

Histological Evaluation and Biomechanical Impact of Titanium Implants Produced by Additive Manufacturing Process in Osteoporotic Animals, Using Risedronate

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Background and Aim:

- Osteoporosis is a metabolic disease that can lead to the deterioration of the bone microarchitecture, impairing the quality of bone tissue and its repair process¹ → Damage to bone / implant interface → risk for implant success. ^{2,3,4}
 - Pharmacological therapy for the treatment of osteoporosis can be classified into antiresorptive and anabolic agents. Bisphosphonates is one of the most commonly medications used in this situation. ^{5,6,7,8}
 - Role of the microstructure of the implant surface → improve the osseointegration. ^{9,10,11}
- This preclinical study evaluated the histological aspect and biomechanical impact of risedronate on removal torque as part of assessing the osseointegration of implants produced by additive manufacturing^{Da} placed in an animal model of induced osteoporosis.



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Material and Methods:

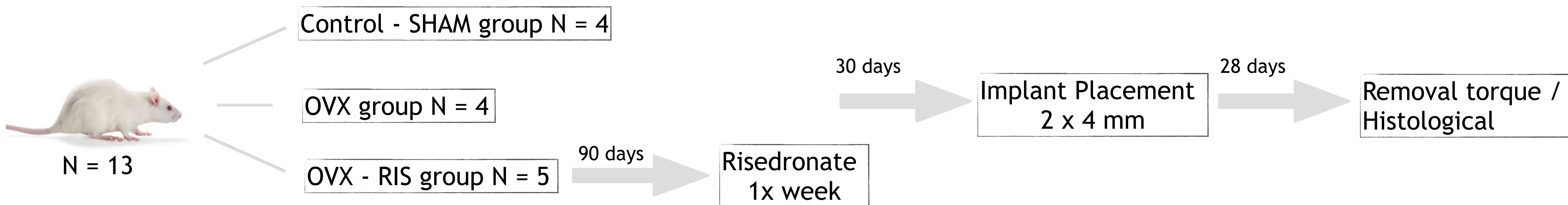
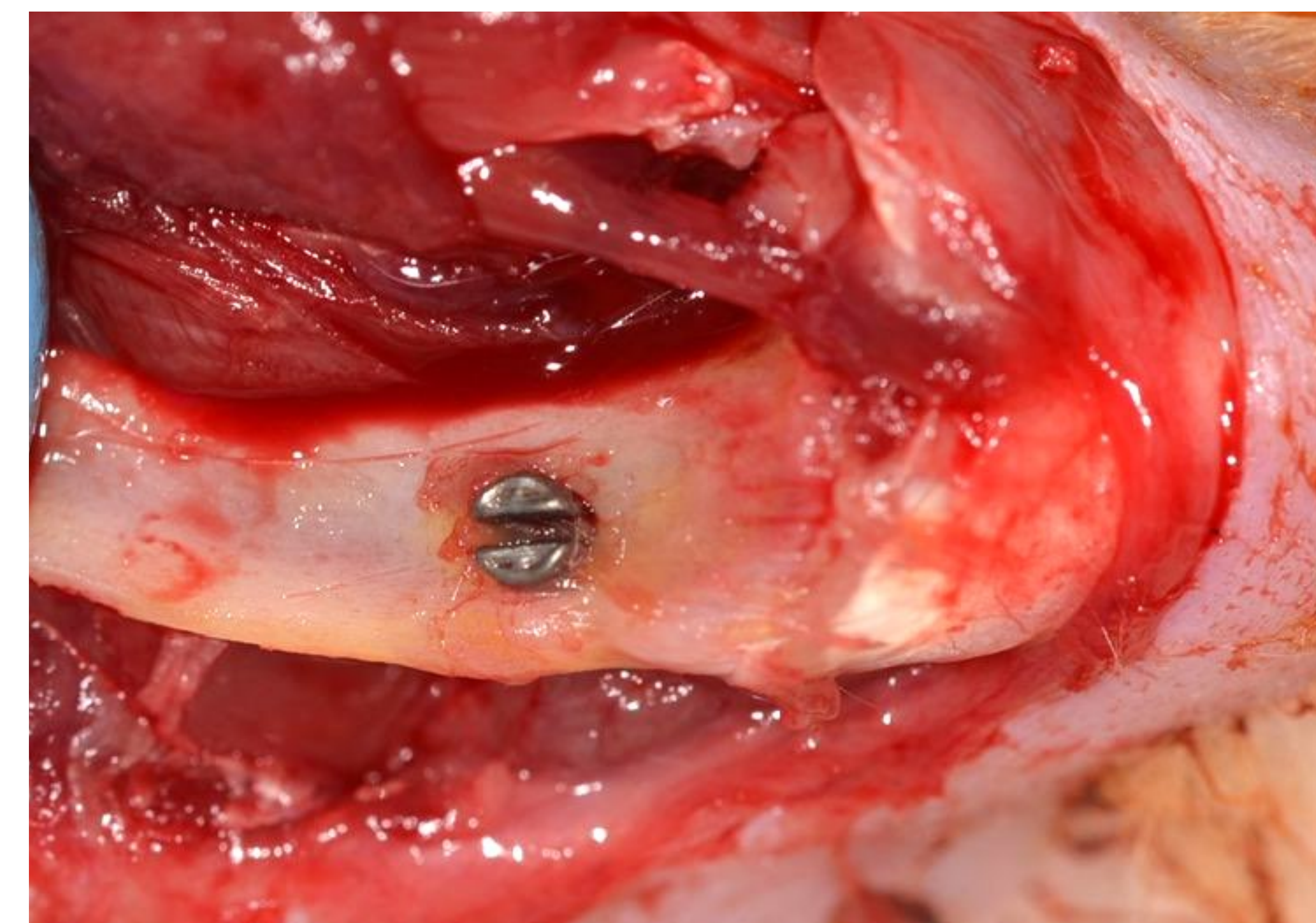


