

# Clinical Outcomes of an Orthopedic Ankle-Stabilizing Boot

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## ABSTRACT

*The emphasis for orthotic treatment of the foot and ankle following injury has shifted from complete immobilization to allowing functional activity to occur in stable planes. The literature supports this concept of orthotic treatment where tolerable flexibility and normal function with conservative intervention will best lead to a favorable clinical outcome. Specifically, the use of orthopedic ankle-support boots in treating acute and chronic ankle injury has not been studied adequately to date.*

*In a retrospective study, 180 patients were surveyed who had been fitted with orthopedic ankle-support boots between 1991-1996 following acute and chronic foot and ankle injury. The boots comprise unique features, including medial and lateral stabilizers, firm reinforced heel cups, a patented lacing system, and torsion-resistant sole design. Clinical outcomes were obtained from a survey mailed to patients. An 18% return rate (33 patients) was achieved. Results indicated that 42% of patients were prescribed the boots to replace an existing orthosis, while 29% claimed that the boots were prescribed to avoid surgery. Eighty-six percent of subjects were able to resume their normal activities immediately once fitted. Only 13% of all subjects had surgical intervention following use of the boots. A high level of compliance was achieved; 86% were still wearing the boots at the time of survey and 77% would prefer the same treatment again.*

*The study indicated positive clinical outcomes with the use of orthopedic ankle-support boots as demonstrated by a speedy return to normal activities; reduced time on disability; its application in acute, chronic, and prophylactic stages; its favorable response over other commonly used modalities; and a high level of compliance.*

**Key Words:** Ankle-Support Boots; Ankle Bracing; Ankle Immobilization; Orthosis; Ankle Injury; Talofibular Injury.

## Introduction

Talofibular joint injuries are the most frequent injuries to the foot mechanism. However, there are no commonly accepted parameters in treating such injuries (1,2). In recent years, the emphasis for the use of foot and ankle bracing has shifted from complete immobilization to providing support in only the unstable planes while allowing functional activity to occur in stable planes. Research has demonstrat-

ed that proprioception can be impaired after immobilization of the ankle (3,4), and atrophy of the leg muscles may occur (5). Buschbacher (1) stated that immobilization is seldom necessary and useful. Rather, stable mobilization of the unstable joint is desired. Evans and Frenyo (2) observed the advantages of flexibility and normal function with conservative versus surgical intervention and immobilization of foot ligament injuries.

Specifically, the use of orthopedic ankle-stabilizing boots to treat acute foot ankle injury, chronic foot and ankle instability, and foot and ankle fractures, and to prevent foot and ankle reinjury has not been studied adequately to date (1). The single publication in this area was that by Hintermann et al. (6), who performed a prospective study on 46 patients with fresh ruptures of the lateral ligaments of the ankle. Twenty-eight patients were fitted with the Ortho Rehab ankle-stabilizing boot (Künzli & Co., Windisch, Switzerland) in lieu of casting. Surgical intervention was performed on 18 patients whose lateral varus subluxation tilt exceeded 12 degrees. Treatment consisted of six weeks of taping and concurrent use of the Ortho Rehab ankle-stabilizing boot. Range-of-motion tests were performed at two and 12 months postinjury. Results at two months and 12 months postinjury showed excellent mechanical and functional stability. Patients returned to routine activities sooner than was achieved with either a plaster of Paris cast or an Aircast Stirrup®(7,8).

This study presents findings of a retrospective study to assess clinical outcomes following the use of orthopedic ankle-stabilizing boots with 180 patients who presented with instabilities and other symptomatic disorders of the foot and ankle.

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**RESEARCH STUDY QUESTIONNAIRE**  
**KÜNZLI ANKLE SUPPORT BOOTS**

1. WHICH KÜNZLI MODEL DO YOU USE?  
 ORTHO WHITE     ORTHO BLACK     ORTHO REHAB     ORTHO REHAB AIR  
 SAFARI PLUS     ROCKY PLUS     ROCKY HIGH     ORTHO OPEN  
 IF YOU ARE NOT SURE WHICH MODEL, PLEASE DESCRIBE \_\_\_\_\_

2. DO YOU STILL WEAR YOUR KÜNZLI ANKLE SUPPORT BOOTS?     YES     NO

3. HOW LONG HAVE YOU WORN THE KÜNZLI ANKLE SUPPORT BOOTS?  
 LESS THAN 1/2 YEAR     1 YEAR     2 YEARS     3 YEARS  
 MORE THAN 3 YEARS

