

# The Obesity Epidemic in Children Is Causing Flatfeet

*Here's a look at a lifestyle-induced foot condition.*

By Paul Scherer, DPM

**T**he health consequences of childhood obesity present a significant health challenge to parents, pediatricians, and now podiatrists. A solid connection has been made between overweight children and pediatric flatfoot deformity. The prevalence rate of overweight children has increased almost threefold since 1960.<sup>1</sup>

Obesity is defined as either a 10% higher weight than what is recommended for height and body type<sup>2</sup> or a total body weight more than 25% fat in boys and more than 32% fat in girls.<sup>3</sup> About 18% of boys and 15.8% of girls in the United States are now obese. Both boys and girls in the 12 to 19 year age category are slightly more overweight today, compared to approximately 4% in 1971.

A report from 2004 from the International Association for the Study of Obesity ranked the prevalence of overweight and obesity in school children as defined by Body Mass Index for 24 developed countries.<sup>4</sup> The United States ranked second highest, followed only by Malta, where 25% of the children are obese.

Not all obese infants remain obese through childhood and not all obese children become obese adults. There is, however, a greater likelihood that overweight children will continue to be overweight throughout their lives. Obesity in childhood is the leading cause of pediatric hypertension and is asso-

ciated with Type II diabetes, as well as an increase in coronary heart disease and an increase in the stress on weight-bearing joints, particularly the subtalar and midtarsal joints.<sup>5</sup>

It is necessary to discuss the causes of this phenomenon of childhood obesity before dealing with the lower extremity consequences. The solution to some pediatric flatfoot pathology may help in the reversal of pediatric obesity.



The causes of obesity are three-fold: the family, low energy expenditure, and heredity. The imbalance of caloric intake and expenditure is the primary agent but this stems from the three causes. The decrease in energy (calorie) expenditure seen in obese children is primarily due to non-physical activities. The most common activity that produces low energy expenditure is television watching, which has increased in school children since 1970.<sup>6</sup>

The risk of childhood obesity is greatest among children who have two parents who are obese.<sup>6</sup> Most believe that this is due to parental modeling, which influences both eating habits and exercise patterns

of their children. Half of the parents of overweight children never exercise vigorously.<sup>7</sup>

Heredity also is a factor since not all obese children are television couch-potatoes nor addicted to eating non-nutritious food. Infants of overweight mothers gain much more weight in the first year of life when compared with infants born to normal weight mothers.<sup>9</sup>

The solutions to the causes of childhood obesity are obvious and actually simpler than in adults, since the goal is not to lose weight, but "to slow or halt weight gain so the child will grow into his or her body weight."<sup>6</sup> The earlier the intervention to change habits, the better. Physical activity on a regular basis, diet management including reduction of calories and dietary fat, and behavior modification, such as limiting television watching and eating time, are all effective.

If pediatric obesity has increased from 5 % to 25 % in the United States, and if pediatric flatfoot is linked etiologically with the increase in obesity, will we be making more pediatric flatfoot diagnoses? The logic and the evidence show this to be a self-fulfilling prophecy. Is pediatric obesity linked to pediatric flatfoot? The first suspicion that there was a causal relationship between childhood obesity and flat feet appeared in a study of Down Syndrome children and the use of orthoses published in 2001.<sup>10</sup> The study highlighted that the population of chil-

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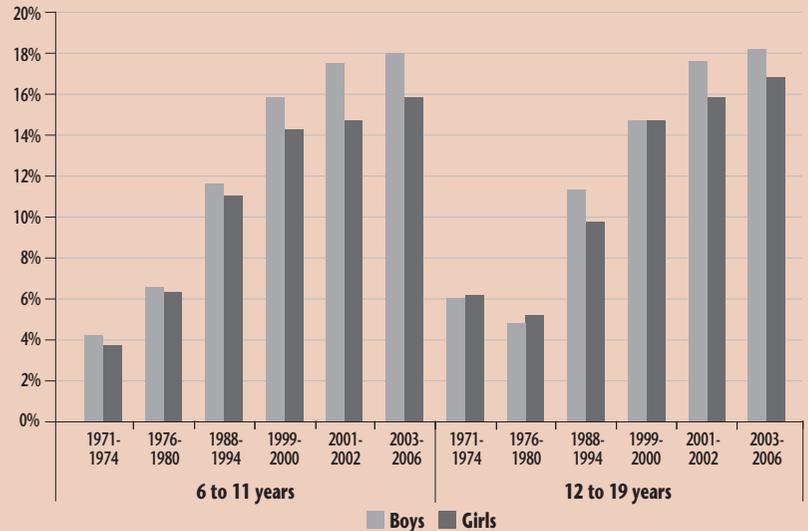
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dren with Down Syndrome, who classically have a higher Body Mass Index, had a very high prevalence of flat feet (83%). This population also has a propensity to hypotonia, weak muscles, and lax ligaments, which also contribute to the flatfoot problems. Although the children were not recorded as losing weight, their gait improved by being less abducted, less everted and having a more consistent walking speed when they were treated with orthoses for flatfoot.

