



## ANDROLOGY AUSTRALIA GP SUMMARY GUIDES

### ANDROGEN DEFICIENCY

#### DIAGNOSIS AND MANAGEMENT

#### SOURCE REFERENCE:

Allan C A, McLachlan R I. Testosterone deficiency in men: Diagnosis and Management. Australian Family Physician: 2003;1-6.

#### REFERENCES:

1. Handelsman D J. Androgens. In: R.I. McLachlan (ed) Male Reproductive Endocrinology. 2002.(URL: <http://www.endotext.org/male/index.htm>)
2. Conway A J, Handelsman D J, Lording D W, Stuckey B, Zajac J D. Use, misuse and abuse of androgens. The Endocrine Society of Australia consensus guidelines for androgen prescribing. Med J Aust; 2000;172:220-224.
3. Rommerts F F G. Testosterone: An overview of biosynthesis, transport, metabolism and nongenomic actions. In: Nieschlag E, Behre HM, eds. Testosterone: Action, Deficiency, Substitution. Berlin: Springer, 1998;293-328.
4. Steers W D. 5alpha-reductase activity in the prostate. Urology; 2001;58:17-24.
5. Khosla S. Oestrogen, bones and men: when testosterone just isn't enough. Clin Endocrinol (Oxf); 2002;56:291-293.
6. Smyth C M, Bremner W J. Klinefelter syndrome. Arch Intern Med; 1998;158:1309-1314.
7. Bojessen A, Juul S, Gravholt C H. Prenatal and postnatal prevalence of Klinefelter syndrome: A national registry study. J Clin Endocrinol Metab; 2003;88:622-626.
8. Morley J E, Patrick P, Perry H M. Evaluation of assays available to measure free testosterone. Metabolism; 2002;51:554-559.
9. Bremner W J, Vitiello M V, Prinz P N. Loss of circadian rhythmicity in blood testosterone levels with aging in normal men. J Clin Endocrinol Metab; 1983;56:1278-1281.
10. Vermeulen A, Verdonck L, Kaufman J M. A critical evaluation of simple methods for the estimation of free testosterone in serum. J Clin Endocrinol Metab; 1999;84:3666-3672.
11. Rosner W. An extraordinarily inaccurate assay for free testosterone is still with us. J Clin Endocrinol Metab; 2001;86:2903.
12. Sodergard R, Backstrom T, Shanbhag V, Carstensen H. Calculation of free and bound fractions of testosterone and estradiol-17 beta to human plasma proteins at body temperature. J Steroid Biochem; 1982;16:801-810.
13. Kapoor P, Luttrell B M, Williams D. The free androgen index is not valid for adult males. J Steroid Biochem Molec Biol; 1993;45:325-326.
14. Feldman H A, Longcope C, Derby C A, et al. Age trends in the level of serum testosterone and other hormones in middle-aged men: longitudinal results from the Massachusetts male aging study. J Clin Endocrinol Metab; 2002; 87:589-598.
15. Harman S M, Metter E J, Tobin J D, Pearson J, Blackman M R. Longitudinal effects of aging on serum total and free testosterone levels in healthy men. Baltimore Longitudinal Study of Aging. J Clin Endocrinol Metab; 2001;86:724-731.
16. Tenover J L. Experience with testosterone replacement in the elderly. Mayo Clinic Proceedings; 2000;75:Suppl S77-81; discussion S82.



