

IT'S A RED FLAG; RELATIVE ENERGY DEFICIT IN SPORT – “RED-S”

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INTRODUCTION

REDS is a syndrome of imbalance between energy intake and expenditure leading to detrimental effects on the gonadal axis. Approximately 30% of young people with avoidant and restrictive food intake disorder are men. In 2014, the International Olympic Committee recognized this condition as “Relative Energy Deficit in Sport” (RED-S) encompassing both male and female reproductive system disruptions. The new terminology brings awareness that male athletes can be affected by relative energy deficiency.

CASE DESCRIPTION

An 18-year-old freshman athlete presented with low libido for one year. He also reported extreme fatigue, diffuse muscle weakness and loss of erections. He was training vigorously for wrestling. He would exercise and weight train for two hours daily while on a very limited calorie intake. He specifically denied using anabolic steroids. On examination, he was a healthy young man with BMI of 19 and Tanner stage 3. Vital signs were significant for low BP of 86/56mmHg and resting heart rate of 45 per min. Testicular examination revealed testicular volume of 8cc bilaterally (normal 12-19cc). Laboratory evaluation revealed suppressed FSH/LH 0.7/0.2 IU/L and low testosterone level of 21.1pg/ml. Further workup revealed normal TSH, ACTH, IGF-1, prolactin, cosyntropin stimulation test and urine drug screen. Pituitary MRI was normal. At this point, a presumptive diagnosis of REDS was made. He was advised to increase carbohydrate intake and decrease exercise to 30 minutes daily. With these changes, he managed to gain seven pounds in two months and started noticing erections and improvement in libido. On six months follow up, he had gained 14 pounds. He noted normal libido, erections and significant improvement in energy. On his follow up testicular examination, both right and left testicular volume increased to 12-15cc. FSH increased to 2.3 IU/L, LH 1.3 IU/L and total testosterone level 452.4 ng/dl, all in the normal range. Currently, his presenting concerns have completely resolved.

DISCUSSION

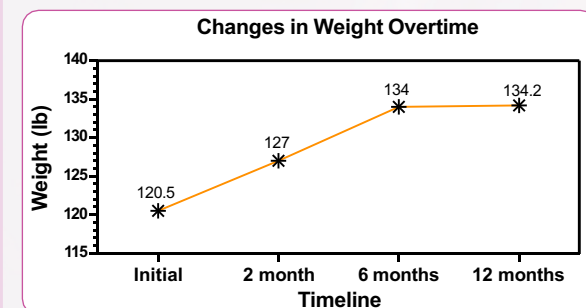
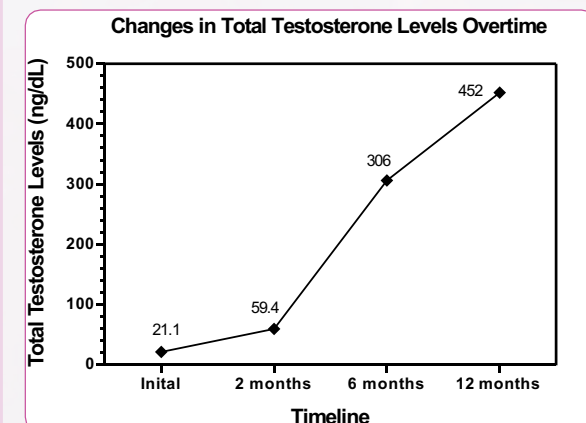
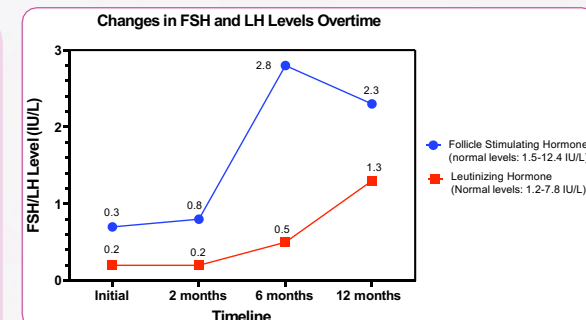
The idea of low energy status as being associated with low testosterone in exercising men was noted in the 1980s¹. REDS is a syndrome that results from energy deficits in athletes. If more energy is expended via exercise than is consumed in a diet, a state of low energy availability occurs, which increases the risk of REDS development. Diagnosing REDS may be challenging as symptoms are subtle. The under recognition in men may in part be due to the absence of specific hypogonadal features akin to oligo/amenorrhea in women. Detailed history of exercise and diet are necessary. The male gonadal axis is sensitive to the effects of exercise-related stress especially if combined with concomitant calorie restriction. The energy deficit associated hypogonadism is due to central suppression of the gonadal axis. Some studies show that reduced leptin blunts GnRH pulse amplitude². Conversely, ghrelin is postulated to raise growth hormone and GnRH release causing hormonal stress associated energy deficit. In some clinical studies, energy deficits are associated with increased inflammatory cytokines that suppress the gonadal axis³. The influencing variables are not well understood but likely to be multifactorial. Therapy should focus on reversing the existing energy deficit to achieve a healthy body weight by limiting intense physical activity.

KEY POINTS

- The male reproductive axis is very sensitive to energy deprivation leading to hypogonadism
- Screening for REDS should be considered as part of annual health exam in athletes
- Recovery with weight gain suggests that the gonadal axis suppression is functional and reversible

REFERENCES

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	Initial	2 months	6 months	12 months
Serum Albumin (normal 3.4-5.4 g/dl)	5.5	4.9	4.9	4.9
Sex Hormone Binding Globulin (SHBG) (normal 10-67 nmol/L)	56.3	43.4	57	33.8
Total Testosterone (normal 300-720 ng/dl)	21.1	59.4	306	452.4
Free Testosterone (normal 9.3-26.5pg/ml)	9.8			23.7
Bioavailable Testosterone (Albumin bound+ Free) (normal 131-882 ng/dl)	0.3			107.2
Follicle Stimulating Hormone (FSH) (normal 1.5-12.4 IU/L)		0.8	2.3	2.8
Luteinizing Hormone (LH) (normal 1.2-7.8 IU/L)	0.1	0.1	0.5	1.3
Weight (pounds)	120.5	127	134	134.2
Testicular size (normal 12-19cc)	8			15
Energy levels	Low		Improved	Improved
Libido	Low		Normal	Normal