A 1999 study evaluated over 1000 children, 4 to 13 years old, by exceptionally strict footprint analysis, and it documented a flatfoot prevalence of 2.7%. However, only 28% of these flatfooted children were previously given treatment. The study noted that an abnormally high percentage of the children with flat feet were overweight as compared to a population of children who were not flatfooted.<sup>11</sup>

A 2001 study used a photo-podoscope to evaluate 243 children between 8 and 10 years and found a prevalence rate of flatfoot of 16% for the entire group, but 24% for the overweight children.<sup>12</sup> These studies

### CHART 1



point a suspicious finger at obesity as a contributing factor to flatfoot.

A 2006 study evaluated over 800 children (ages three to six years) with 3D laser surface scanners and compared the heel-to-ground position and the height of the medial arch. Prevalence of flatfoot was 54% at age three and 24% at age six. A dramatic and obvious increase of flatfoot was found in overweight children in the later group.<sup>13</sup>

Two other research groups attempted to evaluate the prevalence of flatfoot in overweight children using body mass index. Did these children have different function of their feet or just fatter arches that made them appear lower? The controlled studies determined that the children who were overweight had lower arches, not just fatter feet, and also had much higher forefoot pressures during walking.<sup>14,15</sup>

This question of flatter or fatter feet has been pursued in several articles. One investigation used ultrasound measurements of the actual structures that make up the longitudinal arch to determine if the flatfoot was anatomic or just appeared flatter in obese children. The study compared this information with pedobarographs of normal children to determine if the foot just looked flatter in overweight children or if they were actually structurally different. The results showed that overweight children had no difference in fat pad thickness compared to normal weight children. The feet of overweight and obese children were actually flatter.<sup>16</sup>

These findings have created a global awareness of childhood obesity and the epidemic of overweight children. We know that the issue of childhood obesity has a dramatic effect on the increase in diabetes and heart disease, but now we also suspect a long-term effect producing poor foot structure in adults. A 2001 study on this topic unequivocally demonstrated, after testing 377 children between two to six years old, that flatfooted children performed physical tasks poorly

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and walked more slowly.<sup>17</sup> This implies that the increased pressure, function, and structural difference caused by obesity may lead to decreased activity and pathologic foot function, which is carried into adulthood. We are growing a new generation with a propensity for increased foot problems directly related to obesity.

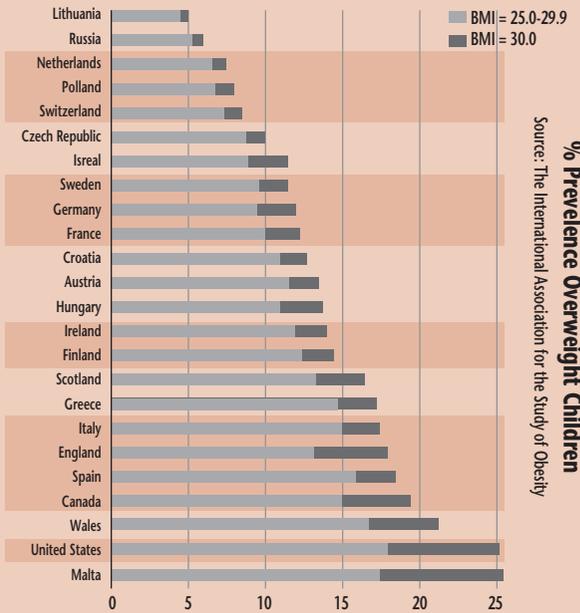
The quandary experienced by most healthcare providers, in relationship to pediatric flatfoot, is whether to treat or not to treat. This dilemma may become more frequent with the obesity epidemic. Most of the literature agrees that a vertical calcaneus by age seven is considered normal development. An everted calcaneus that does eventually become more vertical is considered abnormal development. What should be the proper clinical decision-making guidelines under age seven, especially when the child is experiencing postural complaints, foot pain, skin lesions, poor

running and shoe discomfort? The classic statement that “the child will outgrow it,” followed by no treatment, is a practice in ignorance, especially for those of us who see the deformities in the forefoot of some adults who grew up with untreated hypermobile flatfoot. Most suspect that the increased medial column pressures created by the child’s flat-foot generate the adult pathology associated with pronation.

