

Elite sports performance and reproductive problems

Peter Scott

FRANZCOG

Peter Scott combines his work in obstetrics and gynaecology with training and competition in triathlon events.

The ‘epidemic’ of obesity is something all O and G specialists will be very familiar with, but issues of special importance also arise at the other end of the physical scale. As women compete at elite levels in sport, doctors have become increasingly aware of medical problems associated with these higher levels of physical activity and training. The constellation of endocrine consequences of elite athletic performance has been termed the ‘female athletic triad since the mid-1990s, comprising amenorrhoea, eating disorders and bone demineralisation’.

The incidence of the female athletes triad is difficult to determine but all authors agree that it is almost certainly under-reported. Tostveit found that menarche occurred later and the incidence of amenorrhoea was higher in elite athletes in Norway. In a study of collegiate level runners by Gibson and colleagues, a strong correlation was found between disordered eating and disordered menstruation – 50 per cent of their subjects were amenorrhoeic. Several authors attest to a wide variation in individual susceptibilities, ‘but most recent studies confirm earlier observations of higher incidences in aesthetic, endurance and weight-class sports, and at younger ages higher training volumes and lower body weights’, so gymnasts, dancers and distance runners are most at risk, while swimmers and cyclists are less so.

Brunet points out that ‘the three pathologies are interrelated and difficult to explain without the influence of the other components’. Clearly there is ‘a tremendous overlap between [pre-existing] eating disorders and the female athlete triad’, and there may well be some self-selection, in that girls of a certain build may go into sports where that build is an advantage, and those with a pre-existing problem with body-image may take up strenuous exercise as one way of attempting to avoid weight gain. Kohl’s group found that 80 per cent of patients with anorexia nervosa were ‘exercising excessively during the acute phase of the disorder’.

Physiology

The belief that there is a threshold level of body fat necessary for the initiation or continuation of menstruation is now thought to be inaccurate. The notion of an energy imbalance leading to the abnormalities now appears to have more acceptance and Redman and Loucks have shown that decreased LH secretion

and amenorrhoea appears to result from a dietary intake that was inadequate to compensate for energy output with exercise. They describe experimental evidence that ‘the disruption of LH pulsatility in exercising women could be prevented by supplementing their diet in compensation for their energy exercise expenditure’.

The mechanism by which this energy imbalance causes disruption of the hypothalamic-pituitary-ovarian axis is thought to be multifactorial. The adrenal axis is involved and, as with anorexia nervosa, these women have elevated levels of ACTH and CRH. Recent studies have suggested that the hormone leptin acts as a signal to the hypothalamus of energy-deficient states. Levels are low in both anorexia nervosa and exercise-induced hypothalamic amenorrhoea, and the administration of exogenous leptin can restore ovulation. Insulin, IGF-1, growth hormone, testosterone, prolactin and thyroid levels are also abnormal in these women. Endorphins have also been shown to suppress GnRH secretion.

Management

Most of the menstrual irregularities caused by exercise appear to be reversible with adequate dietary replacement and/or moderation of the training regime. Shangold and Levine showed that future fertility was not impaired in female marathon runners. Of greater concern, and an important reason for investigating any adolescent with menstrual disorders, is the possible effect on bone metabolism. Studies by Cobb’s group and by Poupilai and colleagues found a strong relationship between menstrual irregularity and low bone mineral density. These adverse effects may well be occurring at the very time when maximal bone mineralisation should be happening and have been shown not to be completely reversible with weight gain and resumption or onset of normal cycles. Some gymnasts, for example, may never reach their potential height. In addition, such women are at increased risk of stress fractures. Interestingly, in a study by Warren and colleagues, oestrogen replacement therapy ‘did not change or normalise BMD’, suggesting that ‘mechanisms other than hypo-oestrogenism may be involved with the osteopenia associated with exercise-induced amenorrhoea’, again evidence of the multifactorial nature of the hormonal abnormality – insulin, thyroxine and IGF-1 all have an influence on bone metabolism.

Another area of concern is the possible effect of low oestrogen on cardiovascular health. Amenorrhoeic athletes have been shown to have impaired endothelial function and adverse lipid profiles and ‘altered vascular health outcome are suggestive of increased risk for premature cardiovascular disease’.

The American Academy of Sports Medicine (ACSM) recommends referral of any female athlete showing signs of any of the three components to a health care professional who is part of a multidisciplinary team. Management would ideally be based on advising

the athlete, as well as parents and coaches, of the nature of the condition and its possible deleterious effects on short- and long-term health, particularly emphasising the importance of allowing normal bone growth at the critical time in adolescence. Care should be taken by coaches in the imposition of too-strict weight standards.

According to Prior and colleagues, 'often a weight gain of 1-2kg or a ten per cent decrease in exercise load in either duration or intensity is sufficient to reverse reproductive dysfunction'. Clearly this may be easier in theory than in practice and continuing monitoring and encouragement are needed. Obviously, other causes for menstrual irregularity need to be excluded, including pregnancy and other hormonal abnormalities, such as thyroid disease.

