Does Early Growth Affect Long-Term Risk Factors of Cardiovascular Disease?

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Monitoring growth is an essential part of good pediatric care. The pattern of growth is not only a marker of the immediate physical and emotional wellbeing of the child but it has long-term implications for health. Previously, however, research and clinical practice in pediatrics has focused almost exclusively on achieving adequate growth and the prevention of growth faltering. More recently, compelling evidence has emerged for the adverse long-term consequences of ‘accelerated growth’ or too fast growth. The present review considers this evidence, focusing on the role of accelerated infant growth on long-term risk factors for cardiovascular disease (CVD).

The concept that early growth has an impact on long-term biology was first proposed by McCay [1] as far back as 1933. Since then substantial evidence from animal studies suggests that early overfeeding leading to rapid postnatal growth has adverse long-term effects while calorie restriction during critical windows in development increases lifespan and reduces later adiposity. More recently, we found that infants given formula rather than human milk had greater propensity to obesity, dyslipidemia, raised blood pressure, and insulin resistance, while faster early growth, influenced, or programmed, later insulin resistance, markers of inflammation, higher blood pressure and endothelial dysfunction (an early stage in the atherosclerotic process). As a unifying hypothesis, we proposed that postnatal growth acceleration (upward centile crossing) could explain, in part, adverse programming effects in infants born small-for-gestation (who show ‘catch-up’ growth immediately after birth) and long-term cardiovascular benefits in breastfed babies (who are relatively undernourished and have slower growth compared to those given formula) [2]. Over the last 5 years, substantial evidence has accumulated to support the hypothesis that early growth acceleration increases the propensity to major
components of the metabolic syndrome, the clustering of risk factors (glucose intolerance, obesity, raised blood pressure and dyslipidemia) which predispose to cardiovascular morbidity and mortality.

The association between infant growth and later cardiovascular risk factors is strong, consistent, shows a dose-response effect, is biologically plausible, and is experimentally reproducible in animal models [3]. Moreover, experimental studies support a causal link between infant growth and later CVD risk. For instance, infants born small-for-gestational age (SGA) and randomized to a higher protein diet that promoted growth had approximately 3 mm Hg greater diastolic blood pressure than those randomized to a lower-nutrient diet [4]. The size of this effect was substantial and, on a population basis, would be expected to prevent over 100,000 myocardial and cerebrovascular events per year in the US alone [2].

The strength of the evidence supporting the impact of early growth on the long-term risk is challenging established public health practices. Professional bodies in the UK such as the Royal College of Paediatrics and Child Health, and the Scientific Advisory Committee on Nutrition have recognized the role of faster infant weight gain in increasing the risk of long-term obesity. Furthermore, promoting catch-up growth by nutritional supplementation in healthy term infants born SGA is no longer recommended [5]. Clearly, the risk-benefit of faster early weight gain depends on the population involved. Faster weight gain may improve long-term cognitive function in infants born preterm and has short-term advantages for morbidity in infants with low birthweight from low-income countries. Even in low-income countries, however, massive changes in diet and rise in urbanization mean that large sections of society are at increased risk of obesity and CVD and so susceptible to programming effects of early growth. Evidence that early growth affects CVD risk therefore provides a unique opportunity for the primary prevention of cardiovascular disease to begin as early as the first few months of life.

References