Early cessation of growth at age 13 in an athletic boy

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Learning Point for Clinicians

Current research findings indicate an acceptable safety of age-appropriate resistance training in children and adolescents. However, in rare cases aggressive weight training could cause the premature fusion of bone epiphysis, resulting in impairment and cessation of growth, while no biological maturation has been completed.

Case report

A 13-year-old male adolescent presented to our clinic because of cessation of growth discovered during an annual health examination. He had no relevant medical and surgical history, but had a 4-year history of heavy resistance training (~8 h/week). There was no history of performance-enhancing agent intake, besides carbohydrate-electrolyte drink during exercise in the past 12 months. Parents reported the onset of his puberty, primarily identified as testicular enlargement, shortly after age 10. Parents denied genetic diseases in the family. Father (195 cm tall) reported starting puberty approximately at age 11, while mother (175 cm tall) had menarche at 10.5 years. Examination revealed adult-like pubic hair quality, extending across pubis but sparing medial thighs, with testes long axis measuring 4.5 cm. Facial hair reached upper lip. The patient had an athletic body physique: height = 183.0 cm, weight = 77.6 kg; muscle mass = 52.9%. CDC height for age calculation revealed Z-score of 3.3 and 99.9th percentile. Growth velocity curve showed a tall stature (≥95th percentile) for the past 5 years of height measurement, with annual growth velocity decline from 8 to 2 cm per year. No limb length discrepancy has been found. An X-ray of the left hand and wrist done at chronological age of 13 years (Figure 1) revealed advanced skeletal age closest to 18.0 years; all the epiphyses except that of the radius have fused with their shafts. Laboratory evaluation revealed a serum total testosterone of 743.2 ng/dl (normal range: 7–800 ng/dl), free testosterone of 25.8 ng/dl and Dehydroepiandrosterone (DHEA) sulfate of 211.6 µg/dl (reference values for free testosterone and DHEA sulfate have not been established for patients under age 16), estradiol of 26.9 pg/ml (normal range: 0–38 pg/ml), and free thyroxin of 1.3 ng/dl (normal range: 0.7–2.0 ng/dl). Chromosomal analysis showed normal karyotype.

Deceleration and cessation of growth normally appears at about 17 years in males. Early cessation of growth might be due to underlying pathological abnormalities (e.g. precocious puberty, growth hormone deficiency, cortisol excess) or constitutional attributes. In some cases, aggressive weight training could cause the premature fusion of bone epiphysis, resulting in impairment and cessation of growth.¹ Although current research findings indicate an
acceptable safety of age-appropriate resistance training in children and adolescents,² few isolated cases of sport-related growth disturbances have been described.³ This case highlights the rare occurrence of premature growth cessation as a possible consequence of excessive resistance training in apparently healthy athletic boy with no endocrine dysfunction. In this patient, complete epiphyseal growth plate fusion was observed (except for distal radius) at age 13, while no biological maturation has been completed. An alternative explanation could be borderline precocious puberty that induced early bone maturation and growth termination. This unusual case perhaps illustrates the potential danger of heavy weight training in children, where improper volume of exercise might compromise normal growth. In addition, clinical assessment of skeletal age must be carefully used during evaluation of biological maturation when biological age and skeletal does not match, as in this case.

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References