

Wrist buckle fractures: a survey of current practice patterns and attitudes toward immobilization

Amy Plint, MD;* Tammy Clifford, PhD;† Jeff Perry, MD, MSc;‡ Blake Bulloch, MD;§
Martin Pusic, MD, MA;¶ Amina Lalani, MD;** Samina Ali, MD;‡‡ Bich Hong Nguyen, MD;§§
Gary Joubert, MD;¶¶ Kelly Millar, MD***

ABSTRACT

Objectives: Buckle fractures are the most common wrist fractures in children, yet there is little literature regarding their management. This study examined the management of these fractures and attitudes toward their immobilization by pediatric emergency department (ED) physicians and pediatric orthopedic surgeons.

Methods: A standardized survey was mailed to all pediatric orthopedic surgeons and pediatric ED physicians at 8 Canadian children's hospitals.

Results: Eighty-seven percent of physicians responded, including 33 of 39 pediatric orthopedic surgeons and 84 of 96 pediatric ED physicians. Sixty-four percent of respondents believe that wrist buckle fractures always need to be immobilized; pain control was most frequently cited for this belief. Physicians who did not believe that all buckle fractures need to be immobilized indicated that these fractures are inherently stable and have a low risk of refracture. Forty-eight percent of the orthopedic surgeons prefer below-elbow casts, 30% prefer a combination (splint and cast) and 12% prefer backslabs. Sixty percent of ED physicians "usually or always" use casts and 31% "usually or always" use backslabs. Although there was variation among the orthopedic surgeons regarding the recommended length of immobilization, most (70%) recommended 2 to 4 weeks, although some (12%) treated only until pain free. ED physicians showed greater diversity regarding length of immobilization.

Conclusions: Although many physicians believe that wrist buckle fractures need to be immobilized, a significant number do not. There is substantial variability in the type and length of immobilization used. This variability suggests that the optimal management strategy for wrist buckle fractures is unclear and should be determined in future prospective studies.

* Assistant Professor, Department of Pediatrics, Children's Hospital of Eastern Ontario, and University of Ottawa, Ottawa, Ont.

† Director, Epidemiology; Chalmers Research Group, Children's Hospital of Eastern Ontario Research Institute, Ottawa, Ont.

‡ Clinical Scholar, Division of Emergency Medicine, Ottawa Hospital, Ottawa, Ont.

§ Attending Physician, Department of Emergency Medicine, Phoenix Children's Hospital, Phoenix, Ariz. Note: At the time of the study Dr. Bulloch was an Assistant Professor, Department of Pediatrics, Winnipeg Children's Hospital, Winnipeg, Man.

¶ Assistant Professor, Department of Pediatrics, Vancouver Children's Hospital, Vancouver, BC

** Pediatric Emergency Fellow, Department of Pediatrics, Hospital for Sick Children, and University of Toronto, Toronto, Ont.

‡‡ Assistant Professor, Department of Pediatrics, Stollery Children's Hospital, and University of Alberta, Edmonton, Alta.

§§ Clinical Lecturer, Department of Pediatrics, Sainte-Justine Hospital, Montreal, Que.

¶¶ Associate Professor, Department of Pediatrics, Children's Hospital of Western Ontario, and University of Western Ontario, London, Ont.

*** Pediatric Emergency Fellow, Department of Pediatrics, Alberta's Children Hospital, and University of Calgary, Calgary, Alta.

Received: Sept. 13, 2002; final submission: Jan. 13, 2003; accepted: Jan. 20, 2003

This project was presented in part at the Annual Meeting of the Canadian Association of Emergency Physicians, Hamilton, Ont., April 2002, and at the Annual Meeting of the Society for Academic Emergency Medicine, St. Louis, Mo., May 2002.

This article has been peer reviewed.

Key words: children, fracture, wrist, treatment

RÉSUMÉ

Objectifs : La fracture de Pouteau-Colles est la fracture du poignet la plus fréquemment rencontrée chez l'enfant. Or, il y a très peu de littérature concernant la prise en charge de ce type de fracture. La présente étude a examiné la prise en charge de cette fracture et les attitudes face à son immobilisation par les médecins d'urgence pédiatrique et les chirurgiens orthopédistes pédiatriques.

Méthodes : Un sondage normalisé fut envoyé par la poste à tous les chirurgiens orthopédistes pédiatriques et à tous les médecins d'urgence pédiatrique de huit hôpitaux canadiens pour enfants.

