LMS-based reference charts for testicular volume in Dutch children and adolescents

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Introduction

Measurement of testicular volume

- Basis for assessing delay or advance in onset of male puberty
- Macro-/microochidism associated with genetic defects, pituitary disease, testicular pathology

Techniques

- Prader orchidometer: practical but overestimates true volume
- Ultrasonography: gold standard

Problem

- Testicular volume changes with age until adulthood
- No reference data that allow calculation of SD scores (LMS-curves) are available

Methods

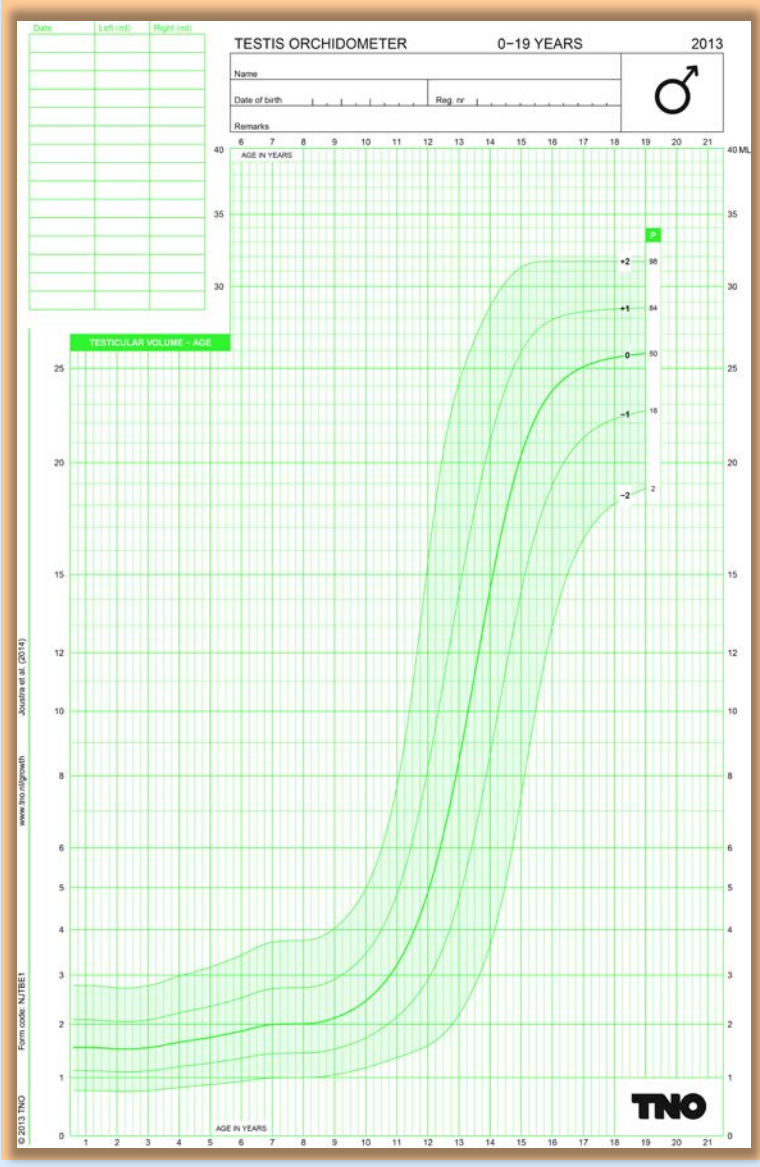
Cohort*

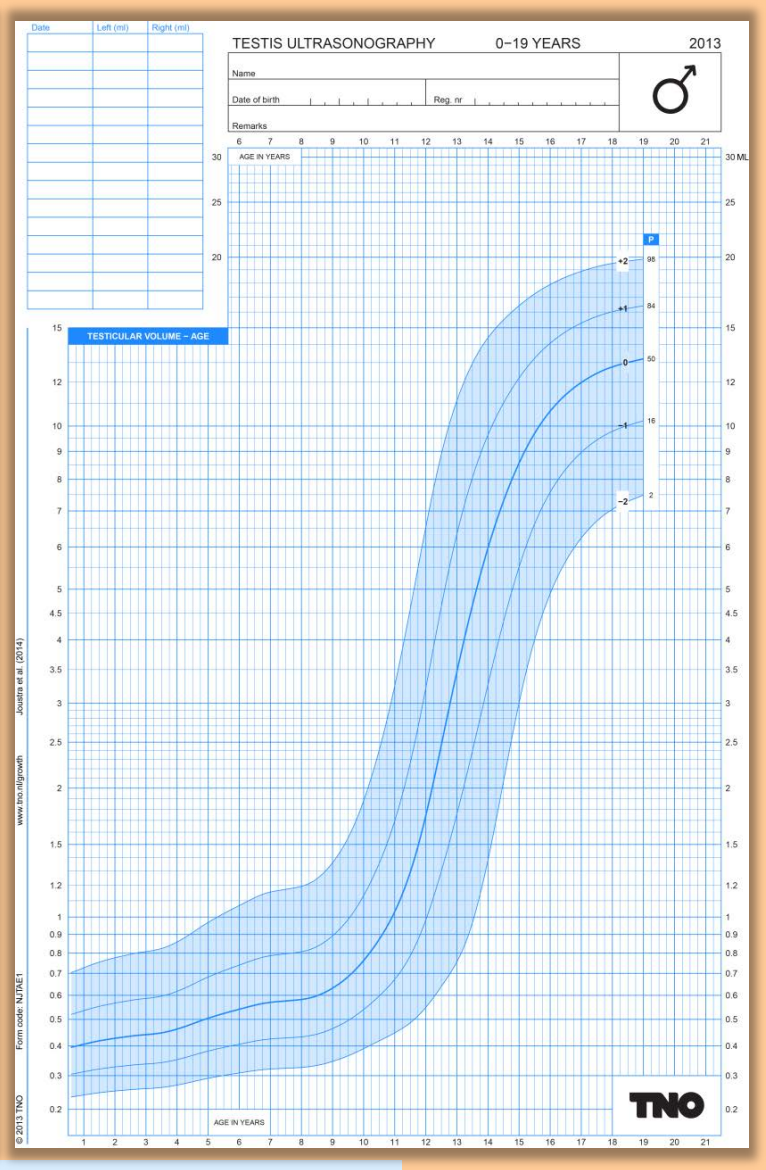
- 769 healthy Dutch boys, age 0.5-19.0 years
- Cross-sectional measurement by one physician
- Prader orchidometer: volumes in between beads or >25 mL were estimated
- Ultrasonography: $\pi/6 \cdot \text{length} \cdot \text{width} \cdot \text{heigth}$

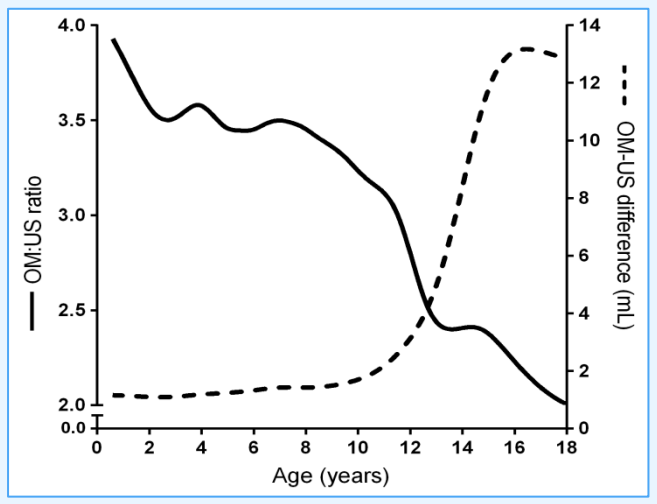
Statistical method

- Distribution summarized by 3 age-dep. smooth curves
- L: skewness, M: median, S: coefficient of variation

