

Prevention of Tinea Corporis in Collegiate Wrestlers

James W. Hand, MS, ATC*; Randall R. Wroble, MD*†

* Ohio University, Athens, OH; † Sportsmedicine Grant, Columbus, OH

Objective: To examine the role of a comprehensive skin disease prevention protocol in conjunction with the use of a barrier cream to prevent tinea corporis (ringworm) in collegiate wrestlers.

Design and Setting: We studied a college wrestling team for 16 weeks during 1 season. During the first 8 weeks, no preventive measures were taken. For the remaining 8 weeks, wrestlers were randomized into 2 groups and used either a barrier or a placebo.

Subjects: Twenty-two male college wrestlers with a mean age of 20.4 years (range, 18.1 to 23.2), a mean weight of 68.4 kg (range, 55.8 to 130.2), and a mean height of 177.8 cm (range, 168.7 to 186.9).

Measurements: We performed skin checks daily. All new or exacerbated lesions were clinically diagnosed by the same team physician and recorded.

Results: Cases of tinea corporis declined from 10 diagnosed before initiation of the protocol to 1 after the protocol was initiated. One athlete in the placebo group was found to have tinea corporis versus none in the barrier cream group.

Conclusions: Strict adherence to the prevention protocol for skin infections significantly decreased the number of cases of tinea corporis. The use of the barrier cream in conjunction with the prevention protocol did not result in any further statistical reduction in the number of wrestlers who contracted tinea corporis.

Key Words: ringworm, barrier cream, skin infections, wrestling, prevention

Tinea corporis, or ringworm, hinders wrestlers by forcing them to cease wrestling practice while contagious, and it may disqualify them from competition.¹ Diagnosing and treating ringworm can be costly to the athlete, the wrestling program, the school or institution, and the responsible insurance company. Prevention of ringworm in wrestling would be of great benefit to athletes, coaches, and supporting medical personnel, decreasing the time the wrestler is withheld from practice and competitions and reducing the costs of diagnosis and treatment.

In an attempt to find an effective preventive regimen, our approach was to use a comprehensive skin disease prevention protocol in combination with a barrier cream. The barrier cream was Kenshield (Kennedy Industries, Maple Glen, PA), a white, nongreasy foam. It consists of polydimethylsiloxane, isopropyl myristate, glycerine, and water. No adverse reactions to this product have been reported in the literature. It must be applied to dry skin and should be reapplied between matches at tournaments or during prolonged wrestling events. The manufacturer claims that Kenshield will protect the athlete for up to 4 hours (the typical wrestling practice is between 2 and 3 hours) by forming a semipermeable barrier on the wrestler's skin.

The purpose of this study was to test our prevention protocol for skin infections used in conjunction with Kenshield barrier

cream to prevent ringworm in collegiate wrestlers. Our hypotheses were that, during a collegiate wrestling season, (1) the implementation of a protocol for skin infection prevention would reduce the number of ringworm infections, and (2) the additional use of Kenshield with the protocol would further reduce the number of ringworm infections in comparison with the use of a placebo.

METHODS

After obtaining appropriate institutional approval, we studied 22 collegiate Division I wrestlers (the whole team) with a mean age of 20.4 years (range, 18.1 to 23.2 years). The mean weight was 68.4 kg (range, 55.8 to 130.2), and mean height was 177.8 cm (range, 168.7 to 186.9) at the beginning of this study. We obtained informed consent by having the head athletic trainer (J.W.H.) explain the study to the entire team and answer questions at a team meeting. Each team member then signed a form acknowledging his understanding and granting consent.

In the first 8 weeks of this 16-week study, no special precautions were taken to prevent skin diseases. Wrestlers were allowed to decide about skin hygiene themselves. This period of time served as a baseline for us to determine the number of ringworm cases to expect during a typical 8 weeks of college wrestling. No wrestler began the study with any skin lesions.

