

AAP  
PEDIATRIC

AN APPROVED SYSTEM FOR CONTINUING MEDICAL EDUCATION

## Important Topics in Sports Medicine

**MODERATOR:** Jordan D. Metzl, MD — Assistant Professor of Pediatrics, Department of Pediatrics and Sports Medicine; Assistant Attending Physician, Division of Sports Medicine, Hospital for Special Surgery, Cornell Medical School, New York, New York

**DISCUSSANTS:** Steven J. Anderson, MD — Clinical Professor, Department of Pediatrics, University of Washington, Seattle; Chair, Committee on Sports Medicine and Fitness, American Academy of Pediatrics, Elk Grove Village, Illinois

Mary Lloyd Ireland, MD — Orthopedic Surgeon and Consultant, Shriner's Hospital; President, Kentucky Sports Medicine, Lexington, Kentucky

*Editor: Kurt Metzl, MD  
Clinical Professor of Pediatrics  
University of Missouri-Kansas City School of Medicine;  
Chief, Section on Community Pediatrics  
The Children's Mercy Hospital  
Kansas City, Missouri*

### This continuing medical education program includes:

- Statement of learning objectives
- Pretest questions and answers
- Audiocassette recording and printed transcript of panel discussion
- Post-test questions
- Post-test response form
- List of recommended supplementary reading materials

*Pediatric UPDATE topics are selected from the annual content specifications provided by the American Board of Pediatrics. These specifications serve as the basis for the ABP's Program for Renewal of Certification in Pediatrics (PRCP), as well as the focus of the PREP program.*



American Academy of Pediatrics



## Learning Objectives

After completing this program, the physician should be better able to:

1. Recognize the importance of finding a history of concussion on the preparticipation examination.
2. Counsel patients more effectively on the importance of preseason conditioning programs.
3. Understand how to assess musculoskeletal injuries with emphasis on history and physical.
4. Learn the common presenting characteristics of anterior cruciate ligament (ACL) injuries.
5. Better understand the difference between microtraumatic and macrotraumatic injuries.
6. Devise a more effective diagnostic approach to the athlete with low back pain.
7. Help develop rehabilitation strategies for swimmers with shoulder pain.

## Pretest Questions

Before listening to the audiocassette or examining the transcript of the panel discussion, you will find it useful to test your general understanding of the subject of this program with this brief introductory quiz. (The correct answers will be found on page 9 of this booklet.)

- |  |   |
|--|---|
| 1. By definition, concussions involve at least a brief loss of consciousness.<br><input type="checkbox"/> True<br><input type="checkbox"/> False   | 4. Most anterior cruciate ligament (ACL) injuries involve contact with another player or another object.<br><input type="checkbox"/> True<br><input type="checkbox"/> False |
| 2. Young people generally do not get stronger with weight training until after puberty.<br><input type="checkbox"/> True<br><input type="checkbox"/> False   | 5. Stress fractures of the tibia may develop after untreated shin splints.<br><input type="checkbox"/> True<br><input type="checkbox"/> False                               |
| 3. Nutritional supplements such as creatine have been tested and cleared by the Food and Drug Administration (FDA) prior to distribution.<br><input type="checkbox"/> True<br><input type="checkbox"/> False | 6. Overuse injuries become more common as children pass through adolescence.<br><input type="checkbox"/> True<br><input type="checkbox"/> False                             |

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# Transcript of the Panel Discussion

(As recorded  
in the Audiocassette)

**DR. JORDAN D. METZL:** I am Jordan Metzl, Assistant Attending Physician in the Division of Sports Medicine at the Hospital for Special Surgery, and Assistant Professor in the Department of Pediatrics at Cornell Medical School in New York City.

**DR. STEVEN J. ANDERSON:** I'm Steven Anderson, Clinical Professor in the Department of Pediatrics at the University of Washington in Seattle. I'm currently the Chair of the Committee on Sports Medicine and Fitness for the American Academy of Pediatrics.

**DR. MARY LLOYD IRELAND:** I am Mary Lloyd Ireland, orthopedic surgeon from Lexington, Kentucky, Orthopaedic Consultant at Shriner's Hospital, and President of Kentucky Sports Medicine.

<sup>1</sup>**DR. METZL:** We are here today to talk about sports medicine. Steve, in your experience how has the practice of sports medicine changed in the past several years?

<sup>2</sup>**DR. ANDERSON:** I think that over the last number of years, pediatricians are finding that they are having increasing responsibility for taking care of injured athletes and sports problems. There's a number of reasons for this, including the increasing number of participants in sports, but also changes in health care, whereby pediatricians are no longer able to refer all problems to specialists for care. They find that they're responsible for taking care of the sore knees, sprained ankles, and back pain.

<sup>3</sup> Another thing that I think has changed over the years is that pediatricians are realizing that they can no longer tell people who are hurt in sports to just rest or that they're going to outgrow the problem. The patients won't accept that, and that's not necessarily the best advice for general health purposes. They need to have a diagnosis. They need to know how to treat and rehabilitate the problems and get people back to their physical activity and sports.

<sup>4</sup>**DR. METZL:** Mary Lloyd, in your 20 years plus experience of sports medicine practice, how has the demographics of sports participation changed?

<sup>5</sup>**DR. IRELAND:** There are a lot more youngsters who are participating in many competitions year-round, whether they do the soccer, basketball, baseball, and the free play or time off, so to speak, for both physical and psychologic rest doesn't exist any more. So, there's a lot of pressure from the youngster's peers and parents to compete and oftentimes in a lot of different sports.

<sup>6</sup>**DR. METZL:** That's true. It seems that kids who are at very high levels of performance are encouraged to participate and keep participating. Whereas in years past, there may have been an off season, now kids who are, for example, very good soccer players not only play on soccer teams in the fall and the spring but also attend soccer camps in the summer. The relative downtime is much less, and that perhaps is a significant cause of overuse injuries, which we are seeing in greater numbers.

<sup>7</sup>**DR. IRELAND:** In the past, we did not seem to see as many overuse problems like stress fractures. I think it's because if you started, you got tired, or if you hurt, you sat down and rested for a while, and free play is no longer. It's more of a competition, a win, beat the other team, and continue to compete.

<sup>8</sup>**DR. METZL:** We are going to base our discussion today on several case scenarios and how they might present. The general trend in pediatrics is to see athletes at the preparticipation physical and also then when athletes become injured. We'll take different scenarios, both from the preparticipation exam and from different injury patterns which might present.

<sup>9</sup> The first case is a 15-year-old male who is coming in for his preparticipation physical examination prior to the commencement of his football season. This is a very underdeveloped 15-year-old male who is Tanner Stage 2 by your estimation, and he wants to play football. On your medical history and questionnaire, he fills out that he has had two episodes of concussion last year. Steve, why do you think this might be of concern?

<sup>10</sup>**DR. ANDERSON:** Concussions are obviously serious injuries, and there's a lot of injuries that happen in sports, including football, that you can treat and rehabilitate and they don't seem to have any long-term consequences, but if you injure your brain, there can be long-term consequences. There can be a cumulative effect. With each concussion, there's a greater chance of having some permanent neurologic impairment that not only can affect their ability to participate in

sports like football but can affect their ability to do well in school and get a job and earn a living.

<sup>11</sup>**DR. METZL:** Mary Lloyd, in your work with the University of Kentucky football team in past years, certainly you saw concussions quite frequently. I was wondering how the management of concussion has changed over the years.