Opinion varies on the advisability and efficacy of oestrogen replacement. According to Goodman's group, 'most studies of oestrogens and oral contraceptives have demonstrated no change in BMD with contraceptive use'. On the other hand, Liu's group report 'fair evidence for a positive effect in hypothalamic oligo/amenorrhoeic women' and point out that the 'decision to treat in these women is clinically more important'. Oestrogen may also be protective against cardiovascular disease. In athletes needing reliable contraception, the OCP would be a logical choice. Clearly prescription of oestrogen is inappropriate in pre-menarchal girls and in these patients the above-mentioned conservative measures should be emphasised. A study by Craciun and colleagues showed a possible beneficial effect of Vitamin K supplementation on bone metabolism. Emans suggests that young women taking 1200-1300 milligrams a day of calcium 'may have a better bone mass'.

Summary

It is obviously important to encourage healthy participation in sport and exercise. However, we need to have an awareness of the possible adverse effects of excess and an index of suspicion, particularly in those young women who may be particularly at risk. Often the solution lies in ostensibly simple changes in diet and exercise, but education, encouragement and a team approach are needed.

References and further reading

- Goodman L, Warren M. The female athlete and menstrual function. *Curr Opin Obstet Gynecol* 2005;17:466-70
- Tostveit M, Sundgot-Bergen J. Participation in leanness sports but not training volume is associated with menstrual dysfunction. *Br J Sports Med* 2005;39:141-7
- Gibson J. Nutritional and exercise-related determinants of bone density in female athletes. *Osteoporosis Int* 2004;15:611-618
- Brunet M. Female Athlete Triad. *Clin Sports Med* 2005;24:623-636
- Emans J. Transcript from Radio National Health Report (20/10/1997) ABC on-line.(www.abc.net.au)
- Kohl M. Hyperactivity and anorexia nervosa. *Encephale* 2004;30:492-499
- Redman L, Loucks A. Menstrual Disorders. *Athletes Sports Med* 2005;35:747-755
- Chan J. Role of leptin in energy-deprivation states. *Lancet* 2005;366:74-85
- Shangold M, Levine H. The effect of marathon training on menstrual function. *Am J Obstet Gynecol* 1982;143:862
- Cobb K. Disordered eating, menstrual irregularity. *Med Sci Sports Exerc* 2003;35:711-9
- Punpilai S. Menstrual status and bone mineral density. *Nursing & Health Sciences* 2005;7:259-65
- Warren M. Persistent osteopenia in ballet dancers with amenorrhoea. *Fertil Steril* 2003;80:398-404
- O'Donnell E. The cardiovascular effects of chronic hypoestrogenism. *Sports Med* 2004;34:601-27
- Prior J. Gonadal steroids in athletic women. *Sports Med* 1985;2:287-295
- Liu S, Lebrun C. Effect of oral contraceptives. *Br J Sports Med* 2006;40:11-24
- Craciun A. Improved bone metabolism in female athletes after Vit K. *Int J Sports Med* 1998;19:479-84

Goulburn Valley Health, Shepparton, Victoria

Consultant Obstetrician and Gynaecologist

- Visiting Medical Officer, fee for service contract appointment; one in four on-call roster
- Support expanding demand for O&G services
- Appointment at nearby private hospital and possible part-time teaching/research position at The University of Melbourne's Rural Clinical School

Goulburn Valley Health (GVH) is seeking a suitably qualified obstetrician & gynaecologist to support an expanding demand for services. The appointment will include a one in four on-call roster. An appointment at the nearby private hospital is also available.

Applicants should have a primary medical qualification registered or registrable in Victoria, FRANZCOG (or postgraduate clinical training, qualifications and experience in obstetrics and gynaecology that would meet the College's requirements for practising under Area of Need provisions) and appropriate experience at specialist level. Remuneration is on a Visiting Medical Officer, fee for service basis. Assistance with relocating and establishing a practice is available.

GVH is a 280-bed multi-campus facility providing a broad range of hospital and community-based health services to the region. Incorporating a modern, well equipped teaching hospital affiliated with The University of Melbourne, it is the designated referral centre and trauma service for central and northern Victoria. Last year it handled 1,000 deliveries. Its O&Gs are supported by a full range of locally resident and visiting specialists; by registrar, HMO, specialist nursing and allied health staff; and by pathology and radiology departments.

The University of Melbourne's Department of Rural Health is co-located with the main Hospital campus. GVH consultants and HMOs participate in the teaching of medical students. A part-time academic position would be available to a suitably qualified appointee interested in research or undergraduate teaching.

Shepparton is a rapidly growing rural city and regional centre 180 km north of Melbourne. With more than 70,000 people and a warm, dry climate, Shepparton has excellent sporting, cultural and retail facilities along with nearby regional attractions which include several wine growing regions, historic Murray River towns and the Victorian High Country and snowfields. It has a range of excellent private and public schools. Further information may be found on the GVH website www.gvhealth.org.au and on www.mycareer.com.au

Applications and enquiries should be directed in the first instance to Les McBride at:

Cleveland  McBride
Health Recruitment

Email: les@clevelandmcbride.com
Tel: 03 9663 0944 Fax: 03 9663 0955
Mail: 19 Lansdowne Street, East Melbourne, Vic. 3002

MB0351