SUPPLEMENTAL FIGURE LEGENDS

Supplemental Fig. 1. Chondrocyte-specific RUNX2 overexpression causes early onset of hypertrophy and terminal maturation. (A) RUNX2 immunohistochemistry on proximal humerus sections from E18.5 Control, *C2T2; R26*$^{Runx2/+}$, and *C2T2; R26*$^{Runx2/Runx2}$ embryos. Top panels are 40X images of the resting zone chondrocytes; bottom panels are 40X images of the hypertrophic zone chondrocytes. (B) Alcian blue Hematoxylin/Orange G staining of tibia sections from E18.5 Control, *C2T2; R26*$^{Runx2/+}$, and *C2T2; R26*$^{Runx2/Runx2}$ embryos (2.5X images). (C) Hematoxylin and eosin (H&E, top panels) and *in situ* hybridization for *Col10a1* (middle panels) and *Mmp13* (bottom panels) on E14.5 Control, *C2T2; R26*$^{Runx2/+}$, and *C2T2; R26*$^{Runx2/Runx2}$ humerus sections.

Supplemental Fig. 2. RUNX2 expression promotes chondrocyte maturation *in vitro*. Primary sternal chondrocytes were isolated from 3-day-old *Rosa-Runx2*$^{f/f}$ mice and infected the following day with adenovirus encoding GFP or Cre at equivalent MOIs. After 48 hours, virus was removed and media containing ascorbic acid added to the cells. Three days later, cells were harvested for (A) Western blot analysis, (B) Alkaline phosphatase staining, or (C) quantitative RT-PCR analysis for the indicated genes (n = 3 for both groups). $^{**}p < 0.01$, $^{***}p < 0.001$, $^{****}p < 0.0001$, Student's t-test.

Supplemental Fig. 3. RUNX2 overexpression does not accelerate articular cartilage degeneration in female mice following MLI. (A) Safranin O/Fast green staining of knee joint sections from female *R26*$^{Runx2/+}$ (Control) and *Acan*$^{CreERT2/+}$*; R26*$^{Runx2/+}$ (RUNX2 OE) mice injected with tamoxifen at 2 months of age and subjected to sham or MLI at 2.5 months of age. Joints were harvested 2 months following injury. Top panels are 5X images of the knee joint; bottom panels are high magnification images (20X) of boxed

regions. (B) Modified OARSI scoring of Control and RUNX2 OE slides from the knee joint receiving MLI. (C, D) Quantitative histomorphometric analyses of total tibial cartilage area (C, left panel), total tibial $SafO^+$ area (C, right panel), unmineralized and mineralized tibial cartilage areas (D, left panels), and unmineralized and mineralized tibial $SafO^+$ areas (D, right panels) where MLI cartilage was normalized to corresponding sham cartilage in knee joint sections from Control (n = 6) and RUNX2 OE (n = 6) mice.