Fig 1. 2 x 4 mm implant produced by additive manufacturing process



Figs 2 and 3. One Implant was placement in each tbibia of each animal

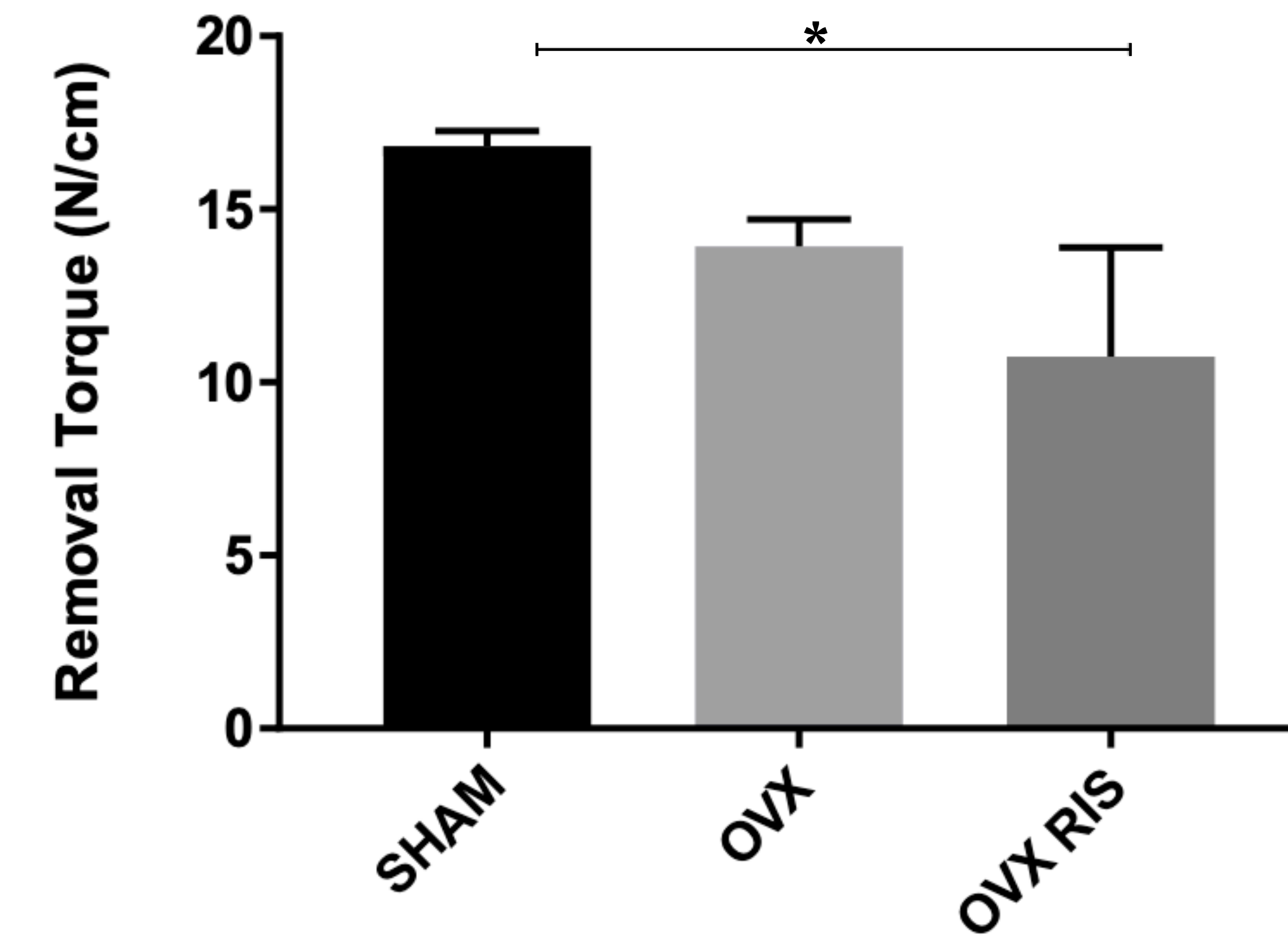
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Results:

