Skiing Trauma and Safety

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Editors

16th Volume

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Skiing Trauma and Safety: Sixteenth Volume

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Foreword

This publication, *Skiing Trauma and Safety: Sixteenth Volume*, contains papers presented at the symposium of the same name held from April 17-23, 2005, at the Arai Mountain Resort and Spa in Niigata, Japan. This publication is sponsored by the ASTM International Committee F27 on Snow Skiing in cooperation with the International Society of Skiing Safety which sponsored the symposium.

The chairman of the meeting was Professor Tsuneo Yamagishi, MD, Ph.D, Department of Orthopaedic Surgery, Jikei University School of Medicine, Tokyo, Japan. Dr. Yamagishi also served as one the editors of this STP along with Robert J. Johnson, MD, Emeritus Professor of Orthopaedics, Department of Orthopaedics, University of Vermont, Burlington, Vermont, and Jasper E. Shealy, Ph.D, Consultant and Professor Emeritus, Rochester Institute of Technology, Rochester, New York.

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Overview

The ten articles published in this book were among the 48 papers that were presented at the 16th International Conference on Skiing Trauma and Safety of the International Society of Skiing Safety (ISSS), which was held at the Arai Mountain Resort and Spa, Niigata, Japan, from April 17-23, 2005. The International Society of Skiing Safety was founded as a result of the 1st World Congress on Skiing Safety that was held in Riksgränsen, Sweden, in 1974. The organization of the Society was instigated under the enlightened leadership of Ejnar Eriksson, MD, of the Karolinska Hospital in Stockholm, Sweden. The second meeting of the society occurred in 1977 in the Sierra Nevada of Spain and has been held biennially ever since. The subsequent meetings occurred in Queenstown, New Zealand in 1979, Bormio, Italy in 1981, Keystone, Colorado, USA in 1983, Naeba, Japan in 1985, Chamonix, France in 1987, Riksgränsen, Sweden for a second time in 1989, Thredbo, Australia in 1991, Zell am Zee, Austria in 1993, Voss, Norway in 1995, Whistler/Blackcomb, British Columbia, Canada in 1997, Breuil Cervinia, Italy in 1999, Queenstown, New Zealand in 2001, St. Moritz/Pontresina, Switzerland in 2003, and Arai, Niigata, Japan in 2005. Planning is now well underway for the 17th meeting of the ISSS to be held in May 13-19 2007, in Aviemore, Scotland under the direction of Dr. Mike Langran. The 18th meeting of the ISSS is being planned for the spring of 2009 near Garmisch Partenkirchen in Germany.

The primary purpose of the Ski Trauma and Ski Safety Congress is to bring together a wide variety of individuals interested in all aspect of snow sports safety. These meetings have served as a format for the presentation of a multitude of subjects concerning snow sports including the means to prevent injury and improve various aspects of the sport and the treatment of injuries. A major accomplishment of each of these meetings has been the publication of the presentations given during the congresses. Since 1983, with the cooperation of the American Society for Testing Materials (ASTM) Committee F27, we have published a book containing papers given at the congresses. These publications have continued to be the primary source of information for all of those interested in winter sports safety. Following the 1999, 2001, 2003 and 2005 meetings, abstracts of the papers presented at the Congress were published in Knee Surgery, Sports Traumatology and Arthroscopy.

Attendees of the symposia of skiing trauma and safety have included representatives of the skiing industry such as binding, boot and ski manufacturers, engineers from industry, universities and technical institutions, skiing professionals such as ski instructors and patrolmen, physicians, lawyers, ski area managers and participants in recreational and professional skiing and riding activities. Interchange of ideas, comments, and critiques are encouraged in formal discussion of the papers. Many of the individuals who attend these meetings are involved in the ASTM International Standards process or those of other national and international standards organizations and are members of the International Society of Skiing Safety but all interested individuals are encouraged to participate.

