

Contact Dermatitis to Personal Sporting Equipment in Youth

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Abstract

Background: Contact dermatitis to personal sporting equipment in youth is poorly studied.

Objective: To review the results of patch testing 6 youth to their sporting equipment in a dermatology general private practice from 2006 to 2011.

Methods: A retrospective analysis of 6 youth aged 11 to 14 who were evaluated for chronic and persistent dermatitis occurring in relation to sports equipment was conducted. All patients were subjected to epicutaneous (patch) testing, which included some or all of the following: North American Contact Dermatitis Group (NACGD) series, textile series, rubber series, corticosteroid series, and raw material from the patients' own personal equipment.

Results: All cases had 1 or more positive patch test reactions to an allergen within the aforementioned series, and 3 subjects tested positive to their personal equipment in raw form.

Conclusions: Allergic contact dermatitis, not irritant, was deemed the relevant cause of chronic dermatitis in 4 of the 6 patients due to positive reactions to epicutaneous tests and/or personal equipment. The utility of testing to patients' own sporting equipment was shown to be of additional value and should be considered when patch testing for contact allergy to sporting equipment.

Résumé

Contexte : Il existe peu d'études sur la dermatite de contact causée par le port d'équipement de sport individuel chez les jeunes.

Objectif : Passer en revue les résultats de tests épicutanés subis par six jeunes utilisant un équipement de sport individuel et s'étant présentés dans une clinique de dermatologie générale entre 2006 et 2011.

Méthodologie : Analyse rétrospective des dossiers de six jeunes de 11 à 14 ans ayant consulté en raison d'une dermatite chronique et persistante liée à l'utilisation d'équipement de sport. Tous les patients ont subi les tests épicutanés suivants ou certains d'entre eux : la série développée par le North American Contact Dermatitis Group, la série de tests d'allergie aux textiles, la série de tests d'allergie au caoutchouc, la série de tests d'allergie aux corticostéroïdes et des tests d'allergie aux matières premières de l'équipement de sport individuel du patient.

Résultats : Tous les sujets ont eu une ou plusieurs réactions allergiques à une substance allergène parmi celles qui sont énumérées ci-dessus; trois d'entre eux se sont révélés allergiques aux matières de base de leur équipement individuel.

Conclusions : En raison des réactions aux tests épicutanés et/ou à l'équipement individuel, une dermatite de contact allergique, et non une irritation, a été diagnostiquée chez quatre des six patients présentant une dermatite chronique. Les tests d'allergie à l'équipement individuel même du patient se sont révélés utiles, et on devrait y avoir recours lorsqu'on fait subir des tests épicutanés pour déceler une allergie de contact à de l'équipement de sport.

Keywords

dermatitis, dermatology

Introduction

Youth who participate in sporting activities are at risk of developing contact dermatitis. They are exposed to a variety of irritants and allergens during these activities. Athletes are potentially more at risk of developing contact dermatitis due to mechanical friction, sweating, and increased temperature, all of which can lead to trauma of the skin and small fissures,

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Table 1. Top Allergens and Sources.

Category	Allergens	Sources
Rubber allergens	Multiple, eg, thiuram, Mercaptobenzothiazole (MBT)	A myriad of athletic products
Metals	Nickel sulfate	Weightlifting equipment
	Potassium dichromate	Leather gloves, etc
	Cobalt chloride	Weightlifting equipment
Adhesives	Para-tertiary butylphenol formaldehyde resin (PTBP-FR)	Athletic tape
	Epoxy resins	Bowling ball production
Plants	Urushiol	Poison ivy, sumac, oak
Preservatives	Multiple (eg, quaternium 15, methylchloroisothiazolinone MCI)	Found in many topical products used by athlete although nonspecific to athlete
Topical antibacterial agents and topical medicaments	Neomycin sulfate	Medicaments
	Bacitracin	Medicaments
	Caine anesthetics, neomycin bacitracin	Used in athletics to treat superficial wounds
Sunscreens	Benzophenone-3	Used in athletics, nonspecific to athlete
Vehicle/emollients	Lanolin alcohol	Found in moisturizers, nonspecific to athlete
Propolis	Propolis (aka, non-medical grade beeswax)	Nonspecific to athlete
Rosin	Colophony	Rosin bag, baseball pitchers
Corticosteroids	Budesonide, many others	Nonspecific to athlete
Fragrance mix ^a	Fragrance mix 1 or 2, Cinnamic aldehyde	Nonspecific to athlete, equipment treated with fragrance to mask odor

Adapted from Ventura MT, Dagnello M, Matino MG, et al. Contact dermatitis in students practicing sports: incidence of rubber sensitization. *Br J Sports Med.* 2001;35:100-102.

