Bone development in the femoral epiphysis of mice: the role of cartilage canals and the fate of resting chondrocytes

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In mammals, the exact role of cartilage canals is still under discussion. Therefore, we studied their development in the distal femoral epiphysis of mice to define the importance of these canals. Various approaches were performed to examine the histological, cellular, and molecular events leading to bone formation. Cartilage canals started off as invaginations of the perichondrium at day (D) 5 after birth. At D 10, several small ossification nuclei originated around the canal branched endings. Finally, these nuclei coalesced and at D 18 a large secondary ossification centre (SOC) occupied the whole epiphysis. Cartilage canal cells expressed type I collagen, a major bone-relevant protein. During canal formation, several resting chondrocytes immediately around the canals were active caspase 3 positive but others were freed into the canal cavity and appeared to remain viable. We suggest that cartilage canal cells belong to the bone lineage and, hence, they contribute to the formation of the bony epiphysis. Several resting chondrocytes are assigned to die but others, after freeing into the canal cavity, may differentiate into osteoblasts.