The Female Athlete Triad and its Effect on Fertility

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The Women’s Health Series

- Interdisciplinary 9-weekend course covering the female reproductive window: beginning with pre-conceptive health through fully recovered postpartum
- Preconception, prenatal and baby nutrition, fertility, infertility (Eastern & Western medical approaches), pregnancy, chiropractic care during pregnancy & labor, infant adjusting, childbirth (various practitioners, settings, birth events), postpartum, pelvic floor issues, healing, rehab, breastfeeding, emotional issues, autoimmune diseases, return to sport/athletics, cardiac health and more...
- Each weekend taught by specialists to the topic at hand.
- Information, diagnosis, testing, treatment options, plans and relevant clinical pearls each session.
- Designed to be utilized immediately with current patient base in a variety of professional office settings (hospital, private clinic, birth center, home visits, etc.)
Why Interdisciplinary?

Today's Lecture Goals

- Comprehension of a normal female fertile monthly cycle
- Definition of the Female Athlete Triad
- Who is most at risk?
- Identify early symptoms
- Test appropriately
- Tentative list of solutions
- Our role in the patient's healing journey

Normal Menstrual Cycle
Medical Professionals NEED to know about menses

- NOT only is this for the OBGYN
- This needs to be common knowledge for anyone that treats young females; pediatrician, GP, DC, PT, dentists, surgeons, athletic trainers, coaches, therapists, etc.
- Lack of information leads to no information or misinformation
- Lack of knowledge leads to shameful behavior (this keeps girls from asking for help)
- Lack of knowledge leads to a delay seeking help

Luxury Tax adds to the Misinformation

Stop…the…
Getting to know the proper terms

- **Menarche**: The very first period a girl has. Important to know if it was prior to the age of 8 and therefore "early" or after the age of 16 and therefore "late".
- **Irregular periods**: Not occurring 1 time/month about 28 days apart. This has a wide field of variation. Also, note, it may take girls 1-2 years from menarche to establish a regular period. (BCP use?)
- **Oligomenorrhea**: more than 35 days between menstruating
- **Amenorrhea**: no menstruation
Women who were far outside the norms for development may continue to have hormonal abnormalities.

Getting to know proper terms - Progesterone
- Progesterone: A hormone primarily produced by the ovaries. Will also be produced by the placenta when pregnant. A portion is also made in the adrenal glands. (this will be an important thing to recall when we discuss the role stress plays in infertility)
- The role of progesterone is help the egg to be released from the ovary, it is then produced in larger amounts to help the endometrium to become thickened and nourishing to a hopefully fertilized egg

Getting to know the proper terms - Progesterone
- Progesterone remains high throughout pregnancy
- Suppresses the release of another egg
- Aids in milk gland growth in the breast tissue
Getting to know the terms- Progesterone

- What if it's too low?
  - This is now a fertility issue.
  - Low progesterone can limit if ovulation occurs.
  - Low progesterone can hinder the endometrium’s growth and the fertilized egg cannot burrow in and/or growth is restricted and miscarriage ensues.
  - Spotting and bleeding can occur during pregnancy, growth will be hindered and miscarriage can ensue.
  - Low progesterone can also allow estrogen dominance to occur.

Get to know the terms- Estrogens

- There is no ESTROGEN, there are only estrogens.
- They are a collection of estrogenic hormones, similar in their chemical make-up.
- There is estrone (E1), estradiol (E2), and estriol (E3).

E1- Estrone

- E1 is a weak estrogen. Produced primarily by the ovaries and fat tissue.
- Yes! Fat has more function than simply fuel storage!
- Can also be converted from other hormones or environmental precursors.
- Can affect the body with the full range of estrogen effects.
- Is a “weak” estrogenic hormone.
- Can also be made from adrenal glands with proper nutrients (again, stay tuned to stress & fertility discussion) from androstenedione.
E2- Estradiol
- “Strongest” of the estrogens and produced in highest amounts from the ovaries.
- Required for over 400 functions in the female body
- Adrenal glands can produce androstenedione which can then be modified by body fat, muscle and skin cells into E2.
- Can also be converted from T2 testosterone- primarily following menopause

E3- Estriol
- The weakest of the 3 estrogens.
- Made from other estrogens.