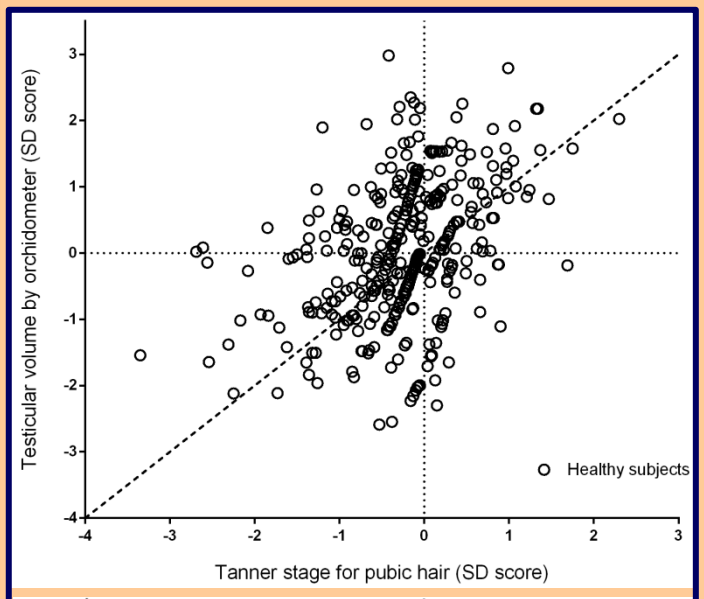
Results

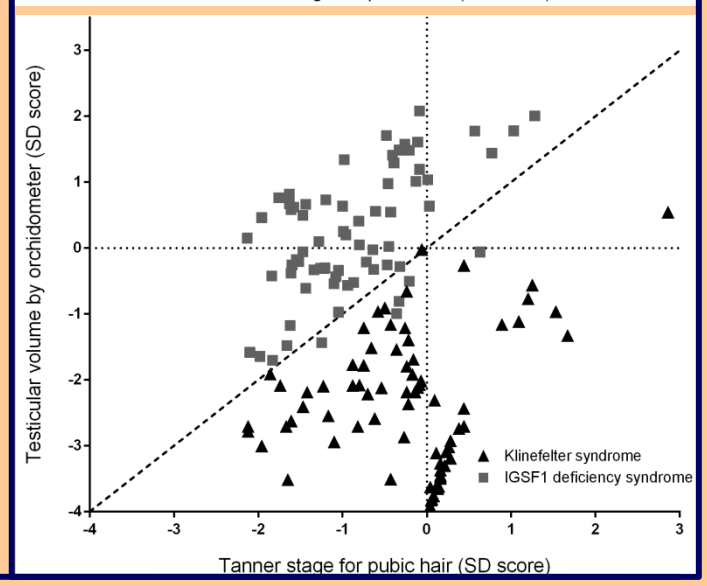






Orchidometer overestimates testicular volume





Discussion

Advantages of these curves

- Calculation of SD scores using LMS-tables (not displayed)
- Follow-up of testicular volume
- Evaluation of Sertoli cell function vs. Leydig cell function

Concluding remarks

- Ultrasonography is more reliable than orchidometer
- Normal onset of puberty: 4 mL (Prader) or 1.4 mL (US) between 9.0-14.0yr
- Curves can also be used for (young to middle-aged) adults
- Prader orchidometer cannot be used to diagonse macroorchidism in adults

Comparing testis volume SDS with Tanner pubic hair SDS** allows evaluation of Sertoli *vs.* Leydig cell function.

- Normally reasonable agreement (upper)
- Dissociation in various diseases (lower)

* Data from this cohort were previously presented in Horm Res Paediatr. 2011;76:56-64

** Stat Methods Med Res 2013;23:346-368