<sup>12</sup>**DR. IRELAND:** I would be very protective of particularly the young brain and not allow them to go out and compete if they have had numerous concussions in that season. At the collegiate level, it seems that we are seeing more concussions. It might be that the athletes are getting bigger. Maybe there're differences in tackling. Oftentimes it is that smaller individuals, it seems, the defensive end or someone, as this individual, who is perhaps 100 lb less weight than the other players, and they may be at increased risk for not only concussion syndrome but other significant injuries.

<sup>13</sup>**DR. METZL:** The issue of concussions is one of paramount importance in preparticipation exams and also to physicians taking care of high school football teams and Pee-wee football teams. This is sometimes a difficult problem. Steve, if this patient were coming in to see you two days after having had a concussion and not during the preparticipation exam, how might you differ in your recommendation as far as having him evaluated or returning him to competition?

<sup>14</sup>**DR. ANDERSON:** There are new grading systems and old grading systems being looked at and revised to try to grade the seriousness of concussions. The grade or seriousness has implications for when it's safe for them to return to play and which kids need further testing and which patients may warrant some exclusion from sports or activities that have a high risk of concussion. If someone came in with a second concussion, I would try to grade the concussion in terms of the level of seriousness.<sup>1</sup>

<sup>15</sup> One of the things that has changed with respect to recognition of concussions is that at one point it was felt that a concussion required you to be unconscious or have loss of memory to be called a concussion, but it's clear now that you can have significant brain injury even if you just have a headache or

1. See Wohltys *et al.* (13) in List of Reading Materials.



some impairment of higher level cognitive function. It might be trouble concentrating. It may be trouble with memory. It may be some trouble with orientation and that could mean a brain injury and a lot of the things that we used to look at — the pupillary changes and loss of strength and reflexes — you have to have a much, much more serious injury to have that, but using those more stringent criteria for a brain injury, I think leads to an underdiagnosis and hence undertreatment of some of the concussions that can have serious long-term effects.<sup>2</sup>

<sup>1</sup> **DR. METZL:** Certainly, that's true and it has sparked a lot of concern among coaches, parents, and pediatricians. Sometimes, this concern is warranted, as in the cases you're talking about. Sometimes repeated micro-traumatic events in the brain, such as repetitive heading of the soccer ball, bring into question long-term effects and sometimes this creates a hysteria in this type of situation.

<sup>2</sup> So, in our medical history, we have a patient who's had two concussions in the past year. Mary Lloyd, what's your thought on the repetitive nature of this type of injury, concussion? Is this something which might recur in subsequent years, if this is somebody who has had a concussion in the past?

<sup>3</sup> **DR. IRELAND:** I think it certainly may recur. It again may be the aggressiveness of the play of the individual, whether or not it's soccer or football, and we, the physicians, I think have to be the protectors of the young individual because sometime the parents, and certainly the child, are unaware of the potential long-term problems and a permanent change in whether it's affect, whether it's the way he looks, the punch-drunk look of a boxer who has been boxing for a long time. That's a very important thing to protect the young kid.

<sup>4</sup> **DR. METZL:** It seems to be a repetitive-type problem, and athletes who have had concussion in the past are more prone to have this injury in the future. So, certainly for a pediatrician in the preparticipation examination, and an athlete with a history of two concussions in the previous year, you're absolutely right, the pediatrician should have a higher index of suspicion for educating both that patient and his parents in this case about the symptoms of concussion and having a

much lower index of suspicion for diagnosing this injury and potentially for referring this child to a neurologist if there is any suspicion on either the present examination or future examinations.

<sup>5</sup> So moving off of his medical history, which was otherwise unremarkable, in our 15-year-old, underdeveloped, delayed-in-maturation male, we notice on his orthopedic examination that he has marked off that he has had a history of repeated ankle inversion injuries, or ankle sprains. Mary Lloyd, how common is this scenario of an athlete who has had repetitive ankle sprains?

<sup>6</sup> **DR. IRELAND:** Number one, I would want to make sure it wasn't coming from his brain. We see certain sports, certainly as basketball, will have more ankle sprains than a cross-country athlete, but it isn't all that common in a football athlete to have repetitive ankle sprains, particularly in a male.

<sup>7</sup> **DR. METZL:** With his history of repeated ankle sprains, what different strategies do you think you might employ before the season starts? This, we'll say, is a month before the start of his football season. What strategies might you employ to help reduce the incidence of ankle inversion injuries during the upcoming season?

<sup>8</sup> **DR. ANDERSON:** Ankle sprains are probably the most common orthopedic injury or musculoskeletal problem. They're so common, that sometimes people are a little casual about the diagnosis and treatment. So, the first thing I would do would be to make sure that these were, in fact, ankle sprains. Often, the injuries to the ankle, no matter what the injury is, it's called a sprain when you have to rule out other conditions in the differential diagnosis, which could include a subluxing peroneal tendon or an osteochondral fracture or a growth plate injury. So, I would make sure that it's sprains.

<sup>9</sup> The best thing to prevent recurrences of this is to rehabilitate the injuries that have happened, to make sure that they've been treated with more than rest. If you've determined that it's an ankle sprain and you can make sure they get back their strength and get back their proprioception or position sense and use a brace or a tape or wrap to provide some support when they return to their activity, that combination of things could reduce the chance of recurrences.

<sup>10</sup> **DR. METZL:** That's absolutely correct advice. We have had some success with trying to base these programs in the school. Sometimes there is a difficulty in actually getting

kids to do these types of rehabilitation programs. They go to school all day and they come home and they're really not very interested in starting any type of strengthening program. We have started to use the school trainers to help develop these rehabilitation programs during school hours. In this case, we're in the middle of the summer doing our preparticipation exams. So having these exercises and showing these young athletes what to do can certainly help decrease the incidence of this type of a problem.

<sup>11</sup> Mary Lloyd, in your sports medicine center, do you send people home with exercises, or do you send them to a physical therapist? How do you determine this?

<sup>12</sup> **DR. IRELAND:** We will usually send them home with a program of proprioception, knowing where the ankle and foot is in space. I would certainly agree with a recurrent ankle sprain. That's the major complication with a first ankle sprain. So, if you rehabilitate it properly the first time and then, usually throughout that first season, have some type of support, like an ankle brace or taping. The braces are a little bit cheaper than taping and may be better worn if the youngster will comply with that. I would also agree that if there are recurrent sprains, a repeat X-ray is necessary to make sure, particularly in the multiple-sport youngster, that there isn't a problem with an osteochondritis dissecans of the talus or some undiagnosed bony problem about the foot and ankle.

<sup>13</sup> **DR. METZL:** Moving on now, we have our young athlete who has had a history of concussions. We've determined that we're going to keep a very close eye on him and consider referring him if he has any positive findings on his examination, a history of ankle sprains in the past year. We've X-rayed his ankle and the X-rays look fine, and we're going to get him started on a strengthening program. Next, how to better prepare this somewhat underdeveloped male for playing football becomes an issue. First of all, Mary Lloyd, is this 15-year-old underdeveloped male somebody whom you would try to discourage from playing football?

<sup>14</sup> **DR. IRELAND:** I would like to know a little more about his weight and how underdeveloped he actually is. It sounds like he's an aggressive player based on his past history of concussions, and sometime the most aggressive players are the smaller, less developed ones. So I would be again concerned about his welfare, but probably allow him to play sensibly and try to get him on a good

2. See Wohtys *et al.* (13) in List of Reading Materials.



strengthening program. One of the problems with head injuries is that maybe the head and neck are used improperly or there's not the proper strength of his trunk and his neck. That would be a good place to start.