Résultats : Quatre-vingt-sept pour cent des médecins répondirent au sondage, dont 33 chirurgiens orthopédistes pédiatriques sur 39 et 84 médecins d'urgence pédiatrique sur 96. Soixante-quatre pour cent des répondants croyaient que les fractures de Pouteau-Colles devraient toujours être immobilisées, la maîtrise de la douleur étant le plus souvent évoquée pour appuyer cette opinion. Les médecins qui ne croyaient pas en la nécessité d'immobiliser systématiquement toutes les fractures de Pouteau-Colles expliquaient que ces fractures sont essentiellement stables et présentent peu de chances de se fracturer de nouveau. Quarante-huit pour cent des chirurgiens orthopédistes préfèrent les plâtres sous le coude, 30 % préfèrent une combinaison attelle et plâtre et 12 % préfèrent les gouttières plâtrées. Soixante pour cent des médecins d'urgence utilisent «généralement ou toujours» des plâtres et 31 % utilisent «généralement ou toujours» des gouttières plâtrées. Bien qu'il y ait eu des variations parmi les chirurgiens orthopédistes concernant la durée d'immobilisation recommandée, la plupart d'entre eux (70 %) recommandaient de deux à quatre semaines d'immobilisation. Par contre, certains (12 %) traitaient seulement jusqu'à la disparition de la douleur. L'opinion concernant la durée d'immobilisation était beaucoup plus diversifiée parmi les médecins d'urgence.

Conclusions : Bien que de nombreux médecins croient en la nécessité d'immobiliser les fractures de Pouteau-Colles, un nombre important n'y croient pas. Il existe une grande variabilité quant au type et à la durée d'immobilisation. Cette variabilité suggère que la stratégie optimale de prise en charge des fractures de Pouteau-Colles n'est pas claire et devrait être déterminée dans le cadre d'études prospectives ultérieures.

Introduction

Buckle fractures of the distal radius and ulna are a common form of wrist fracture in children and a frequent reason for visits to the emergency department (ED). According to the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP), wrist and forearm fractures represent about 7% of all injury-related pediatric ED visits,¹ and data from one of the hospitals participating in the present study (the Children's Hospital of Eastern Ontario, Ottawa) suggest that buckle fractures may represent over half of these cases (Plint AC, Perry J, Tsang JLY, unpublished data, 2002). Often these children present several days after the injury with complaints of discomfort or swelling. In this scenario, questions have been raised as to the probable outcome had medical attention not been sought. While standard orthopedic textbooks recommend 2 to 4 weeks of immobilization in a short arm cast,^{2,3} management of wrist buckle fractures is variable: some children are placed in a cast, others in a splint, and the duration of immobilization differs from physician to physician.

The aim of this study was to determine the beliefs of pediatric ED physicians and pediatric orthopedic surgeons about whether immobilization is necessary, what the preferred immobilization technique is, and what duration of immobilization is necessary. We anticipated that significant variation in practice and attitudes toward immobilization exists and that such variation might relate to practice site, physician's specialty and number of years in practice.

Methods

Study design

This cross-sectional study surveyed pediatric ED physicians and pediatric orthopedic surgeons regarding their management of wrist buckle fractures and attitudes toward immobilization.

Study setting and population

Pediatric ED physicians and pediatric orthopedic surgeons at 8 of 11 tertiary children's hospitals across Canada were surveyed. The 8 hospitals belong to Pediatric Emergency Research Canada (PERC), a collaborative nationwide

emergency research group.* All physicians whose primary clinical appointment was to the pediatric ED (herein referred to as "ED physicians") or to the pediatric orthopedic service (herein referred to as "orthopedic surgeons") were eligible for study participation. The research ethics committee at the institute of the principal investigator (A.P.) deemed this proposal exempt from formal review.

Survey tool

A standardized self-administered questionnaire was developed, pretested among a convenience sample of physicians, and then mailed to all eligible participants in November 2001. The questionnaire consisted of a series of single- and multiple-select closed-ended items; however, these items also allowed for selection of a residual "other" category. In cases where respondents felt that their response did not correspond to those already listed (i.e., they selected "other"), they were asked to elaborate upon their answer in full text. It was decided, a priori, that all full-text responses would be entered into the database and later examined. If a sufficient number of respondents gave a similar full-text response, the database would be revised to reflect this new category.

Study protocol

Study coordinators at each site identified eligible participants and distributed the surveys. A modified Dillman's method was used for contact and follow-up procedures.⁴ Non-responders received second and, if necessary, third direct mailings.⁴ Participants were identified only by study number, and the site coordinators and principal investigator were blinded to this assignment, thereby assuring respondent confidentiality.

