Should you suspect the female athlete triad?

Is your patient’s dedication to her sport putting her health at risk? This review—complete with a brief screening tool—will help you identify at-risk athletes and those whose health is already being compromised.

PRACTICE RECOMMENDATIONS

› Screen all adolescent female athletes for components of the female athlete triad at the preparticipation examination or whenever they present with any of the triad’s symptoms. (C)

› Order a dual-energy x-ray absorptiometry scan to measure bone mineral density on all female athletes with a history of stress fracture—not just those who also have amenorrhea, oligomenorrhea, or disordered eating. (C)

› Prescribe oral contraceptives to regulate an athlete’s menstrual period only as a last measure for those who, despite following recommendations, do not have a normal return to menses after 6 months. (B)

CASE ▶ Cassidy, age 14, comes to you for a physical in preparation for track and field tryouts. If she makes the team, she will practice 90 minutes every afternoon with optional practices 2 mornings a week.

She says that her period has been irregular since it started a year ago, and she complains of knee and shin pain that her mother attributes to “growing pains.” She says she usually skips breakfast due to a lack of time in the morning, but eats the school lunches. She is considering becoming a vegetarian. You suspect that the female athlete triad is at work here. How would you proceed?

The female athlete triad (“the triad”) is considered a spectrum of 3 interrelated disorders: low energy availability, menstrual dysfunction, and altered bone mineral density.¹ Low energy availability—total dietary energy in (calories in) minus total exercise energy expended (calories out)—is considered the key cause. Previously, the triad was described as disordered eating, amenorrhea (having no menstruation for >3 sequential months), and osteoporosis.² However, this definition has been expanded to encourage detection before clinical problems progress. In most instances, an athlete will develop only one or 2 of the 3 components of the triad.³ ⁴ This article describes the clinical manifestations of the triad, how to screen patients for it, and indications for referring affected athletes.

How common is the triad?
The prevalence of the triad is difficult to determine because published studies often feature poor standardization of definitions and scales, small sample sizes, and no control groups. In limited studies, the estimated prevalence of female athletes with the complete triad ranges from 1.3% to 4.3%.⁵ ⁶ Many stud-
In most instances, an athlete will develop only one or 2 of the 3 components of the triad:
caused by inadequate accumulation of optimal BMD during childhood and adolescence. A diagnosis of osteoporosis in patients ages 5 to 19 requires the presence of low bone mass and a clinically significant fracture history.17

BMD is assessed by dual-energy x-ray absorptiometry (DXA). DXA results are reported as a T-score, in which a patient’s bone density is compared with that of a healthy 30-year-old woman, or Z-score, which compares patients’ BMD with age- and sex-matched controls. The International Society of Clinical Densitometry recommends using Z-scores instead of T-scores when screening for osteoporosis in premenopausal women and in children.18

Z-scores are expressed as the number of standard deviations above or below the average value of the reference group. For every reduction by one standard deviation in BMD, the patient’s fracture risk doubles. The American College of Sports Medicine defines “low BMD” as a Z-score between -1 and -2.0 and osteoporosis as a Z-score ≤-2.0.1 For both definitions, the patient must have at least one secondary clinical risk factor for fracture, such as low estrogen, history of stress fracture, or nutritional deficiencies.

**Screening for the triad: What to ask, what to look for**
Screen all adolescent female athletes at preparticipation physicals or whenever they present with any of the triad’s signs and symptoms. Look for risk factors such as calorie restriction practices, vegetarianism, a history of injuries, extended exercise periods, or increased training, particularly sport-specific

