

## Three Common Skin Infections in a Student Athlete and a Subsequent Outbreak of Methicillin-resistant *Staphylococcus aureus* Skin Infections in a Single Gym: a Case Report

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Individuals with frequent physical contact, such as wrestlers, are at an increased risk of developing infectious diseases, including bacterial, viral, and fungal infections. Herein, we report the case of a student wrestler who developed three common skin infections and a subsequent outbreak of methicillin-resistant *Staphylococcus aureus* (MRSA) skin infections in a single gym. A 14-year-old male presented with a 2-week history of an edematous, painful skin lesion on the left outer ear. He responded poorly to empirical antimicrobial therapy. Examination revealed multiple crusts and oozing on the left ear helix. A solitary, erythematous firm nodule was also observed on the left posterior neck. Bacterial culture confirmed MRSA resistance to clindamycin and tetracycline. Further assessment confirmed the diagnosis of herpes labialis and tinea faciei. Within 3 weeks, six additional cases of MRSA skin infections were reported, all linked to the same wrestling gym. Most patients were effectively treated with oral cephalosporins combined with topical fluoroquinolones and occlusive dressing.

**Key Words:** Herpes gladiatorum, Methicillin-resistant *Staphylococcus aureus*, Skin infections, Tinea gladiatorum, Wrestler

### INTRODUCTION

Skin-to-skin contact provides opportunities for the transmission of infections because bacteria, viruses, and fungi can spread from person to person. The most common species transmitted among wrestlers are *Staphylococcus aureus*, herpes simplex virus (HSV), and *Trichophyton tonsurans*<sup>1</sup>.

Methicillin-resistant *S. aureus* (MRSA) causes mild to severe skin and soft tissue infections. MRSA infections have increased and become prevalent as a causative strain of skin and subcutaneous tissue infections. A South Korean report revealed

that more than half of *S. aureus* isolates from hospital tests were resistant to methicillin, and another study indicated that 18.1% of MRSA isolates were community-acquired<sup>2,3</sup>.

Community-acquired MRSA (CA-MRSA) infection has a different clinical profile than hospital-acquired MRSA (HA-MRSA) infection. Given that CA-MRSA infections often develop in immunocompetent individuals exposed to environments with relatively high levels of physical contact, athletes, military personnel, and prisoners are at a high risk for this type of infection.

Herein, we report the case of a student wrestler who

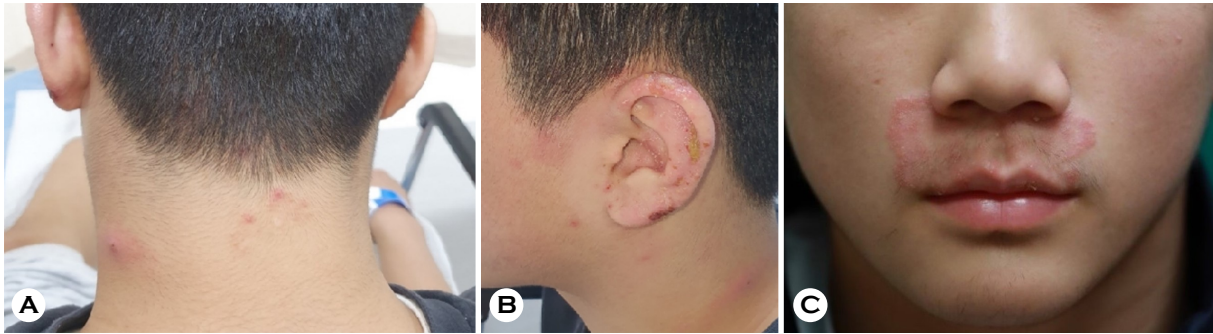
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**Fig. 1.** Clinical presentation of the index patient (A) Erythematous nodule on the posterior neck (B) Crust on the left ear (C) Erythematous annular patch on the philtrum at the 4th week visit

developed three common skin infections and a subsequent outbreak of MRSA skin infections in a single gym.

## CASE REPORT

A 14-year-old male patient presented to the emergency department with an edematous skin lesion and pain in the left outer ear for 2 weeks. The patient had a fever of 37.8°C, and physical examination revealed multiple crusts and oozing on the left ear helix and a solitary, erythematous firm nodule on the left posterior neck (Figs. 1A and 1B). After being diagnosed with cellulitis of the left arm at a primary care clinic, the patient had been taking cefaclor and applying mupirocin ointment for 2 months. However, his neck and ear lesions had not improved. In addition, the patient had a history of herpes zoster on the scalp approximately 2 months prior. The patient was a student wrestler, and some wrestlers in his gym exhibited similar skin symptoms. He received all mandatory vaccinations as scheduled and had no other underlying medical or drug history. Laboratory tests revealed elevated C-reactive protein levels and erythrocyte sedimentation rate and mild leukocytosis. Bacterial culture identified MRSA with resistance to clindamycin and tetracycline. Although the lesions initially improved with oral cefadroxil and topical ofloxacin, this improvement fluctuated within 2 months. After incision and drainage and switching to trimethoprim-sulfamethoxazole, all lesions resolved.

Other clinical symptoms were noted a week after the first visit. Vesicular lesions developed on the lips. Polymerase chain reaction assay of skin swab specimen detected HSV type 1, and famciclovir was added to the prescribed drugs. At the 1-month follow-up, an erythematous annular patch appeared on the philtrum (Fig. 1C), and fungal culture revealed *T.*



**Fig. 2.** Erythematous nodule with crust on the right shoulder of the fifth case patient; The lesion responded poorly to a 1-week empiric antimicrobial therapy.

