Forbidden fruit for athletes, but possible divine blessing for rehabilitation: testosterone

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Testosterone is regarded as an attractive supplement for obtaining masculinity and sexuality; however, there have been pros and cons regarding its application as a treatment. In addition, there is also conventional repulsion on adoption of testosterone to any kind of exercise to anyone with concern with sports. However, we should keep in mind that in terms of rehabilitation, our main concern is not fairness but efficiency. And there are obvious advantages of testosterone in recovery and rejuvenation. We aim to introduce the possibility of testosterone in recovery and rejuvenation and are to bring up a topic the application of testosterone in exercise rehabilitation. Considering the light and darkness in testosterone, moderate use of testosterone under professional medication counseling might be an effective possibility to those with sickness and illness and should be considered as a possible option to assist the recovery from frailty and illness.

Keywords: Testosterone, Exercise, Rehabilitation, Rejuvenation

INTRODUCTION

Since the doping test was first adopted in 1968, the 10th Winter Olympic game in France, there has been increasing awareness of the need to intensify the efforts to fight unfairness in sports (Lippi et al., 2008) Testosterone has been a representative forbidden drug and unrecoverable stigma has been attached to the athlete detected as a drug user by doping test, no matter how famous he/she is or how great his/her achievement. Therefore, usage of androgenic hormones like testosterone might be a very sensitive topic to those having any relation with any kinds of sports. This ergogenic aids have been considered as unfairness and immorality in any society governed by the rule of law in the physical competition filed like sports. Therefore, caution is required when introducing the efficacy of an androgenic hormone like testosterone for improving the exercise capacity to those specializing in a field of exercise. We are very sensitive to that. Paradoxically, it has been efficient that way. However, as a matter of fact, you are not an Olympic team coach, but an expert in exercise rehabilitation. Not for breaking a new record, but for efficient recovery and early reversion of an object, such a minor foul should be admitted, of course. Could we not make this forbidden fruit for athletes, testosterone, as a divine blessing for exercise rehabilitation?

REHABILITATION AND TESTOSTERONE

Traditionally, androgen is known not only as a material for intensifying the masculine sexuality, but also as a material to assist anabolic mechanism. Therefore, in the viewpoint of action mechanism of testosterone, there might be two types of rehabilitation, and both of these mechanisms might have effective roles in rehabilitation. One is rehabilitation form disease including injury or disease-'recovery’, the other is rehabilitation from aging-'rejuvenation’. In fact, these two concepts are overlap significantly.

In view of the recovery aspect, testosterone has a critical role in mediating the improved muscle mass and is essential for skeletal muscle growth (Sinha et al., 2014). Therefore, testosterone therapy might improve exercise capacity, muscle strength, glucose metabolism, and baroreflex sensitivity (Caminiti et al. 2009). Actually, it was reported that exercise induces an increase of sex steroid, testos-
terone and exercise-induced increase of testosterone in muscle may positively impact age-related concerns such as life-related diseases and sarcopenia (Sato and Iemitsu, 2015). There are some beneficial effects of testosterone therapy on functional capacity, cardiovascular parameters, and quality of life in patients with congestive heart failure. Therefore, in view of rehabilitation from disease, testosterone administration during exercise rehabilitation is feasible and can positively impact health outcomes in elderly males even those with congestive heart failure who have low testosterone (Caminiti et al., 2009; Stout et al., 2012). In addition, there might be additional beneficial effects on mood, energy, and sense of well-being (English et al., 2000).

In another viewpoint of rehabilitation, rejuvenation, testosterone administration showed some benefit on sexual health related outcome like sexual desire and performance (Krause et al., 2005). In addition, testosterone plays a critical role in the mood and cognitive function of humans. There was evidence supporting the existence of a relationship between testosterone and depression and it was reported that after administration of testosterone, depression showed a significant level of improvement (Pope et al., 2010). Testosterone also seems to influence certain aspects of cognition. This effect of testosterone on behavioral performances is mediated in part through androgen receptors on the brain (Jia et al., 2013). Testosterone replacement in men diagnosed with hypogonadism has shown a beneficial effect on several cardiovascular risk factors, functional exercise capacity and improved mortality (Kelly and Jones, 2014). Testosterone was also reported as an efficacious Paradigm in management of sarcopenia, loss of skeletal muscle mass and strength that occurs with aging. In addition, an important regulatory enzyme of inflammation, nuclear factor-B inducing kinase, which may regulate human skeletal muscle catabolism, and that appears to be counter-regulated by administration of testosterone (Urban et al., 2014). This is important because a number of age-related clinical circumstances trigger acute and chronic muscle loss, including cancer, chronic obstructive pulmonary disease, hospitalization, acute and chronic illness, and diseases in which systemic inflammation occurs (Urban et al., 2014).

Actually, some reports proved the positive effects of steroid in rehabilitation. After anabolic steroid of nandrolone in lean elderly women after femoral neck fracture, less dependency and positive effects on lean body mass, activities of daily living, and health related quality of life were reported (Tidermark et al., 2004). In another report, there were also positive effects on muscle mass, bone mineral density, and clinical function after administration of nandrolone in patients with hip fracture (Hedstrom et al., 2002). There was even the effect of reducing the number of hospitalizations and duration of hospital administrations of those undernourished old people in case of administration of testosterone with high calorie oral nutrition (Chapman et al., 2009; Piantadosi et al., 2011). However, unfortunately there was a lack of well systemized and randomized prospective trials proving the efficacy of testosterone administration in patients needing rehabilitation.

We do not intend to insist that testosterone is a panacea for all types of rehabilitation. Surely, there are light and shadow, so there may be pros and cons. Some potential risks of testosterone replacement include hepatic toxicity, endocrine dysfunction, dyslipidemia, violent behavioral changes, and cardiovascular complications, including arterial hypertension, myocardial infarction, congestive heart failure, sudden death, arterial and ventricular thrombosis, and stroke, although most of them have not been fully proven (Handelsman, 2011; Nigro and Christ-Crain, 2012). In addition, there is controversy regarding the efficiency of testosterone administration in patients without abnormal range of testosterone level. Therefore, more high quality evidence based results should be yielded.

CONCLUSIONS

Therefore, moderate use of testosterone under professional medication counseling might offer effectiveness and efficiency in both recovery and rejuvenation and should be considered a possible option in conducting study for exercise rehabilitation.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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