<sup>1</sup> **DR. METZL:** A further comment on the strengthening programs is certainly strengthening in prepubescent and, in this case, pubescent athletes has been an issue which has been slow to be embraced. At present, strength training in preadolescents is endorsed by the American Academy of Pediatrics and the American College of Sports Medicine as well as the American Academy of Orthopedic Surgeons. Yet, it seems that pediatricians have been somewhat slow to encourage their preadolescents, in particular, to start strength-training programs. Steve, do you deal with this problem? How do you approach it?

<sup>2</sup> **DR. ANDERSON:** This is one of the more common scenarios where you have a kid that's maybe a little late in maturing and is underdeveloped and wants to do a tough macho sport like football and wants to get a little bit bigger, stronger, and faster. I think this is an important area for pediatricians to connect with their patients because when a kid wants to get bigger and stronger, they may be looking for some short-cuts. When this scenario comes up, I, first of all, make sure that there's no physical reason why the kid is underdeveloped. If you've ruled that out and he is just a late maturer and is interested in getting stronger, I find out what other things they've considered to gain strength, including the use of performance-enhancing drugs and nutritional supplements, but with respect to the question of strength training, there was a myth that has since been disproven, that kids don't get stronger when they lift weights and that if they lift weights, they get injured. The American Academy of Pediatrics has just revised their statement on strengthening and conditioning and, after a careful review of the literature, kids, including preadolescent, prepubescent kids, can get stronger if they lift weights, and, if they lift weights with proper techniques, they can avoid the injuries.

<sup>3</sup> What I tell my patients is that they're not going to gain the bulk until they get hormones and that they're generally safer lifting a weight that they can lift multiple times. Machines seems to be safer than free weight because it doesn't require as much technique, but if they really want to improve their performance, they may be better off focusing

on other aspects of the sport besides just gaining the size and the bulk.

<sup>4</sup> **DR. METZL:** Certainly, this issue of how to devise strength-training programs for adolescents and preadolescents is one which is difficult. The American Academy of Pediatrics as well as the American College of Sports Medicine have been proactive at encouraging these types of strength-training programs. However, most health clubs don't allow children under the age of 16 or 18 to lift weights. So, oftentimes many of these programs are devised at home.

<sup>5</sup> I think the important point with regard to your comments is that these programs need to be supervised. In fact, the majority of these injuries, as both of you are well aware, with regard to strength training have occurred when weights have dropped on unsuspecting young athletes when they're doing these types of programs in an unsupervised environment. Generally using whatever resources are available to a young athlete, including the athletic trainer at the local school, is a fantastic way to encourage safe strength training, which is a very good method of injury prevention.

<sup>6</sup> Just picking up on another comment which you made about nutritional supplement use, this certainly has a significant amount of attention in the media and increasingly is a topic which is faced by many pediatricians. Mary Lloyd, in your experience, I'm wondering how this issue of nutritional supplement use and performance enhancement has changed.

<sup>7</sup> **DR. IRELAND:** I think the families, the parents, sons and daughters are much more aware of certain supplements. In the past when physicians were asked about anabolic steroids, we made the mistake of saying that they weren't helpful. They didn't help with strength, and the young men in the weight room said, "This is not true." So now, with the new one on the block of creatine, I think we need to be very careful about saying it doesn't work, because certainly it does work. I would not recommend it in the pediatric-age group or perhaps in other age groups. It could be a trend, but we, as physicians, need to get our patients the answers by making sure that they consult with people who are very aware of some of the potential complications. Certainly, creatine does not seem to have the potential problems that the anabolic steroids have, but we don't really know, and an access through a father or a mother of creatine or some of these other supplements is something that I would not encourage. I also think that you have to gain strength by hard work and

not by a quick fix of a pill or supplement. Trying to emphasize that and proper technique in lifting is a much better way to go.

<sup>8</sup> **DR. METZL:** We have seen a trickle-down effect with regard to nutritional supplement use, which I think is of concern to pediatricians. In previous years, nutritional supplement use was restricted to professional sport athletes and then, as nutritional supplements and the broader category of ergogenic aids, supplements used to enhance athletic performance, were embraced by professional athletes, then college athletes and Olympic athletes started embracing these products, and, last but not least, these products seem to have trickled down into the adolescent-age group, into the high school and junior high level. There have been several studies, as you are both aware, looking at the incidence of anabolic steroid use in both high school and junior high school students, and this demonstrates a concerning trend.

<sup>9</sup> However, of perhaps even greater concern is this issue of nutritional supplement use. In my opinion, nutritional supplements are marketed much like the Joe Camel cigarette ads in the 1970s, which gave a vision of a healthy lifestyle, increased viability, and increased attractiveness if you smoked cigarettes, which 20 years later was found to be a disaster. My great concern about nutritional supplements is these products have not been tested at all in any of the pediatric- or adolescent-age patients, and the popularity of these agents is of concern because we simply don't know what effects these might have.

<sup>10</sup> **DR. ANDERSON:** I think the whole problem of performance enhancement is it's an immense problem and, as you indicated, it used to be felt to be just a concern of Olympic and professional athletes, but there has been a trickle down, as you indicated. I performed a study that was presented at an AAP meeting in Seattle<sup>3</sup> looking at performance-enhancing substances and it's not just anabolic steroids, but it's growth hormone and erythropoietin and all the things you hear about.

<sup>11</sup> The thing that has been most frightening to me is that when you talk to families and coaches and athletes about the performance-enhancing substances and you tell them how many people are using them and some of the potential side effects, my expectation was

3. Plenary Session, AAP, Spring Meeting, Seattle, Washington, 1990.



that people would be alarmed, but the response I had, more often than not, was people were both defensive and were telling me that if their child needs to take anabolic steroids, as an example, to get a college scholarship and if that's the only way they're going to get an education or if that's the only way they're going to get a pro contract and get the family out of poverty or whatever, it's none of my business. That's a frightening response and I have heard that frequently and I have been told to mind my own business on this. So, when you look at the high societal rewards for success in sports and you look at the invincibility that a lot of these young athletes have being immune from injury and other medical side effects and you put those two together and the pediatrician or physician talking about health risk for some of these things just isn't going to be heard and isn't going to have an effect.

<sup>1</sup> Furthermore, we've looked toward sanctions and penalties and drug testing as a way to curb this, but that's just not going to be practical for the pediatric population. So, it's clear that they're using these substances. It's clear there's rewards. There is not the universal outrage that a lot of people thought would be present and it's unlikely that, even if drug testing could be afforded and was feasible, the problem would be stopped.

<sup>2</sup> **DR. METZL:** This problem is perhaps most commonly encountered during the preparticipation examination, as we're discussing. Pediatricians have been grappling with how to address these issues because there is very little in the way of scientific evidence to speak against this issue. I think we're both very much fundamentally against the use of any type of supplement to enhance performance. A much better message is, go to the gym and start a strength-training program, which probably will be much better for you in the long run and the short run.

<sup>3</sup> **DR. ANDERSON:** I think it's clear that using scare tactics is ineffective. As Mary Lloyd indicated, telling people that these things don't work, you lose credibility when you say that. If you tell people that they're going to get cancer if they take anabolic steroids, yes, that's a possibility, but not everyone gets cancer. If you tell them things that are untrue, then things that are true, they're not going to believe you. You've lost your credibility.

