Novel references for ultrasound estimated testicular volumes and pubic hair in 6 to 16-year-old Norwegian boys

*Ninnie B. Oehme 1,2, Mathieu Roelants 3, Ingvild S. Bruserud 1,2, André Madsen 1,6, Geir Egil Eide 1,5.
Robert Bjerknes 1,2, Karen Rosendahl 1,6, Pétur B. Júlíusson 1,2.*

1. University of Bergen, Bergen, Norway; 2. Department of Pediatrics, Haukeland University Hospital, Bergen, Norway; 3. Environment and Health, Department of Public Health and Primary Care, KU Leuven – University of Leuven, Belgium; 4. The Hormone Laboratory, Haukeland University Hospital, Bergen, Norway; 5. Centre for Clinical Research, Haukeland University Hospital, Bergen, Norway; 6. Department of Radiology, Haukeland University Hospital, Bergen, Norway.

Background

Studies on secular trends in male pubertal development report equivocal results. Lack of reliable pubertal markers makes pubertal assessment in boys challenging, but testicular growth is considered to be the best indicator of pubertal onset.

Objectives

To present novel references for ultrasound (US) estimated testicular volume (TV) and Tanner stages of pubic hair (PH) in 6 to 16-year-old healthy Norwegian boys.

Methods

TV was measured using US in a cross-sectional study of 514 healthy boys (range: 6.1-16.4 years). A continuous TV for age reference curve was estimated with the LMS-method (Figure 1). Tanner stages for PH were clinically assessed in 452 boys (range: 6.1-16.3 years). Age references for pubertal milestones were estimated for selected TVs (Table 1) and each of the PH stages (Table 2) with probit regression. An empirical equation to predict Prader orchidometer volume from US volume was derived as $V_{OM} = 1.96 \times V_{US}^{0.71} (1)$.

Results

Puberty onset, defined by an US testicular volume of 2.7 ml, corresponding to a Prader orchidometer volume of 4 ml, occurred on average at a mean (SD) age of 11.7 (1.1) years. The mean age (SD) of reaching Tanner PH stage 2 was 11.8 (1.2) years.

Conclusions

New references were estimated for TV measured using US and equivalent Prader orchidometer volumes, and for Tanner PH. US provides continuous measure of TV that allows for calculation of z-scores and to detect smaller changes in the testicular volume to detect testicular pathology. No secular trend in pubertal onset was observed when compared to previous studies. The clinical definition of normal pubertal onset in boys remains between 9 to 14 years.

References