Muscling in on the truth

A look at the causes of malocclusion

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Debate on the causes of malocclusion has been raging since the genesis of the orthodontic science, but has the answer already been found?

Various factions in the orthodontic tradition have declared the influence of both environmental and genetic determinants in malocclusion. Common consensus regards tooth position to be more environmentally influenced and skeletal development more genetically.

Genetic factors

Lauc et al (2003) claim that genetic factors are significant in malocclusion, citing a number of studies of twins. However, sibling genetic correlations are intrinsically fallacious in that they do not consider the influence of shared environments, which Garn et al (1979) have termed the “co-habitational effect.”

Nonetheless, certain traits do seem to be characteristic among family members, and a possible explanation is that all animals seem to inherit certain muscular functions; Wiley (1962) describes the mating ritual of the three-spined stickleback, stating “the pattern and sequence of these movements is just as much a part of the genetic make-up of the fish as its body shape.”

Epidemiological studies of malocclusion show it does not follow Mendelian laws of inheritance. Mew (1986) cites the example of sickle cell anaemia, which provides near immunity to malaria. It has become endemic in populations where it is an asset for survival, and it displays a progressive familial and geographic spread.

Malocclusion, however, has shown no type of progressive spread, with every permutation found in every corner of the globe. An evolutionary change of this magnitude would also require millions of years, not one generation, and furthermore what genetic advantage has malocclusion provided for this supposed evolutionary change to materialize?

Certainly, there is a quality of irrationality to the genetic model for the etiology of malocclusion, but what is the answer?

Environmental factors

Evidence for environmental causes is formidable. Weiland et al (1997) compared skulls from 19th century Austrian males with their contemporaries, finding that change in diet ensured the latter displayed significantly higher malocclusion scores.

Corrucini and Beecher (1981, 1983, 1984) have also shown that a soft diet significantly increases dental and skeletal malocclusions in rats, macaques and primates.

This is most likely because of less toxicity in muscles of mastication, resulting in compensatory overactivity in muscles of facial expression. Perhaps most telling has been Harvold’s series of experiments on primates in which induced oral respiration caused a range of malocclusions but all included increased face height, steeper mandibular plane and larger gonial angle — in short, skeletal and dental discrepancies. Harvold’s summation was that oral respiration was the trigger factor, but it is “deviant muscle recruitment” that directly causes maldevelopment.

The weight of the evidence, be it from the genetic or environmental school, seems to rest with muscle dysfunction being the cause of malocclusion.

Texture and nutritional value of diet has been shown to have an impact on toxicity of facial muscles, oral respiration causes “deviant muscle recruitment” and even from the genetic standpoint, the animal kingdom shows a marked tendency for muscle function (and dysfunction) to be inherited.

P.R. Begg’s seminal 1954 manifesto asserted that a lack of grit in modern diets results in less interproximal wear and subsequently more crowding.

Although Begg believed that this environmental factor caused dental crowd-
In spite of the evidence, the industry holds the concept of muscular causes of malocclusion at arm’s length. Because when it is acknowledged, then the moral imperative for big changes will be inescapable.