

# The influence of alternate parathyroid hormone treatment and mechanical loading on osteoporotic mice tibia

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## Background

Osteoporosis is one of the major health problems for women, which increases the risk of fracture and serious clinical consequences. Intermittent PTH treatment is also a common osteoporosis therapy, and physical activities are generally known as a method to improve bone strength.

The aim of this project is to determine the local bone changes in the mouse tibia due to alternate PTH(1-34) treatment and mechanical loading according to the *in vivo* microCT images.

## Methods

The Regions of interests (ROI) were manually marked and cropped. All the cropped images were divided into 10 sections (11 slices), and consecutive images were superimposed by counting the number of voxels that had undergone apposition.



Figure 1. Study design and treatment schedule

### Study design

Six ovariectomised(OVX) female C57BL/6 mice were treated between week 18 and week 22 (Figure 1)[1].

### Image alignment and processing

The fibulae were digitally removed from the microCT images. The tibiae were aligned with the same reference bone using Amira.

### Polar plot

The apposition on the bone surfaces was separated into their endosteal and periosteal surfaces. The map of Euclidean distances from the change in thickness for the surfaces was computed. The thickness were averaged for the pixels enclosed within an azimuthal range of 5°.

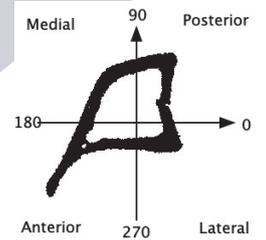


Figure 2. Anatomical regions and angles of remodelled tibia.

## Results

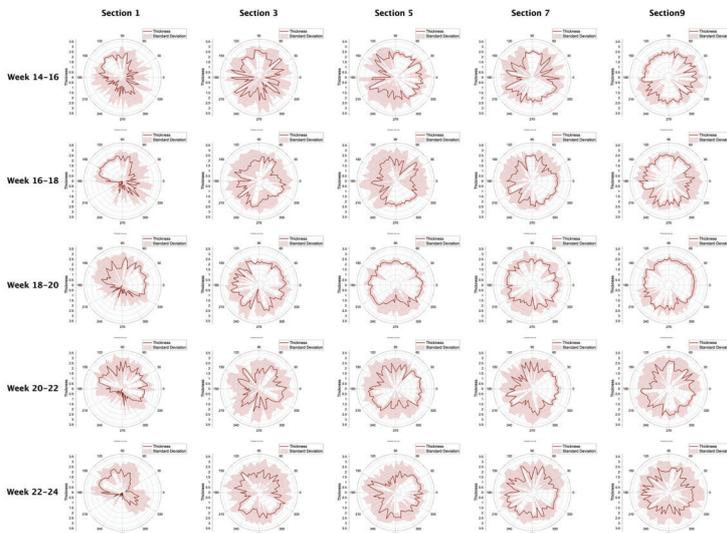


Figure 3. The change in apposition on the endosteal surface for 6 murine tibiae.

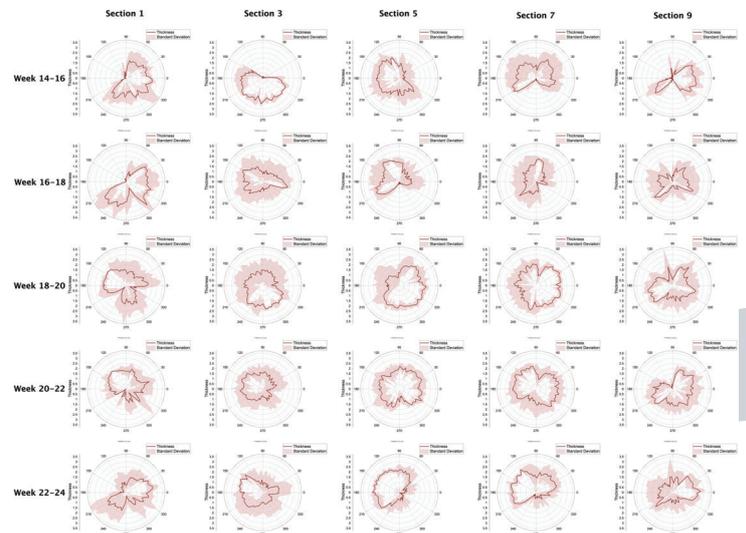


Figure 4. The change in apposition on the periosteal surface for 6 murine tibiae.

## Conclusions

- The apposition with alternating treatment showed both local heterogeneity and regional heterogeneity, especially on the proximal and distal metaphysis.
- On the distal metaphysis, the endosteal appositional growth was higher in the posterior section, and the periosteal appositional growth is along the medial-lateral section on the periosteal surfaces.
- On the proximal metaphysis, the growth was observed higher in lateral surface on the periosteum and evenly on the endosteal surface.

## Reference

[1] Roberts *et al.*, 2020.

## Acknowledgements

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