A17: Effects of Mechanical Stimulation on Bone and Cartilage Development in Organ Culture Model

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Mechanical stimulation or exercise stress can affect the bone mass and metabolism have been reported. However, action on bone and cartilage tissue of mechanical stimulation, and how mechanical stimulation promotes bone formation are not clear. We have devised an organ culture model using three-dimensional culture apparatus mechanical stimulation. Effects of mechanical stimulation on bone and cartilage development were examined by evaluating changes in the histological structure. In the forelimbs metatarsals of C57BL/6 strain of 3-4 week-old mice were excised and bone and cartilage organ culture was performed for 4 days. Metatarsals embedded in collagen sponge were subjected to cyclic compressive loading in the direction of the long axis of metatarsal at 0.5 Hz for 1 hour. After organ culture, Histological sections of metatarsals were prepared and compared structure changes between control and loading groups. Growth plate at epiphyseal cartilage in the loading groups obviously tends to enlarge compared with control (unloading). Hypertrophic zone of epiphyseal plate increased by mechanical stimulation markedly promoted osteoid and trabecula formation with developing a zone of calcified cartilage towards metaphysis. This organ culture model could not only help to elucidate the mechanism of promoting bone formation, also be applied to the evaluation system of drug screening and discovery.

REFERENCE