13. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol*. 2009;62:e1–e34.
14. Higgins JP, Thompson SG, Deeks JJ, et al. Measuring inconsistency in meta-analyses. *BMJ*. 2003;327:557–560.
15. Plint AC, Perry JJ, Correll R, et al. A randomized, controlled trial of removable splinting versus casting for wrist buckle fractures in children. *Pediatrics*. 2006;117:691–697.

16. Oakley EA, Ooi KS, Barnett PL. A randomized controlled trial of 2 methods of immobilizing torus fractures of the distal forearm. *Pediatr Emerg Care*. 2008;24:65–70.
17. Williams KG, Smith G, Luhmann SJ, et al. A randomized controlled trial of cast versus splint for distal radial buckle fracture: an evaluation of satisfaction, convenience, and preference. *Pediatr Emerg Care*. 2013;29: 555–559.
18. Schranz PJ, Fagg PS. Undisplaced fractures of the distal third of the radius in children: an innocent fracture? *Injury*. 1992;23:165–167.
19. Harbison JS, Stevenson TM, Lipert JR. Forearm fractures in children. *Aust N Z J Surg*. 1978;48:84–88.
20. Allison SG. Paediatric torus fracture. *Emerg Nurse*. 2008;16:22–25.
21. Randsborg PH, Sivertsen EA. Distal radius fractures in children: substantial difference in stability between buckle and greenstick fractures. *Acta Orthop*. 2009;80:585–589.
22. Farbman KS, Vinci RJ, Cranley WR, et al. The role of serial radiographs in the management of pediatric torus fractures. *Arch Pediatr Adolesc Med*. 1999;153: 923–925.
23. Bennett DL, Mencio GA, Hernanz-Schulman M, et al. Buckle fractures in children: Is urgent treatment necessary? *J Fam Pract*. 2009;58:E1–E6.