Removal torque test N.cm

Group	Mean $\pm$ SD
SHAM	16.84 $\pm$ 0.43 *
OVX	13.94 $\pm$ 0.98
OVX - RIS	10.74 $\pm$ 3.14 *

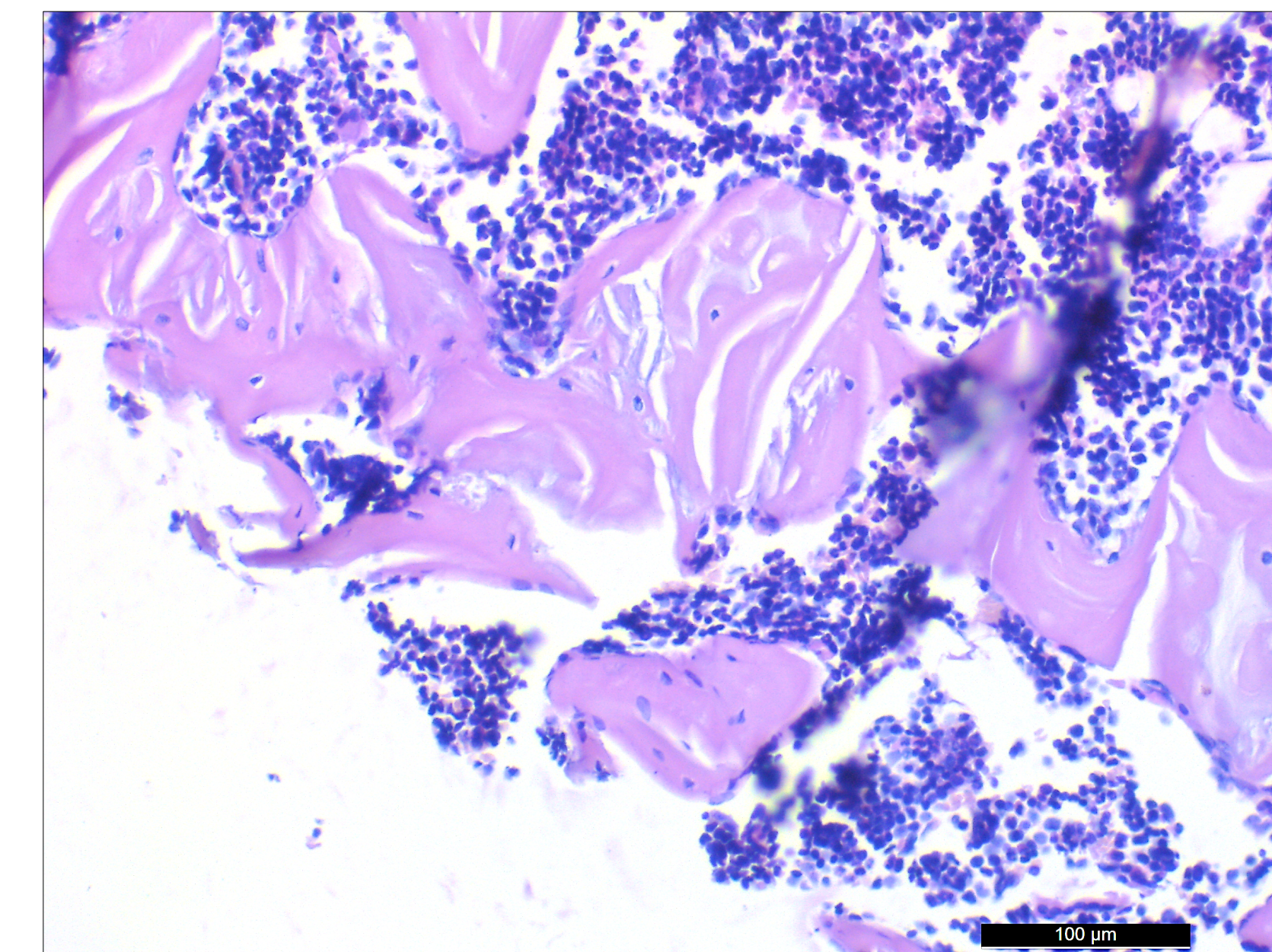
Anova one way test - *P < 0,05



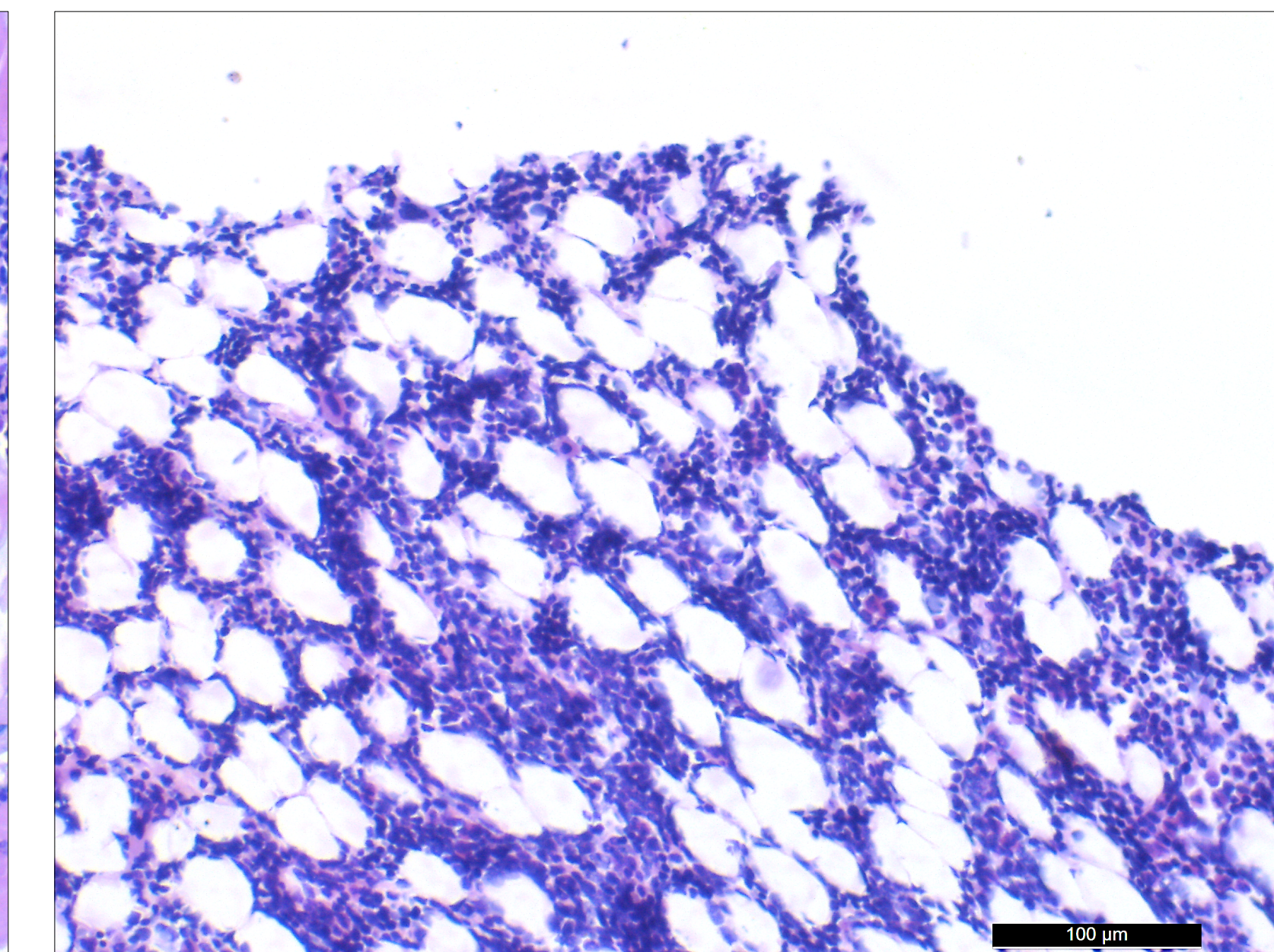
Histological evaluation:

- SHAM: important **mature bone formation** in the region of the implant threads.
- OVX: medullar tissue and **absence of bone formation** close to the implant thread.
- OVX- RIS: a more organized connective tissue, with **some areas of bone formation** close to the implant threads