<sup>4</sup> **DR. METZL:** All right, let's move away from our preparticipation physical examination in our 15-year-old whom we have presumably cleared to play football, with recommendations for a strength-training program

and a close eye on a concussion, and now switch over to a 15-year-old female who comes in for evaluation of a knee injury. This 15-year-old female comes to your office one day after suffering a noncontact, twisting injury to her left knee. She was running down the soccer field, planted her left leg and twisted, and felt the knee go out on her. Her parents took her to the emergency room last night and had the knee X-rayed. Those X-rays were normal. She comes in to see you the next day for further evaluation of her knee injury. Mary Lloyd, how common is this story in soccer?

<sup>5</sup> **DR. IRELAND:** This story is very common in soccer and, based on your history, without knowing your physical exam, I would say she has a torn anterior cruciate ligament. In the female athlete, oftentimes, patellofemoral problems are thought to be the culprit, but we are seeing an increased incidence of anterior cruciate ligament injuries in the female athlete at the collegiate level, two and a half times greater in soccer and four times greater in basketball.

<sup>6</sup> **DR. METZL:** Steve, do you have any suggestions on how this history might be interpreted by a pediatrician to help better arrive at the diagnosis of an anterior cruciate ligament tear?

<sup>7</sup> **DR. ANDERSON:** Well, this history is so common for an anterior cruciate ligament. I think it's reasonable to assume it's an ACL, or anterior cruciate ligament, until proven otherwise. The key element of this was twisting. Occasionally, patients will report that there was a noise, a distinct snap or pop, in their knee. They may say that their knee buckled or gave way. Patients, when they're doing their exam, will often give you what we call the double-fist sign, where they put one hand on top of the other and move it back and forth, indicating how the knee shifted, but one of the things that will lull doctors into complacency is that not everyone with this injury has a high degree of pain. Not everyone has immediate swelling, or swelling even later on. Not everyone is rendered unable to walk. In fact, many of these kids can put weight on their leg. They can stand; they can walk; they can maybe run. So part of the history should be what happens if they try to do something that involves jumping, twisting, pivoting, changing directions because many of these kids will say they had a pop in their knee. It may have shifted. They might have even tried to play again, but when they tried to run or cut, they say they haven't tried to do that, or they did that and something felt like it wasn't right.

<sup>8</sup> **DR. METZL:** Yes, this type of injury and injury pattern is a very common one. Mary Lloyd, I know you've done a lot of work with regard to gender differences in ACL injury patterns. Do you have any comments with regard to perhaps the Olympic basketball team study which you did, which seemed to indicate that this injury is much more common in females than males.

<sup>9</sup> **DR. IRELAND:** Yes, certainly, this is not an easy one-factor answer. I feel that the more important thing with the female athlete is perhaps her trunk control and her hip strength. This usually involves an action that they do quite often. In basketball, it's driving for a shot, stopping, trying to catch the ball before it goes out of bounds. It's almost like they have a mini-stroke, if you will, where there's lack of muscular control or lack of the proper order of firing the muscle that happens very, very quickly, in about 70 msec as a matter of fact. So, when you look at some of these injury patterns, sometime they're out of control even up in the air as they come down, and they reach this position of no return that might be more accentuated in the female athlete because of some differences in pelvic width, valgus alignment, but I think more importantly, not some of the nonchangeable anatomic factors but some of the movement patterns that we see, where the trunk and the hip strength and balance may be different in the female athlete.

<sup>10</sup> **DR. METZL:** We had reported at the American College of Sports Medicine meeting in Seattle, Washington,<sup>4</sup> the possibility that this trend towards increasing incidences of anterior cruciate ligament tears in college-age females as compared to males is actually applicable to the adolescent population as well. In fact, female soccer and basketball players appear to be more prone to ACL injuries compared to males.

<sup>11</sup> Certainly, the next step in taking care of these types of injuries is figuring out preventive strategies and there are a number of theories on how these types of injuries might be prevented. Steve, do you have any tips on how you advise female athletes who are in their preparticipation exam, for example, and play either soccer or basketball and how they might avoid this type of injury?

<sup>12</sup> **DR. ANDERSON:** I was going to ask that same question to Mary Lloyd because I'm

4. See Micheli *et al.* (11) in List of Reading Materials.



interested in these trunk-control and proprioception issues. I am unaware of any particular exercise that is going to prevent these injuries. There may be some shoe-surface interface issues, in other words, related to how much the shoe grabs on the surface when they do pivoting sports and has been indicated as a risk factor, but I'm not going to tell people to walk on ball bearings to prevent an ACL injury. I am not aware of a prevention strategy that is effective, including the use of prophylactic knee braces for this, but I will defer to Mary Lloyd.

<sup>1</sup> **DR. IRELAND:** The shoe issue is an interesting one, and, certainly, the friction between the shoe and the floor might help set up this cascade, but I don't think that that's the important factor to focus on. In fact, we don't even need to focus on the knee as much as we need to focus on the hip and the trunk. A specific program has not been developed. However, in reviewing the ways kids get hurt, we almost need to back up and try to program them to, if they do get in that position, in a Pavlovian way, straighten themselves up and stay out of this position of no return. Specifically, I think some balance use of Swiss ball activities and doing this very early on, perhaps in middle school. We used to have something called a Jungle Gym that — I don't know if it exists any more — involves jumping. It involves landing. If we know how to land, I think that will reduce the risk of this injury and the concerning thing has been that Title IX has been now almost 30 years and we're not seeing a reduction in these injuries despite more talented younger athletes starting at age 5 playing soccer or basketball. We're not seeing a reduction in this.

<sup>2</sup> Another comment regarding the management and diagnosis is that this individual should not go out and play again. The vast majority of the anterior cruciate ligament injuries are complete, probably about 95%, and the next thing that they do is they tear their meniscus or they have an osteochondral fracture or they have a worsening problem from a lateral compartment bone bruise, so I think we do a disservice to this individual to say, "Well, we're not quite sure. We'll let you go back and play." The number one thing that the kid wants to do is get out there and play in that soccer game tonight, and I think that we again have to be the protectors of the individual and not allow them to get back in play.

<sup>3</sup> My first step is not to jump and get an MRI scan. My first step is to work on getting rid of the hemarthrosis by giving them time, work

on a gentle range of motion and regain quad control. Then see them back in another week, rather than jumping in and immediately getting a scan. We can diagnose an ACL tear by physical exam in this person. To allow her to get back to a high competitive of soccer, she's going to have to be fixed.

<sup>4</sup> **DR. METZL:** In summary, from this case, we can say that the mechanism of injury in this case of planting, twisting, noncontact injury with subsequent loss of stability in the knee was a contributing factor in helping to make this diagnosis, and it's very important to listen for this injury pattern in helping to diagnose an ACL injury.

<sup>5</sup> **DR. ANDERSON:** If I could just make a couple of other comments on ACL diagnosis, another common mechanism is a hyperextension mechanism. One of the common areas to have pain with an ACL injury is in the posterior lateral portion of the knee and when people hyperextend and have pain, posterior lateral, you might think that you tore a hamstring muscle back there, but that's not the mechanism for tearing a hamstring. That's not where hamstring injuries hurt. That's an ACL injury.