All authors who present papers at the meeting were encouraged to submit their papers in a manuscript form to be considered for publication in a Special Technical Publication (STP) and now the Journal of ASTM International (JAI), which results from the peer review and editorial processes of the ASTM International. We believe that this ongoing effort has produced the standard for the world in the assemblage of a relevant body of literature dealing with safety in

winter sports as well as the prevention and treatment of injuries sustained by participants in these activities. The fundamental goal of both the International Society of Skiing Safety and the American Society for Testing Materials International Committee F27 on Snow Skiing is to improve the sport of skiing and associated activities by reducing the risk of injury, produce better and more enjoyable means of participating in all these winter snow sports activities, and, when necessary, provide appropriate treatment for injured participants.

Since the inception of the International Society of Skiing Safety in 1973, a decrease of approximately 50% in the overall incidence of ski trauma has been noted, and, in particular, a reduction of about 90% has been observed with regard to lower leg injury. More recently a reduction of 35-40% in the ACL incidence rate has also been observed. We believe that the efforts of our members through their research, their participation in the promulgation of standards, and their influence on equipment design have been at least partially responsible for these salutary results.

Summary of Papers

In a follow-up of the ongoing series of the epidemiological analysis of Norwegian winter sports injuries, Ekeland and Rødven concluded that injured alpine skiers were more prone to knee injuries compared to all other types of winter sports participants evaluated. Skiboarders were the most prone to lower leg fractures, and injured snowboarders were most prone to suffer wrist injuries. The percentage of knee injuries among females was almost twice that of males in skiers and snowboarders. Injuries sustained among snowboarders were more severe in terrain parks than injuries occurring on standard slopes.

Dickson, using telemark skiers as a study group, established that risk management needs to be pursued from a holistic approach to snow sports injury prevention. This endeavor brings in the tools developed from an occupational health point of view and chooses a proactive approach rather than a reactive approach in an attempt to more effectively manage the risk to which snow sports participants are exposed.

Cooper and Greenwald used observational techniques to better understand the mechanisms of falling during snowboarding accidents. Observing snowboard participants in terrain parks and half-pipes, the authors noted that beginners fall approximately six times more frequently than advanced snowboarders and average more than one fall per run. Beginners fall in such a fashion that in 72% of their falls, the individuals land on their hands. More experienced participants had a much higher incidence of falls on their backs or buttocks. They found that 90% of children wore helmets while less than 40% of young adults used helmets.

Shealy and colleagues evaluated traumatic fatalities occurring to recreational skiers and snowboarders in the U.S.A. between 1992 and 2005. During that time, 562 deaths were recorded, with 97 of these occurring to snowboarders and 465 occurring to alpine skiers. The fatality rate for skiers was approximately 0.75 deaths per million skier visits. The snowboarder rate was 0.53 deaths per million snowboarder visits. There was no evidence of an increasing frequency of deaths during the observed study time. Helmet utilization did not appear to affect fatality incidence but did result in a shift of the primary cause of death from mostly head injuries for those not using helmets to injuries of the chest and torso for those who did wear a helmet.

In the first of three articles concerning medical topics, Yamagishi and colleagues reviewed their experience with eleven patients who underwent total knee arthroplasty and returned to alpine skiing. Their two-year follow-up evaluation of these patients revealed that once strength, mobil-

ity and coordination had been improved following surgery, their patients could be successfully allowed to return to downhill skiing with no early evidence of any untoward consequences.

Zacharopoulos and his associates studied their experience with eighteen patients who had sustained primary shoulder dislocations in skiing accidents. They performed arthroscopic primary repairs of the Bankart lesions that were found in each of their patients. They followed their patients for a mean of 31 months. The patients were allowed to return to active sports six months after surgery and at the time of follow-up, none had sustained a recurrent dislocation. The outcomes of their patients using the Rowe-Zarins scale were very satisfactory.

In a study evaluating the diagnosis and treatment of Lisfranc ligament injuries sustained in windsurfers, Mitani et al. found that these injuries were frequently misdiagnosed, especially if weightbearing anteroposterior radiographs were not obtained. In their case series of three patients, two were successfully treated with surgical intervention and one with conservative measures.

