Delays and Poor Management of Scaphoid Fractures: Factors Contributing to Nonunion

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Purpose Scaphoid fracture nonunion remains prevalent, and it was our purpose to examine the initial care, fracture site, and patient gender and age to determine factors contributing to fracture nonunion.

Methods The charts of 96 consecutive patients with 99 scaphoid fracture nonunions were reviewed for demographic information, and contact was made with 85 patients (with 88 scaphoid nonunions) to determine the pattern of presentation and initial treatment, if any.

Results Of the 88 scaphoid nonunions, 78 were in men, and 46 were sports injuries; 7 patients had no recollection of an injury. Twenty were proximal pole fractures. For 57 fractures, patients sought care following their injury, but only 42 were diagnosed with scaphoid fractures and received appropriate treatment, although one did not follow up in the clinic. Fifteen patients with nonunions did not receive radiographic investigations or did not have an identifiable fracture on initial x-rays and received no further follow-up or treatment. For 27 nonunions, medical attention was sought but was delayed, with an average time of 57 days between injury and initial assessment. For 31 fractures, medical attention was not sought for the acute injury but presented later following a re-injury (17 nonunions) or with progressive pain or stiffness (13 nonunions).

Conclusions The high rates of delayed presentation and incomplete evaluation and treatment suggest a strong need for better patient and doctor education on the subject of scaphoid injuries and nonunions particularly because the initial injury is, unfortunately, sometimes perceived as trivial. Nonunions do occur despite appropriate immobilization. Proximal pole fractures and fractures that show inadequate progression toward union while being treated in a cast should be considered for surgical intervention based on the high number of such cases identified in this study. *(J Hand Surg 2011;36A:1471–1474. Copyright © 2011 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Prognostic II.

Key words Fracture, nonunion, pseudarthritis, quality of care, scaphoid.

THE SCAPHOID IS the most common carpal to fracture, accounting for an annual incidence of 3.8 to 4.3 fractures per 10,000 people.[1,2] Nonunion of a scaphoid fracture is a problem following both nonsurgical and surgical treatments.[3–8] Both clinical and biological factors contribute to the development of nonunion. Biological factors include the degree of fracture displacement, the fragile vascular supply of the scaphoid, and its complex anatomy.[6–10] Clinical factors include variable patient symptoms such as minimal pain and swelling, compliance with immobilization, lack of medical and radiological diagnosis, and delays in treatment.[3–8,10–12] Langhoff and Andersen[7] found that the nonunion rate was 40% when diagnosis and treatment was delayed by 4 weeks, compared to 3% when diagnosis and treatment occurred within 4 weeks. As such, the timing of the initial presentation and the

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quality of treatment provided at initial presentation might contribute to scaphoid nonunions.

Difficulty in diagnosis is highlighted by a false negative rate of 2% to 20% in initial radiographs.[1,2,8,13] Dias et al[14] found that delayed radiographs at 2 to 3 weeks were also unreliable. Other studies have examined other imaging modalities to aid diagnosis.[15,16]

Many studies have examined different casting and surgical fixation techniques for scaphoid fracture care.[3–5,17] McQueen et al[17] and Bond et al[3] compared surgical treatment with casting in mostly nondisplaced scaphoid fractures. No significant difference in the union rate was found in either study, but both studies did show quicker time to union and faster recovery in the surgery group.

Nonunion rates have generally been consistent with Filan's and Herbert's 12% nonunion rate[18] and Kawamura's and Chung's 10% nonunion rate[6] and are generally considered to be higher for proximal pole fractures.

The aim of this study was to examine factors associated with scaphoid fracture nonunion to better educate patients and medical practitioners regarding means of avoiding nonunions.

METHODS

We retrospectively examined the charts of 96 consecutive patients with 99 scaphoid nonunions. All cases were referred to a single hand surgeon at a tertiary center from 2004 to 2008 for treatment of the nonunion. Demographic information, circumstances involving the injury, and resulting medical management (as outlined later) were extracted.

The following were identified: gender, age, dominant hand, fracture location, and side. Charts of patients who received medical attention for their injury were examined for details of radiological investigations performed, time between injury and presentation to medical attention, and any further investigations and treatments. We identified a delay in treatment if the time from injury to first medical assessment was greater than 1 day. Patients who did not receive x-rays or were not immobilized for their injury were classified as a failure in medical management. Patients could fall into either or both categories of delay and/or failure of management. Patients with previous surgical intervention were excluded.

