



Expression of Cbfa1 and Collagen X in Mandibular Condyle under Mechanical Strain

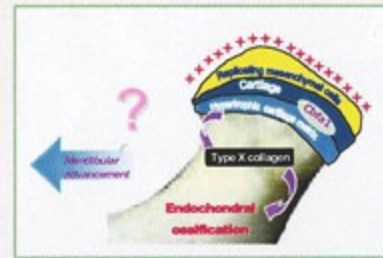
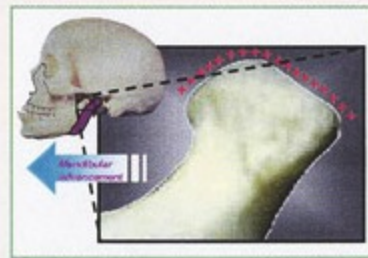
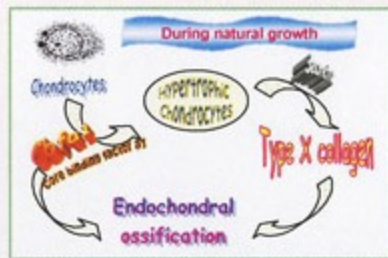
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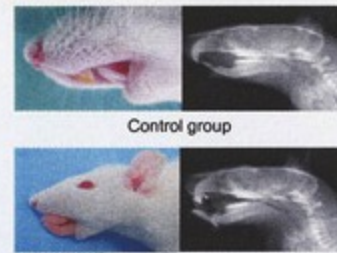
Introduction:

Core binding factor a1 (Cbfa1) is a crucial transcriptional factor for chondrocyte maturation and osteoblast differentiation in the mandibular condyle during natural growth. Collagen X marks the onset of endochondral ossification in the condyle. Their expression in response to single-step and stepwise mandibular advancement could offer us an insight into the effect of mechanical strain on the condylar tissue.



Objective: to quantitatively assess the amount of mRNA expression of Cbfa1 and collagen X in response to single-step and stepwise mandibular advancement.

Materials & Methods: 420, 35-day-old female Sprague-Dawley rats were divided into experimental and control groups. Experimental animals were either fitted with single-step bite-jumping appliance with 4mm mandibular advancement or stepwise bite-jumping appliance with 2mm advancement initially and another 2mm advancement after 30 days. Rats were sacrificed after 3, 7, 14, 21, 30, 33, 37, 44, 51 and 60 days. Mandibular condylar cartilages were dissected under microscope, Cbfa1 and collagen X mRNA were quantified with real-time RT-PCR.



Experimental group with bite-jumping appliance

Results: quantitative analysis demonstrated that Cbfa1 and collagen X mRNA expression for all 3 groups reached a peak on experimental day 21. During the period of first advancement, expression of Cbfa1 and collagen X were consistently higher in the single-step group compared with the stepwise advancement group.

In response to the second mandibular advancement, both Cbfa1 and collagen X levels in the stepwise group were significantly higher than levels expressed in the single-step advancement and untreated controls.

Conclusion: Mandibular advancement promoted chondrocytes maturation and osteoblast differentiation by upregulating the level of Cbfa1 and collagen X. Stepwise advancement produced a higher level of Cbfa1 and collagen X expression leading to more cartilage engaging in endochondral ossification.

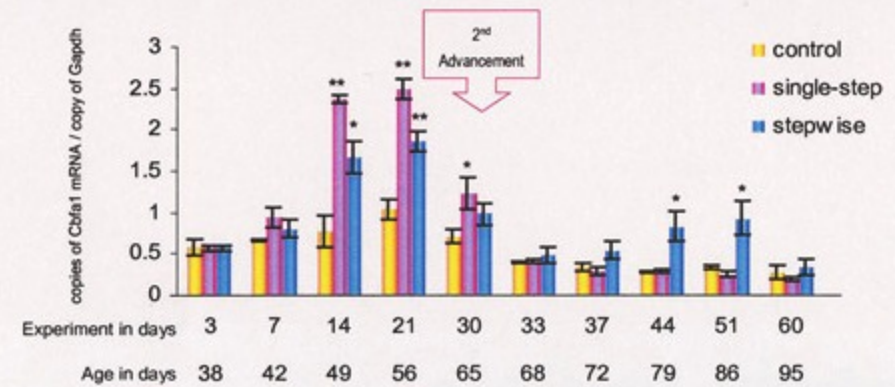


Figure 1 Quantitative analysis of Cbfa1 mRNA expression in condylar cartilage with real-time RT-PCR during natural growth (control), single-step and stepwise mandibular advancement (*p<0.05, **p<0.01)

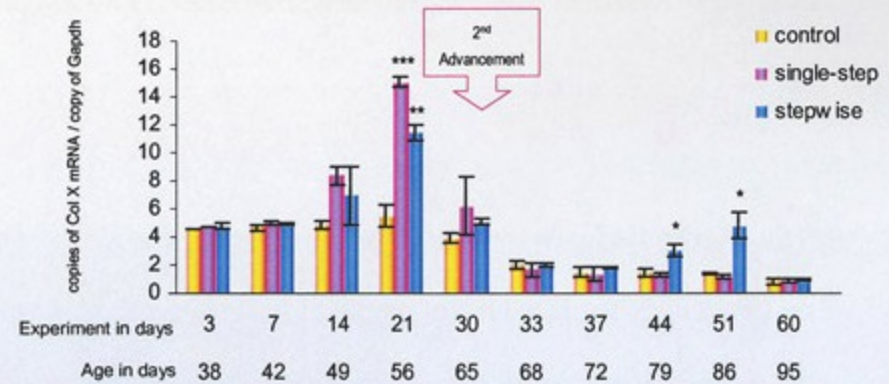


Figure 2 Quantitative analysis of collagen X mRNA expression in condylar cartilage with real-time RT-PCR during natural growth (control), single-step and stepwise mandibular advancement (*p<0.05, **p<0.01, ***p<0.001)