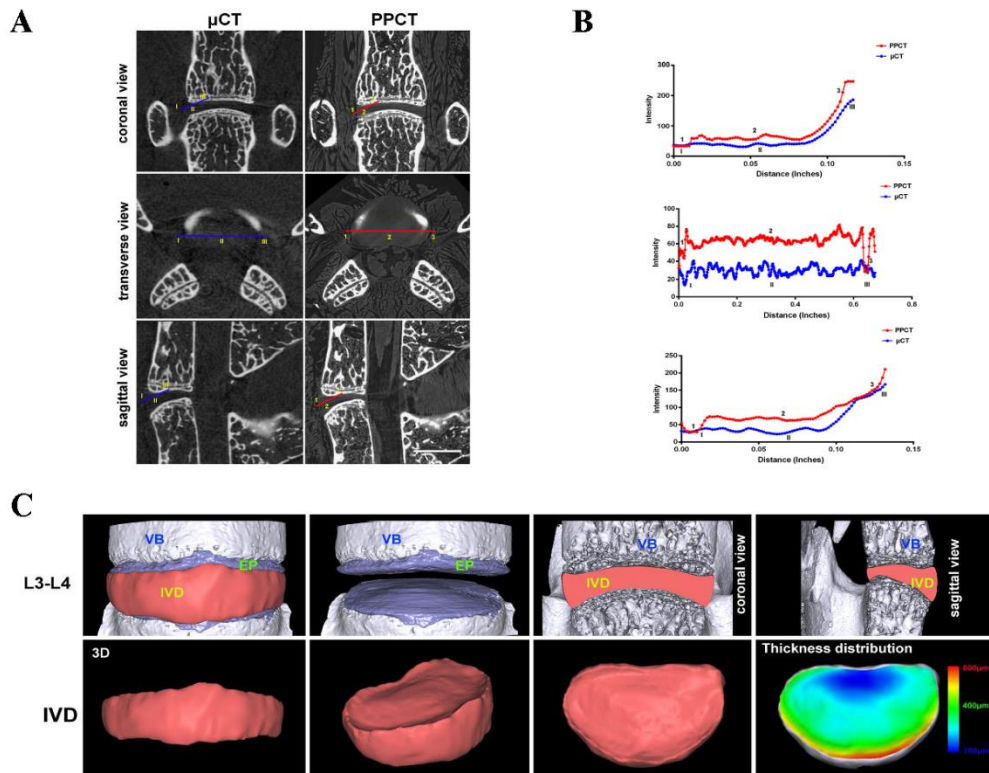
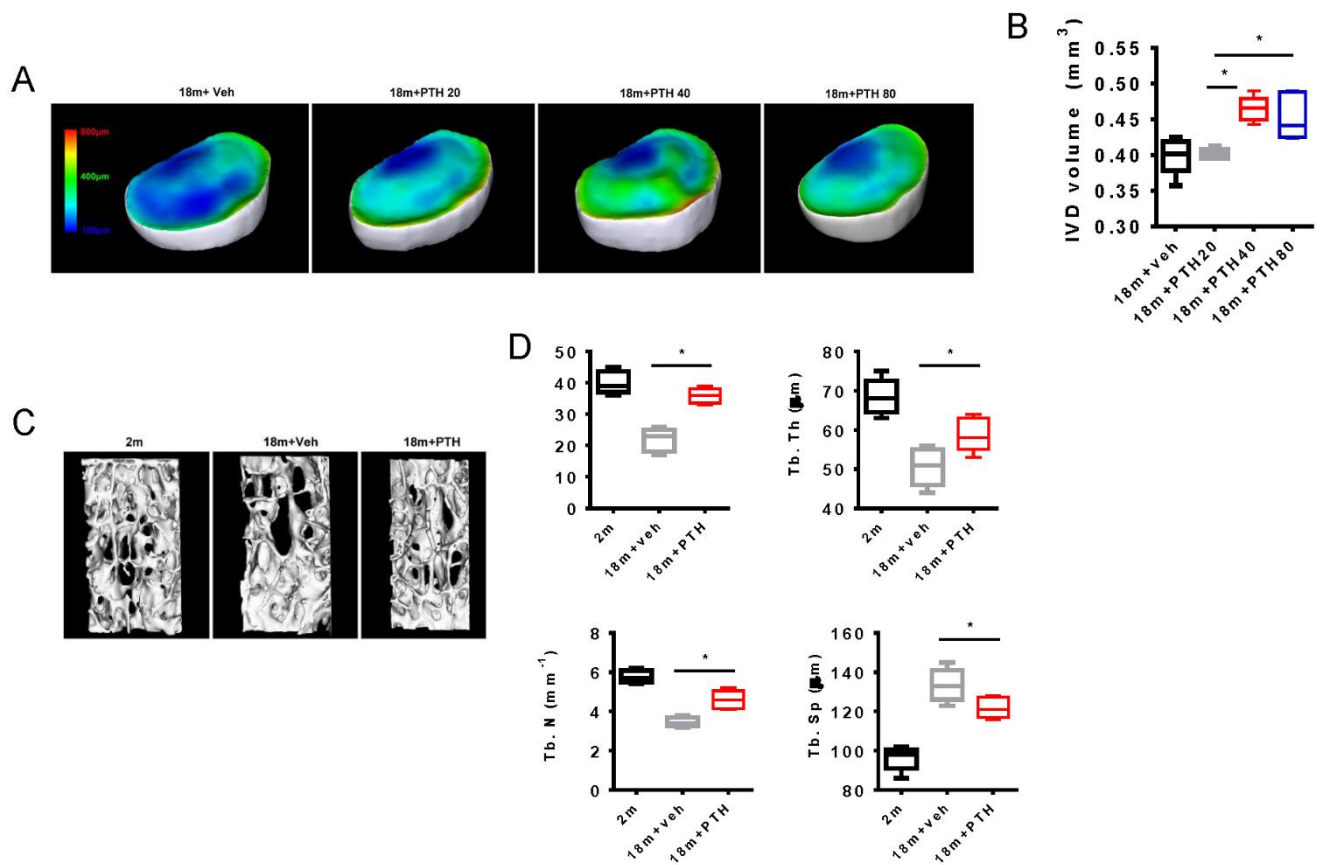