^aFragrance mix added by the authors as this was a relative positive allergen in our case series.

abrasions, or erosions.¹⁻³ Continued exposure to the same allergens via equipment and the disruption of the normal epidermal layer may lead to an increased risk of developing contact dermatitis.^{2,3}

Each sport has its own unique set of exposures. Brooks et al¹ demonstrate that the majority of team sports participants present with possible cases of contact dermatitis to limbs protected or supported by sport equipment. As with all cases of possible contact dermatitis, determining a thorough list of possible exposures is important. With sporting equipment, detection of allergens may be missed due to the complexity of the equipment and lack of afforded information on their makeup.

Epicutaneous patch testing is the gold standard for diagnosis of allergic contact dermatitis. There is a paucity of information regarding patch testing suspected cases of contact dermatitis to sports equipment, and case series such as this one comprise the majority of the literature.⁴ A recent article, though not limited to youth, summarizes the commonly reported allergens in these case series² (Table 1).

Patch testing is imperative to distinguish between irritant and allergic contact dermatitis. In children or youth, this can be more difficult, but it must be stressed that it is necessary to obtain the correct diagnosis. Furthermore, our case series illustrates that testing the actual sporting equipment is often necessary to obtain the correct diagnosis.

Methods

All patients/guardians gave authorization to be included in this study.

In a private general dermatology clinic, 6 children (5 boys, 1 girl) were evaluated with a history, physical examination, and patch testing. The patients were referred by their pediatricians/dermatologists for possible allergic or irritant contact dermatitis localized to areas in direct contact with their personal sporting equipment. All patients had chronic recurrent dermatitis; 2 had a history of atopic dermatitis. Due to severe widespread dermatitis, 1 patient was patch tested while on Prednisone 10 mg.

Patch testing was conducted in a standardized fashion according to the North American Contact Dermatitis Group (NACDG).⁵ All youth were patch tested to the NACDG series. Five patients also underwent patch testing to the rubber adhesive series, 3 patients to the textile colour and finish tray, and 1 patient to the corticosteroid tray.

Test allergens were obtained from Chemotechnique Diagnostics (Vellinge, Sweden) with the exception of the NACDG series, which was obtained from AllergEAZE (Calgary, Alberta, Canada). Testing was performed using IQ Chambers obtained from Chemotechnique Diagnostics.

Readings were performed at 48 hours and 96 hours. Results are shown from the 96-hour reading. Patch test reactions were graded according to the International Contact Dermatitis Group (ICDRG) grading system, adopted by the NACDG: 1+ (weak reaction: papules and erythema), 2+ (strong reaction: edematous or vesicular), or 3+ (extreme reaction: spreading, bullous, or ulcerative).⁵

All children were also tested to their personal sporting equipment in raw form. Samples of their respective pieces of equipment were cut into 1-inch squares of less than 1 cm

Table 2. Clinical Cases.

Case	Sport/Activity	Patch Testing	Body Location	Patch Test Results	History of Atopy
No. 1 Boy, 13 y	Soccer	NAS, RS, TS, shin pads	Shins	Nike blue backing I+ Adidas backing I±	Negative atopy
No. 2 Girl, 13 y	Soccer	NAS, RS, TS; Rubber athletic gear: shin pads, ankle guard, protective sleeves	Legs and dorsal feet	Colophony I+ Mercapto mix I+ Nickel sulfate I+ Bishenol F I+ A new and a used shin pad with and without Febreze spray I±	Negative atopy
No. 3 Boy, 13 y	Hockey	NAS, RS, corticosteroid series, own hockey equipment	Entire body, with flexure prominence	Disperse Blue 106 I+ in both standard and textile series Iodopropynyl butyl carbamate 0.2% Pet I+ Cobalt I+	Atopic eczema as a child
No. 4 Boy, 14 y	Hockey	NAS, RS, TS, own hockey equipment	Elbows, shins, and hips	Cinnamic aldehyde I+ Fragrance mix I 2+ Elbow and shin pad I+ (Equipment sprayed with Febreze repeatedly)	Negative atopy
No. 5 Boy, 11 y	Hockey	NAS, RS, TS, own hockey equipment	Limbs and torso	Cobalt I+	Positive atopy ++ FH history
No. 6 Boy, 12 y	Hockey	NAS, RS, TS, shoe series	Feet, stomach, elbows, hands	Not relevant Nickel 2+ Not relevant	Negative atopy

Abbreviations: FH, family history; NAS, North American Contact Dermatitis Group series; RS, rubber adhesive series; TS, textile colour and finish tray series (TS).

thickness (to prevent pressure effect) and soaked in sterile water for 30 minutes before being applied to the skin. The equipment was left on the patient for 4 full days.

