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Early Puberty: A Cautionary Tale

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Academy of Pediatrics (AAP) as opposed to pictorial anticipatory guidance (PAG) sheets that the authors designed. The authors do not reference their method of determining the reading level of the TIPP materials (stated to be 9th grade), but the AAP-assessed grade level is 6.3 using the Flesch-Kincaid method (personal communication, AAP, September 9, 1999). This could easily account for the similar results using both sets of materials. Nevertheless, this is an interesting study, because although it has been well established that injury prevention counseling based in primary care settings can result in positive outcomes,[2] there is not much information regarding the efficacy of education when used specifically in low-income clinic populations.

As is so often the case in injury prevention research, determining whether the outcome was successful or not is often a matter of the researchers' expectations and perspective. The authors felt that their parents as a group might be considered difficult to educate using TIPP counseling materials, and it is difficult to gauge what level of benefit might be considered successful from a single counseling encounter using either of the counseling approaches. TIPP attempts to build on the known efficacy of physician counseling[2] and is based on the premise that the "typical" parent will need repetitive reinforcing messages to be educated in an effective manner. TIPP has 3 components: an Injury Prevention Schedule, the TIPP sheets, and the Framingham Safety Surveys. Powell et al decided to use only the TIPP sheets for this study.

The authors observed that there was no difference between the use of the TIPP sheet versus the PAG sheets and concluded that recall of injury information several weeks after a clinic visit was "limited."

These results, based on a phone survey performed several weeks after the counseling, are presented in terms of the negative data; that is, 17% to 20% of the parents were unable to name an injury topic discussed at the visit. When grouped by categories (fire/burns, falls, guns, drowning), there was no recall in 30%, 22%, 40%, and 33% of parents, respectively, who were given TIPP sheets. Had the inverse positive data been used, the authors could have stated that 80% to 83% of the group were able to name an injury topic and that there was some recall (directed or prompted) in 70%, 78%, 60%, and 67% of the parents for each of the specific topics. Perhaps this is a limited result as the authors see it. Personally I consider it quite successful, given the initial assumptions of the authors. In my own experience, such a result from an even more typical parent population would be considered well within expectations. In any case, evidence now exists of the educational value of even a single use of one component of TIPP.

I certainly concur with the authors' conclusion that successful injury prevention counseling needs to be comprehensive and repetitive, not only for clinic parents but for any group. In addition, injury prevention counseling should never be viewed as the sole approach to childhood injury prevention but must always be placed in synergy with other approaches, including technological advances implemented with legislation and regulation. At the same time, it is encouraging that even one counseling encounter with either counseling method had some demonstrable educational effect.

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ABBREVIATIONS. PP, precocious puberty; SD, standard deviation; ACTH, adrenocorticotropic hormone; 3β-HSD, 3β-hydroxysteroid dehydrogenase.

Precocious puberty (PP) is typically defined as the appearance of any sign of secondary sexual maturation at an age >2.5 standard deviation units (SD) below the population mean. The classic definition of PP, the onset of puberty before the age of 8 years in girls and 9 years in boys, relied largely on Marshall and Tanner's[1] studies on variations of pubertal changes in girls. In a large, cross-sectional study reported in *Pediatrics*, Herman-Giddens et al[2] described the onset of puberty in girls in the United States to be earlier than previously thought. The mean onset of puberty as evidenced by breast development was 10 ± 1.8 years for white girls and 9 ± 1.9 years for black girls. The mean age of pubic hair development was 10.5 ± 1.7 years for white girls and 8.8 ± 2.0 years for black girls. This has led to a change in the definition of PP in a major endocrine textbook,[3] with the lower limit of normal age of pubertal onset of breast development set at 7 years for white girls and 6 years for black girls. In accordance with this, many American pediatricians evaluate girls with early signs of puberty (development of breast tissue and/or pubic hair) conservatively, usually with watchful waiting.