Estrogens
- Travel via bloodstream to the receptors throughout the tissues.
- Affect the bone formation and density, reproductive functions, and cardiovascular health.
- Their actions with the receptors throughout the body vary.
- Estrogenic receptors are found in bone, muscle, brain, vaginal, gastro-intestinal, bladder, skin, uterine, liver, blood vessel and heart tissues.
- Responsible for the development of female sex characteristics.
Estrogens and Menses

- Estrogens are lowest at the beginning of a woman's cycle. This dip in hormones signals the pituitary gland to start to increase production of Leutinizing Hormone (LH) and Follicle Stimulating Hormone (FSH). This starts to prep the follicle to develop.
- Estrogen will rise and surge near ovulation again cuing high levels of LH and FSH
Egg Prom

FSH

LH

EGG

Luteinizing Hormone

- Released by pituitary gland in the brain
- Released in pulses, its release can cause a positive feedback cycle that encourages estradiol throughout the follicular phase of the cycle
- Surges around ovulation synergistically with FSH, stays elevated for 24-28 hours

Follicle Stimulating Hormone-FSH

- Released from the pituitary
- Main role is to initiate the granulosa cells within the ovary to develop and push a follicle to maturity
Menstrual items

Menstrual Pads – disposable or cloth reusable

Menstrual Cups
Tampon placement (absorbs) vs. Cup placement (collects)

Physicians, therapists, coaches & athletic trainers need to be asking about periods. Period.

GET COMFORTABLE BEING UN-COMFORTABLE
Female Athlete Triad

- Female athlete triad is a combination of three conditions: **disordered eating**, amenorrhea, and osteoporosis. A female athlete can have one, two, or all three parts of the triad.
- Female athlete does not have to be on a competitive team. This can arise from exercise and eating habits individually.

Energy Depletion => weight loss, fatigue, poor recovery, injuries

- **Primary amenorrhea**: energy too low in the system to fail to ever start having periods
- **Secondary amenorrhea**: energy deficiency may cause the periods to stop coming after they have begun
- ...less than 1% of all women have **primary amenorrhea**, but it happens in 10% of ballet dancers and 20% of gymnasts.
- **Secondary amenorrhea** occurs in 2-5% of all women but in 65% of distance runners and almost 70% of dancers.
Risk Factors

Table 1: Risk Factors for the Female Athlete Triad

- Participating in sports that emphasize body size or appearance
- Pressure to lose weight to improve performance
- Competitive personality traits
- Lack of non-athletic social or recreational outlets
- Training when injured, sick or exhausted
- Experiencing a traumatic event, injury, poor performance, change in coaching staff or other life stressors

Important Terms

- Athlete
- Anorexia Nervosa
- Bulimia
- Anorexia Athletica
- Orthorexia

Female Athlete Triad Pre Participation Evaluation

Informational packet for team physicians and other health personnel working with the female athletes. (See PDF)

Authors:

This document has been compiled by a working group of the Female Athlete Triad Coalition including:

Dr. Margo Mountjoy (chair)
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Female Athlete Triad Pre Participation Evaluation

- This evaluation functions with 2 questionnaires
- FIRST is a SCREENING
- SECOND is a through follow up.

- This allows the first to be easily used by coaches, trainers, teachers and then have a comprehensive follow up for those that indicate a possibility of falling with the triad parameters.

Start young- because the media has
By age 7, 1 in 4 kids has tried dieting

½ of girls and 1/3 if boys aged 6-8 think their ideal size is thinner than their current size.

The Dieting is already happening...

- Family, friend, and media factors are associated with patterns of weight-control behavior among adolescent girls.

- Balantekin KN1,2, Birch LL3, Savage JS4,5.
Outcomes

- Amongst 15 year olds...
- Functioning family unit was a protective aspect for body image
- Peer talk (teasing or just topic focus) was a negative influence
- Media a negative influence

Do we need to have a diagnosed eating disorder to have concerns of the Triad?

- Disorders of the female athlete triad among collegiate athletes.
- Beals KA1, Manore MM.

Health disruption even prior to official eating disorder

- 7 US Universities/ 425 female athletes tracked
- Disordered eating, menstrual dysfunction, and musculoskeletal injuries were assessed
- Those ‘at-risk’ for an eating disorder reported more frequent menstrual irregularity and had increased amount of bone injuries during collegiate athletic career (Using EAT-26)
- Menstrual irregularity by 31% of the women not on birth control!!!
There was a similar percentage of athletes with anorexia and/or bulimia within aesthetic, endurance and team sports.

Athletes in aesthetic sports scored higher on the EAT 26 than endurance or team sport athletes had a higher % of "at-risk" athletes.
Dance, Gymnastics, Track, X-Country, Figure Skating...

