Medical and Orthopedic Conditions and Sports Participation

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• Juvenile arthritis • Scoliosis • Spondylolysis
• Scheuermann disease • Slipped vertebral apophysis

Adolescents with chronic conditions are often restricted unnecessarily from sports participation or other physical activities for fear of injury or other complications. For some of the orthopedic conditions, athletes are also advised prolonged periods of rest and restrictions from sports. The benefits of sport participation, with few exceptions, far outweigh any concerns for potential injuries or complications in these adolescents. This article reviews sport participation guidelines for some of these medical and orthopedic conditions.

ARTHRITIS

With the increasing problem of the obesity epidemic, it has been shown that youths with low levels of physical activity and high body fat are at increased risk for cardiovascular disease. In contrast, it is a challenge for our patients who suffer from chronic illnesses to be encouraged to stay active and fit while keeping their condition under control.[1] One such condition is juvenile idiopathic arthritis (JIA), which is the most common chronic rheumatoid disease in childhood. Exercise is an integral part of managing this condition to preserve joint mobility and maintain muscle mass and strength.[2,3] However, data show that these patients are less active than their peers.[4] It is vital to have a multidisciplinary team approach to achieve success and adherence to a sound and practical exercise program.[5]

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Despite having no significant effects on endurance and functional ability of patients with JIA, an aquatic-based program studied by Takken and colleagues[6] has been shown to positively influence the health-related quality of life of these patients. Takken and colleagues[7] found this to be a safe program, with no signs of worsening in the health status of patients. A land-based aerobic program that included warm-up and stretching used by Singh-Grewal and colleagues[8] in a randomized controlled trial resulted in improved physical function as measured in the Child Health Assessment Questionnaire. There was better compliance with the control group that involved the qigong regimen, which is similar to tai chi.[8] An intensive Cochrane review did not show statistically significant evidence that exercise therapy can improve functional ability, quality of life, aerobic capacity, or pain, but it did affirm that exercise does not exacerbate arthritis.[9]

Participation in sports needs to be individualized for each patient with JIA, as is the case for any chronic condition. Aerobic, flexibility, static, dynamic, and neuromuscular demands of the sport should be considered, as well as the potential for contact or collision.[2] The availability of safety equipment has to be explored, alongside the need for splints or orthosis.[2] The family and coaches have to assess the athlete's ability to self-limit participation.[2]

JIA often persists into adulthood, although fewer than 10% become severely disabled.[10] Promoting sports during childhood and adolescence hopefully will help individuals to acquire healthy practices and maintain an active lifestyle as they transition into adulthood.

EYE INJURIES

Eye injuries are rare among high-school and college athletes but have the potential for high morbidity.[11,12] Baseball and basketball in the United States and soccer in European countries are most commonly implicated to cause eye injuries.[13] Injuries range from the more benign eyelid laceration, corneal abrasion, foreign bodies, and hyphema to the more serious blow-out fracture, retinal detachment, or globe rupture. Children and adolescents are still developing their muscle coordination and reaction time, making them more vulnerable to these injuries.[14]

Injured players may return to play immediately, depending on the extent of the trauma, but, if they received a topical anesthetic in the eye, then they should not be allowed to resume play.[14] The affected eye should be pain free and have adequate recovery of vision.[14] Symptoms like foreign-body sensation, vision loss, proptosis interfering with vision, pain, loss of visual field, or a flash sensation are warnings for an ophthalmology evaluation and clearance for return to play.[15]

The American Academy of Pediatrics (AAP) and American Academy of Ophthalmology issued a joint policy statement in 2004 recommending that all youths in organized sports should wear appropriate eye protection.[16] There are sport-specific eye protectors such as a face guard attached to the helmet in baseball or a full-face shield in hockey. Protective eye wear for sports should meet the requirements of certifying bodies like the Protective Eyewear Certification Council, American Society for Testing and Materials (ASTM), Hockey Equipment Certification Council (HECC) and the National Operating Committee on Standards in Athletic Equipment (NOCSAE). Regular spectacles and contact lenses do not offer protection, so the appropriate eyewear is still strongly recommended.[15] Functionally one-eyed athletes should wear protective eyewear as well as those whose ophthalmologists recommend eye protection after surgery or trauma.[15] Sport-appropriate and properly fitting eye protectors reduce the risk of significant eye injury by at least 90%, so young athletes

should develop the habit of using this protective gear early to avoid potentially blinding injuries.[4]