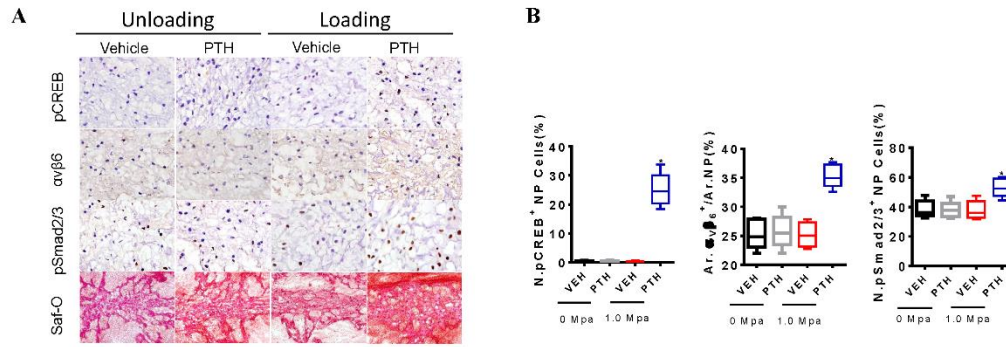
Supplementary information



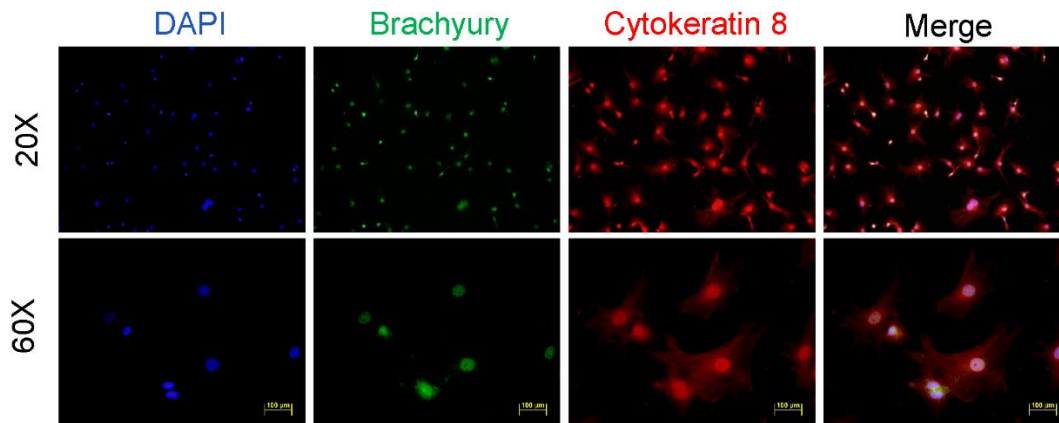
Supplementary Figure 1 3D visualization of IVDs by propagation phase contrast microtomography (PPCT) based on the Synchrotron radiation. (A) Coronal, transverse and sagittal views of the intervertebral disc were detected by PPCT; these views of the disc are difficult to delineate with conventional μ CT. (B) The intensity distribution of the correspondence lines marked in (A). The blue line (I, II and III) refer to μ CT, whereas the red line (1, 2 and 3) refer to PPCT. (C) Intact 3D images of the L3-4 segment. The vertebra (VB), endplate (EP) and IVD could be visualized separately and from multiple perspectives. The 3D thickness distribution could be defined using different color coding. Scale bar, 500 μ m.