4. WHAT ACTIVITIES DO YOU USE YOUR KÜNZLI ANKLE SUPPORT BOOTS FOR?  
 WORK     SPORT     EVERYDAY ACTIVITIES  
 OTHER, PLEASE DESCRIBE \_\_\_\_\_

5. WHAT SPORTS DO YOU USE YOUR KÜNZLI ANKLE SUPPORT BOOTS FOR?  
 TENNIS     BASKETBALL     HIKING     NONE  
 OTHER, PLEASE DESCRIBE \_\_\_\_\_

6. HOW DO THE BOOTS FEEL?  
 VERY COMFORTABLE     COMFORTABLE     UNCOMFORTABLE     CAN'T WEAR

7. HOW DID YOUR INJURY OCCUR?  
 FELL     SLIPPED     TWISTED  
 OTHER, PLEASE DESCRIBE \_\_\_\_\_

8. WERE THE BOOTS PRESCRIBED SO THAT SURGERY COULD BE AVOIDED?  
 YES     NO     DOES NOT APPLY     DO NOT KNOW

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9. DID YOUR INJURY RESULT IN:  
 MUSCLE/TENDON/LIGAMENT SPRAIN (TWIST) OR STRAIN (OVER-STRETCHING)  
 MUSCLE/TENDON/LIGAMENT RUPTURE  
 FRACTURE (BONE BREAKAGE) OF ANKLE/FOOT  
 ALL OF THE ABOVE  
 OTHER, PLEASE EXPLAIN \_\_\_\_\_

10. DID USING THE BOOTS RESULT IN RECOVERY OR HEALING OF THE INJURY?  
 YES (IF YES, HOW LONG UNTIL RECOVERY?) \_\_\_\_\_  
 NO

11. WERE THE BOOTS PRESCRIBED INSTEAD OF ANOTHER TYPE OF ANKLE BRACE?  
 YES (IF YES, WHAT KIND OF BRACE?) \_\_\_\_\_  
 NO     DOES NOT APPLY     DO NOT KNOW

12. DID YOU UNDERGO SURGERY OF THE FOOT OR ANKLE AT ANY TIME WHILE USING THE KÜNZLI ANKLE SUPPORT BOOTS?  
 YES     NO     NOT SURE

13. IF YOU HAVE NOT UNDERGONE SURGERY SINCE USING THE KÜNZLI ANKLE SUPPORT BOOTS, DO YOU THINK, IN YOUR BEST JUDGEMENT, THAT THEY HAVE AIDED IN PREVENTING SURGERY?  
 YES     NO     NOT SURE

14. WOULD YOU PREFER THE SAME TREATMENT OF USING KÜNZLI ANKLE SUPPORT BOOTS IF YOU HAD THE SAME INJURY AGAIN?  
 YES     MAYBE     NO (IF NO, WHAT ALTERNATIVE?) \_\_\_\_\_

15. HOW MANY DAYS DID IT TAKE YOU TO RESUME BACK TO NORMAL ACTIVITY FROM THE TIME YOU STARTED USING KÜNZLI ANKLE SUPPORT BOOTS?  
 WORK     SPORT     OTHER (EXPLAIN) \_\_\_\_\_

16. PLEASE DESCRIBE ALL POSITIVE AND NEGATIVE ASPECTS OF THE KÜNZLI ANKLE SUPPORT BOOT.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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Figure 1. The study questionnaire sent to patients fitted with the Künzli Orthopedic Ankle-Support Boot.

**Methodology**

A 16-question survey was sent to 180 patients who were fitted with Künzli Orthopedic Ankle-Support boots (Künzli & Co., Windisch, Switzerland) between 1991-1996 (Figure 1). All patients were referred by orthopedic surgeons or primary care physicians. Clinical outcomes were obtained in the survey by obtaining information on mechanical and functional stability, compliance, injury sustained, and time to resume normal activity, among other questions (Figure 1). Patients were fitted with one of eight boot models. All of the eight models fitted are comprised of the following four generic features (Figure 2):

1. "A-Principle" dual medial and lateral removable stabilizers or stays that maintain stability in the ML plane while allowing dorsi- and plantarflexion. The plastic stabilizers are comprised of two types of stiffness grades: polyester (rigid) and nylon (semi-rigid). Both grades of stays are thermomoldable and are easily interchangeable.
2. A firm, reinforced heel cup of cardboard-leather combination that has been solidified with a bonding solution.
3. A lacing system (patented in 1959) with nylon webbing that inserts distally at the plantar aspect of the boot, providing an even distribution of instep pressure over the entire dorsal aspect of the foot. At the proximal end are "D-shaped" eyelets made from one-piece, punched-out, sheath metal.
4. "Sandwich construction" intermediate sole design that

is torsion-resistant in the medial-lateral plane with flexibility in the anterior-posterior plane.