SOLITARY KIDNEY

Should an athlete with a solitary kidney be allowed to participate in contact sports? The answer to this question remains inconsistent, controversial, and difficult. In 1994, a survey of 438 members of the American Medical Society of Sports Medicine (AMSSM) showed that 54% would allow participation, but that this decreased to 42% when the athlete was their own child.[17] More recently, Grinsell and colleagues[18] showed only 34% of respondents from the American Society of Pediatric Nephrology (ASPN) would allow participation, and Sharp and colleagues[19] likewise found that 32% of pediatric urologists surveyed would agree to contact sports for these patients. However, studies suggest that the risk of renal injury in contact or collision sports is extremely low. Recreational activities such as cycling, skiing, sledding, snowboarding, and horseback riding have shown higher risks of renal injury.[18–21] A review of data from the National Pediatric Trauma Registry (NPTR) by Wan and colleagues[22] during a 10-year span from 1990 to 1999 concluded that abdominal and testicular injuries are rare in team and individual contact and collision sports. Another extensive NPTR study reported that much more common causes of catastrophic kidney loss were those from motor vehicle crashes, pedestrians being struck by a vehicle or other object, and falls.[23]

Several factors are considered when arriving at the decision of precluding an athlete with a solitary kidney from participating in contact or collision sports. These include the perception of injury risk (whether accurate or not), weighing the benefits of participation versus the tragic consequence of the potential loss of the remaining kidney, absence of a clear consensus, and ethical and medicolegal concerns. Restriction not based on clinical evidence can result in depriving an athlete of the physical, social, and educational rewards of their involvement in sports. Some would even argue that we let athletes with solitary brain, heart, and spinal cord play, and these have higher injury rates.[18]

The AAP recommends a ''qualified yes'' for athletes who have a solitary kidney, with an individual assessment.[24] As with athletes with a solitary testicle, providing protective equipment is essential. It is imperative that an open discussion on potential risks and benefits of sports participation take place among the athlete, the parents, and the clinician before making the informed decision not only about whether to play contact sports but also about participating in certain recreational activities.

SKIN CONDITIONS

Unlike most other organ systems that show benefits from increased physical activity, skin actually develops pathologic conditions directly attributed to sports participation.[25] Skin is subjected to direct repetitive trauma producing abrasions, blisters, chafing, corns, calluses, and black heel. Most of these lesions will not lead to significant interruption of athletic participation if recognized early and treated appropriately.[26]

Making return-to-play decisions for infectious dermatologic conditions is another issue altogether. Skin infections are commonly encountered in the athletic setting. Player hygiene; close physical contact in locker rooms, buses, and benches; moist environments; and sharing of towels, equipment, and even housing accommodation all contribute to the host factors of the incubation and transmission process.[27] An epidemiologic study on wrestling done by the National Collegiate Athletic Association

(NCAA) Injury Surveillance System from 1988/1989 to 2003/2004 recorded that infectious dermatoses accounted for the most missed practice time, amounting to more than 17% of the reported events.[28]

For bacterial (most commonly staphylococcal or streptococcal) infections including impetigo, folliculitis, furuncles (boils), carbuncles, abscesses, and cellulitis, the NCAA will preclude an athlete from participating if they are at risk of transmitting the infection. According to the NCAA protocol, the athlete must meet the following criteria: (1) no new lesions within the past 48 hours, (2) completion of 72 hours of antibiotic therapy, and (3) no moist, exudative, or purulent lesions at time of play.[29] The National Federation of State High School Associations (NFHS) endorses these guidelines for wrestling and football, which they consider high risk for significant contact with opponent or equipment.[30] Methicillin-resistant *Staphylococcus aureus* (MRSA), frequently called the superbug, has been the latest sports epidemic because of the emergence of antibiotic resistance. Increasing prevalence and reports of significant morbidity and mortality have brought MRSA to the attention of the sports community. The Centers for Disease Control and Prevention (CDC) reinforces the NCAA guidelines of excluding the athlete if the wound cannot be properly covered during participation, and even if it can be covered but still poses a risk to the health of the infected athlete, such as a further injury to the affected area.[31]