Data entry and analysis

Data entry and analysis were performed using the SPSS-PC Version 10 statistical package (SPSS; Cary, NC). Descriptive statistics were used to characterize the sample, vis-à-vis length of time since graduation from medical school and years of practice in specialty. Response rates were calculated, overall, by site and by specialty (ED physician vs. orthopedic surgeon). Frequencies of responses to questionnaire items that solicited information regarding physicians' current management of wrist buckle fractures, and their attitudes toward immobiliza-

tion and backslabs were tallied. The statistical significance of observed differences between categorical independent variables (i.e., site, specialty, length of time in specialty) was assessed using the Mantel-Haenszel chi-squared test or Fisher's exact test, where appropriate. In the case of continuous variables of interest, Tukey's method was used to adjust for multiple comparisons if the one-way analysis of variance (ANOVA) indicated that differences existed between means. Alpha was set at 0.05 for all significance tests.

Results

Respondents

At the 8 children's hospitals, 135 eligible participants were identified and 117 returned completed surveys, for an overall response rate of 87%. This included 84 of 96 ED physicians and 33 of 39 orthopedic surgeons. Response rates, by site, ranged from 76% to 100%. The orthopedic surgeons had been in practice for significantly longer, averaging 23.6 years (range 8–43) from medical school graduation versus 14.9 years (range 4–34) for the ED physicians.

Attitudes toward immobilization

Sixty-four percent (75/117) of respondents believed that *all* wrist buckle fractures require immobilization. Figure 1 shows that the prevalence of this belief varied widely at individual sites, ranging from 14% to 90% ($p = 0.015$); however, it was not significantly associated with length of practice or specialty. Table 1 summarizes the reasons why physicians believed (or did not believe) that all buckle fractures require immobilization. ED physicians and orthopedic surgeons provided similar reasons, except that ED physicians were more likely to be influenced by "parental factors."

To determine whether the severity of the buckle fracture

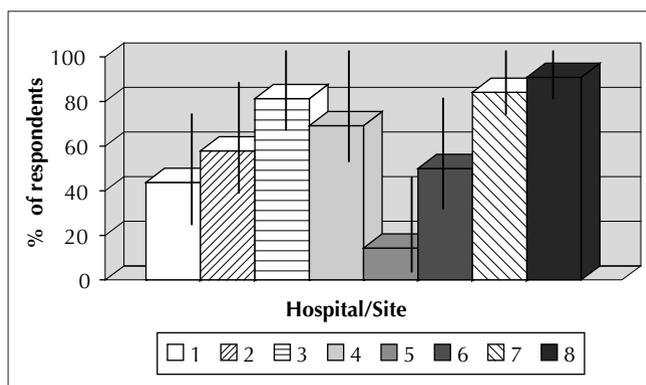


Fig. 1. Belief that *all* wrist buckle fractures need to be immobilized, by site.

* PERC is a network of health care professionals that was formed in 1995. Membership in PERC is open to all health care professionals with an interest in pediatric emergency medicine including physicians, nurses, respiratory therapists and epidemiologists. Currently, 10 of the 11 Canadian children's emergency departments are members of PERC.

would influence attitudes toward immobilization, respondents were shown 2 x-rays: a “mild” buckle fracture (with buckling visible only on the lateral view) and a “severe” buckle fracture (with buckling visible on both the anterior–posterior and lateral views). Sixty-six percent of respondents reported that they would immobilize the “mild” fracture, and 79% would immobilize the “severe” fracture. These attitudes did not vary significantly by specialty or site. ED physicians were more likely to cite pain relief ($p < 0.001$) and parental factors ($p = 0.017$) as key reasons to immobilize “severe” buckle fractures. Orthopedic surgeons were more likely to cite the risk of refracture as an important reason to immobilize “minor” fractures (55.8% vs. 42.4%; $p = 0.04$).

Current management of wrist buckle fractures

Table 2 summarizes ED physician responses regarding the preferred *initial* immobilization method for different types of pediatric buckle fractures. When questioned about their preferred immobilization method for the *entire treatment course*, 48% of orthopedic surgeons preferred below-elbow casts, 12% preferred splints, 30% preferred a combination of splint and cast, and just over 6% had no preference. Orthopedic surgeons were also asked which factors would influence their decision regarding length of immobilization. The most commonly cited factors were child’s age (85%), degree of child’s cooperation (58%), severity of buckling (55%) and severity of pain (52%). Only 15% of surgeons felt that a history of a previous wrist fracture should influence length of immobilization. Table 3 suggests that ED physicians tend to recommend shorter immobilization periods than do orthopedic surgeons.

