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Mini Review

How to Investigate, Diagnose and Manage Female Athlete Triad (FAT) in an Athlete

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Abstract

The female athlete triad is a disorder seen in physically active females including three basic characteristics: 1) low energy threshold with or without disturbed eating habits , 2) menstrual dysfunction, and 3) low bone density [1].

It is essential to realise that an athlete does not need to have all three components of the female athlete triad simultaneously to be diagnosed with the condition.

The effects of the disorder may not be completely reversible, so prevention, early diagnosis, and staged intervention are crucial and must be addressed by a multidisciplinary medical team.

All athletes are at risk of the female athlete triad, regardless of body build or sport. Hence, all active females should be assessed for signs of the triad and further investigation should be performed if one or more components are identified.

Possible harmful effects include susceptibility to musculoskeletal injuries, infertility, poor athletic performance, stress fractures, osteoporosis and phycological disorders.

All team physicians should routinely screen their female athletes for any components of FAT with physical examination and related questionnaires.

After prompt diagnosis, an integrated treatment plan should be established.

Successful treatment is based on a multidisciplinary approach, including a primary care and/or sports medicine physician, a sports dietitian and mental health practitioner.

Keywords: *Female Athlete Triad (FAT); Athlete*

The female athlete triad is a medical condition typically observed in active females. It includes three basic elements:

1. Low energy threshold, which could be irrelevant to eating habits
2. Irregularity of menses
3. Decreased bone density [1].

It is essential to realise that an athlete does not need to have all three components of the female athlete triad simultaneously to be diagnosed with the condition.

The International Olympic Committee suggested changing the name of the diagnosis to more accurate : “relative energy deficiency in sport" [2].

The effects of the above mentioned disorders may not be completely reversible, so precautionary measures, prompt and accurate diagnosis and adequate intervention are essential.

All athletes might suffer from the female athlete triad. Hence, all active females should be evaluated for signs of the triad and further intervention is warranted if one or more components are established.

Why is the Triad harmful to an athlete's health?

Smith AD [3], summarizes the effects of the Triad and differentiates them into immediate and long term.

Immediate effects
Increased musculoskeletal injuries (e.g., sprains, strains, tendonitis)
Infertility (reversible if energy availability and menses normalize)
Poor athletic performance due to low energy availability
Stress fractures
Long term effects
Infertility (if energy availability and menses do not normalize)
Lifelong eating disorder or disordered eating
Low bone mineral density/osteoporosis
Psychiatric disorders

Based on current literature, certain sports such as ballet or gymnastics and sports with weight divisions (martial arts, wrestling etc) have a higher percentage of female athletes suffering from the condition [4].

Investigation

The team physician is the first to screen the athletes for components of the disorder at frequent intervals.

The elements that should be assessed for the Triad include: history of menstrual irregularities or amenorrhoea, history of stress fractures, history of eating or weight problems, negative thoughts, anxiety or depression, a history of dieting, personality traits such as perfectionism and pressure to lose weight and/or frequent weight cycling, early start of sport-specific training, overtraining, repetitive and non-healing injuries.

Questionnaires given to the female athletes should include inquiries about their current weight and expectations, as well as period pattern and history, dietary concerns/restrictions, and a bone fracture history.

With the above information, the physician should be able to identify athletes at risk of developing the disease or athletes already suffering from the female athlete triad.

A study [5] looked into grouping the athletes according to their risk for stress fractures. They used a specific questionnaire and they concluded that high risk athletes were four times likely to suffer an injury, when compared to the low risk group.

They argue that stress fractures injuries were more prevalent in cross-country athletes.

According to M De Souza [6], physical examination signs such as low body mass index (BMI), recent or continuous weight loss, orthostatic hypotension, lanugo, yellow skin (hypercarotenaemia), hair loss or additional signs of an ED, such as parotid gland swelling and callus on the proximal interphalangeal joints (also known as Russell's sign), should also prompt further evaluation.

Taking an accurate menstrual history is important, starting from age of menarche to the present, inquiring regarding months of consecutive missed menses and the number of menses per year since menarche.