Herpetic infections include simplex, fever blisters, zoster, and gladiatorum. To be allowed to participate, a wrestler must: (1) be free of systemic symptoms of viral infection; (2) have no new blisters for 72 hours before the examination; (3) have no moist lesions, and any remaining lesions must be dried and have a firm adherent crust; (4) have been on antiviral therapy for at least 120 hours before meet time; and (5) not cover active lesions.[29]

Tinea lesions need oral or topical treatment for a minimum of 72 hours for skin lesions and 14 days on scalp lesions before the athlete is allowed to return to play.[29,30] Wrestlers with solitary or clustered lesions will be disqualified if the lesions are in a location that cannot be adequately covered.[29] If wrestlers have contracted scabies, they should have a negative prep at tournament time.[29] Because there are no clear rules for most other sports, it is recommended that the guidelines for wrestling be used for any contact or collision sports or other sports that involve shared equipment or facilities like a gymnasium or pool.[32] As the NCAA/CDC poster says, ''If in doubt, check it out.''

SCOLIOSIS

Most scoliosis is not related to instability, especially if it is classified as early- or late-onset hereditary scoliosis. Pain is an uncommon feature for these patients; however, if present it may require some restrictions to control the symptoms. Most of these patients will not require restrictions to protect from instability.[33,34] Some congenital scoliosis may present with such sharp angulations that the spinal cord is impaired or at risk. In these cases, restriction from contact and high-level sports requiring bending or aerial activities should be advised. Patients who have undergone surgical fusion for scoliosis and are fully healed can often participate in noncontact sports. Although the authors often advise their patients to avoid contact, some do participate without significant injury. No good studies have been published to offer scientific guidelines for postoperative patients. Consultation with the spinal surgeon will often be necessary.[35,36]

Patients with scoliosis are often treated with a thoracic lumbar sacral orthosis (TLSO, eg, Boston brace) or cervical TLSO (Milwaukee brace). These braces pose

a risk of injury to other athletes participating in the game or practice, and can restrict movements for the patient. In many cases, the orthotics can be removed during the game or practice.[37] Consultation with the orthopedic surgeon is advised in these cases.[38]

KYPHOSIS

Scheuermann kyphosis or juvenile idiopathic round back is a hereditary deformity of the thoracic spine. In mild and moderate cases this is a structurally stable condition. In these cases, no restrictions from sports are necessary. Some patients have pain, which may require some modification of participation to control the pain. Moderate deformities (>50°) are often treated with an orthotic such as a Milwaukee or Boston brace. These orthotics can often be removed during games or practices to allow the athletes to participate in sports. These modifications of the treatment regimens also improve patients' willingness to comply with the brace treatment plans.[39–41] Some kyphotic deformities are so severe that spinal cord compromise is found. These patients should be restricted from sports until there is a full evaluation by the spine surgeon.[35]

Atypical Scheuermann kyphosis, or rower's back, is a deformity of the thoracolumbar or lumbar spine associated with a large defect in the anterior superior vertebral end plate. This condition is classically seen in athletes who are required to flex and extend the spine repeatedly, such as gymnasts, rowers, wrestlers, football players, weight lifters, tennis players, and bicycle riders.[35] These lesions are stable but often painful. The pain is frequently relieved by restriction of the sporting activity for a period of 6 months. A TLSO brace can often be used to provide relief sooner and allow athletes to return to sports within a 2- to 3-month period. However, returning to the sport often results in recurrence of the pain. Sometimes activity modifications are necessary. Rarely, surgical intervention can relieve the pain and allow participation in high-level athletes.

