Consideration of whole body posture in relation to dental development and treatment of malocclusion in children

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Introduction

The ability to control our body's position in space is fundamental to everything that we do because all tasks have postural requirements. Although it has been established that dental health can have an impact on general health,[1,2,3] when dentists are trained not much emphasis is given to teaching them about the relationship between dental development, oral function and posture.

The aims of this paper are to provide an overview of what is meant by posture, its development and how it is controlled. The relationship between posture and eruption of the deciduous dentition will be discussed. Examples of how posture may be influenced by specific dental factors, including various types of malocclusion and the effects of functional orthopaedic treatment will be provided.

Some general thoughts about mature standing posture in humans

A good standing posture in adults is seen when their head is supported by their vertebral column, which in turn is supported by their pelvis, legs and feet. The arms are suspended from the individual's shoulders that are level with respect to the pelvis and feet. This ideal posture requires minimal muscle activity to maintain a person in the standing position. Control of posture involves two different components; stability and orientation. Stability is the factor which controls the individual's centre of gravity within the body, such that the person's weight is distributed evenly through all the vertebrae and the person is comfortable. The feet are at the centre of the physical forces acting on the body whilst standing. McCollum and Leen[4] have studied this phenomenon and concluded that the limits of stability were defined by the length of the feet and the distance between them. The second factor; orientation can be defined as the ability to maintain an appropriate relationship between body segments as well as between the body and its environment. This is related to general muscle tone, which refers to the force with which the muscles resist being lengthened[5]. Orientation is often tested clinically by passively flexing and extending a relaxed patient's limbs and assessing the stiffness and ease of movement in their joints. In a relaxed state there is no electrical activity in the muscles even though there is some general tone, which is reported to be provided by a non-neural mechanism. One possible explanation for this is that there are free calcium ions within the muscle fibres that allow some recycling of the cross-bridges that form when muscle contracts[6]. In addition, there is postural tone, which is the background level of activity in various groups of muscles which work together and are responsible for maintaining an individual's posture. There are several factors that can contribute to good postural tone including: somatosensory inputs especially from the feet and cervical vertebrae, as well as sensory inputs from the vestibular and ocular systems. Maintenance of an erect head posture depends upon the interaction between gravity and the muscles, bones and joints that are coordinated by the individual's nervous system. This brief overview is clearly a simplification but conveys the essence of the general principles involved in control of mature posture.

Postural control in children

As a baby, posture is controlled by reflex coordination of the neuromotor system[7]. Development of postural control in children has been linked with the well established sequence of developmental motor milestones; crawling, creeping, sitting, pulling to stand and walking[8]. The classical neuro-maturational theory describes the control of posture as being dependent upon the appearance and then integration of reflexes. The pattern of emergence and subsequent disappearance of these reflexes is said to correspond with maturation of cortical, volitional brain function[9]. This integrates the reflexes that are controlled at lower levels within the brain and central nervous system to allow functional and volitional postural responses[10].