<sup>6</sup> One other point just on the diagnosis. If you can see these people in the office early and see them before they have developed a lot of swelling and pain, it is easier to do that physical exam, but if they are swollen, painful, and guarding, rather than send them off to the radiologist to make a diagnosis for you, or the MRI, you can very safely put them in a splint, a compressive wrap, ice packs, get the knee quieted down; have them come back in a week or 10 days and repeat the examination when things have calmed down.

<sup>7</sup> I agree with Mary Lloyd that you should be able to make the diagnosis reliably with physical exam. Pediatricians need to know, there's no medical urgency in making this diagnosis. You do not have to send these people off and do surgery in the first few days or even the first few weeks.

<sup>8</sup> **DR. METZL:** The only problem with that scenario is that the possibility of a fracture needs to be ruled out. I mentioned in this case, this child had gone to the emergency room the night before and had been X-rayed, but in a patient who is 15 years old and a male, the possibility of a residual patent physis is an important one. So, once the possibility of fracture has been alleviated by the use of an X-ray, the management of this problem by a pediatrician, including getting the knee quieted down and starting some physical therapy, is certainly very appropriate.

<sup>9</sup> **DR. ANDERSON:** The one type of fracture that is particularly important to recognize early is perhaps in a younger child who pulls the anterior cruciate off the tibial eminence. This is usually younger than the one we've been talking about, the 8- to 12-year-old patient, but these are people who will have a similar mechanism of injury that we've described, will have a positive Lachman test, which is the test that is used to diagnose anterior cruciate laxity, but if they have pulled off the bony attachment, that is worth learning about early, because if the detached fragment is not significantly displaced, these are people who can be treated adequately in a long-leg cast. If it is displaced, it can be fixed surgically early on. You have to recognize this early to get him on the right course of treatment. If you wait on these people for three or four weeks, you may have missed an opportunity to do something that would work easily to treat the problem.

<sup>10</sup> **DR. METZL:** Our third case is a different type of case. This case is a 13-year-old gymnast who comes into your office complaining of low back pain. She is a very competitive gymnast who is involved in a local gymnastics club. She describes a low back pain, which seems to bother her the most when she does back bends. Mary Lloyd, in this type of a situation, how would you go about further evaluating this back injury?

<sup>11</sup> **DR. IRELAND:** If she has pain on hyperextension when I ask her to extend her back that is in the paralumbar area, I think an X-ray is warranted, which would include a standing lateral view to make sure she doesn't have a spondylolisthesis, as well as oblique views to look at the pars interarticularis to see if she has a spondylolysis.

<sup>12</sup> **DR. METZL:** To define these terms better, spondylolysis is a stress fracture of the pars interarticularis. This type of injury is a very common overuse injury in athletes who are involved in repetitive bending, in particular, back bending. These athletes generally include figure skaters, ballet dancers, and gymnasts. In our gymnast, she describes a pain with bending backwards. As I mentioned, the bar, in particular, in bending backwards over the bar, was extremely painful for her. Steve, in your evaluation of a child with low back pain who is involved in this type of activities, X-rays certainly are part of that diagnosis. Are these X-rays usually positive in cases of spondylolysis?

<sup>13</sup> **DR. ANDERSON:** One of the problems with diagnosing spondylolysis is if you X-ray a group of 100 sixth graders as an example,



you will find a defect in the pars interarticularis or spondylolysis in 5 or 6% of those patients. Not all of those patients have back pain. If you do X-rays on gymnasts, you will find a higher incidence of white female gymnasts as an example and maybe 10% will have spondylolysis, but, again, not everyone that has a spondylolysis on an X-ray has back pain, and not everyone who has a pars interarticularis stress fracture has an abnormality on a plain film. So what I recommend doing is correlating the X-ray findings with the history and the physical exam. If you have a young patient who has usually midline low back pain that is worse with standing, arching, extending, may be relieved by sitting, bending, and flexing, has a physical exam where there may be local tenderness, where they may have pain when they stand on one foot and arch backwards, then, look at the X-rays and, if there is a spondylitic defect on an X-ray with all those other things fitting, it's probably spondylolysis causing the pain. If the X-ray is normal in that setting, you may have to do other studies to confirm the diagnosis, such as a bone scan.

<sup>1</sup> **DR. METZL:** This type of diagnosis is sometimes very tricky. The important points, as you mentioned, are a history of repetitive extension and hyperextension and pain in the low back, which seems to worsen with this type of problem. In our experience, using a SPECT bone scan, a special type of bone scan which combines both bone scan and CT, is the most sensitive way at looking at the lumbar spine for evidence of increased uptake and stress fracture known as a spondylolysis.

<sup>2</sup> **DR. ANDERSON:** The SPECT scanner stands for single-photon emission computerized tomography. It is both more sensitive and more specific for this. I would encourage people, if they're going to order a scan to confirm the diagnosis, which is helpful to confirm the diagnosis and helpful to plan management, that they don't order just a plain bone scan, that they order a SPECT scan because the plain bone scans miss a number of these cases.

<sup>3</sup> **DR. METZL:** Obviously, not all 13-year-old gymnasts who come in with pain in their back have spondylolysis. In this type of sport, this is the most common cause of back pain, but certainly not the only cause of back pain.

<sup>4</sup> **DR. IRELAND:** Back pain in a pediatric-age athlete is something to be taken very seriously and should be worked up. The most likely diagnosis in this individual is a spondylolysis. However, disk problems can

exist. There can be facet problems, SI [sacroiliac] joint problems. Certainly a genitourinary workup may be necessary in the female athlete and also a history of previous problems. Have there been problems with previous stress fractures, previous back problems in this highly competitive 13-year-old?

<sup>5</sup> **DR. METZL:** Steve, how do you go about sorting out these many different causes of low back pain?

<sup>6</sup> **DR. ANDERSON:** My algorithm for evaluating back pain in kids is, first of all, ruling out what I call medical causes of back pain. Medical causes are things like infections, tumors, congenital abnormalities. It may be an abdominal or a genital urinary problem. The medical causes represent a very small proportion of all back pain, but you have to think about those and rule those out first, and that can usually be done by taking a medical history. If people have no history of injury or repetitive activity, if they have pain that is constant that isn't affected by their position or activity or just symptoms in other organ systems, that's a clue that there's maybe a medical cause and that needs to be ruled out first.

<sup>7</sup> Once you've done that and you decide that it's a mechanical back problem, mechanical back pain tends to be pain that's brought on by either specific activities or trauma. It tends to be worsened with certain movements and activities, relieved by others. I divide that up into anterior segment pain and posterior element pain. Anterior segment pain is pain that may be generated from a problem with a disk or a vertebral end plate or a vertebral body. Posterior element pain is like a spondylolysis or a facet problem. Anterior segment pain patterns tend to be worse when you put stress on the anterior segments: sitting, bending, lifting, coughing, sneezing, straining, all tend to make anterior segment problems worse. Posterior element problems tend to be worse with lumbar extension, so standing, arching, running, jumping, bending backwards, back walk-overs in the gymnasts are things that tend to make a posterior element problem worse.

<sup>8</sup> So if you find a pain pattern that fits in one of these categories, then you can actually confirm this on your physical exam, too. You can do what's called quadrant testing, where you have the patient bend forward, bend to the side, bend back, bend and rotate. You can see where the restrictions are, what reproduces the pain. As you do these evaluations, you can just say, what structure is being stressed when this patient is bending over and touching their toes? So, you correlate that

with the history. You correlate that with the exam and then you can narrow down your diagnostic possibilities to a number of the conditions that Mary Lloyd just mentioned.