*tonsurans*. The skin lesions resolved after 2 weeks of pulse therapy with itraconazole.

Six other patients presented to the outpatient clinic with cutaneous lesions within 3 weeks of the index case. Five of them were wrestlers in the same wrestling gym, and the remaining patient was the mother of the index case. A clinical photograph of one of the subsequent patients is shown in Fig. 2. According to the patients' statements, almost all 30 gym members developed similar dermatological symptoms

**Table 1.** Demographic and clinical features of cases in a single wrestling gym

Case number	Days after index case	Age/ Sex	Skin lesion	Type of infection	Anatomical site	Bacterial study result
1	–	14/M	Erythematous nodule, erosion with crust	Cellulitis	Posterior neck, left ear	MRSA
2	5	14/M	Erythematous nodule	Cellulitis	Posterior neck, right arm	No growth
3	6	17/M	Crusted papules and nodules	Impetigo	Left shoulder	MRSA
4	9	14/M	Erythematous ulcerated plaque	Abscess	Right posterior thigh	MRSA
5	11	15/M	Erythematous nodule with crust	Impetigo	Right shoulder	MRSA
6	12	14/M	Erythematous papules with crust	Impetigo	Left neck	MRSA
7	20	44/F	Erythematous subcutaneous nodule	Abscess	Right buttock	MRSA

within a month. The demographic and clinical features of the cases, including the index case, are summarized in Table 1. All patients showed insufficient responses to empiric antimicrobial therapy administered in primary care clinics. MRSA specimens with identical antimicrobial resistance profiles were isolated from bacterial cultures of skin lesions. The patients were instructed to thoroughly cover their lesions and avoid contact with others. All of them responded well to oral cephalosporins and topical fluoroquinolones.

## DISCUSSION

CA-MRSA infections are a major problem among student athletes who participate in group training. Outbreaks have occurred in sports where physical contact is common, such as football, rugby, and wrestling. A study of high school and college athletes in the United States reported an incidence of 20.3 per 10,000 for CA-MRSA infection<sup>4</sup>. The rate was particularly high among male gymnasts, rugby players, wrestlers, and soccer players. Nevertheless, outbreaks have also been reported in fencing, cross-country, and volleyball athletes without frequent physical contact, suggesting that contaminated surfaces and environments may also contribute to the transmission of infections<sup>5</sup>.

In addition to bacterial skin infections, a nongenital cutaneous HSV infection is commonly detected and transmitted in wrestlers. Referred to as herpes gladiator, this condition is predominantly caused by HSV type 1 and affects body

areas that are in frequent contact with opponents during sports competitions. Among fungal infections, *T. tonsurans* has a widespread transmission. Named tinea gladiatorum, this infection may be transmitted via person-to-person contact. Other infectious diseases, such as varicella zoster virus infection, molluscum contagiosum, and verruca vulgaris, can also be transmitted among wrestlers<sup>1</sup>. The index patient had three common infections among wrestlers: MRSA skin infection, herpes gladiatorum, and tinea gladiator. However, no signs of transmission of viruses or fungi to other wrestlers were observed.

All the cases were epidemiologically relevant because all patients belonged to the same wrestling gym. Of the seven patients, six were young wrestlers aged between 14 and 17 years. The adult patient was the mother of the index case. MRSA was isolated in the bacterial cultures from six of the seven cases. All isolates had an identical antimicrobial susceptibility profile.

The most affected anatomical site was the neck, followed by the shoulder. A possible explanation is that bare neck and shoulder contact is common during wrestling matches. According to a South Korean report, fungal infections of the head and neck area are common among wrestlers, with 1.7 times more infections recorded on the right side of the body than on the left<sup>6</sup>. This phenomenon is attributed to the relatively high number of right-handed wrestlers whose right body sides are often in contact during matches. However, no left or right bias was observed.

In our cases, the bacteria may have spread because of

skin-to-skin contact and poor hygiene in the wrestling gym. Multiple interventions can be adopted to control infections among athletes. Proper education regarding personal hygiene and improved access to sanitizers can help prevent the spread of pathogens in the environment<sup>7</sup>.

The U.S. Center for Disease Control and Prevention proposes various strategies to prevent staphylococcal skin infections and their transmission among athletes and emphasizes the importance of covering wounds, maintaining hygiene, and early recognition of infection.

Clindamycin and trimethoprim-sulfamethoxazole are recommended as first-line empiric antibiotics for patients suspected of having CA-MRSA skin infections<sup>8</sup>. However, a Chinese study reported that most CA-MRSA strains are resistant to clindamycin and erythromycin<sup>9</sup>.

The resistance profiles of CA-MRSA differ from those of HA-MRSA. CA-MRSA demonstrates 94% susceptibility to ciprofloxacin, whereas HA-MRSA has only 14% susceptibility<sup>9</sup>. A Korean report recommended first-generation cephalosporins as the first-line treatment for suspected outpatient bacterial infections<sup>10</sup>.

The CA-MRSA strain identified in our cases was resistant to clindamycin. Oral cephalosporins combined with topical fluoroquinolones and occlusive dressing were effective in most of the patients except for the index case who responded to trimethoprim-sulfamethoxazole.

This case report describes a student wrestler diagnosed with three common skin infections confirmed by microbiological testing. The other six patients had an outbreak of MRSA skin infections linked to a single wrestling gym. Given that a gym can act as a site of pathogen transmission, regular disinfection of the gym and assessment of the players' skin lesions at an early stage are crucial to prevent the spread of infectious diseases.

## CONFLICT OF INTEREST

In relation to this article, we declare that there is no conflict of interest.

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## PATIENT CONSENT STATEMENT

The patient provided written informed consent for the publication and the use of his images.

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