All patients were fitted with one of eight Künzli boot models. The Ortho White, Ortho Black, Ortho Rehab, Ortho Rehab Air, and Ortho Open models have waffle soles (Figure 3). Safari Plus, Rocky Plus, and Rocky High have perforated soles indicated for industrial and outdoor activities (Figures 4, 5). Ortho White differs from the Ortho Black in color only.



Figure 2. Schematic diagram of the Künzli Orthopedic Ankle-Support Boot: (1) A-Principle stabilizers; (2) firm reinforced heel cup; (3) lacing system (patented in 1959); (4) "sandwich construction" sole design (torsion-resistant intermediate sole).

The Ortho Rehab and Ortho Rehab Air model differ only inasmuch as the Ortho Rehab Air comprises dorsal perforations for better heat dissipation. The Ortho Rehab and Ortho Rehab Air models are the most rigid of the eight models fitted. They feature an additional and extended heel cup reinforcement with longer medial and lateral stabilizers. Both were designed initially to be used in lieu of a cast.



Figure 3. The Ortho White model with the waffle sole.



Figure 4. The Safari Plus model and the perforated sole.

The Ortho Rehab was also the model used in the study performed by Hintermann et al. (6).

The Ortho Open is similar to the Ortho White and Black models but has Velcro closures. This is indicated for patients who cannot fit into the other models as a result of foot deformities such as hammer toes, a large instep area, or the inability to plantarflex their feet for insertion.

The Safari Plus and Rocky Plus models are similar except for their cosmetic designs and are indicated for industrial and outdoor use. The Rocky High is four inches higher over the lower calf section, but is otherwise similar to the Rocky Plus and Safari Plus models.

### Results

The survey return rate achieved was 18% or 33 patients (67% male, 33% female; mean age  $51.6 \pm 16.7$  years). Only

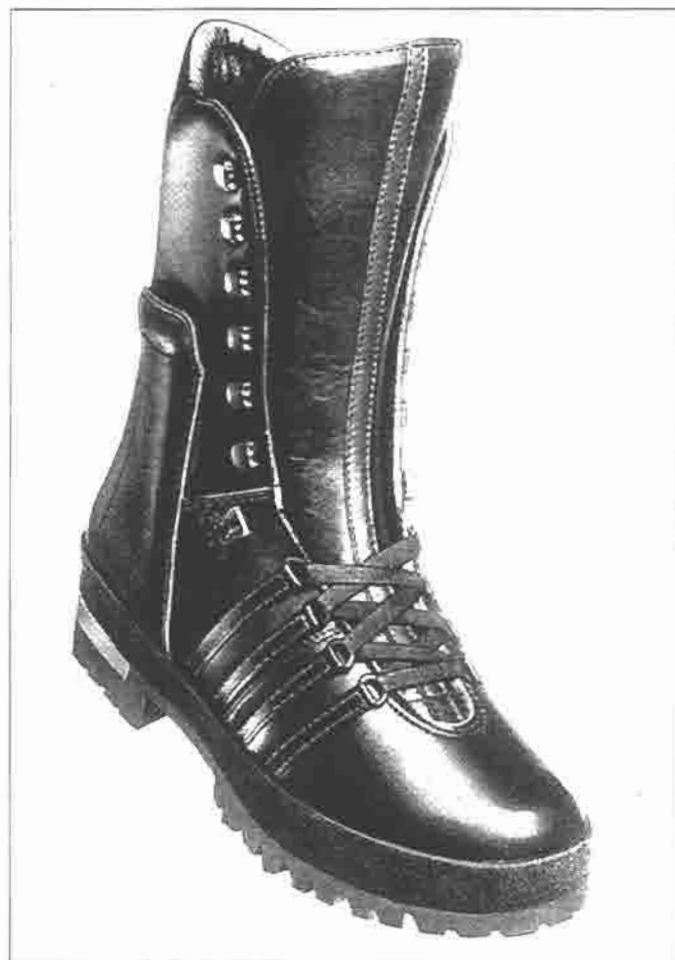


Figure 5. The Rocky High model.