<sup>9</sup> There's a few other anterior segment things that I might add to the list: Scheuermann's disease, vertebral apophysitis. In the posterior element problems, I think the spondylolysis is the first thing that should be ruled out, but if that can be ruled out, the other things that were mentioned, facet problems, and there were a few other anatomic variations that sometimes produce that pattern.

<sup>10</sup> **DR. METZL:** Now that we have taken our patient and we have entertained the different diagnostic possibilities and we've put her through a pretty thorough back examination, we find that she is pain free with flexion, but extension, in particular, provocative hyperextension, which is standing on one leg and bending backwards, causes extreme discomfort. Based on these findings, the physician is concerned about the entity of spondylolysis and our patient is sent off for X-rays, which are normal. In follow-up, a SPECT scan is sent for an attempt to confirm the diagnosis of spondylolysis, which in fact shows a right-sided spondylolysis. In this case, the patient, while standing on the right leg and doing the provocative hyperextension test, was most painful on the right side, which is often the pattern in spondylolysis. The question now is, how do we treat this problem, and what do we do? Mary Lloyd, how would you go about treating this problem?

<sup>11</sup> **DR. IRELAND:** There are those of us who think this will heal with bracing. Then there are other people who think that the spondylolytic defect does not heal. I think, in a 13-year-old, an attempt should be made to reduce her activity level and I would put her into a polypropylene Boston overlap brace to immobilize her for a period. Unfortunately, it takes two to three months at least for you to have a chance at getting this to heal. Also, in the history, we should ask about her menses and her nutrition. When you go into an orthopedist's office, they may quickly ask about these things, but I do think an indepth nutritional history of what she is eating and her menstrual status need to be investigated as well.

<sup>12</sup> **DR. METZL:** This branches into a topic known as the female athlete triad, a triad of symptoms, including osteoporosis, amenorrhea, and disordered eating or anorexia. This is a problem in sports where thinness is required to attain a certain level of success, such as figure skating, ballet, and gymnastics. Sometimes, these patients show up in



your office with a stress fracture as the only presenting sign or symptom of this problem. In this case, you might find a 16- or 17-year-old female who is yet to begin menstruating and has perhaps decreased bone density as a result of very poor intake of calories and poor circulating estrogen levels. This type of scenario is more common in an older athlete, so if we took a 17- or 18-year-old gymnast, for example, instead of a 13-year-old gymnast, who came in with a stress fracture and a history suggestive of female athlete triad, Steve, how would you go about intervening in this type of situation?

**1 DR. ANDERSON:** Well, if we're talking about stress fractures that, maybe not in the spine, but other stress fractures, a tibial stress fracture or a metatarsal stress fracture, one of the challenges is making a diagnosis of a stress fracture. You don't have an acute injury. You often don't have dramatic physical findings. People are not often completely limited from doing their activity. They just have pain. So, you need to, first of all, make the diagnosis, but if you make the diagnosis of a stress fracture, then you have to ask what caused this stress fracture. Is it something related to the training? Is it something related to their anatomy? Their biomechanics? Their equipment? The surfaces they're on? As well as other intrinsic factors related to their nutrition and hormonal status. So, a question that I ask, which can be a significant risk factor for developing stress fractures in female athletes, is their history of menses. Do they have regular menstrual periods? I also ask for a dietary history. If they are not having periods, they haven't started, or if they have started and stopped, or if they have some dietary deficiencies in calcium, I see that as one of the risk factors that needs to be addressed during the course of time when you're letting the stress fracture heal.

**2 DR. METZL:** Having done work with the ballet and gymnastics community myself, I think that this is an entity which is becoming increasingly recognized in these different communities, but pediatricians still are oftentimes the frontline people who will deal with these types of issues. I think it's helpful to get these young athletes off to a nutritionist who is used to working with this type of athlete very early in their treatment. Not all nutritionists are familiar with, for example, the thinness required in ballet or gymnastics and when you send these athletes to a nutritionist who's not sympathetic to these issues and they simply tell this child to start eating and start eating regularly, you move backwards instead of forwards. So I think it's important

to contact perhaps the local dance company or gymnastics group and find out which type of individual, with respect to nutrition, has been working with this patient.

**3** Back to our 13-year-old patient, though, if we're going to brace her, another important consideration is to get her started in some physical therapy to try to address some of the underlying muscle problems which may have contributed to this injury in addition to the fact that she's been doing a lot of back bending. Mary-Lloyd, in your experience, finding someone who is familiar with working with dancers or gymnasts is sometimes a perplexing problem. How do you go about finding the right individual for this type of patient with respect to physical therapy?

**4 DR. IRELAND:** Well, after you've gotten her stress fracture healed, then certainly we need to address, were there underlying biomechanical abnormalities that caused this, work her up for any nutritional or menstrual problems and get her to the right person, multiple disciplinary approach, i.e., of the right nutritionist, the physical therapist who can work with this individual. We underestimate the pressures that these kids put on themselves, particularly if they're now out of their sport. They want to get back as quickly as possible and they will mask if they're having any pain. You need to get them to somebody that can work with them on a routine basis and try to get somebody who works cross patterns, works with a Swiss ball, working with movement patterns and strengthening in that way, doing a plyometric upper extremity program. It's very important to integrate the whole individual from head to toe.

**5 DR. METZL:** I'd like to add that dance therapists as a subset of physical therapists are perhaps the most adept at employing some of the strategies which you discussed. Contacting the local dance company is a very helpful way at finding somebody who is sensitive to the different requirements with dance.

**6** Perhaps the only way we differ is that the importance of starting physical therapy while the stress fracture is healing is a topic on which nobody agrees. I generally try to get these kids started in a physical therapy program early on and get them started in correcting some of the muscle imbalances early on, though there is not a great deal of uniformity. Steve, how do you address these problems?

**7 DR. ANDERSON:** Stress fractures take longer to heal than many of the injuries that we see and athletes want to have some quick

fix and some shortcut to get back, but it's very hard to accelerate the healing of a stress fracture and a lot of the treatment is geared at creating an environment where it can heal optimally and you're not slowing it down, but one thing I've found helpful for these motivated, driven patients who don't like to be told to rest and have never maybe had to rest in their life is if you can find something for them to do, to stay active, to maintain their fitness while they're healing their stress fracture. You can buy some time with them. Most athletes that have, for instance, a lower extremity stress fracture are able to tolerate some low-impact aerobic activity, biking or swimming. They may be able to tolerate a weight-lifting program and, if you can allow them to do something as an outlet for their energy, something to stay in shape, you can buy time to let the stress fracture heal. Then, as the bone is healed, that's the time when you might want to look at some of the more specific biomechanical muscle imbalance issues related to that stress fracture and start addressing those in preparation for their carefully graded return to activity.

**8 DR. METZL:** These types of injuries are much more common as kids finish or even enter into their rapid period of growth. In this case, a 13-year-old gymnast is more likely to have muscle tendon imbalance as a result of her rapid growth. It's no surprise that we see an increasing number of these overuse-type injuries, including tendinitis, apophysitis, and stress fracture in kids who are undergrowing and finishing their period of rapid growth. Your point about keeping these kids active and keeping a positive focus with respect to their healing is very well taken. I think it's very important to keep these kids active in a very helpful and constructive way and keep them active, involved in their own personal care, because these are very high-level athletes and they can get these injuries for a reason. Simply to say, "Stay off of this and come back in two or three months when this is fully healed," oftentimes results in not very good compliance and probably then in some depression as well.