The previously cited Garcia-Ro-

## CHART 2

Prevalence of overweight and obesity in schoolchildren aged 10-16 years, as defined by body mass index, 2001-2



driquez article is a prime example

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of the confusion of over- and under-treatment during the last century.<sup>11</sup> The authors examined 1200 grammar school children and identified, by very strict criteria, that only 2.7% of the group had pediatric flatfeet. They found that 11% of all the children evaluated were being treated for flatfoot pathology with shoes, braces, or orthoses, clearly demonstrating overtreatment. They then looked at the 2.7% confirmed flatfooted children and found only 25% of those children who absolutely had flat feet were being treated, demonstrating a clear case of under-treatment. The only thing the article really demonstrated was that we may not know how to make a diagnosis or which children to treat.

A more recent article attempted to clarify the question of whether to treat or not and may provide a good guideline for the obese child with flatfeet. This article attempted to discover the true evidence about

pediatric flatfoot from a meta-analysis of the contemporary medical literature and provide recommendations based on the critical analysis of that literature.<sup>18</sup> Nine articles were weighted by their investiga-

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tive methods and their recommendations. Three of the articles were selected for inclusion because they were randomized, controlled trials specifically for non-surgical intervention for pediatric flatfoot. The three articles contained mixed results, which ranged from signifi-

cant improvement to no significant difference between treatment and no treatment.<sup>19-21</sup>

This analysis of the literature related to decision-making about treating the pediatric flatfoot produced an algorithm for treatment. The author uses the algorithm with a patient-generated index of signs and symptoms and proposed the use of a single case experimental design to evaluate treatment efficacy. It is suggested that this treatment algorithm may reduce some criticism of over-prescription of foot orthoses because of its more logical approach, and also prevent under-treatment through "natural resolve" or the common philosophy of "they will outgrow it."

The author produced a very well thought-out and efficient "pediatric flatfoot clinical care pathway" which combines the physical exam, children's history, patient-generated index, differentials, and treatment plan documentations. The pathway focuses on flatfoot

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subtypes and guides the treating physician in a manner not previously described.

### Must Treat Category

The "must treat" category of this algorithm includes the symptomatic child with gait abnormalities. The treatment goal is to hold the foot in a more anatomic position and alleviate symptoms. This is accomplished by providing adequate footwear, stretching where appropriate and prefabricated orthoses or kiddythotics that have similar qualities of their custom counterpart, including a rigid device, a medial flange for foot contact and a rearfoot post for orthotic stability.

### Asymptomatic Category

The second category includes asymptomatic hypermobile flatfoot that is not deteriorating and has extrinsic factors that may contribute to symptoms and deformity according to the literature. These include obesity, extreme hypermobility of the joints, and systemic or genetic abnormalities. This category has the recommendation of periodic monitoring to see if there is a transition into the first group. The third group is the hypermobile flatfoot of the normal developing child. No treatment or monitoring is recommended.<sup>18</sup>

Though the studies reviewed do not provide conclusive evidence that would direct the clinician when treating hypermobile pediatric flatfoot, sufficient evidence does exist to guide the clinician to better therapies than "let them outgrow it". When a clinician cannot conclusively decide whether an abnormal appearance represents pathology or the progression to normalcy, simply assuming that it will disappear with time is an insufficient medical decision.

There is no doubt from the data available worldwide that childhood obesity has been increasing in the last 30 years and will continue to increase. There is also little doubt that this epidemic of obesity produces a greater number of pediatric flatfeet. The decision our profession needs to make is this: How do we recognize the problem and let our pediatrician colleagues know that these little flat and fat feet will likely develop midlife pathologies? We must also develop and agree to a treatment protocol which will not be criticized as over-treatment or under-treatment for these children. The documentation in this article may be useful to your local pediatric specialist. ■

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