17. Handelsman D J. Testicular dysfunction in systemic disease. *Endocrinol Metab Clinics North America*; 1994;23:839-856.
18. Hudson B H, de Kretser D M, Coghlan J P, Taft H P. Testosterone Plasma Levels in Normal and Pathological Conditions. In: *The Human Testis*. Plenum Press, 1970; 423-436.
19. Haren M T, Morley J E, Chapman I M, O'Loughlin P D, Wittert G A. Defining 'relative' androgen deficiency in aging men: how should testosterone be measured and what are the relationships between androgen levels and physical, sexual and emotional health? *Climacteric*; 2002;5:15-25.
20. Gray A, Feldman H A, McKinlay J B, Longcope C. Age, disease, and changing sex hormone levels in middle-aged men: results of the Massachusetts Male Aging Study. *J Clin Endocrinol Metab*; 1991;73:1016-1025.
21. Eckersley R M. Losing the battle of the bulge: causes and consequences of increasing obesity. *Med J Aust*; 2001;174:590-592.
22. Juul A, Skakkebaek N E. Androgens and the ageing male. *Human Reprod Update*; 2002;8:423-433.
23. Gruenewald M D, Matsumoto A M. Testosterone supplementation therapy for older men: Potential benefits and risks. *J Am Geriatr Soc*; 2003;51:101-115.
24. Snyder P J, Peachey H, Hannoush P, et al. Effect of testosterone treatment on bone mineral density in men over 65 years of age. *J Clin Endocrinol Metab*; 1999;84:1966-1972.
25. Snyder P J, Peachey H, Hannoush P, et al. Effect of testosterone treatment on body composition and muscle strength in men over 65 years of age. *J Clin Endocrinol Metab*; 1999;86:2647-2653.
26. Kenny A M, Bellantonio S, Gruman C A, Acosta R D, Prestwood K M. Effects of transdermal testosterone on cognitive function and health perception in older men with low bioavailable testosterone levels. *J Gerontol. Series A, Biological Sciences and Medical Sciences*; 2002;57:M321-325.
27. Reddy P, White C M, Dunn A B, Moyna N M, Thompson P D. The effect of testosterone on health-related quality of life in elderly males - a pilot study. *J Clin Pharm Ther*; 2000;25:421-426.
28. Vermeulen A. Androgen replacement therapy in the aging male--a critical evaluation. *J Clin Endocrinol Metab*; 2001;86:2380-2390.
29. Brill K T, Weltman A L, Gentili A, et al. Single and combined effects of growth hormone and testosterone administration on measures of body composition, physical performance, mood, sexual function, bone turnover, and muscle gene expression in healthy older men. *J Clin Endocrinol Metab*; 2002;87:5649-5657.
30. Jannini E A, Screponi E, Carosa E, et al. Lack of sexual activity from erectile dysfunction is associated with a reversible reduction in serum testosterone. *Int J Androl*; 1999;22:385-392.
31. Handelsman D J, Conway A J, Boylan L M. Pharmacokinetics and pharmacodynamics of testosterone pellets in man. *J Clin Endocrinol Metab*; 1990;71:216-222.
32. Handelsman D J, Mackey M A, Howe C, Turner L, Conway A J. An analysis of testosterone implants for androgen replacement therapy. *Clin Endocrinol (Oxf)*; 1997;47:311-316.
33. Meikle A W, Mazer N A, Moellmer J F, et al. Enhanced transdermal delivery of testosterone across nonscrotal skin produces physiological concentrations of testosterone and its metabolites in hypogonadal men. *J Clin Endocrinol Metab*; 1992;74:623-628.
34. Arver S, Dobs A S, Meikle A W, et al. Long-term efficacy and safety of a permeation-enhanced testosterone transdermal system in hypogonadal men. *Clin Endocrinol (Oxf)*; 1997;47:727-737.
35. Wang C, Swedloff R S, Iranmanesh A, et al. Transdermal testosterone gel improves sexual function, mood, muscle strength, and body composition parameters in hypogonadal men. Testosterone Gel Study Group. *J Clin Endocrinol Metab*; 2000;85:2839-2853.
36. Schurmeyer T, Wickings E J, Freischem C W, Nieschlag E. Saliva and serum testosterone following oral testosterone undecanoate administration in normal and hypogonadal men. *Acta Endocrinol (Copenh)*; 1983;102:456-462.
37. Snyder P J, Peachey H, Berlin J A, et al. Effects of testosterone replacement in hypogonadal men. *J Clin Endocrinol Metab*; 2000;85:2670-2677.
38. Sikaris K, McLachlan RI, Kazlauskas R, de Kretser D, Holden CA, Handelsman DJ. Reproductive Hormone Reference Intervals for Healthy Fertile Young Men: Evaluation of Automated Platform Assays. *J Clin Endocrinol Metab* 2005; 90:5928-5936.



39. Allan C, McLachlan R. Age-related changes in testosterone and the role of replacement therapy in older men. Clin Endocrinol (Oxf). 2004 Jun;60(6):653-70.

## **ABBREVIATIONS USED IN THIS GUIDE**

<b>47XXY</b>	Klinefelter's syndrome
<b>AD</b>	Androgen Deficiency
<b>DRE</b>	Digital Rectal Examination
<b>ED</b>	Erectile Dysfunction
<b>FSH</b>	Follicle Stimulating Hormone
<b>IM</b>	Intra muscular
<b>LH</b>	Luteinizing Hormone
<b>MRI</b>	Magnetic Resonance Imaging
<b>PBS</b>	Pharmaceutical Benefits Scheme
<b>PSA</b>	Prostatic Specific Antigen
<b>SHBG</b>	Sex Hormone Binding Globulin
<b>T</b>	Testosterone
<b>TRT</b>	Testosterone Replacement Therapy

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