

Biomechanical characterization of mandibles and femurs in an animal model of osteochondronecrosis in rats

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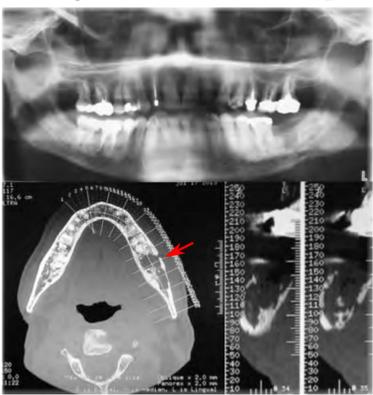
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INTRODUCTION

Bisphosphonates (BPs) are commonly used to treat bone diseases such as osteoporosis, malignant hypercalcemia, and bone metastases. BP-related osteonecrosis of the jaw (BRONJ) is a major side effect of these drugs, occurring after tooth extraction in 61.8% of cases. The cumulative incidence of BRONJ ranges from 2.8 to 11.6% per year depending on the study, with 0.01% in patients with osteoporosis [1].



Limited medical treatment (patient with weak health):

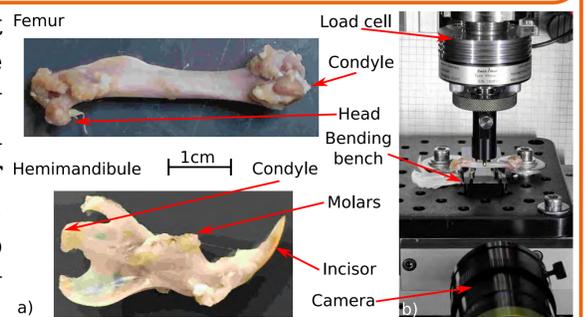
- ✗ grafts
- ✗ implants

✓ Low level laser therapy (LLLT)

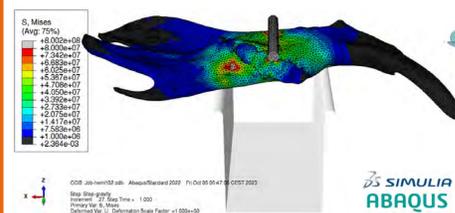
The effects of BRONJ remain poorly studied in terms of the mechanical response of bone structure in preclinical studies, due to the lack of a reproducible animal model and the difficulty of setting up appropriate experiments.

MATERIALS & METHODS

A 3-point bending test was used until the sample broke, following a procedure described in the literature for hemimandibles [2], which was extended to the femur by applying the load to the central area [3].



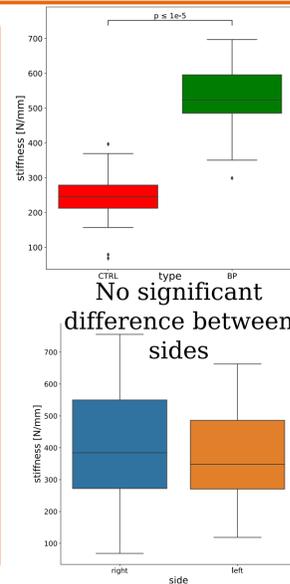
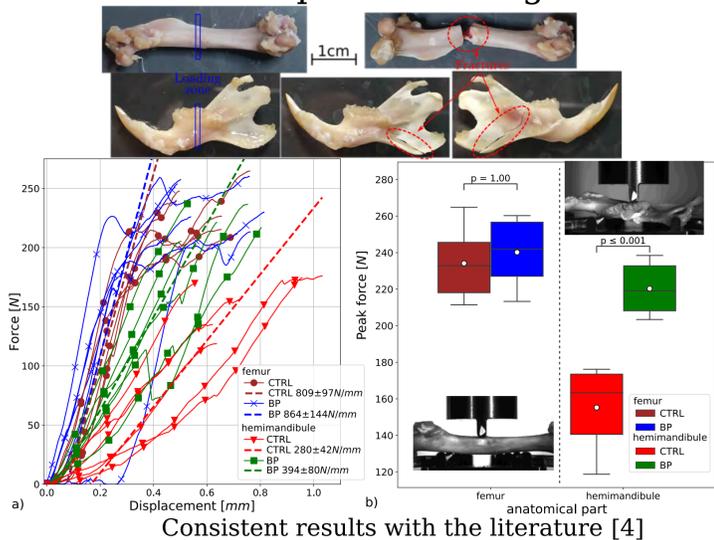
In parallel, a finite element (FE) simulation tool was used to characterize the mechanical properties of the tissues. The pins were considered to be solid rigid in frictionless contacts with the bone structures [2].



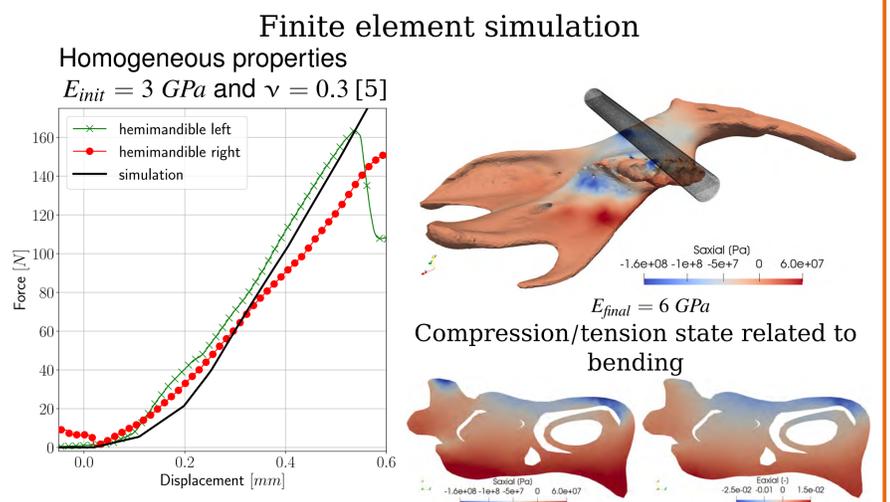
Two types of sample were tested: control (CTRL) and BPs treated (BP).

RESULTS

Three point bending

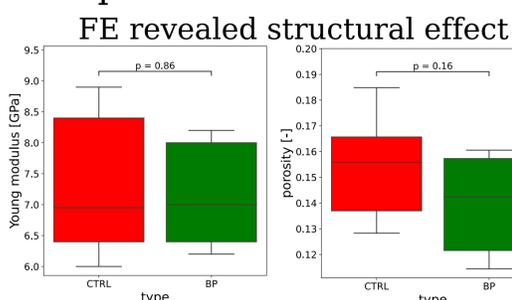


Focus on hemimandibles

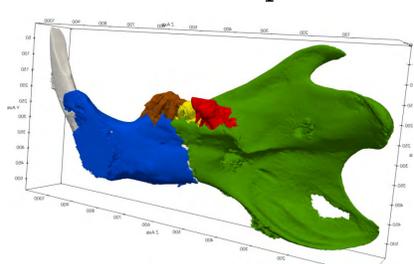


CONCLUSION & OUTLOOK

The objective of this study is to validate and characterize a model of BRONJ in rats, with a view to evaluating the effect of preventive therapies in vivo.



Various fracture patterns



Extension to femur



This study highlights that bisphosphonate treatment does not affect bone tissues in the same way: hemimandibles are more sensitive to the BPs.

ACKNOWLEDGEMENTS



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