

The effect intrasulcular application of Bisphosphonate Risedronat hidrogels towards osteoclast and osteoblast ratio during relapse tooth movement period

Conclusion

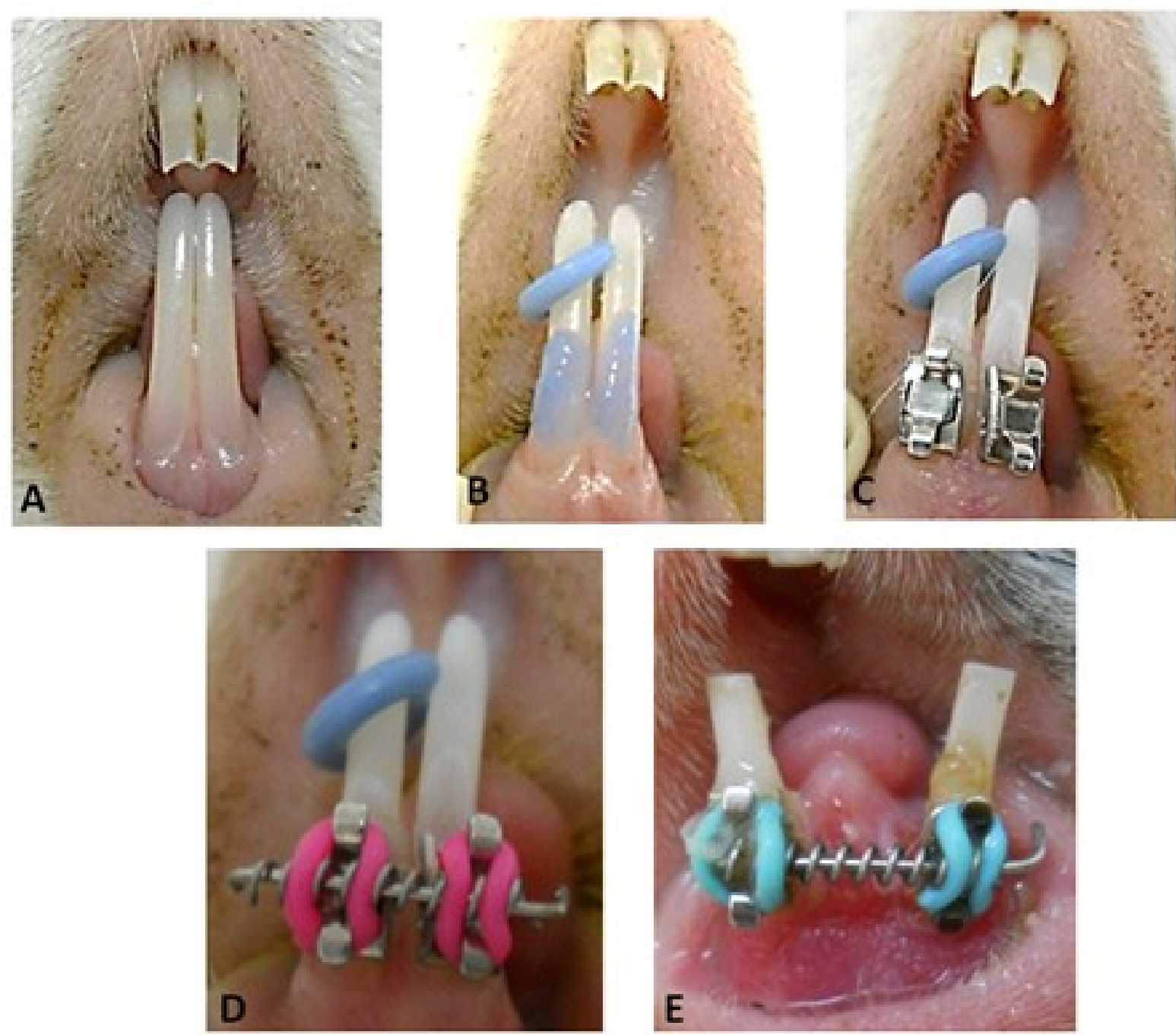
- Histology examination using HE staining show that osteoblast has dominant activity than osteoclast during relapse tooth movement period.
- Bisphosphonate risedronate with gelatin hydrogel as a carrier have an effect on the ratio of osteoclast and osteoblast in relapse tooth movement.

Objective

The aim of this study was to determine the effect of bisphosphonate risedronate with gelatin hydrogel as a carrier to the ratio of osteoclast and osteoblast in relapse tooth movement.

Research Method

- Lower incisor of 75 guinea pigs were moved distally using open coil spring until ± 3 mm.

