

6th Asia-Pacific Congress on Sports Technology (APCST)

Does wearing a wrist guard affect the site of wrist fracture in snow sports?

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Received 15 April 2013; revised 22 May 2013; accepted 29 May 2013

Abstract

The aim of this study was to determine if wearing a wrist guard in snowsports impacted on fracture site in the wrist. Participants presenting to two Australian resort medical centres with wrist fractures for one month in peak season 2010 were invited to participate. Differences between the mean distance ratio of the fracture site in the wrist were determined between the guard wearing and non-guard wearing populations using analysis of variance. The mean distance of the wrist fracture sites in the forearm from the wrist joint was 2.8 (SD 1.8) times the radius diameter in individuals who reported using guards and in non-guard wearers was 2 (SD 1.3) times the radius diameter. No significant difference was found in the distance of fracture from the wrist joint between these two groups ($F=62.8$ $p>0.08$).

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Selection and peer-review under responsibility of the School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University

Keywords: Wrist guard; fracture; injury; snowsport; snowboarding; skiing

1. Introduction

Fractures of the wrist are the most common fracture injury in snowsports, Dohima et al report that they represent up to 48% of all snowsport-related fractures [1] and Yamauchi et al stating that they represent 54% of upper limb injuries [2]. They have also been described as the most common injury in snowboarding for over 15 years [3, 4].

It has been demonstrated that wrist guards reduced the risk of a wrist injury in snowboarders however it has also been recommended that future research is needed to explore the efficacy of different wrist guard designs as well as whether the use of a wrist guard increases the risk of upper extremity injuries [5,

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6]. This additional research will support sport injury prevention strategies such as the Australian Alpine Responsibility Code's recommendation to: "Use appropriate protective equipment to minimize the risk of injury" [7].

While research reports and industry bodies support the use of wrist guards, previous studies of snowsport participants have suggested that the main reason boarders did not wear protective equipment such as wrist guards, were that they did not see a strong need to wear them and that they were considered to be uncomfortable to wear [7-11]. Additionally anecdotal reasons given for participants not wearing wrist guards include the claim that the wrist guard "does not prevent fractures" or "it simply moves the injury further up the arm." Thus, the aim of this study was to address the recommendation for further research and one of the expressed anecdotal concerns about the wearing of wrist guards regarding the relocation of fractures by assessing if the anatomical site of fracture in individuals suffering forearm fractures when participating in snowsports was affected by the use of a wrist guard.

2. Method

Ethics approval for this study was obtained from the University of Canberra Human Ethics Research Committee.

Forty snowboarders with wrist fractures who attended either of two Australian snowsport resorts during the peak season of winter 2010 agreed to participate in this study. Diagnosis of wrist fracture was confirmed by the medical officer on-duty and the participants consented to having an image of their plain x-ray recorded for the study. Fracture image evaluation was undertaken using Adobe Acrobat Pro for interpretation of fracture site and measurements were undertaken using the proprietary "Measure" tool in the software. The determination of fracture position on each wrist X-ray was taken as the distance from the distal tip of the radial styloid process to where the fracture line crossed the mid shaft of the radius (refer Figure 1).

All measures were undertaken by the one researcher to minimize measurement error. Reliability of the measurement protocol was assessed by determining Pearson's r coefficient. Three X-rays were measured five times by the same assessor with no feedback as to the accuracy of the measurement given between each measure. Reliability was high with a Pearson's r from 0.99 $p < 0.05$ to 1.0 $p < 0.01$.

To allow for potential differences in body size and stage of skeletal maturity the distance to the fracture site was expressed as a fraction of the radial diameter measured at the smallest diameter mid shaft. The correlation between age and radial diameter in the participant group was $r = 0.3$ $p < 0.01$. Analysis of variance was used to assess any difference between the mean distance ratio of the fracture site in the wrist between the guard wearing and non-guard wearing populations.



Fig. 1. The distance of the fracture line (A) from the distal radial styloid (B) is measured at (C). This distance was expressed as a function of radial cross section (D). All measures were standardized using known dimensions of the X-ray marker tags (E).

3. Results

Of all the snowboarders, 35 (87.5%) were not wearing a wrist guard and 5 (12.5%) were wearing guards of five different models/designs. In individuals using wrist guards the mean distance ratio of the wrist fracture sites in the forearm from the wrist joint was 2.8 (SD =1.8) times the radius diameter and in non-guard wearers was 2 (SD = 1.3) times the radius diameter. There was no significant difference in the distance of fracture from the wrist joint between these two groups ($F=462.8$ $p>0.08$).

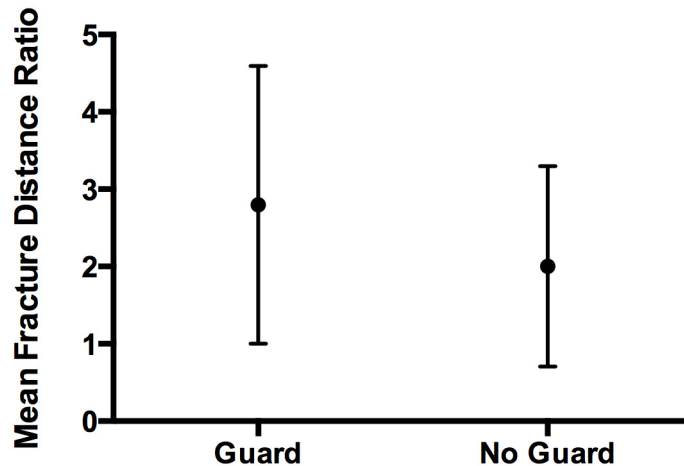


Fig. 2. Mean and standard deviation of the wrist fracture distance from the tip of the radius expressed as a function of radial cross sectional distance in the wrist guard wearing and no guard wearing groups.

4. Discussion

Even though the mean fracture distance from the wrist in the guard-wearing group was 40% further from the wrist than the fractures in the non guard-wearing group this study found no significant difference between those wearing wrist guards and those not wearing wrist guards. This may be a factor of sample size and supports the need for research on a larger sample.

Similarly, it is beyond the capacity of this study to definitively evaluate the efficacy of specific wrist guard designs, degree of stiffness, palmar versus both sides and short versus long, as these factors were not controlled for in this study. Effective evaluation of efficacy of wrist guard designs will require further prospective studies. Participants in this study who suffered a wrist fracture were wearing a number of different brands but there were not enough of any one brand to allow appropriate analysis, nor is there sufficient capacity to determine whether the guard was of the correct size nor fitted or worn appropriately at the time of injury.

A further limitation of this study is that as the data collection occurred in the medical centres of the two resorts which could mean that persons with less severe symptoms could bypass these centres and seek attention in their home region. This could result in the data from the resort centres reflecting only more significant injuries and potentially skewing any interpretation of the effectiveness of wrist guards if they are reducing injury severity.

5. Conclusion

This research sought to explore whether the location of snowboarding wrist injuries are impacted by the wearing of a wrist guard. The results from this small-scale study indicate that the fracture location is not significantly impacted by the wearing of a wrist guard. In order to provide evidence-based advice for injury prevention a larger-scale study is required that also addresses the issues related wrist guard design.

This research is necessary to inform and develop the evidence base to support appropriate criteria for designers, engineers and manufactures to address in the design and development of wrist guards as part of appropriate personal protective equipment. Any research needs to take a systems approach

acknowledging the multifactorial nature of the issue including not only, for example, the technological aspects of appropriate materials selection but also designs that may address issues such as correcting fitting and increasing the desire of boarders to take up wearing such a device.

Acknowledgements

This research was funded by the NSW Sporting Injuries Committee.

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