**ABSTRACT**

Seventy-two, female, 3-month old OSX-mcherry mice were included in the study. Osteoporosis was induced by ovariectomy (OVX) and calcium-deficient diet in 36 mice, test group (TG). The other 36 mice were sham operated (their ovaries were identified and surgically exposed) - control group (CG). Seven weeks following osteoporosis induction, 1 implant (0.9 x 8 mm) was placed in each femur of each animal for both groups (Neodent Implants, Straumann). One implant had a hydrophilic surface (Neopros) and the other one had a hydrophilic treatment surface (Acqua). New bone formation and bone-implant contact was assessed by histology and NanoCT analysis at 14, 21 and 28 days after implant placement. Calcium content was measured by EDX on the surface of the implant after 7 days. After 3 and 7 days gene expression of several genes were evaluated using real time PCR. The amount of calcium deposited on the surface due to the mineralization process was higher for (Acqua) surface after 7 days. Consistently, in our gene expression studies, hydrophilic treatment surface showed increased levels of gene expression related to bone formation. Analysis in TG showed that genes involved in the bone morphogenetic protein signaling, such as ALP, BSP, SOST and SP7, were significantly activated in the hydrophilic treatment surface.

**RESULTS**

Experimental animal model

- **SEM/EDX evaluation**
  - 7 days
- **Gene expression**
  - 3 and 7 days
- **NanoCT evaluation**
  - 14, 21 and 28 days
- **Histological evaluation**
  - 14, 21 and 28 days

**METHODS & RESULTS**

**INTRODUCTION**

The number of elderly patients seeking treatment with dental implants and affected by conditions that lead to more implant failures has increased in the recent years. The literature remains deficient in indication protocols for dental implants in patients with osteoporosis. Using a mouse osteoporotic model this study aimed to determine the influence of titanium surfaces (hydrophilic and hydrophobic) on gene expression and bone formation during the osseointegration process. The present study aims to determine the pattern of bone formation on two different titanium implant surfaces (hydrophilic and hydrophobic) in an osteoporotic model defining surface influence in osseointegration.

**DISCUSSION**

1. Elderly patients seeking treatment with dental implants and affected by conditions that lead to more implant failures has increased in recent years. The literature remains deficient in indication protocols for dental implants in patients with osteoporosis. This study aimed to study the influence of titanium surface energy (hydrophilic and hydrophobic) on during osseointegration using an osteoporosis mouse model.

2. An increase in the differentiation of mesenchymal stem cells and their production of osteogenic and angiogenic microenvironment has been shown to occur with increased roughness and wettability of a Ti surface.

3. Successful induction of osteoporosis in rodents has been reported in previous studies where a similar experimental model was used for the evaluation of bone healing in osteoporotic conditions.

4. In this study, it has been proved that the amount of Calcium is greater around the hydrophilic surface and it is known from previous studies that Ca and (PO4)3- ions stimulate cellular and intracellular signaling and favor osteoblast cell activity in the process of bone formation.

5. Real-time PCR analysis at 3 and 7 days revealed different effects of the experimental surfaces on gene expression levels in periimplant osteoporosis.

6. Consistently, in our gene expression studies, hydrophilic treatment surface showed increased levels of gene expression related to bone formation.

7. The control ratio of pro-inflammatory and anti-inflammatory response revealed in this study at the host-biometric interface will allow damaged tissue to be removed without a prolonged immune response that can lead to the creation of foreign body giant cells and inhibition of healing and integration.

**SUMMARY**

Based on our results, due to the increased expression of genes related to osteogenic differentiation and significant amount of calcium content, the choice of the hydrophilic surface in situations of osteoporosis could be considered to improve osseointegration process.