surveys that were completed in full were counted as a return. Of the type of model used, 51% of patients were fitted with the waffle-type sole while 49% were fitted with the perforated sole (Figure 6). At the time of the study, 50% of patients had been using their orthopedic ankle-support boots longer than two years, 19% longer than three years. Twenty-three percent of respondents utilized the boots exclusively for work, 25% exclusively for sport, and 52% for everyday activities, including work and sport. Etiology of injury showed that 31% of subjects sustained falls, 19% twisted their ankle, 7% slipped, and the remaining 43% had other reasons, e.g., due to Charcot Marie Tooth disease, polio, traumatic compression injuries, or rheumatoid arthritis. The orthopedic ankle-support boots were prescribed following ankle sprain and strain (20%), rupture of ankle tendons or ligaments (43%) or following open reduction, internal fixation of fractures (23%) (Figure 7). Fifty-four percent of the subjects found wearing the boots "very comfortable," 33% found them "comfortable," while 13% found them "uncomfortable." Forty-two percent of respondents stated that the boots were prescribed to replace an orthosis (Figure 8). Twenty-seven percent of all subjects had full recovery or healing from their foot and ankle in-

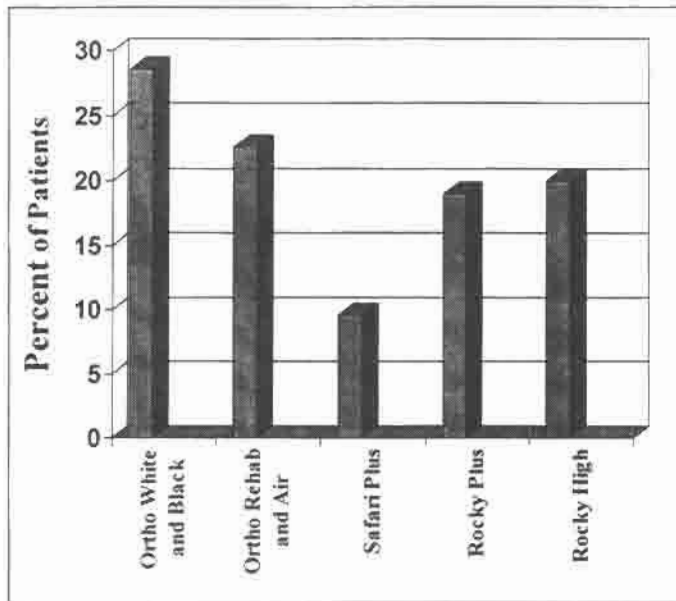


Figure 6. The distribution of the types of models fitted to patients.

jury as a result of wearing the boot, although most continued to wear them as a prophylactic measure. Thirty percent of respondents claimed the boots were prescribed in lieu of foot and ankle surgery. Only 13% of subjects underwent surgical intervention after being fitted with the boots. Of the 87% of subjects who did not undergo surgery while utilizing the boots, 44% felt that the boots directly aided in preventing surgery. Other results showed that 86% of the subjects were able to resume their usual activities immediately following use of the boots. At the time of the survey, 87% of respondents were still wearing the boots daily. Seventy-seven percent of the subjects would prefer the same treatment again.

**Discussion**

This study of 33 subjects indicates positive clinical outcomes with utilization of the orthopedic ankle-support boots. Most boots were indicated for chronic use. More than half of all subjects had used their boots for over two years, and a fifth of all subjects for over three years. This result indicates that the boots are durable; they usually require resoling or other leather work on an as-needed basis only. This is more impressive in light of the fact that most of these patients were fitted with only one pair of boots, for which they performed all daily activities of work and recreation. The authors postulate that there was good patient compliance, a claim substantiated by the finding that 87% of respondents still utilize their boots daily, and that 77% would prefer the same treatment again. At the end of the survey, patients had the option of commenting on positive and negative aspects of the Künzli Orthopedic Ankle-Support boots. Positive aspects included ankle stability, excellent comfort, boot quality construction, cosmetic appear-

