

## Short-Term Effect of Testosterone Treatment on Reduced Bone Density in Boys With Constitutional Delay of Puberty

This study demonstrates: (1) that boys with constitutional delay in growth and sexual maturation (CDGP) have decreased bone mineralization beyond that which can be explained by their short stature or delayed bone age, and (2) that in subjects who have received testosterone for 6 months there is increased bone mineralization 6 months later compared with untreated subjects. Bone mineral density (BMD; grams per square centimeter) and bone mineral content (BMC; grams per centimeter) were determined in the nondominant radius by single photon absorptiometry (SPA) in 17 white males with CDGP. BMD and BMC were decreased relative to control data for chronologic age ( $14.6 \pm 1.0$  years), height age ( $11.6 \pm 1.6$  years), and bone age ( $11.9 \pm 1.6$  years). Eight boys received testosterone depot, 100 mg/mo intramuscularly, for 6 months. Six months later (12 months after initiation of testosterone therapy), height, weight, and sexual maturation of the testosterone-treated youths were greater than that of the 9 control subjects, and BMD and BMC had increased substantially as well ( $P < 0.001$ ). BMD increased  $+26.2\% \pm 13.6\%$  in testosterone-treated boys versus  $+0.54\% \pm 8.7\%$  in nontreated subjects. BMC increased  $+41.1\% \pm 28.8\%$  in testosterone-treated boys and  $+5.1\%$  in the untreated subjects. The investigators concluded that boys with CDGP have decreased bone mineralization that is disproportionately greater than that related

to their short stature and delayed skeletal maturation, and that short-term administration of testosterone increases bone mineralization.

Bertelloni S, et al. *J Bone Miner Res* 1995;10:1488-1495.

**Editor's comment:** Approximately 30% of adult lumbar spine BMC is accumulated within a 3-year peripubertal interval, and half of the increase in BMC that occurs during adolescence reflects growth in bone size rather than increase in bone density. Young adult males with CDGP have lower spinal BMD than do control subjects with earlier adolescence, emphasizing the importance of the timing of adolescence as well as the secretion of sex hormones themselves for this process. Whether there are adverse clinical consequences of the lower BMD of CDGP subjects is not known. In the present report, compact bone mineralization has been measured only at the radius by SPA. It will be important to confirm these findings by more extensive evaluation of skeletal mineralization, including sites of trabecular bone such as the lumbar spine and hip, employing dual-energy X-ray absorptiometry. Whether decreased bone mineralization in the male with CDGP should lead to more aggressive therapy is uncertain as yet.

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## Computer-Aided Skeletal Age Scores in Healthy Children, Girls With Turner Syndrome, and in Children With Constitutionally Tall Stature

The aims of the present study were: (1) to evaluate the reliability of a computer-assisted bone age scoring system in healthy children; (2) to compare this method against a manual rating system in healthy children, as well as in subjects with 2 specific entities, manifested by short and tall stature, respectively; and (3) to determine whether a shortened version of the bone age scoring system might substitute for the original long version. Reference curves for bone maturation in Turner syndrome (TS) and constitutionally tall stature (CTS) determined by the computerized system are presented.

Three groups of individuals—healthy children, girls with TS, and children with CTS—underwent bone maturation evaluation. Evaluations were conducted manually using the 13b model of the Tanner-Whitehouse method (TW-RUS), and by the long (13b) and the shortened (6b) models of the computer-aided skeletal age scoring system (CASAS), a transformation of the TW-RUS method into a computerized image analysis system.

As evaluated by the percentage of equal ratings on duplicate (within-observer as well as between-observer) assessments, reliability was high ( $\pm 90\%$ ) in healthy children and similar to those obtained by the manual ratings. The comparability of

CASAS (both 13b and 6b models) with the manual rating system was assessed by calculating the correlation coefficients and evaluating the average and the limits of the range of agreement by a method described by Bland and Altman. Although some of the mean differences of methods were statistically significant, they were not clinically significant, as they were  $< 0.4$  bone age year. Up to 8% of manual insertions occurred in all groups. The percentage was lower in the 6b model than the 13b model, particularly in the CTS children. This suggests that the 6b model of CASAS may have a comparable level of reliability, while introducing a smaller degree of inconsistency.

The authors conclude that CASAS is applicable in TS and CTS. Their data support the use of the 6b model of CASAS, as it is less time-consuming and labor-intensive and provides data almost as reliable as the manual ratings.

Van Teunenbroek A, et al. *Pediatr Res* 1996;39:360-367.

**Editor's comment:** This challenging article compares CASAS scores, particularly those obtained with the 6b model, with manually obtained TW-RUS scores, in the evaluation of the bone maturation in 3 populations of children. Although some