- “In 1997, Boston Ballet dancer Heidi Guenther, dealing with an eating disorder, died at age 22; in 2012, Italian dancer Mariafrancesca Garritano publicly accused La Scala and its academy of turning a blind eye to the culture of eating disorders causing infertility among her fellow dancers.”
- Excerpt from 'The Cult of Thin' Dierdre Kelly Dance Magazine June 30, 2016

ATHLETE & COACH MUST READ

Dear Younger Me: Lauren Fleshman

DEAR YOUNGER ME
May 17, 2017

Fantastic piece written by former elite runner about the complexities female athletes face from sports pressure, coach and team pressure and its impact on health, eating disorders, menstrual irregularities and chronic injuries.
Medical Community Impact: these are real statements my patients have been told

- You don’t need to have a period…
- Your period is too painful/heavy/irregular/long/short…
- Do you WANT to have a period every month?
- It doesn’t matter, when you want to have babies we can use medicine

Female Athlete Triad

Consider…

- Amenorrhea corrected by change in training schedule and diet:
- Amenorrhea NOT corrected by change in training schedule and diet:

Reproductive System is a secondary system

- Lack of energy due insufficient caloric intake or excessive caloric expenditure
- Hormone cascade conjugates pregnenolone to cortisol to maintain energy and this pulls from production of progesterone and estrogen
- Too low of progesterone, no endometrial lining thickening, no initiation of ovulation
- Too low of estrogen, no cuing the LH or FSH to begin follicle development, as well as no ability to initiate ovulation
Energy is a resource

- When in short supply, brain and body must allocate and conserve, especially under the high demand of sport.
- Energy in the body is ATP, produced throughout the Kreb’s and Lactic Acid cycles (1 molecule of glucose equaling about 30-32 ATP)
- Body will utilize ATP for CNS, organs, MSK all prior to care for reproductive system

Estrogen and Bone density

- Estrogen plays a role in proper bone mineralization
- Low estrogen levels can lead to osteopenia and eventually osteoporosis
- This osteoporosis may be irreversible
- The Triad during developmental years may mean that Peak Bone Mass Density was never achieved leading to a future of low bone density issues.
- Bone Stress Injuries (BSI)
- Repeat bone injury

Estrogen, Bone Density and High Risk BSI

- Pelvis, proximal femur, anterior tibia, patella, tarsal navicular, base of 5th metatarsal, talus, great toe sesamoids, medial malleolus and growth plates are high risk areas.
- Complete Triad screening and endocrine work-up required

- Casey, Rho, Press “Sex Differences in Sports Medicine”
What are the warning S/S?

- Irregular cycle or amenorrhea
- Weight loss
- Disordered eating
- Repeat MSK injuries
- Stress fracture, especially in a high risk zone
- High score on the EAT 26
- Poor recovery

History

- What brought this patient in to you? Injury? Pain? What is the story of this injury? Do you understand the needs of the sport? Are there additional pressures to the sport?
- Eating history
- Use of BCP and if yes, why?
- Past injuries

Physical

- Thinning hair
- Dry skin
- Consider Tanner Scale for appropriate age/development
- Menarche? Current cycle?
- Perfusion
- Affect
- Lanugo
- Swollen parotid glands
- Enamel erosion
- Nail biting
Labs
- Baseline bloodwork
- Female Hormone panel
- Cortisol testing
- Micronutrient testing
- DEXA
- MRI for BSI severity

Co-management
- Therapist with training in eating disorders
- Functional Nutrition Specialist for best food needs discussions
- Physicians for management of endocrine, injury, rehab... Focus on your specialty and refer for the others
- Coaches

General Supplementation
- Omega 3 fish oils (from FISH) 2-3grams/day
- High grade multi-vitamin (with iron if testing reveals a need)
- Probiotic
- Bone support- Calcium (not carbonate) + Mag. 1200mg/Ca++/day
- Vitamin D3 – test prior to achieve blood levels of 50-80ng/dL
Can Fertility be restored?

Yes!

FERTILITY RECOVERY

Recovery of bone mineral density and fertility in a former amenorrheic athlete.

Fertility

- Has good chance of recovery if achieved within 3rd decade
- If isn’t recovered within the 3rd decade, early onset menopause has occurred
- Recovery defined: weight gain, return of menstruation, improved diet
  - Recovery aided by cognitive behavioral therapy
Will fertility always be restored?

Will bone density always be restored?

WAIT...

NO!

Importance of Intervention

- Get coaches, team physicians, athletic trainers, parents...anyone with athlete contact...on board with typical symptom presentation.
- Get teams to utilize the Screening Tools and have a ready to go list of easy referrals
- Team/Athlete Education. Studies show that an educated and supportive team can help lower the risk of female athlete triad within the team.
Importance of Co-Treatment

- Athlete will need:
  - Social support
  - Food planning
  - Hormone testing/tracking/education (Sex, thyroid, adrenal...)
  - MSK eval/treatment
  - Bone care and comprehension
  - Nutrient replacement
  - Baseline lab tracking

Return to play

Return to Life
Be More Dense

The average human body contains enough bones to make an entire human skeleton.

Thank you!!