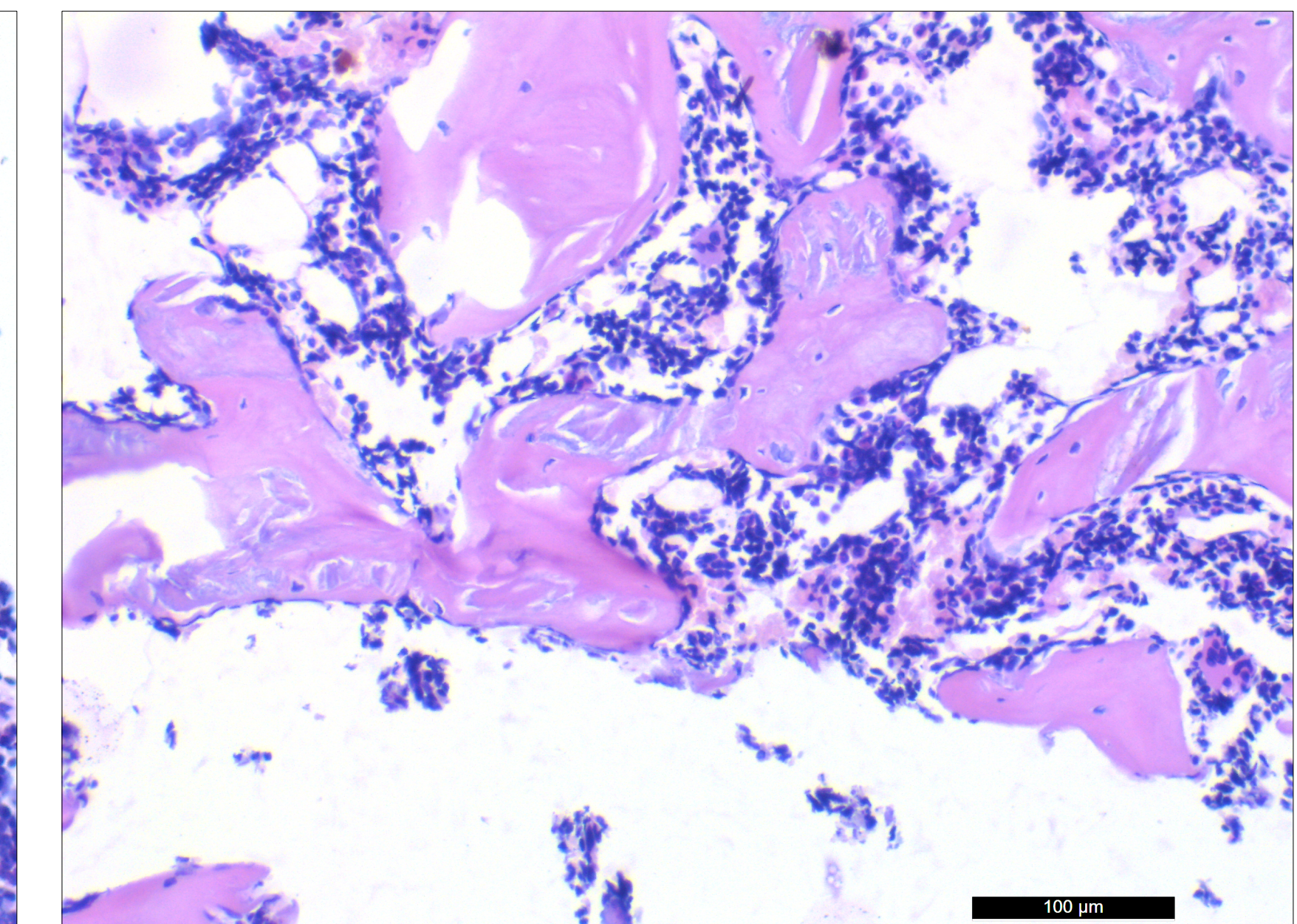
SHAM



OVX



OVX + RIS



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Discussion:

- In agreement with previous studies, our results showed that **osteoporosis can jeopardize the osseointegration of dental implants**.
- In this study we used an **implant produced by additive manufacturing process**, wich **seemed to be beneficial** for the biological events related to the osseointegration in the control and OVX - RIS groups.
- Systemic medications ?? heterogeneity → Time, frequency, duration of use ?? Variation → Favorable / Unfavorable Results ??
- In our study the use of **Risedronate** showed to be **beneficial for the bone formation** around implants.

Conclusion:

- The use of risedronate improved the peri-implant bone formation in osteoporotic animals. However, it did not influence the removal torque value of the implants.

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