

FUNCTIONAL STABILIZATION IMPROVES ANKLE RANGE OF MOTION

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ÖZET

FONKSİYONEL İMMOBİLİZASYON AYAK BİLEĞİ HAREKETLERİNİ GELİŞTİRİR

Bu çalışmanın amacı halen tedavisinde fikir birliği sağlanamamış sık görülen yaralanmalardan olan ayakbileği ligaman lezyonlarının (lateral ligaman sprain) konservatif tedavisinde immobilizasyonun ayak bileği hareket açıklığına etkisini araştırmaktır.

Bu amaçla, ayak bileği lateral ligaman yaralanmasıyla başvuran olgular iki gruba ayrılarak, birinci gruba fonksiyonel immobilizasyon amaçlı Soft Cast® bandajı ve diğer gruba ise semi-sentetik yada alçı materyalinden konvansiyonel diz altı yürüme alçısı uygulandı. Grup 1, ortalama yaşı 34 olan 16 erkek ve dört kadın hastadan oluşur iken Grup 2'de ortalama yaşı 33 olan 15 erkek ve beş kadın hasta bulunmaktaydı ve gruplar arasında istatistiksel anlamlı fark yoktu. Her iki grupta da immobilizasyon süresi olan üç haftanın sonunda goniometreyle ayak bileği hareket açıklığı ölçüldü.

Fonksiyonel immobilizasyon uygulanan konvansiyonel olgularla karşılaştırıldığında, plantar fleksiyon için 32 dereceye 25 derece, dorsal fleksiyon için 11 dereceye sekiz derece ve toplam ayak bileği hareket açıklığı için 44 dereceye 33 derece olmak üzere anlamlı olarak daha iyi hareket açıklığı sonuçları gösterdiler.

Sonuç olarak, ayak bileği ligaman lezyonlarının tedavisinde stabilite yönünden etkinliğini daha önceki çalışmalarda kanıtlamış olan Soft Cast® bandajı, tedavi sonrasında ayak bileği hareketlerindeki üstünlüğüyle de güvenli ve yararlı bir teknik olarak görünmektedir.

Anahtar Kelimeler: *Soft Cast, Fonksiyonel Immobilizasyon, Ayak Bileği, Ligaman Yaralanmaları, Sprain.*

ABSTRACT

The aim of this study was to search the effect of immobilization on ankle range of motion (ROM) in the conservative treatment of ankle ligamentous lesions (lateral ligament sprain) which is a common injury still having a controversy about the treatment.

The patients were assigned into one of the groups; an above ankle Soft Cast® bandage for functional immobilization was applied in Group 1, and a conventional rigid below knee walking cast with Plaster of Paris or semi-synthetic material was applied in Group 2. The groups were comparable statistically. Sixteen of the patients were male and four were female with a mean age of 34-years for Group 1. Group 2 consisted of 15 male and five female subjects with a mean age of 33-years. Duration of immobilization was three weeks for both groups and ankle ROM (dorsal and plantar flexion) was measured with a goniometer at the day of the cast removal.

Functional immobilization group showed significantly better results for plantarflexion, dorsiflexion, and total ROM values (32 to 25 degrees, 11 to eight degrees and 44 to 33 degrees, respectively).

As a result, Soft Cast® ankle bandage which proved its efficiency on ankle stability by previous studies, is a safe and beneficial technique in the treatment of ankle lesions bringing a better ankle mobility immediately after treatment.

Key Words: *Soft Cast, Functional Immobilization, Ankle, Ligamentous Injuries, Sprain.*

INTRODUCTION

Ankle ligamentous lesions (lateral ligament sprain) are frequently encountered injuries in orthopaedic practice, but there is still a controversy about the

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treatment of this common lesion. The treatment can be either operative or conservative. Adhesive tape bandages, orthosis, rigid immobilization materials are commonly used in the conservative treatment for immobilization purposes.

The effects of immobilization on bone and soft tissues have been widely studied and well established. All tissues move with function and any attempts to eliminate such movements are not physiologic¹. Immobilization atrophies the muscle very quickly, significantly already after one week. Its effect on tendon or ligament tissue can be summarized as a decrease in the tensile strength, elastic stiffness and total weight. Compared with the knowledge on immobilization, the effects of remobilization on musculoskeletal tissues have not been well established. What is sure that remobilization and rehabilitation require much more time than the time needed that causes the side effects of immobilization^{2,3}.

In our minds, the best way to avoid the side effects of immobilization is to avoid unnecessary immobilization and perform controlled motion as possible. This can be accomplished by new immobilization materials and techniques. Traditional concepts of immobilization require a cast or splint that extend to one joint above and below the affected area and immobilize them. As a result, stiffness, muscle atrophy, weakened and impaired circulation and osteoporosis are usually encountered. Functional immobilization has evolved dramatically during the past few decades and has been helped by the developments in new synthetic splinting bandages. Functional casting aims to prevent movements in undesired planes while allowing other movements in a controlled manner.