Address correspondence to Randall R. Wroble, MD, 323 E. Town Street, Columbus, OH 43215. E-mail address: drrandyman@msn.com

During the second 8 weeks of the study, our skin disease prevention protocol was initiated (Table). All wrestlers who had had a ringworm infection during the first 8 weeks (5 of 11 in each group) had been successfully treated; thus, all wrestlers were clear of ringworm entering this phase of the study. The 22 wrestlers were randomly selected into 2 groups of 11. Group 1 had Kenshield barrier cream, and group 2 had a placebo cream applied before each practice or match. Neither the wrestlers nor the investigators knew which cream was applied to which group until the end of the study. Strict adherence to the skin disease prevention protocol was mandatory for wrestlers in both groups, and any wrestler who did not adhere to this protocol was excluded from the study. Two athletes (1 from each group) were excluded for wrestling without the use of barrier cream and were not included in the statistical analysis.

The same certified athletic trainer (J.W.H.) performed skin checks daily. All skin lesions and their characteristics were charted on a topographic anatomy chart designated for each individual. Athletes with lesions were then referred for definitive diagnosis to the same team physician, who had 20 years' experience with wrestlers and their skin diseases. Diagnoses were made clinically, ie, by the characteristic appearance of the lesions, not microscopically. A medical report accompanied the athlete to the doctor's office and was used to record the diagnosis.

The application of Kenshield (or placebo cream) to the athlete was observed and assisted by either a certified athletic trainer or 1 of 2 student athletic trainers who had been instructed in the proper application technique. The athletic trainer logged each application. Cream covered every exposed area of the skin, including the scalp, hairline, face, ears, neck, back, arms, and legs. The cream was not applied to athletes withheld from practice due to injury or illness, nor was it applied for those practices consisting only of running or weightlifting. The proper application procedure cannot be stressed enough because, without complete coverage, a barrier will not be constructed.

We analyzed the data in 2 ways. First, we compared the number of cases of ringworm in the first 8 weeks of the study with the number of cases of ringworm in the second 8 weeks of the study. Statistical analysis was performed using McNemar's test and StatXact software (version 3.02; Cytel Software Corporation, Cambridge, MA). Second, we compared cases of ringworm in group 1 versus cases of ringworm in group 2.

Statistical analysis was performed using Fisher's exact test. Because of the sparse cell counts, the exact hypergeometric distribution of the test statistic was used to determine significance. We considered $P < .05$ to be significant.

RESULTS

Cases of ringworm declined from 10 (2 head, 4 shoulder, 2 thigh, 1 leg, and 1 back) diagnosed before the protocol was instituted to 1 case (shoulder) after the protocol was initiated. The 2-sided P value was 0.0117, indicating a significant reduction in ringworm incidence. All infected wrestlers were successfully treated with Lamisil (Novartis, Summit, NJ), a topical antifungal cream. No wrestler had a recurrence. Introduction of and strict adherence to the prevention protocol for skin infections thus significantly decreased the number of cases of ringworm.

No adverse reaction to either the placebo or the Kenshield cream was noted in any wrestler during the study period. The only case of ringworm noted after the introduction of the skin disease prevention protocol occurred in a wrestler in the placebo group who had not previously had ringworm. The difference in ringworm incidence between groups 1 and 2 was not statistically significant ($P = 1.00$).

DISCUSSION

Tinea corporis is a superficial fungal infection of the skin of the body that is most prevalent in hot, humid environments. Any member of the microsporum, trichophyton, or epidermophyton dermatophyte families can cause tinea corporis.² These fungi can survive for a prolonged period of time in a warm, dark, and humid environment.³ The incubation period lasts from 2 to 7 days before clinical infection becomes apparent. The organism invades and is nourished by the keratin layer of the skin and the hair follicles.⁴

Inflammatory dermatitis accompanies the infection and causes red, raised borders.⁴ Classic ringworm is characterized by 1 or more sharply circumscribed, annular, slightly erythematous, dry, scaly patches with elevated borders and progressive central clearing.² The athlete's complaints can range from minimal irritation to severe itching with extensive excoriations and secondary bacterial infection.³ The condition is not difficult to contract if occlusion, irritation, maceration, or minor abrasions are present. The fungus can be spread through sweat,

Prevention Protocol for Skin Infections

Clean and dry mats at least once daily. We use Kenmat (Kennedy Industries, Maple Glen, PA) mat disinfectant made especially for this purpose. The wrestling room is well ventilated to help dry the mat and reduce the humidity.

Wash and dry workout gear every day, after every workout.

Shower after every workout and after every event with an antibacterial soap.

Do not leave wet towels or gear in lockers overnight.