SPONDYLOLYSIS

Lytic lesions of the pars interarticularis of the lumbar spine are common in athletes who repeat extension of the spine. This condition is common in gymnastics, defensive linemen in football, weight lifters, and cheerleaders. These patients present with pain because of the acute nature of the fracture.[35] Restrictions from participation are necessary to treat the stress injury, along with a TLSO to splint the spine, and physical therapy. After the lesion heals or develops a painless fibrous union, usually following 4 to 6 weeks of treatment, the athlete can return to gradual training and participation as long as the pain does not return.[38,39,42]

SPONDYLOLISTHESIS

Chronic pars interarticularis fractures with fibrocartilaginous union can be silent and found incidentally on radiographs done for another reason. If the slip is less that 50%, the athlete can often be allowed to participate as long as pain remains absent or mild. Routine follow-up of the slip with radiographs is necessary during the growing years.[35] If the slip is greater than 50% or progressive, the spine may be unstable, and restrictions are advised until the patient can be fully evaluated by a spine surgeon. Some patients have undergone spinal fusions to treat spondylolisthesis. Once the fusion is solid, patients may return to full sport activities, including contact sports, without problems.[42]

DEGENERATIVE DISC DISEASE

Injury to the discs produce annular tears and loss of water content that leads to reduced height and a black disc on the T2 magnetic resonance image. They are associated with pain that can be disabling. Sports such as weight lifting and football have been shown to increase disc disease, as have improper or excessive training for any sport. Sports participation should be limited until the patient has rested for a brief period with nonsteroidal antiinflammatory drugs, then started on a strengthening and stretching program, once pain free. A physical therapist is often invaluable in obtaining patients' optimal recovery. Once the pain has been totally relieved, with demonstration of muscle strength without spasm, the athlete can return to training and sports. If the pain is chronic, evaluation by a spine surgeon will be necessary.[39]

ADOLESCENT DISC HERNIATION

Intervertebral discs can herniate portions of the nucleolus fibrosis, producing compression of lumbar spinal nerves. Patients with these conditions present with back pain and sciatica. Often, they also have reactive or sciatic scoliosis. Initial restrictions from participation in sports are necessary, along with physical therapy. Once the initial pain has subsided, often after 6 to 12 weeks of treatment, the patients may gradually return to sports. Continued sciatica and back pain may require more restrictions and an evaluation by a spine surgeon.

SLIPPED VERTEBRAL APOPHYSIS

This condition involves the fracture and displacement of the ring apophysis into the spinal canal with neurologic damage and symptoms. Because this tissue is hyaline cartilage and not likely to resorb, restrictions from sports and training are advised, as is a referral to a spine surgeon for evaluation. Surgical excision of the offending portion of the ring apophysis is likely required. After the surgery and healing, return to sports can be considered with selective rehabilitation.[35]

CONGENITAL ABNORMALITIES OF THE CERVICAL SPINE

Certain odontoid abnormalities and congenital fusion of the C1 to C2 area can be associated with catastrophic injuries or progressive deformities, and resultant sudden-onset neurologic loss or instant death are common. Therefore these lesions, in isolation or in combination with other congenital lesions, are contraindications to participation in sports.

Klipple-Feil anomalies are congenital fusions of the cervical spine. If there are limited fusions in the C3 to C4 area with full range of motion, sports can be allowed without worry of increased injury risk. However, if there are multiple levels of fusion in the cervical spine, the forces can lead to increased risk of injury. In these cases the participation in sports should be restricted. Fusions limited to 1 or 2 levels with associated limited range of motion are also at an increased risk, indicating an absolute contraindication to participation in sports.[43]

STINGERS AND BURNERS

Burners or stingers in the high-school population are caused by brachial plexus stretch in about 50% of the high-school-age football players who sustain them; the other 50% of this age group, as well as most college and professional players with burners or stingers, exhibit compression within the foramina of the cervical spine. If

the first-time burner completely resolves, return to sports without restriction can be allowed. However, persistent numbness, neck pain, or motion restriction, especially with a repeat injury, should restrict the player from sports until a further evaluation is performed.[44]

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