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# 第206回松本歯科大学大学院セミナー

日　時: 2009年10月16日(金) 11時00分~12時00分

場　所: 創立30年記念棟 大会議室「常念岳」

演　者: Arthur J. Miller 氏
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タイトル: **How the Craniofacial Form Depends on Function, and the Potential for Using Cone Beam Computed Tomography**

The craniofacial skeleton depends on periodic development of forces through its temporomandibular joints, dentition and directly where the muscles insert into the bone. Muscles provide continuous tension through the passive elastic components of the muscle tissue which surrounds the contractile elements within the muscle cells. Muscles also develop active tension during swallowing, chewing, and speech, but the tension only exceeds 30% of the maximum muscle tension in less than 5% of a 24-hour period. Simulating tension developed by jaw muscles by using robotic models, incorporating human skulls that chew, show that the muscles induce continually changing tensile and compressive strain in the surface of the cortical bone both in the lateral and medial surfaces of the mandible, and well beyond the site of muscle attachment. Strain gauges placed on the surface of cortical bone in live experimental animals chewing, support the same concepts including demonstrating compressive strains in the neck of the condyle suggesting reaction forces on the condyle during clenching and chewing. Finite element models predict distortion and bending of the craniofacial bones during normal function like chewing. Genetically impairing the development of the jaw muscles in the fetus, or weakening the jaw muscles in the human during postnatal development due to neuromuscular disorders, alter the shape and size of the bones and the form of the craniofacial region. These studies of muscle and bone indicate that the craniofacial skeleton needs to have forces generated through it for normal development of shape, size, and mineralization. The data suggest that the craniofacial skeleton needs to have some continuous level of tension with periodic forces that are within a range and above a certain minimum threshold. The condyle also depends on a range of forces to maintain its normal shape. Developing asymmetrical forces on the condyle as with weakening jaw muscles on one side, or having the mandible continually close to one side results in changes in the condylar shape as well as developing an asymmetrical mandible. Frequent development of low forces will not support the normal shape of the condyle as seen with animals that have soft diets. The craniofacial skeleton will also adapt to much more complex functional changes as with total obstruction of the nasal passageway in the experimental animal. Increasing the resistance of the nasal passages above a certain threshold induces more mouth breathing which results in malocclusions and changes in mandibular shape and vertical facial dimension. The underlying factors that induce these changes in form are complex. With the application of cone beam computed tomography, the three-dimensional evaluation of the craniofacial skeleton and airway is feasible. The true growth of the craniofacial region can be described, and the underlying factors that modify this growth can be further analysed in well-designed experimental studies of the three-dimensional form.

担当:健康増進口腔科学講座　松 尾 浩 一 郎