The charts were examined by one researcher for data collection. If charts were incomplete, attempts were made to contact the patient by telephone. Of the 96 patients, 11 had inadequate information in their chart and could not be contacted by phone, resulting in a cohort of 85 patients with 88 nonunions for further detailed review. This study was approved by the hospital ethical review board.

Of the 85 patients with 88 scaphoid nonunions, 78 injuries were in men and 10 were in women. There were 52 injuries to the left scaphoid and 36 to the right scaphoid, and this included 3 bilateral injuries; half of the injuries were to the dominant wrist. The average patient age was 28 years at presentation of nonunion. There were 65 fractures in the scaphoid waist, 20 in the proximal pole, and 3 in the distal pole.

RESULTS

For 57 of 88 fractures, patients sought medical attention directly due to symptoms with their original injury; however, only 49 of these scaphoids received x-ray evaluation. Of these, 42 were diagnosed with a scaphoid fracture, and these patients received standard nonsurgical treatment. This group of 42 fractures represented approximately three-quarters of patients who presented for medical management. One patient, properly diagnosed and treated on the initial visit, did not return for follow-up evaluation. Patient presentation and fracture management are summarized in Figure 1.

Of the 57 fractures for which medical attention was sought, patients with 30 of the fractures sought care on the day of the injury, whereas patients with 27 of the fractures sought care on average 57 days (range, 1 d to 9 mo) after injury. Of these 27 fractures with delayed care, 13 were seen within 4 weeks following injury, and 13 presented later. One patient had an indeterminable delay of treatment. A delay in seeking care beyond 4 weeks (either for the initial injury, for a subsequent injury, or for late symptoms including pain and stiffness) was considered a patient factor that potentially contributed to the nonunion.

Eight fractures in the group that sought medical attention did not receive radiographs, and no diagnosis of a fracture or possible fracture was made. Seven other fractures had initial radiographs that were regarded as normal and did not receive any further investigations, follow-up, or treatment. These 15 fractures were not diagnosed, and they represented 15 of 57 fractures for which medical care was sought following injury.

Patients with 31 fractures presented for secondary symptoms or issues not initially thought to be related to their index injury. Seventeen had a re-injury, and 13 presented with a recent onset of pain and stiffness. The overall delay following the original injury for this group averaged 7.5 years (range, 3 mo to 49 y). Seven patients had no recollection of the original injury, but radiographs at presentation indicated an established non-