Use of backslabs

Sixteen percent of ED physicians and 52% of orthopedic surgeons reported never using backslabs ($p = 0.001$). In cases where backslabs are used, 52% of ED physicians allow their removal for bathing and 15% “usually or always” allow their removal for other activities. A majority (64%) of ED physicians recommend that, apart from these specific activities, patients should wear the backslab at all times during the immobilization period.

Discussion

Pediatric buckle fractures of the wrist are common injuries, yet little has been published regarding their treatment.⁵⁻⁷ This study, the first to address the current management of wrist buckle fractures by pediatric ED physicians and orthopedic surgeons, identified significant practice variation among ED physicians and orthopedic surgeons regarding the need for immobilization and the preferred type and duration of immobilization. There was striking variability (between sites) in the proportion of physicians who believed that all wrist buckle fractures should be immobilized. While most physicians believed some form of immobilization was necessary, a substantial number did not.

Our data suggest that orthopedic surgeons and pediatric ED physicians differ in their opinions about the reasons for immobilization and in the value of backslabs. In determining the need for immobilization, ED physicians more often reported concerns about pain relief and parental factors, whereas orthopedic surgeons reported more concerns about the possibility of refracture. In addition, many of the physicians (orthopedic surgeons, 52%; ED physicians, 16%) re-

Table 1. Physicians’ responses to the query: “Do you immobilize all wrist buckle fractures?”

Response and reasons	ED physicians,* no./total no. (and %) (n = 84)	Orthopedic surgeons, no./total no. (and %) (n = 33)
Yes	52 (61.9)	23 (69.7)
Pain relief	49/52 (94.2)	20/23 (86.9)
Risk of refracture / extension	29/52 (55.8)	17/23 (73.9)
Parental factors†	17/52 (32.7)	2/23 (8.7)
Medicolegal concerns	13/52 (25.0)	2/23 (8.7)
No	26 (31.0)	9 (27.3)
Inherently stable	21/26 (80.8)	6/9 (66.7)
Low risk of refracture	18/26 (69.2)	3/9 (33.3)
Unsure of response	6 (7.1)	1 (3.0)
Unaware of literature suggesting benefit	6/6 (100)	No reasons given

ED = emergency department

* See Methods section for definition of “ED physician.”

† $p = 0.05$ between ED physicians and orthopedic surgeons

NB: Values do not add to 100% because respondents could choose more than one answer.

ported “never” using backslabs. These results contrast sharply with recent British studies showing that splinting is a common and accepted treatment.^{6,7} In one of the studies, most British orthopedic surgeons indicated a preference for 1 to 4 weeks of immobilization using a splint.⁶ In the other, all of the children were treated with a backslab.⁷ The use of follow-up x-rays also varies widely, with some physicians never ordering follow-up x-rays and others ordering up to 3 such films.^{5,6} It appears that, even among pediatric orthopedic surgeons, there is no “gold standard” for wrist buckle fracture management.

This level of practice variability, along with the paucity of evidence showing benefit of immobilization, suggests the need for well designed prospective trials to determine whether any of the described management strategies are associated with better clinical outcomes. On one hand, immobilization may reduce pain and enhance healing; on the other, to a child, casting or splinting may represent significant limitation in performing and enjoying activities. Furthermore, cast-related problems and the need for follow-up and cast removal represent an inconvenience to families and, perhaps, an unjustified burden on our health care system.

Limitations

Reliance on self-reporting is a limitation of this study. What doctors say they do may not be what they actually do; therefore, prospective confirmation of actual practice patterns and patient outcomes would be more accurate. However, given that there are no clinical practice guidelines and there is no clear consensus around optimal management, it is unlikely that participants would have felt the need to censor their responses. The validity of our findings is supported by our 87% response rate and the inclusive nature of the study sample, which represents a majority of the pediatric orthopedic surgeons and pediatric ED physicians in Canada.

While we described the preferred management strategies of the physicians surveyed, we did not study the influence of orthopedic surgeon management preferences upon ED physician management (or vice versa). Nor did we assess whether the cost and availability of splinting materials, and the time involved in casting influence treatment decisions. Finally, although we did not survey physicians from non-tertiary centres, it is likely that a similar or greater degree of practice variation would be

seen in these settings — further supporting the need for future research in this area.

