Effects of PTH treatment on tibial bone of ovariectomized rats assessed by in vivo micro-ct
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Effects Of PTH Treatment On Tibial Bone Of Ovariectomized Rats
Assessed By In Vivo Micro-CT
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Introduction

- Parathyroid hormone (PTH) stimulates bone growth in osteoporotic patients and ovariectomized rats [1].
- Conflicting results have been found however, on the effects of PTH on trabecular thickness and number [1,2].
- Ovariectomy (OVX) has different effects in the meta- and epiphysis of the bone [3,4], and it remains unknown to what extent PTH effects will also vary between these locations.

Therefore, our aim was twofold: 1) determine the effects of PTH on trabecular number and thickness over time, in respect to overall structural changes and 2) compare response to PTH between the meta- and epiphysis. We used an in vivo micro-CT scanner to analyze the trabecular bone in the tibial epi- and metaphysis of OVX rats.

Material and Methods

- Sixteen 6-month old rats were ovariectomized and divided into a PTH (n=9) and (OVX) (n=7) group.
- After 8 weeks the PTH group received a daily s.c. PTH injection (60 μg/kg/day) for 6 weeks.
- Proximal tibiae were scanned (Scanco vivaCT) at week 0, 8, 10, 12 and 14 using a micro-CT scanner (res=30 μm).
- CT-scans were registered to the baseline image to ensure equal orientation.
- Bone structural parameters (bone volume fraction (BV/TV), connectivity density (Conn.D), structure model index (SMI), trabecular number, thickness and separation (Tb.N, Tb.Th, Tb.Sp)) were determined in the epiphysis and metaphysis (fig 1).
- A 1-way ANOVA with repeated measures was done on data between week 8 and 14. P-values below 0.05 were considered significant.

Results

**Metaphysis:** At week 8, both groups showed a deterioration of all structural parameters, indicating the development of osteoporosis (fig 2). PTH treated animals displayed a crude plate-like trabecular bone structure (fig 3a). PTH directly led to an increase in BV/TV accompanied by an increase in Tb.Th, and prevention of further loss of Tb.N. This increase was linear and continued until sacrifice. Loss of Conn.D was prevented and SMI decreased by PTH treatment agreeing with the plate-like appearance.

**Conclusions and Discussion**

- For the first time, the effects of PTH in vivo in the metaphysis were determined agreeing with earlier findings [1].
- In the epiphysis, Tb.N increased linearly over time, while Tb.Th gains waned over time.
- Visual inspection of the registered images did not provide any evidence for de novo formation of new trabeculae, suggesting that some trabecular tunneling would take place.
- PTH treatment interestingly led to approximately the same gain over time in BV/TV in the meta- and epiphysis. These findings suggest that bone cell responses to PTH are similar in the epiphysis and metaphysis, but the resulting structure is different.

References:


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