Athletic trainers should examine wrestlers for skin lesions.

All athletes with skin infections or lesions are referred to a physician for diagnosis and treatment.

Infected wrestlers are excluded from practice until lesions are no longer infectious.

Ringworm is considered noninfectious and can be covered by a nonpermeable dressing after 48 to 72 hours of treatment if lesion is "dry" or no longer scaly.

direct body-to-body contact, or contact with contaminated mats, clothes, or furniture. The natural course of tinea corporis ends with spontaneous remission, but reinfection and exacerbations are common.

Treatment of uncomplicated ringworm can be effectively accomplished with the use of topical preparations, including tolnaftate, undecylenic acid, haloprogin, triclosan, and the imidazoles.³ These agents can be used in cream, lotion, solution, or spray forms. Examples of over-the-counter agents include Tinactin solution (Schering Plough, Madison, NJ), Micatin spray (McNeil Consumer Products, Fort Washington, PA), and several generic antifungal creams. An extensive number of topical preparations are available by prescription. These medications should be used for no less than 4 to 6 weeks. In most cases, these agents clear the infection. In cases of severe or extensive infections in which topical treatments fail, oral antifungal agents such as fluconazole or griseofulvin are used^{2,5,6} for 6 weeks. Although these oral antifungals have high success rates, they can have toxic effects on the kidneys and liver and should be used with appropriate caution.²

Tinea corporis is a threat to wrestlers because of the constant skin-to-skin contact and minor abrasions that are common to the sport. Skin-to-skin contact between infected wrestlers is the main way ringworm is transmitted.⁷ Ringworm can sweep through a team in a matter of days unless wrestlers are monitored and treated effectively. Ringworm hinders the wrestler by forcing him to cease contact activities during practice and may disqualify him from competition.¹ NCAA and high school rules dictate that medical personnel disqualify those with contagious skin infections from competing in championships, tournaments, and other competitions.

Preventive measures are of primary importance and require the cooperation of each wrestler and coach. Protocols for prevention have included some combination of the following: washing of wrestling mats before and after each practice and competition; showers before and after each practice; clean clothing issued before each practice; and exclusion of wrestlers with infections.^{1,7,8} We found no current research advocating the use of a barrier cream such as Kenshield or a more extensive skin disease prevention protocol.

The cost of treating ringworm should also be considered. Treatment can become cost prohibitive to the athlete, the wrestling program, the school or institution, and the responsible insurance company if the number of cases on a team is large. The costs of topical or oral medications, as well as the physicians' fees, are the principal expenditures. A typical office visit to a dermatologist costs about \$100. A 6-week treatment course of Lamisil cream costs \$57.45, making the approximate cost of treating 1 case of ringworm about \$160. Each can of Kenshield costs about \$12.50, and each wrestler requires about 1.5 cans per season. So, a team with 20 wrestlers on the roster could be treated for an entire season for about \$300, or less than the cost of treating 2 cases of ringworm.

We faced 4 main obstacles concerning the methods in this study. First, hygiene and behavior could not be controlled or

monitored when wrestlers were at home or away from the wrestling facilities. Two wrestlers (1 from each study group) had contact with their former high school teams over winter break and wrestled unprotected and without adherence to the prevention protocol for skin infections. These wrestlers were excluded from the study. Second, showers were not taken before the application of Kenshield, to rid the body of potentially infectious microorganisms, due to time constraints. Third, the diagnoses were made clinically, not microscopically. Fourth, the study groups were small enough that a potential difference in ringworm incidence in placebo versus Kenshield may not have been detected.

We suggest that further, more extensive research be conducted on the use of prophylactic barrier creams in the prevention of ringworm in wrestlers. Longer study duration, a larger study population, and microscopic diagnosis by a dermatologist may provide more definitive information.

CONCLUSIONS

A comprehensive skin disease prevention protocol achieved a statistically significant 90% reduction in the number of cases of tinea corporis on a college wrestling team. In the half of the team that also received application of Kenshield barrier cream, no wrestlers developed ringworm. This result was not statistically significant, and thus we could not demonstrate that Kenshield adds a preventive effect above that offered by a thorough skin disease prevention protocol. Further study is warranted to determine whether Kenshield can act as an adjunct in preventing ringworm.

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