# P2-6

## **Orofacial bone remodeling and** regeneration of hypoparathyroidism

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## **Objectives**

Hypoparathyroidism (HypoPT) is a rare endocrine disorder characterized by hypocalcemia and low or undetectable levels of parathyroid hormone (PTH). The clinical symptoms of HypoPT patients include perioral numbness, muscle cramps, paresthesia et.al. These symptoms are mainly due to hypocalcemia since PTH functions as a key mediator in mineral ion homeostasis and skeleton remodeling. The skeletal dynamics of HypoPT patients are reported to be affected. As a crucial part of the skeletal system, orofacial bone harbours distinct developmental origin and osteogenic pattern. However, the remodeling and regeneration of orofacial

3. Histology and immunostaining analysis of bone Figure regeneration and remodeling condition at extraction socket.





bone under HypoPT condition remains unknown.

## Methods

In the current study, we applied bilateral parathyroidectomy (PTX) and unilateral extraction of maximal first molar to 8 weeks SD rats to establish four surgery groups, including sham group, PTX group, sham+extraction group and PTX+extraction group.

Figure 1. Hypo-PT rat model was built under the guidance of carbon nanoparticles suspension injection and confirmed by ELISA assay.



parathyroid gland (yellow dash line). (d) The procedure of parathyroidectomy was completed. (e) PTX group showed significantly reduced serum calcium.(n=16) (f) Serum phosphate was significantly increased in PTX group. (n=16) (g) ELISA assay confirmed undetectable PTH levels in PTX group. (n=16)

#### Runx2/DAPI

(a) HE staining showed the newly formed bone volume in extraction socket of PTX+extraction group is lower than sham group. Scale bar, 100µm. (b) TRAP staining showed the number of osteoclasts in PTX+extraction group is less than sham group. Scale bar, 50µm. (c) Immunofluorescence staining of Runx2 in extraction socket at POD 14 and 28 exhibited lower osteogenic protein levels in PTX+extraction group. (n=6) Scale bar, 100µm.



### Figure 2. MicroCT analysis of alveolar bone volume at 7, 14, 28 post operative days (POD).



Figure 4. RNAseq analysis revealed significant changes in expression pattern between PTX and sham group.



## Conclusions



(a) The region of interest (ROI) of control group is alveolar bone located at root furcation. (b) The ROI of extraction group is the extraction socket of two mesial roots. (c) The bone mineral density (BMD) of intact alveolar bone in PTX group is significantly higher than sham group at POD28. (d) BV/TV of intact alveolar bone in PTX group is significantly higher than sham group at POD28. (e) Micro CT simulated X ray image of tooth extraction model at POD0. (f) Micro CT 3D reconstruction image of tooth extraction model at POD0. (g) Micro CT 3D reconstruction image of extraction socket at POD7, 14, 28. (h) The BMD of newly formed bone at extraction socket in PTX group is statistically lower than sham group at POD7 and POD14. (n=6-12) (i) The BV/TV of newly formed bone at extraction socket in PTX group is statistically lower than sham group at POD7. (n=6-12)

In summary, our study successfully generated HypoPT rat model and found that HypoPT suppressed bone remodeling, ultimately led to higher alveolar bone volume under physiological condition. Yet, HypoPT resulted in impeded bone turnover, which delayed the repair and regeneration of the extraction socket. These results provide fundamental basis for diagnosis and treatment of orofacial bone defects related diseases in HypoPT patients.

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