In this study we aimed to search only the effect of immobilization on ankle range of motion (ROM). We investigated the results of two different methods in the treatment of lateral ligament sprain with respect to ankle ROM.

MATERIAL AND METHODS

Casting Material

Soft Cast® (3M, Minnesota) consists of a knitted glass fiber backing, impregnated with polyurethane resin⁴. Its flexibility makes it possible to use for the treatment of patients with musculoskeletal injuries, even for the fractures with a special technique. It can provide some motion in moving

parts but it does not stretch. When stabilization is needed, it can be combined with reinforcement splints to have rigidity.

Patients

Cases with acute inversion injuries without a fracture and with an isolated injury to the lateral ligaments of the ankle were included. The degree of ligament injury was assessed by clinical criteria, swelling, echymosis and tenderness over the ligaments.

The patients were assigned into one of the groups; an above ankle Soft Cast® bandage was applied in Group 1, and a conventional rigid below knee walking cast with Plaster of Paris or semi-synthetic material was applied in Group 2. Soft Cast® ankle bandage was applied by a special "heel lock" and a "figure of eight" technique described by Schuren and only stockinette padding was used in order to obtain a skin-tight application (4). The patients were allowed weight bearing as soon as possible; depending on the pain tolerated after the acute phase subsided.

The groups were comparable statistically. Sixteen of the patients were male and four were female with a mean age of 34-years for Group 1. Group 2 consisted of 15 male and five female subjects with a mean age of 33-years.

Duration of immobilization was three weeks for both groups and ankle ROM (dorsal and plantar flexion) was measured with a goniometer at the day of the cast removal. Student's *t*-test was used for statistical analysis, by "S. P. S. S. for Windows" software on a IBM compatible personal computer.

RESULTS

The results at the day of cast removal obtained by goniometer measurements are given in Table I. For Group 2, a reduction in the ankle dorsal and plantar-flexion was observed, which was statistically significant.

Table I: Ankle Range of Motion Results and p Values at the Day of Cast Removal

	Average Dorsiflexion	Average Plantarflexion	Total ROM
Group 1	11.3° (±3.6)	32.3° (±8.4)	43.5° (±9.15)
Group 2	7.9° (±2.7)	25.2° (±9.4)	33.1° (±9.2)
P Value	0.002	0.017	0.001

DISCUSSION

The concept of functional immobilization of the fractures has been popular initiating after a publication on a functional below-the-knee cast for tibial fractures⁵. Since then, many studies on the subject have been published. Most of the studies on ankle ligament injuries treated with functional immobilization techniques concerned with the ankle stability achieved after treatment. In a prospective study, Neugebauer et al. investigated on the use of Soft Cast[®] on 75 patients with lateral ankle ligament injury. The authors have performed x-ray examination as an objective measure of ankle instability and recommended semi-rigid immobilization with Soft Cast[®] in both operatively and conservatively treated patients with ruptures of the lateral ankle ligaments⁶. Infanger et al. reported a large series, the results of 184 patients treated with Soft Cast[®] and they stated that the bandage offers sufficient stability for the regeneration of ligament lesions with simultaneous functional treatment and protection against extreme movements⁷. In a prospective randomized study Cavenaile et al.⁸ performed a comparison between Soft Cast[®], elastic tapes and rigid cast in a group of patients treated both conservatively or operatively and found Soft Cast[®] as effective and comfortable. Soft Cast[®] has also been compared with standard adhesive tape treatment and both methods were reported to be effective giving sufficient stability⁹. Avcı and Şaylı¹⁰ are other authors who contributed the knowledge on the stability achieved after a treatment with Soft Cast[®] bandage. In their prospective randomized study compared semi-rigid immobilization performed with Soft Cast[®] with rigid immobilization. At the end of six weeks follow-up, authors found out both methods to be equally effective in providing ankle stability. In addition with semi-rigid immobilization patient satisfaction was found to be higher. The authors concluded about Soft Cast[®] treatment to be the "material of choice".

We can conclude that functional immobilization with Soft Cast[®] proved its efficiency in aforementioned studies by objective methods as; "a reduction in talar tilt and anterior drawer" tests were detected. In this study we only aimed to determine ankle ROM. We did not search for the stability of the ligaments after healing as in previous studies Soft Cast[®] material showed its effectiveness on the healing of the lateral ligament complex.

According to our results, ankle ROM values of functionally immobilized group were significantly better in both planes (dorsal and plantar-flexion) and also as total ROM values (p values; 0.002, 0.017, 0.001, respectively). There exists a strong possibility that the difference between the groups will not be significant when a well-designed rehabilitation schedule is properly applied or even this restriction of the ankle may resolve with daily activities of the patients by time. This can be answered by a larger group with a long-term follow-up, and seems an interesting point to identify and we are still working on this subject.

As a result, Soft Cast[®] ankle bandage is a safe and beneficial technique in the treatment of ankle lesions, with a better ankle mobility immediately after treatment.

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