Premature adrenarche, the early appearance of pubic hair, has long been considered a benign condition that may produce a transient acceleration of growth and bone maturation, with no negative effects on the onset and progression of puberty and final height in most subjects.[4] Supporting the mounting evidence[5–7] that girls with premature adrenarche are at risk for polycystic ovarian syndrome and its long-term se-

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quelae is the recent article by Banerjee et al[8] that appeared in *Pediatrics electronic pages*. Corticotropin-stimulated levels of adrenal steroids were evaluated in their report, but insulin resistance, an important feature of the polycystic ovarian syndrome, was not. In contrast to the common belief that premature adrenarche is a relatively isolated phenomenon pertaining to adrenal androgen hypersecretion, a recent follow-up study of adolescent girls with a history of premature adrenarche has shown that many girls also experience early menarche, and hence gonadarche, in addition to acne, and hirsutism.[9]

A white girl, 8 years, 5 months old was recently evaluated in our clinic for PP. She was noted to have pubic hair development soon after her sixth birthday and breast development during the past year. Her pediatrician had previously informed her parents that her early development was benign. Her past medical history and family history were unremarkable. She was mildly obese (body mass index = 24.4 kg/m^2) with Tanner II breasts, and Tanner III pubic hair. There was no evidence of systemic virilization and no acanthosis nigricans. Her bone age was 10 years, 6 months. Her predicted height using the Bailey-Pinneau method[10] was compatible with her genetic potential. Adrenal hormones including dehydroepiandrosterone, dehydroepiandrosteronesulfate, androstenedione, and testosterone were all normal for her age. An adrenocorticotropic hormone (ACTH) stimulation test was normal, excluding the diagnosis of late-onset 21-hydroxylase or 11-hydroxylase deficiency, however, 17-hydroxypregnenolone was mildly elevated (ACTH-stimulated 17-hydroxypregnenolone: 38 318 pmol/L [1276 ng/dL], 17-hydroxyprogesterone: 4743 pmol/L [157 ng/dL]). Significant insulin resistance was identified by a fasting insulin level of 217 pmol/L (30.3 uU/mL) and a peak insulin level of 3278 pmol/L (457 uU/mL) in response to 3-hour oral glucose tolerance test. We recommended dietary modification and an increase in physical activity.

Our patient is a perfect example of an individual whose early development fell within the normal range according to the data presented by Herman-Giddens et al. Her adrenocorticotropin-stimulated level of 17-hydroxypregnenolone was elevated (+4 SD units above the mean), indicating that she might have a mild defect of her adrenal 3β-hydroxysteroid dehydrogenase (3β-HSD). Recently, however, despite the presence of hyperresponsiveness of 17-hydroxypregnenolone to ACTH in a significant proportion of hirsute women and children with premature adrenarche, no abnormality in the gene encoding the 3β-HSD enzyme was found in these individuals.[11] Only patients with markedly elevated 17-hydroxypregnenolone of >10 SD units above the normal level were shown to have defects in the 3β-HSD gene.[12] Hence, it is more likely that this patient has excessive zona reticularis function without an enzymatic block. In the latter case, she would be at risk of developing polycystic ovarian syndrome, and consistent with the data presented by Banerjee et al. Most importantly, significant insulin resistance was already present at her eighth year. This case illustrates the importance of evaluating patients with premature adrenarche for insulin resistance.

Pediatricians are undoubtedly called on to evaluate girls with early signs of pubertal development. To date, the medical work-up of patients with premature adrenarche has emphasized either a conservative management (ie, watchful waiting) or an evaluation of the hypothalamic-pituitary-adrenal axis by an ACTH stimulation test to rule out mild forms of congenital adrenal hyperplasia. In fact, a fasting insulin level may be the most important part of the evaluation in girls with early puberty. Careful long-term monitoring of girls diagnosed with premature adrenarche (in the presence or absence of early gonadarche) is necessary so that both hyperandrogenism and hyperinsulinism can be appropriately managed. Girls with higher body mass index or evidence of insulin resistance (eg, elevated fasting insulin level) at initial diagnosis warrant particularly close follow-up because of their increased risk for developing possibly preventable manifestations of metabolic syndrome X and its devastating sequelae.

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