In an elaborate study investigating backward falls which can result in head injuries, Scher and his colleagues determined the average speed at which beginner and intermediate snowboarders travel on their snowboards. They then used an anthropomorphic test device that simulated the 50% percentile male. They tested simulated falls of their anthropomorphic test device both with and without helmets in a backward fall simulation of snowboarding at realistic speeds. Analysis of the fall kinematics demonstrated a rapid transition of whole body angular motion during the fall. The use of a helmet reduced substantially the linear accelerations and head injury criterion associated with head to ground contact on hard, icy snow during these falls. The findings indicated that helmets can mitigate head to ground contact severity associated with the common mechanism of falling backward while snowboarding.

Ettlinger and his colleagues evaluated differences between the release moments of equipment associated with lower extremity injuries and uninjured controls using a commercially available testing device. In their evaluation, 43 anterior cruciate ligament sprains, 79 lower leg injuries and 99 uninjured controls were studied using data gathered between December 1997 and April 2004. In terms of quantitative critical defects, 17% of the control group, 14% of ACL group and 39% of the lower leg injury group exhibited release levels more than 30% above recommended. Other qualitative critical defects were also much more common in the lower leg injury group than those found in the control group or the ACL injury group. The authors concluded that sprains, fractures, and strains and contusions of the lower leg among alpine skiers were associated with measurable or observable qualities of the release system, whereas serious sprains of the knee were not.

In the final paper, Grewal, Lund and Rossetter evaluated snowboard mechanical properties. To better understand the influence of core materials and construction on a boards stiffness, the ultimate failure load and stored energy of several commercially available snowboards were tested to failure in three point bending. The results showed that stiffness and ultimate failure load are most strongly influenced by the core wrap thickness while the energy storage is most strongly influenced by differences in the core material and construction methods.

Concluding Remarks

The inter-relationship between the International Society of Skiing Safety and the American Society for Testing and Materials International has resulted in a unique method for providing a

Overview

forum for the discussion of problems of winter sports safety and the publication of a state-of-the-art book such as this Special Technical Publication. When it was initially organized, the goal of the ISSS was to address the problems of alpine and Nordic skiing safety, but through the years the scope has evolved to include freestyle skiing, snowboarding, skiboarding and other hybrid activities that occur on the slopes of the worlds mountains. Our primary goal remains the identification of the risks and the means of reducing the risks in these activities. We encourage all who are interested in these snow sports to join us in the future as we seek to improve their quality and safety of these sports.

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Topics include: â€¢ Injuries in Norwegian Ski Resorts 2002â€”2004. â€¢ Observations study on fall trends in snowboarding. â€¢ On piste fatalities in recreational snow sports in the U.S. â€¢ Arthroscopic treatment of the first anterior shoulder dislocation in young skiers. â€¢ Evaluation of the protective role of helmets in snowboarding. â€¢ Functional and release characteristics of Alpine ski equipment. â€¢ And more! Table of Contents. Injuries in Norwegian Ski Resorts 2002 â€“ 2004. Thirty-nine papers, by experts in skiing traumatology and safety, cover: epidemiology, skier behavior, ability, and conditioning, specific injuries, boot and binding mechanics, biomechanics of the lower extremity and of thumb injuries, skiing safety, biomedical testing, clothing. These are papers of the meeting in Chamonix, France, May 1987. Annotation copyrighted by Book News, Inc., Portland, OR.Â Annotation Research findings and expert opinion on the problem of snow skiing injury. Thirty-nine papers, by experts in skiing traumatology and safety, cover: epidemiology, skier behavior, ability, and conditioning, specific injuries, boot and binding mechanics, biomechanics of the lower extremity and of thumb injuries, skiing safety, biomedical testing, clothing. Two Epidemiological Factors in Skiing and Snowboarding. 58. Death in Downhill Skiing from 1976 through 1992A Retrospective View. 66. Loads Transmitted in the Practice of Snowboardingalexis bally. 196. Influences of Ski Boot Binding System on Load Reduction and Kinematics. 206. Treatment of Cruciate Ligament Injuries in World Cup Racers and Successive. Skiing trauma and safety : 20th volume. Skiing Safety, R. Johnson, J. Shealy, R. Greenwald, Astm Subcommittee F . on Skis, Boots. Medicine. 30 July 2015.Â Skiing trauma and safety : sixteenth volume. R. Johnson, J. Shealy, å±±å²¸æ'é›„, Skiing Safety. Medicine. 2006.