**9 DR. ANDERSON:** I think these principles of treatment apply not only to the high-level, highly motivated athletes but to the athletes in general who have injuries who may not be that motivated. It may be the kid that shows up in the office with an injury, a sprained ankle or knee pain, that is looking to get out of PE class and if you tell these people to just take time off and rest, they may take someone



who is just looking for an excuse to be sedentary and they may get very comfortable with that habit.

<sup>1</sup> **DR. METZL:** Moving on, our 13-year-old patient has been diagnosed with spondylolysis and has been treated in a brace. She returns to see you, having started some good physical therapy in addition to keeping her brace on for 23 hours a day according to a standard protocol for treatment of spondylolysis. She returns three months later and her symptoms have abated. Mary Lloyd, how do you make a decision as far as getting this child back to her gymnastics?

<sup>2</sup> **DR. IRELAND:** If her plain films were negative to start out with, I probably would not repeat them. If she had abnormalities, as our case did not, on the plain films, I would repeat a standing lateral and obliques. In general, the stress fracture, spondylolysis, does not progress to a spondylolisthesis. So we're not dealing with a progressive, developmental, congenital anlage problem of a spondylolisthesis. So, this is a specific separate entity from that. In assessing when to get her to go back, that can be very difficult. You don't want to just write a little prescription of "Go back to gymnastics," because she's back in the gym doing everything. I think we have to look again at her biomechanics, at what caused the problem. The last thing you want her to get back into is the hyperextension, repetitive loading on her back, and now that we've kept her in a swimming program, kept her in good shape, I think again, working with that physical therapist again on a routine basis, somebody who knows gymnastics or knows dance activities, to develop some of the cross patterns and some of the trunk control.

<sup>3</sup> You also mention that she's in a growth phase and I think that this is a time when, particularly the female athlete, she looks like she's all legs, may lose some of the strength and balance in their trunk and their hips and we really need to redevelop that using balance patterns, Swiss balls, those type things. It will probably take her three months to get back to a highly competitive level. So, it's almost as long as she's been immobilized that it will take her to get back. So, this is usually a six-month injury off of gymnastics.

<sup>4</sup> **DR. METZL:** There is no clear-cut strategy that is now in place to help advise people when these athletes are free to return to competition. However, I think the best way is to use both their symptoms and some type of method to evaluate this injury. A number of centers have used a very thin-cut CT to help evaluate the bony lesion further. Even though

the X-ray may in fact be negative and the SPECT scan, which is a form of CT with bone scan incorporated in that, may be positive, the CT is sometimes used to further define the bony anatomy. The down side of this is that CT does pose a significant radiation risk and we don't want to go around doing CTs routinely on the lumbar spines of our young athletes, so the criteria to return this athlete to competition are both based on the CT findings and also, most importantly, on her physical symptoms.

<sup>5</sup> When she is pain free and able to do all of her activities in a pain-free fashion, that's when we generally like to get these kids back to activity. In ballet, we often used what's called the transition class, where these athletes will go back to, for example, doing bar work only, but limiting their hyperextension, or in gymnastics, limiting their back bending while getting back some of the basic moves as they rehabilitate from this injury. Steve, did you have a comment on your position on getting these kids back?

<sup>6</sup> **DR. ANDERSON:** People like to have discrete time frames for injuries. How long will it take a grade 2 ankle sprain to recovery? How long will it take a spondylolysis to recover? But time frames tend to be arbitrary. Recoveries tend to be highly variable, so I encourage people to use function rather than time, so if there's someone that has to do a sport or activity that requires back arching or back extension, they need to be able to demonstrate an ability to do that in a controlled setting. They have to have enough flexibility, strength, and control to do that in a controlled setting before they do it in a setting that may be less controlled or more repetitive. So you look at the functional demands of the sport. You do exercises to restore the function and then you can use what's called a functional progression, where you start with something simple, low intensity, a few repetitions, and you build up gradually. When they can follow through that functional progression and do all the things that are required for their sport in a pain-free, normal manner, that tends to be a reliable indication of their readiness to return.

<sup>7</sup> **DR. METZL:** Our final case is that of a 17-year-old swimmer who comes into your office with a three-week history of right shoulder pain. He is a very active level swimmer who is very excited about completing his senior year in high school and going on to the state championships. He is now approximately one month before the state championships and he comes in complaining of right shoulder pain, which has worsened

over the past couple of weeks. Mary Lloyd, how would you go about evaluating this type of right shoulder injury? I'll also tell you that he is a very high level freestyle and butterfly swimmer.

<sup>8</sup> **DR. IRELAND:** In taking care of swimmers, you really need to get a good history of where they are in their training cycle. Are they increasing their yardage? When, during the stroke, does it bother them? Usually, it's during the catch or when the arm is as elevated as it will be. What's the character of the pain? Is it a dull, aching pain? Does he have to stop? In general, the diagnosis, which you need to be specific on, would be involvement of the rotator cuff. Is it a rotator cuff tendinitis, as opposed to other problems such as an instability problem? Based on his history, it sounds like it is more of a rotator cuff overuse tendinitis, strain, if you will, and you can use all or any of those terms. In the young athlete, however, we need to make sure that it isn't an instability problem, not as common in the swimmer as it would be in a dominant-sided baseball pitcher, for example.

<sup>9</sup> **DR. METZL:** To help differentiate between these types of problems, people who come in describing shoulder injuries which are suggestive of instability, oftentimes, though not always, will describe a slipping sensation in their shoulder. In contrast, our swimmer today comes in with a history of progressive right shoulder pain which is not traceable to any specific episode of injury. We have all been talking about overuse injuries and these types of injuries are really microtraumatic injuries. These are not one specific injury, such as a fracture or a ligament tear, which is graded as a macrotraumatic injury, but, in fact, these are repetitive-use injuries, which result from repetitively doing some type of motion. In our previous case, this was back bending and resulted in a microtraumatic injury to the lumbar spine, known as spondylolysis. In this case, it sounds like we're talking about a microtraumatic injury to the rotator cuff, which causes rotator cuff tendinitis.

<sup>10</sup> Steve, in this patient, we've diagnosed what sounds like rotator cuff tendinitis of the right shoulder. How would you go about taking care of this patient?

<sup>11</sup> **DR. ANDERSON:** The diagnosis of rotator cuff tendinitis and other overuse syndromes is difficult because, as you indicated, this is cumulative microtrauma. You don't see a single injury or an event and he may not have symptoms, unless you're doing some repetitive activity, and, because of this, there's often the delay in recognizing that there's a



problem, seeking medical attention, and, if you're not used to seeing some of the subtle findings, the diagnosis may be difficult on that basis.

<sup>1</sup> The difference between acute and overuse injuries, I tell my patients, is like the difference between a cut and a blister. With a blister, you don't really see it happen, but it's there and it's painful, and if you don't identify the cause you can't treat it. With a cut, it doesn't necessarily matter if it happened from a piece of glass or a knife, you treat it the same way. That analogy is important when you are trying to evaluate a rotator cuff problem.