Supplementary Figure 2 The dose screen of intermittent PTH effect on IVD volume. (A) The 3D thickness distribution of IVD with iPTH injection of PTH (1-34) 20 µg/kg/d, 40 µg/kg/d and 80 µg/kg/d, daily for 8 weeks. (B) Quantitative analysis of IVD volume of (A). (C) 3D image of L4 vertebra microarchitecture from 2-month old mice and 18-month old mice with or without iPTH. (D) Quantitative analysis of trabecular bone volume fraction (BV/TV), trabecular thickness (Tb. Th), trabecular number (Tb. N) and trabecular separation (Tb. Sp) with iPTH injection. * $P < 0.05$, ** $P < 0.01$. Statistical significance was determined by one-way ANOVA and student t -test. All data are reported as the mean \pm s.d.



Supplementary Figure 3 The effect of PTH treatment in an IVD ex vivo compression model of 3-month-old rat. (A) pCREB, Integrin $\alpha_v\beta_6$, pSmad2/3 or Safranin-O staining of IVD sections from an IVD ex vivo compression model of 3-month-old rat with treatment of either vehicle or PTH (PTH1-34, 100nM). (B) Quantitative analysis of the percentage of pCREB, pSmad2/3 positive cells and the Integrin $\alpha_v\beta_6$ positive areas as a percentage of total IVD area (Ar) of (t). All data are reported as the mean \pm s.d. *P < 0.05, **P < 0.01. n=8 per group. Statistical significance was determined by one-way ANOVA and student t-test.



Supplementary Figure 4 Identification of NP Cells from human lumbar disc specimens. Immunostaining for DAPI (blue) and two markers of NP cell (Brachyury (green), Cytokeratin 8 (red)). Scale bar, 100µm.

Supplementary Table 1**Intergrin β_6 promoter sequence**

Target gene	Forward primer (5'-3')	Reverse primer (5'-3')
Primer 1	TGTGCTGTTCCAACCTCT	TTCCTGAAGAACACCCTG
Primer 2	TTGAAACGAACCCTGAAA	TTCCCTAGCCTTCCTTCT
Primer 3	ATTTTGGTGTAAGTTCTATG	GACTATATTTCTATTGCTGTTGTGA
Primer 4	TCAGCGTTACAAGACCAA	TCCAGGTAGCCTCTGTTT
GAPDH	CCTGCTTATCCAGTCCCTAGCTCA	AAATGAGGCGGGTCCAAAG

Supplementary Table 2**The primers sequences**

Target gene	Forward primer (5'-3')	Reverse primer (5'-3')
ACAN	CAGATGGCACCCCTCCGATAC	GACACACCTCGGAAGCAGAA
CCN2	CCGCCAACCGCAAGATC	ACCGACCCACCGAAGACA
α V	ACTGTGAAGGCGCAGAATCA	TGCCTCTATCCAGTCGACCA
β 3	CTCCCTTCTTCCCTCCCCTC	ATCTCGATTACGGGACACGC
β 5	GCCAAGTTCCAAAGTGAGCG	CTACCAGGTCCCTTAGGGCT
β 6	CTCACGGGTACAGTAACGCA	CCACAAAAGAGCCAAAGCCC
β 8	TTATGCAGCAGAGCCCCATC	CAAGACGGAAGTCACGGGAA
GAPDH	AATGTGTCCGTCGTGGATCTGA	AGTGTAGCCCAAGATGCCCTTC