Conclusions

There is substantial variability among physicians and between centres in the management of children with wrist

Table 2. ED physicians' initial immobilization preference based on site of fracture

Initial immobilization preference	Fracture site, no./total no.* (and %) of physicians		
	Distal radius	Distal ulna	Both bones†
Cast			
Never	11/81 (13.6)	11/81 (13.6)	8/81 (9.9)
Rarely	10/81 (12.3)	10/81 (12.3)	8/81 (9.9)
Sometimes	11/81 (13.6)	14/81 (17.3)	6/81 (7.4)
Usually	38/81 (46.9)	35/81 (43.2)	33/81 (40.7)
Always	11/81 (13.6)	11/81 (13.6)	26/81 (32.1)
Backslab or splint			
Never	10/80 (12.5)	10/80 (12.5)	22/79 (27.8)
Rarely	15/80 (18.8)	13/80 (16.3)	13/79 (16.5)
Sometimes	27/80 (33.8)	28/80 (35.0)	21/79 (26.6)
Usually	20/80 (25.0)	21/80 (26.3)	14/79 (17.7)
Always	8/80 (10.0)	8/80 (10.0)	9/79 (11.4)
Tensor bandage only			
Never	62/78 (79.5)	62/78 (79.5)	65/77 (84.4)
Rarely	13/78 (16.7)	12/78 (15.4)	10/77 (13.0)
Sometimes	2/78 (2.6)	3/78 (3.8)	1/77 (1.3)
Usually	1/78 (1.3)	1/78 (1.3)	1/77 (1.3)
Always	0	0	0
No treatment			
Never	54/79 (68.4)	55/79 (69.6)	64/78 (82.1)
Rarely	23/79 (29.1)	21/79 (26.6)	12/78 (15.4)
Sometimes	2/79 (2.5)	3/79 (3.8)	2/78 (2.6)
Usually	0	0	0
Always	0	0	0

See Table 1 for definitions.

* Not all 84 ED physicians responded to each question, and this is reflected in chart totals.

† “Both” indicates both distal radius and ulna fractures involving the same wrist.

Table 3. Physicians' recommended duration of immobilization for wrist buckle fractures*

Recommended duration of immobilization	ED physicians, no. (and %) (n = 78)	Orthopedic surgeons, no. (and %) (n = 31)
Until pain free	15 (19.2)	4 (12.9)
<2 wk	15 (19.2)	1 (3.2)
2–3 wk	30 (38.5)	15 (48.4)
≥3 wk	18 (23.1)	11 (37.9)

See Table 1 for definitions.

*Excludes physicians who responded “Unsure” (see Table 1).

buckle fractures. The wide variability, lack of consensus and paucity of outcome data suggests the need for well designed prospective trials to determine the optimal management for this common pediatric injury.

Competing interests: None declared.

Acknowledgements: We are grateful to the physicians who took time out of their busy schedules to complete this survey.

Dr. Plint is the recipient of a Junior Clinical Investigator Award from the Children's Hospital of Eastern Ontario Research Institute.

References

1. Injury Section, Health Canada. Wrist fractures in children. In: Analyses of data from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP). CHIRPP database 1990–2000; Feb 2002. Available: http://cythera.ic.gc.ca/dsol/is-sb/index_e.html (accessed 2003 Feb 11).
2. Lawton LJ. Fractures of the distal radius and ulna. In: Letts MR, editor. Management of pediatric fractures. New York: Churchill Livingstone Inc; 1994.
3. Armstrong PF, Joughin VE, Clarke HM. Pediatric fractures of the forearm, wrist and hand. Vol 3. In: Green NE, Swiontkowski MF, editors. Skeletal trauma in children. Philadelphia: Saunders Company; 1993.
4. Dillman DA. Mail and telephone surveys: the total design method. New York: Wiley; 1978.
5. Farbman KS, Vinci RJ, Cranley WR, Creevy WR, Baucher H. The role of serial radiographs in the management of pediatric torus fractures. Arch Pediatr Adolesc Med 1999;153:923-5.
6. Davidson JS, Brown DJ, Barnes SN, Bruce CE. Simple treatment for torus fractures of the distal radius. J Bone Joint Surg [Br] 2001;83:1173-5.
7. Symons S, Rowsell M, Bhowal B, Dias JJ. Hospital versus home management of children with buckle fractures of the distal radius: a prospective, randomised trial. J Bone Joint Surg [Br] 2001;83:556-60.

Correspondence to: Dr. Amy Plint, Division of Emergency Medicine, Children's Hospital of Eastern Ontario, 401 Smyth Rd., Ottawa ON K1H 8L1; 613 738-3237, fax 613 738-4852, plint@cheo.on.ca