<sup>2</sup> Most of the rotator cuff problems in swimmers happen from compression of the rotator cuff in an area called the subacromial space, and that may be due to their training, their technique. It may be due to muscle imbalances, particularly weaknesses of muscles that keep that space open, the downward humeral stabilizers. There are postural abnormalities. The typical swimmer build has a forward shoulder posture, where there may be more crowding and impingement in the cuff on that basis. For people who can become familiar or do know the sport, there are some technique and training issues associated with this. The simple things are the too-much, too-soon, too-fast scenario, but more subtle issues like failing to rotate your shoulders properly when you're doing your freestyle, using hand paddles or anything with added resistance may be risk factors. If you can identify these contributing factors in the training, that may be an important part of your treatment.

<sup>3</sup> So, my evaluation is getting more detail of the history and the training and it's often hard to find out about their technique without looking at them, but you can find out if they've been using hand paddles. In my physical exam, I look for posture, muscle development. I look for range of motion and test impingement signs and look very specifically for these protective muscles that keep that subacromial space open, testing the external rotators, testing the scapular stabilizers. Usually, after this assessment, you can find the particular factors that contributed to this individual's shoulder pain and have a more specific rehab plan.

<sup>4</sup> **DR. METZL:** Again, as we mentioned during the gymnastics case, once you get started with strengthening these different muscles, finding a therapist who is familiar with this sport is very, very helpful. In your experience working with swimmers and divers, I'm certain that you have therapists who are very

much aware of the different patterns of injury and different strengthening patterns, which are very helpful for rehabilitating injured swimmers or divers in cases such as this.

<sup>5</sup> **DR. ANDERSON:** There are a number of therapists that have a special interest in this. For the pediatrician who's not doing this full time, they can often ask the patients if there is a therapist that works with their team or has worked with some of their teammates as a way to find these therapists.

<sup>6</sup> The other thing that I would encourage, though, is that pediatricians may feel uncomfortable talking to a therapist without having the same mastery or command of some of the lingo and some of the injuries, but I think that most pediatricians would find that if they do talk to a physical therapist and simply describe what they think is going on and suggest some of the rehabilitation goals and solicit the therapist's input as to what they would recommend in terms of treating a problem of instability or inflexibility or rotator cuff weakness, they will find that the communication helps their patients get better. They will find that they learn more about how to manage these problems for subsequent cases.

<sup>7</sup> **DR. METZL:** I completely agree. I have found that this line of communication between physical therapists and athletic trainers and pediatricians has not traditionally existed in the same way that it has existed with orthopedic surgeons and physical therapists and athletic trainers. Pediatricians are very much benefited by this type of interaction, so I really would agree with you that it should be encouraged as a helpful way of fostering this type of communicative relationship.

<sup>8</sup> I'd like to thank my two colleagues, Steve Anderson and Mary Lloyd Ireland, for their participation in this discussion, and I'd also like to thank the American Academy of Pediatrics for making available this type of forum to allow us to discuss these issues of sports medicine.

### List of Supplementary Reading Materials

To help you obtain more details regarding this program's subject, the following supplemental reading materials are recommended:

1. Anderson, S.J., and Sullivan, J.A. "Care of the Young Athlete." Am. Acad. Orthoped. Surgeons, Rosemont, and Am. Acad. Pediatrics, Elk Grove Village, Illinois, 1999.
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### Answers to Pretest Questions

- |          |          |         |
|----------|----------|---------|
| 1. False | 3. False | 5. True |
| 2. False | 4. False | 6. True |



## Post-test Questions

After listening to the cassette and reading the transcript of this panel discussion, measure your expanded knowledge of the subject by answering the multiple choice questions below.

1. Check only *one* answer for each of the 12 questions.
2. When you have completed the test, transfer all 12 responses to the Post-test Response Form.
3. Return your answers in the pre-addressed envelope marked "Post-test Response."
4. Your confidential score will be sent to you on a quarterly basis.
5. If any questions are answered incorrectly, the cumulative score card will indicate the page and paragraph numbers where the correct answer will be found.

Your participation in this official AAP CME program meets the criteria for 3 hours of Category I credit toward the Physician's Recognition Award of the AMA, and 3 credits toward PREP (Pediatrics Review and Education Program) Education Award, provided that it is used and completed as designed.

**CME Credits can be earned for tests of issues submitted no later than 3 years from the date of publication. All tests postmarked by December 31 will be credited for the year submitted.**

**Release date: December 1, 1999. Test invalid for credit after December 1, 2002.**

1. The differential diagnosis of ankle sprains includes all of the following *except*

☐ a. distal fibular epiphyseal fracture  
☐ b. osteochondritis dissecans of talus  
☐ c. plantar fasciitis  
☐ d. peroneal tendon subluxation

2. Prevention of recurrent ankle sprains can best be accomplished by

☐ a. proper rehabilitation  
☐ b. taping  
☐ c. surgery  
☐ d. anti-inflammatory medications

3. A hyperextension injury of the knee associated with an audible "pop" is most likely due to

☐ a. posterior cruciate ligament sprain  
☐ b. medial collateral ligament sprain  
☐ c. torn meniscus  
☐ d. anterior cruciate ligament (ACL) sprain

4. Spondylolysis is most likely to cause back pain with

☐ a. sitting  
☐ b. lifting  
☐ c. arching  
☐ d. coughing/sneezing

5. The gradual onset of shoulder pain in a

swimmer is most likely due to

☐ a. deltoid strain  
☐ b. rotator cuff tear  
☐ c. shoulder separation  
☐ d. subacromial impingement

6. An athlete sustains a concussion and then comes in three days later with persistent headaches and difficulty concentrating. These symptoms are most consistent with

☐ a. epidural hematoma  
☐ b. subdural hematoma  
☐ c. sheer injury  
☐ d. postconcussive syndrome

7. An athlete comes in and wants to use creatine to enhance strength and performance. Which *one* of the following would be a physician's best response?

☐ a. Creatine is safe, well-tested, and can increase strength  
☐ b. Creatine is unsafe, untested, and can cause long-term renal damage  
☐ c. The long-term effects of creatine are not presently known in subjects less than 18 years of age  
☐ d. Creatine use is decreasing among teens

8. The female athlete triad consists of the

following conditions *except*

☐ a. anorexia  
☐ b. amenorrhea  
☐ c. polydipsia  
☐ d. osteoporosis

9. Which *one* of the following is an example of a microtraumatic (overuse) injury?

☐ a. Spondylolysis  
☐ b. Tibial plateau fracture  
☐ c. ACL rupture  
☐ d. Concussion

10. An athlete is found to have an ACL tear by examination. Which *one* of the following mechanisms is most consistent with an ACL tear?

☐ a. Medial contact knee injury (player struck from inside)  
☐ b. Noncontact twisting injury with planted foot  
☐ c. Hyperflexion injury to the knee  
☐ d. Direct fall onto the patella

11. Regarding youth sports participation, which *one* of the following is the prevailing trend?

☐ a. The number of young athletes playing competitive sports is unchanged  
☐ b. The number of athletes playing competitive sports is increasing  
☐ c. Soccer is the most dangerous youth sport  
☐ d. The number of female athletes is greater than the number of male athletes

12. Regarding ACL injuries, which *one* of the following is the prevailing trend?

☐ a. ACL tears are equally common in boys and girls  
☐ b. ACL tears are more common in boys than in girls  
☐ c. ACL tears are more common in girls than in boys  
☐ d. ACL tears most commonly happen in contact injuries



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