Lab tests of secondary amenorrhoea in girls should begin after 3 months or more of missed menses.

A medication history should be also obtained, including medications which may affect the period and/or BMD, such as oral contraceptive pills or other contraceptive agents, such as depot medroxyprogesterone acetate.

A history of physician diagnosed bone stress injuries and other fractures should be noted as well as a family history of ED, osteoporosis and/or fractures.

A complete physical examination should include height and weight, blood pressure and heart rate. Also, a study of the athlete's growth chart could reveal growth arrest.

Bradycardia (which is a resting heart rate of less than 50 beats per minute) is common in cases of anorexia nervosa. However, it is a commonly found and anticipated as normal in elite athletes.

During clinical evaluation, orthostatic hypotension should be checked as well, as it is sometimes present within the female athlete triad. Usually a gynecologic examination is normal in athletes at risk of FAT.

A laboratory investigation of an amenorrhoeic athlete should include a pregnancy test and all hormonal blood tests. More laboratory tests may be required based on the medical history and physical findings.

When an athlete suffers from an eating disorder or bradycardia, a variety of specific investigations should be done, such as a complete blood count, electrolytes, blood glucose, urinalysis and electrocardiogram/cardiac echo.

Diagnosis

Sporadic menstrual disorders, or complete amenorrhea, in a female athlete can be the first sign of female athlete triad.

Osteoporosis and stress fracture, psychological dysfunction and decreased athletic performance may be the first signs of the disorder.

Management of the female athlete triad

The aim of the treatment is to resume normal period cycles, increase bone quality and address psychological disorders [7].

Nonpharmacological interventions, including phycological therapy and family support, may also be an efficient way to treat an eating disorder.

However, it is critical to note that not all athletes with female athlete triad suffer from eating disorder. Many athletes have not realized their high energy needs. Others do not fulfill their daily caloric intake due to poor appetite. An experienced nutritionist can advise the athlete and her family regarding adequate food consumption and special dietary supplementation, in order to restore energy levels and improve bone quality. Generally, daily consumption of 1000 - 1300 mg of calcium and 600 international units of Vitamin D is sufficient.

In particular athletes, coaches may have to decrease athletic activity levels until energy levels are fully restored.

The most important factor to return normal menstruation is proper weight increase.

Treatment can be difficult if the athlete and her environment are convinced that weight increase, higher energy intake or temporary decreased training activity may lead to poor sports performance.

The physician should discuss and analyze the treatment plan with the athlete, her family and trainer.

Coaches often are not familiar with the symptoms of the female athlete triad or the serious consequences of the disorder, so education of coaches is vital.

Adequate communication with families and coaches ensures they understand that the athlete is unfit to participate in sports until treatment goals are reached.

Successful management is only achieved by a multidisciplinary team composed of the physician, the sports nutritionist, sports phycologist, trainers and family members.

Pharmacologic therapy in the management of the female athlete triad is not yet established.

According to Chamberlain [7] treatment with medication may be considered only when nonpharmacologic treatment has not achieved the treatment goals.

In patients with severe anxiety or depression, antidepressant medication should be prescribed.

Current studies support the use of oral contraceptive pills to improve bone mineral density, however it is important to communicate with the athlete that the medication cannot act efficiently without adequate food intake [8].

Overall, successful treatment of athletes is highly dependent on a multidisciplinary approach, including a sports medicine physician, a sports dietitian and mental health practitioner. Depending on the individual situation, consultation from an endocrinologist, orthopaedic surgeon, psychiatrist, or exercise physiologist, may be beneficial. This treatment approach should be based on trusting and respectful interactions between healthcare providers and the athletes. Careful management and consideration of the effects of treatment goals on health status, athletic performance and personal lifestyle is mandatory to ensure treatment adherence and necessary post-treatment follow ups by affected female athletes and their families [9,10].

Conclusion

Physicians should inform trainers, coaches and parents to stay alert for symptoms and signs of FAT. Frequent updates and discussions with the athletic staff and parents about the warning signs may help in preventing the disease or diagnosing it in its early stages.

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