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**TABLE 1**

<table>
<thead>
<tr>
<th>Question</th>
<th>Red flags</th>
<th>Action for a “red flag” response</th>
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<tbody>
<tr>
<td>What sports are you playing?</td>
<td>“Thin image” sports (eg, distance running, dance, gymnastics, figure skating)</td>
<td>Record sport in chart. Note increased risk</td>
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<tr>
<td>How many hours a day do you train?</td>
<td>Multiple practices a day, year-round practices, an athlete who trains markedly longer than others in the same sport</td>
<td>Assess motivation, look at level of athlete desire vs parental involvement/desire for successful athlete</td>
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<tr>
<td>How do you feel about your body/weight?</td>
<td>“I’m too fat/skinny,” “I’d be faster if I was thinner,” “Terrible,” etc.</td>
<td>Follow-up questions (eg,”How do you manage those feelings?” “What makes you think that?” “What are you doing to manage your weight?”)</td>
</tr>
<tr>
<td>Do you eat breakfast?</td>
<td>Never being hungry for breakfast, parents not home, etc.</td>
<td>If “No,” ask if other meals are skipped. If “Yes,” ask, “What do you eat for breakfast?”</td>
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<tr>
<td>What do you eat in a typical day? (or) What did you eat yesterday?</td>
<td>Refusal to answer. Choosing only junk or snack food. Vegetarian/vegan/&quot;I never eat ____.”</td>
<td>Consider follow-up visit for nutrition discussion. Recommend that patient keep a food diary. Discuss resources such as choosemyplate.gov, a USDA site that offers information on healthy eating</td>
</tr>
<tr>
<td>Have you started your periods?</td>
<td>No start by age 15, or started and then stopped</td>
<td>Consider further testing, including pregnancy test, FSH, LH, prolactin, TSH</td>
</tr>
<tr>
<td>When was your last period?</td>
<td>Cycles &gt;35 days, no periods for 3 months</td>
<td>Consider low energy availability as cause. See above for testing. Rule out pregnancy</td>
</tr>
<tr>
<td>Have you ever broken a bone? Which one? How?</td>
<td>Any recurrent fractures, stress fractures, fractures with little or no force involved</td>
<td>Consider DXA scan. May need repeat in one year if patients with amenorrhea do not resume menses</td>
</tr>
<tr>
<td>Do you drink milk? What about yogurt? Calcium supplements?</td>
<td>Never, seldom, can’t tolerate, etc.</td>
<td>Discuss calcium requirements and alternative milk sources such as yogurt, cottage cheese, or soy products. Consider supplements</td>
</tr>
</tbody>
</table>

DXA, dual-energy x-ray absorptiometry; FSH, follicle-stimulating hormone; LH, luteinizing hormone; TSH, thyroid-stimulating hormone; USDA, US Department of Agriculture.
Strenuous training alone is not enough to alter menstrual cycles; dietary restriction must occur.

If you believe a patient is at risk, ask her about her exercise and eating habits, menstrual cycles, and fracture history (TABLE 1).1 During the physical exam, look for signs that suggest the triad, including lanugo, enlarged parotid glands, and bradycardia (TABLE 2).1

Be sure to calculate the patient’s body mass index or body fat percentage.

Based on the history and physical findings, consider laboratory testing for a complete blood count with differential, ferritin, serum iron, B12, folate, comprehensive metabolic panel, thyroid function tests, erythrocyte sedimentation rate, and a urinalysis. 20 For an athlete in whom you highly suspect the triad, order urine electrolytes, salivary amylase, and stool guaiac tests, as well as an electrocardiogram.19

If your patient is amenorrheic, be aware that functional amenorrhea is a diagnosis of exclusion. Other diagnoses to consider include pregnancy, polycystic ovary syndrome, prolactinoma, anatomic defect, and ovarian failure. A pregnancy test, FSH and LH levels, prolactin, and thyroid-stimulating hormone testing should all be considered during evaluation for amenorrhea.

All patients with a history of stress fracture should undergo a DXA scan, whether or not they have comorbid amenorrhea, oligomenorrhea, or disordered eating.20 In patients with amenorrhea, the DXA may need to be repeated in one year if menses does not resume.

For patients who screen positive for disordered eating, amenorrhea, or decreased BMD, the International Olympic Committee (IOC) guidelines are an excellent starting point for further evaluation.19 The IOC has “decision trees” for female athletes with disordered eating, amenorrhea, and osteoporosis that are available at http://www.olympic.org/Documents/Reports/EN/en_report_917.pdf.19

In addition to screening female athletes for the triad, consider addressing eating attitudes, menses, and fracture history in routine office physicals for all female patients. Also, be aware that triad symptoms are not limited to female athletes; male athletes, particularly those in sports that focus on leanness, physique, or weight classes (eg, wrestling) also are at risk for low energy availability, disordered eating, and low BMD.