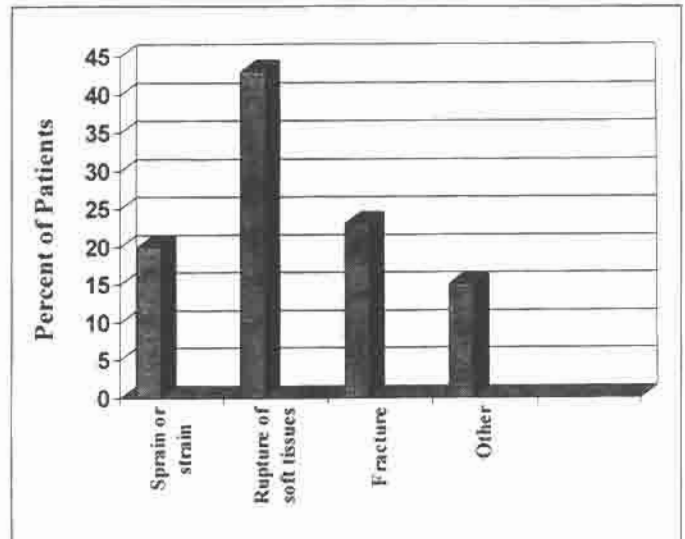


Figure 7. The types of injuries sustained by the patients.

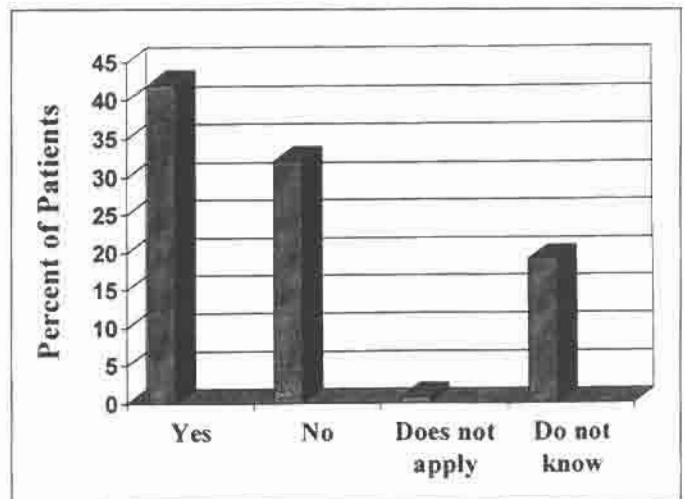


Figure 8. The distribution of patients prescribed with Künzli boots to replace other ankle braces.

ance, style options, support on uneven terrain, and the ability to accommodate custom-made foot orthoses. Negative aspects included weight, stiffness, the lack of a model with a steel toe, only one width option, and donning time.

About two-thirds of injuries were soft-tissue related, with the remaining patients sustaining bone or joint fractures. Of the soft tissue injuries, two-thirds involved a rupture of ligaments or tendons. It is evident that most patients in this study sustained significant trauma to the foot and ankle. Forty-two percent of the subjects stated they were prescribed the orthopedic ankle-support boots to replace other orthoses that were being used at that time (Figure 8).

The results of the study demonstrate that use of the Künzli Orthopedic Support boots met with high patient compliance, provided support and comfort adequate enough for patients to resume immediately their usual activities

(barring sports activities), and subsequently led to a very low proportion of patients requiring foot and ankle surgery. The retail cost of the eight models ranges from \$300-\$500. In light of the results of the study, the Künzli Orthopedic Ankle-Support boot has demonstrated its ability to provide an improvement in patients' quality-of-life and a cost-effective orthotic option for foot and ankle injuries.

### Indications

Indications for using the orthopedic ankle-support boots include:

- semi- and complicated cases of soft tissue injuries of the foot and ankle (muscle, tendon, and ligament);
- in lieu of casting and other commonly used orthotic/orthopedic modalities;
- following operative treatments of strains, sprains, ruptures, and fractures of the foot and ankle.

### Conclusion

This retrospective study on 33 subjects reported clinical outcomes with the use of an orthopedic ankle-support boot. Examination of the results showed that patients achieved the following with the use of Künzli Orthopedic Ankle-Support boots:

- a speedy recovery to normal activities
- reduced time on disability
- a cost-effective form of treatment
- continuous use in acute, chronic, and prophylactic stages
- a favorable response over other commonly used modalities
- sufficient mechanical and functional stability
- a high degree of compliance.

*Disclosure:* Künzli Orthopedic Ankle-Support boots are manufactured by Künzli & Co. (Windisch, Switzerland) and distributed in North America and the Caribbean by Swiss International, Inc. (Hollywood, Florida). Swiss Balance, Inc. has no business or financial interest with either Künzli & Co. or Swiss International.

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