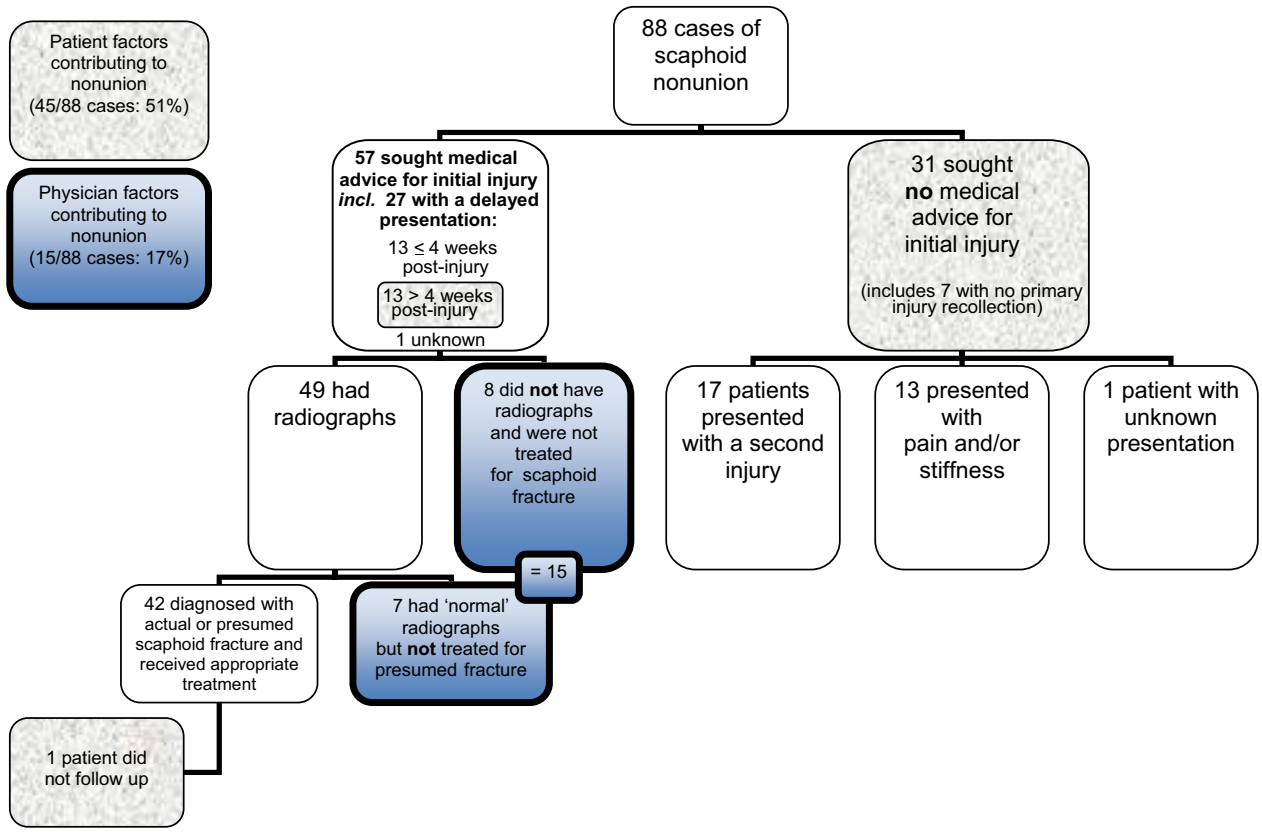

FIGURE 1: Summary of presentation and initial management of 88 scaphoid fractures that became nonunions.

union. From chart review, we could not determine the specific reason why one patient presented for medical care.

DISCUSSION

This study demonstrates that more than half of patients with scaphoid fracture nonunions did not necessarily receive standard initial management for their acute injuries and presented late for initial management, or they presented much later with secondary symptoms or reinjury. The demographic characteristics of our cohort were generally similar to those reported for acute scaphoid fractures.[1,2,8,13,17] In our study group, 89% of fractures occurred in men with an average age of 28 years, compared to a range of 74% to 86% men with a range of 25 to 29 years from other studies.[1,2,8,13,17] The similarity in age between our nonunion group and the acute fracture studies implies that there is not a specific age group that is susceptible to developing a nonunion.

Proximal pole fractures are cited[19] to have a prevalence of 5% but accounted for 23% of our nonunions, confirming the high risk that proximal pole fractures will progress to nonunion.

Delay in diagnosis is an important risk factor for the development of nonunion.[6,7] There might be numerous reasons for the high number of patients not seeking medical attention following injury (35%) and seeking delayed medical attention (31%) in our study. Many patients might have felt that their symptoms did not warrant medical attention. Patients frequently commented that their pain improved following their injury in absence of treatment. Studies have indicated that not all radiographically confirmed fractures have pain over the scaphoid.[6,10] The young male population in which these injuries occur might also be intrinsically unwilling to seek medical advice and be under pressure to minimize sports injuries.

Access to health care might also delay presentation, although there is universal health care in the province of Ontario, where this study was conducted. We did not feel that there were any delays in accessing medical care that contributed to the nonunions. Emergency room or urgent care waiting times are typically measured in hours and, therefore, did not contribute to delays in our patient cohort. Any time lag beyond 1 day from the injury to the primary medical visit was used to define a delay in treatment. Subsequent referral for further management was not defined as a delay if patients had been immobilized for their injury following the initial visit. Patients who were not immobilized or

who did not receive x-ray evaluation were classified as a failure of initial medical management. No patients stated that their referral care was delayed.

Seven patients with nonunions had no recollection of a primary injury. It is commonly assumed that a re-injury that reveals a nonunion can be relatively trivial, whereas the primary injury is most commonly related to a high-impact injury. In this series, there were no cases of multiple trauma, in which case a wrist injury could have been overlooked, but this also is a possible scenario for a missed fracture.

This study was limited in that the results are affected by retrospective recall bias. A small number of patient charts were incomplete, and data collection was not completely standardized. We could not ascertain all factors that might have contributed to some patients not receiving radiographic evaluation or immobilization for possible scaphoid fractures.

Constant vigilance and continued education will help trainers, coaches, and athletes to recognize the potential consequences of wrist injury and pain, which would apply not only to scaphoid fractures but also to other wrist injuries such as scapholunate ligament tears. Medical practitioners, particularly primary care physicians and emergency doctors, must remain alert to the varying presentation of scaphoid injuries and current treatment and follow-up that includes radiological investigations.

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