**Table 2**

Physical exam findings that suggest the female athlete triad1

<table>
<thead>
<tr>
<th>Exam component</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Vitals</td>
<td>Low BP or orthostasis, bradycardia, weight fluctuations or significant weight loss, high or low BMI</td>
</tr>
<tr>
<td>General</td>
<td>Anxious, overly thin, paleness, fatigue, arrested growth, delayed puberty, dry hair or hair loss</td>
</tr>
<tr>
<td>HEENT</td>
<td>Dental erosions/caries, enlarged parotid glands, dry mucous membranes</td>
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<tr>
<td>Cardiovascular</td>
<td>Sinus bradycardia or other arrhythmias, postural or nonpostural hypotension</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Discomfort, full abdomen/constipation, rectal prolapse</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>Muscle weakness, bone pain, joint pain, scoliosis</td>
</tr>
<tr>
<td>Extremities</td>
<td>Edema</td>
</tr>
<tr>
<td>Neurologic</td>
<td>Peripheral neuropathy</td>
</tr>
<tr>
<td>Skin</td>
<td>Lanugo, hand abrasions, dry skin</td>
</tr>
</tbody>
</table>

BMI, body mass index; BP, blood pressure; HEENT, head, eyes, ears, nose, and throat.
cornerstone of the triad, the priority in treating an affected athlete is to restore sufficient nutrition for caloric needs. Referral to a registered dietitian for full nutritional assessment and meal planning is recommended. If your athlete is unwilling or unable to follow dietary recommendations, refer her to an eating disorder specialist team. Ideally, this specialist team would consist of a registered sport nutritionist, a physician, and a psychologist or psychiatrist who specializes in eating disorders.

**Drugs that can augment your efforts**

Although they play a small role in treating the triad, pharmacologic therapies may be used to augment nutrition counseling. The selective serotonin reuptake inhibitor fluoxetine is the only medication approved by the US Food and Drug Administration for treating patients with bulimia; it is not approved for those with anorexia nervosa. Oral contraceptives may help women return to monthly menses, but they do not normalize the metabolic factors that impair bone formation and bone health. They can be used as a last measure in athletes who will not follow dietary or exercise recommendations, or those who, despite following recommendations, do not have a return to normal menses after 6 months.

Nasal calcitonin may be used to treat low BMD; order a follow-up Dxa scan in 12 months to monitor improvement. However, prolonged use of nasal calcitonin may increase the risk for cancer, and in October 2013 nasal calcitonin was withdrawn from the Canadian market. For amenorrheic athletes, recommend oral calcium, 1000 to 1300 mg/d, and vitamin D, 400 to 800 IU/d. Ideally, patients should receive these levels of nutrients via dietary intake, but if that is not realistic, supplements may be considered. Bisphosphonates and selective estrogen receptor modulators are contraindicated for premenopausal athletes.

**Can the patient return to play?**

The athlete will need to be medically and psychologically cleared before being allowed to return to play (RTP). If she has menstrual dysfunction or low BMD, these conditions should be addressed as a prerequisite for RTP. If the treating physician, nutritionist, and/or eating disorder specialist team recommends specific treatments or other interventions, the athlete should agree to the treatment plan in order to RTP. The physician or assessment team should determine the time frame for RTP on an individual basis. Athletes who do not comply with treatment regimens should, for their health and safety, be prohibited from return to sports participation.

**Focus on prevention**

Primary prevention should focus on educating female (and male) athletes about regarding food as fuel, discouraging unhealthy weight loss, and enlisting the support of coaches and governing bodies. An athlete’s coaches may be the first to notice symptoms of the triad as changes in performance or behavior, but coaches should not encourage athletes to lose weight or be involved in determining an athlete’s weight.

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**References**

8. De Souza MJ, Miller BE, Loucks AB, et al. High frequency of luteal phase deficiency and anovulation in recreational women run-


