Propofol attenuates osteoclastogenesis by lowering RANKL/OPG expression ratio in mice osteoblast

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Background

- Bone homeostasis is maintained by a balance of bone remodeling, osteoblastic bone formation, and osteoclastic bone resorption.
- Propofol is widely used for induction and maintenance of general anesthesia in various clinical situations.
- Although there are studies on the effects of various drugs on bone loss and fracture outcome, the effect of propofol on bone remodeling process has not been clearly investigated.
- Therefore, this study have examined the effect of propofol on the
 - osteoblastic differentiation
 - the expression of RANKL/OPGto delineate the correlation between propofol administration and bone remodeling process.

Methods

- The effects of Propofol on cell viability and proliferation were measured by **MTT assay**.
- The osteogenic differentiation was evaluated by **ALP staining** or **ALP enzyme activity assay**
- Calvarial pre-osteoblast cells were cultured in the OM for 8 days in the presence of indicated doses of propofol (0, 20, 50 μ M).
- At the end of culture
 - osteoblast markers (ALP, OCN, and OPN)
 - osteoclastogenic cytokines (RANKL and OPG)were examined by **RT-PCR**.
- The expression levels of **RANKL** and **OPG mRNA** were assessed by **quantitative real-time PCR** analyses.
- TRAP staining** was performed and the number of **mature osteoclasts** was counted to verify the effect of propofol on osteoclastogenesis.

Results

- Propofol does not have either cytotoxic effect or cell proliferation altering effect on primary calvarial osteoblast.**
- Propofol does not affect osteoblast differentiation.**
- The RANKL/OPG ratio was decreased by propofol administration.**

[Figure. 1]

- At the end of culture, the protein levels of
 - Osteoblast markers (ALP, OCN, and OPN)
 - Osteoclastogenic cytokines (RANKL and OPG)

[Figure. 2]

- The expression levels of **RANKL** and **OPG mRNA** were assessed by **quantitative real-time PCR** analyses

4. Propofol lowers the osteoclastogenesis supporting activity of osteoblast

[Figure. 3]

- At the end of culture, **TRAP staining** was performed and the numbers of **matured osteoclasts** were counted

Conclusion

- This study identified that **propofol attenuated RANKL expression** in osteoblast without affecting cell viability.
- It might be confirmed the correlation between propofol administration and bone remodeling process.
- As one of the most commonly used drugs in orthopedic procedure, it would be liked to make a point of confirming that propofol is helpful in bone remodeling process.

References

- Theill LE, Boyle WJ, Penninger JM. RANK-L and RANK: T cells, bone loss, and mammalian evolution. Annu Rev Immunol 2002; 20: 795-823.
- Coetzee M, Kruger MC. Osteoprotegerin-receptor activator of nuclear factor-kappaB ligand ratio: A new approach to osteoporosis treatment? South Med J 2004; 97: 506-11..