Results

The demographics, sporting activity, patch test trays, location of dermatitis, history of atopic diathesis, and patch test results are recorded in Table 2.

Three cases had positive reactions to their sporting equipment in raw form. The positive reaction to raw materials helped with the management of the dermatitis because it assisted with the choice of alternative sporting equipment. The limited financial resources did not allow for the identification of the exact causative allergen within the equipment.

Case No. 3 was so severe and widespread that he had to be tested while on Prednisone 10 mg but still developed a I+ reaction to Disperse Blue 106/124 on the NACDG series and Disperse 106 on the textile tray.

Two cases had positive patch test results that were not deemed clinically relevant.

Discussion

In the 6 youth patch tested, evidence of contact allergy (ie, positive patch test reactions) was found in all patients tested, with allergic contact dermatitis (with current clinical relevance) only in 4. The presence of atopic background was evident in 2 cases.

Case No. 1 is the most interesting case in the series as he tested negative to all the standard patch tests but strongly positive to 1 of his own shin pads, specifically the material against his skin, Nike blue backing (Figure 1). It is important to note that he was treated several times in the emergency department for cellulitis and had many courses of intravenous and oral antibiotics (Figure 2). As we could not counsel him on what allergens to avoid, he was instructed to take the plastic shell of his skin pads to a cobbler, and white cotton backing was sewn into the plastic shin guard, with clearance of his eruptions. He also appeared to have little reaction to the Protouch shin guard. This case illustrates the importance of testing to sporting equipment in its raw form to prevent missing a relevant allergen and assisting with alternative choices of sporting equipment.



Figure 1. Allergic contact dermatitis. Case No. 1 with allergic contact dermatitis to shin guards.

Case No. 2 has several positive patch test results that were felt to be relevant, specifically Colophony, Mercapto Mix, and Bisphenol F. She also had query positives to a new and used shin pad. Colophony has been identified as a sensitizer in soccer shin pads via patch testing.^{2,6}

Case No. 3 was a high-level competitive hockey player who had widespread dermatitis continually during his season. This patient had to be placed on Prednisone in order to patch test. He was tested on Prednisone 10 mg and found to be allergic to Disperse 106 on both the NACDG and textile series. The relevance of his positives to iodopropynyl butyl carbamate and cobalt are more difficult to establish. He wore a full-piece black lycra bodysuit under his hockey equipment. Once he stopped this practice and wore cotton under his hockey equipment, his eruptions mainly resolved. It is known that black lycra body clothing uses disperse dye technology.^{2,7-9}

The most surprising case was No. 4. This young 14-year-old hockey player was so strongly positive to fragrance mix that he produced a strong 2+ reaction at 48 hours that spread and continued to the 96-hour read. He also reacted to cinnamic aldehyde. It was later determined on discussion with his mother that she sprayed a fragranced odor masking agent into his hockey bag on a regular basis. He had to purchase all new equipment, and his eruptions resolved.

Case Nos. 5 and 6 did have positive patch test results, but they were not relevant to the sports equipment. Irritant contact dermatitis was their final diagnosis by exclusion with an atopic overlay in case No. 5.

This case series illustrates the importance of patch testing youth who are involved in sports that require the athlete to wear or use specialized equipment against the skin for long periods of time. The importance of a thorough history, as

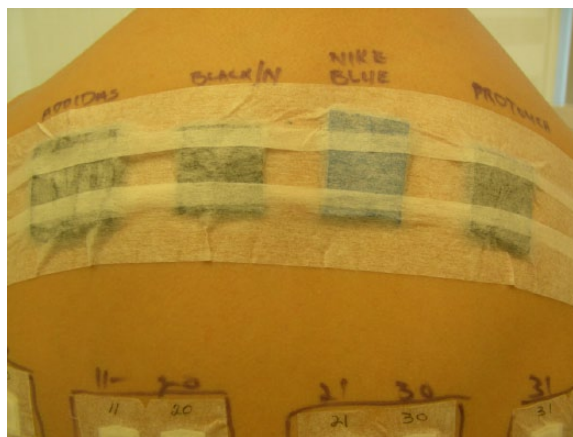


Figure 2. Allergic contact dermatitis. Case No. 1, 96-hour patch test results to raw materials of shin guards, showing positive to Nike blue backing.

evidenced by case No. 4, and testing to patients' own sports equipment, as evidenced by case No. 1, should be reinforced. Finally, all relevant patch test results in our case study would have been detected by either the NACDG series or the patients' own sports equipment. In the 6 youth patch tested, evidence of contact allergy was found in all patients tested with allergic contact dermatitis (with current clinical relevance) only in 4. The presence of atopic background was evident in 2 cases.

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