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Cartas científicas

Nutrition and tracheal morphology; does malnutrition lead to characteristics of premature aging?

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Interest in tracheal surgery and invasive airway endoscopic procedures has increased in the last two decades. This is a direct consequence of the aging of population and improvement in intensive care units. The most prevalent airway disease requiring surgery or invasive endoscopic procedure is tracheal stenosis. The occurrence of this disease is related to abnormal healing after injury to mucosa, usually by orotracheal or tracheostomy tube. Importantly, this healing process is initiated in, and coordinated by, the extracellular matrix.[1,2]

Our initial studies revealed that the arrangement of extracellular matrix components in the Wistar rat trachea, such as elastic fibers, collagen and smooth muscle are essentially the same that are in human trachea.[2] Attempts to substitute a tracheal segment with aortic allograft have been performed in pigs, where the normal aortic tissue was replaced by a structure resembling a "new trachea" with histological characteristics of a normal trachea. Interestingly, this new trachea has developed amid islets of elastic fibers in the extracellular matrix of the aortic allograft.[3] In his work on tissue-engineered major airway replacement, Macchiarini and coworkers discuss the role of extracellular matrix as an active part in regulating diverse aspects of cell biology that are essential to the normal function of tissue.[4]

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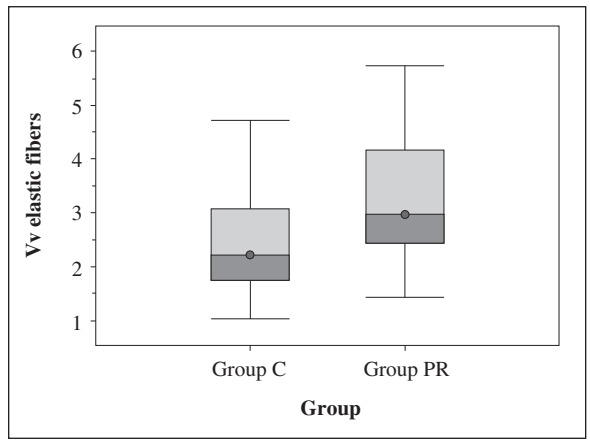

Fig. 1.—Volumetric density, expressed as percentage, of the elastic system fibers of the trachea of Wistar rats at the age of 21 days. Values expressed as the mean of volumetric density ± SD of 6 pups per group (P < 0.01). Vv %: Volumetric density, expressed as percentage; SD: standard deviation; Group C: Control group; Group PR: Protein restricted group.

Our initial research concerns maternal protein restriction in Wistar rats' offspring during lactation and tracheal extracellular matrix. We found an augmentation in tracheal elastic fibers concentration, measured by stereological method, of the malnourished rats, comparing to controls (fig. 1). Interestingly, augmentation in concentration of these fibers also occurs in the elderly; a population that is known to have a trachea with lesser elastic properties and more suitable to anastomotic problems when submitted to surgical procedures.[1] While this find could be interpreted as nonsense, it may be well explained by molecular characteristic of elastin: in the elderly, there are more elastic fibers, but the elastin is binding to calcium through cross-linked reactions. Therefore, the trachea in the elderly is less extensible and more difficult to manipulate during

surgical procedures.[1,4] If this augmentation in the elastic fibers leads to a tracheal tissue more prone to stenosis, malacia and other problems related to cicatricial process is not clear. Also, studies involving surgical procedures are necessary to evaluate the morphological tissue response to healing. Moreover, these findings about malnutrition and tracheal tissue alterations demonstrate the critical role of nutrition in tracheal tissue development, which has unique importance, given the prevalence of malnutrition among hospitalized patients and during childhood, especially in developing countries.[5]

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