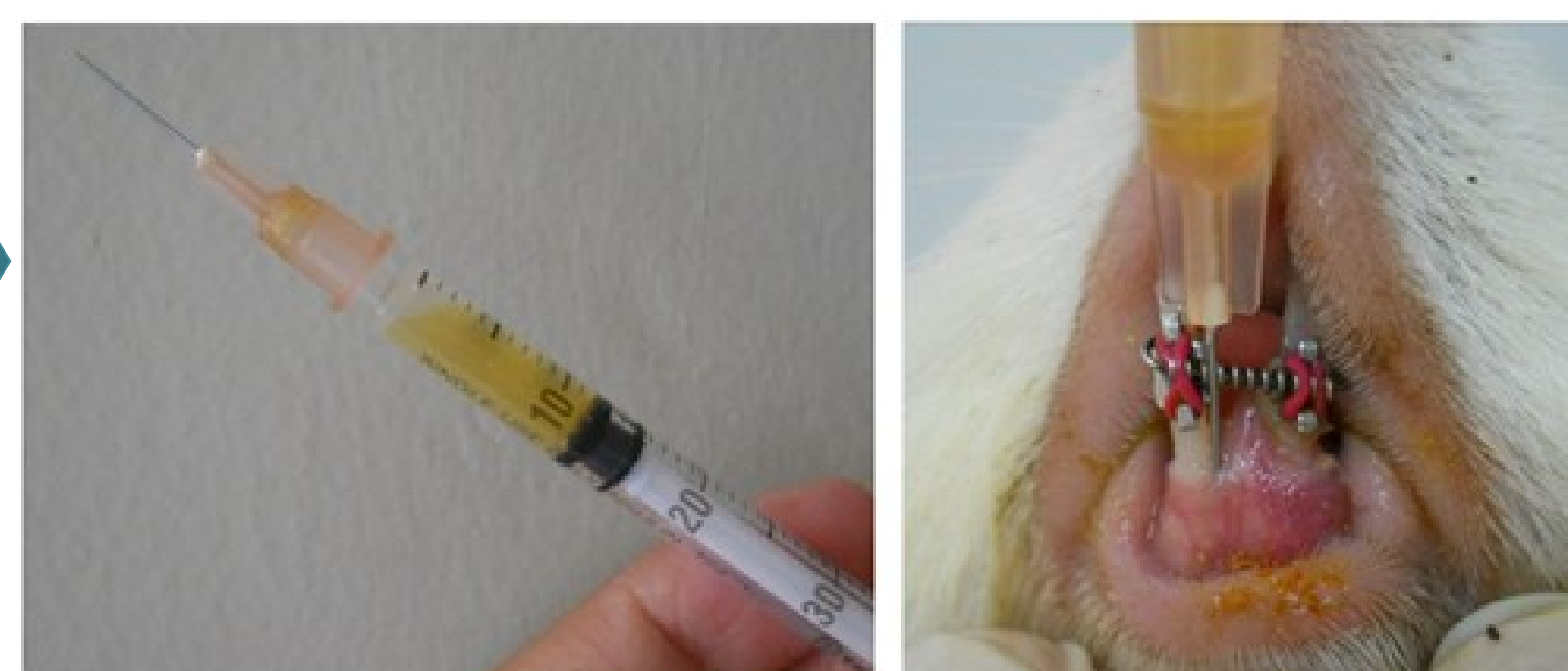


- Risedronate hydrogel concentration of 250 $\mu\text{mol/L}$ (Group B) and 500 $\mu\text{mol/L}$ (Group C) was applied to each 25 guinea pigs in the gingival sulcus mesial area every three days.

- After stabilization for 14 days, open coil spring were removed and histology examination made (mesial side) by counting the number of osteoclast and osteoblast at day 0, 3, 7, 14 and 21 using HE staining.



- 25 guinea pigs without application of hydrogel were use as control (Group A).



Introduction

Relapse is tooth movement into its original position which has the same pattern with orthodontic tooth movement. The bone resorption undergo in pressure area with increase osteoclast activity, however in tension area bone formation with osteoblast activity. Bisphosphonates are class of drugs that prevent differentiation and activity of osteoclast that is important to inhibit bone resorption and then is expected inhibit relapse. Bisphosphonate also reported to have straight effect towards osteoblast. Some studies related to the preventive effects of bisphosphonate against bone resorption have been extensively done in dentistry. However, topical administration to result local effect is still problems. Drug delivery technology using drug carrier is considered to be a candidate to overcome the problems because the system is effective to transport pharmaceutical substances into targeted area and affect topically.

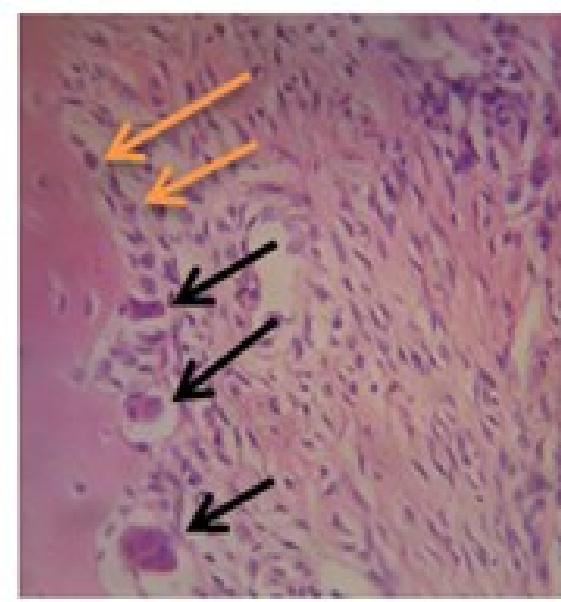
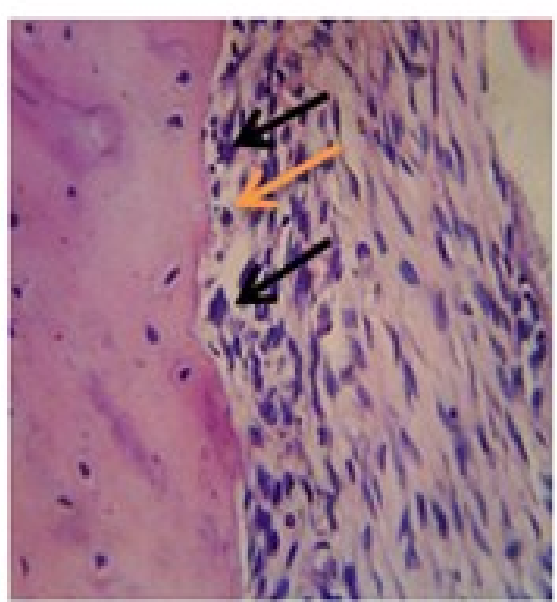
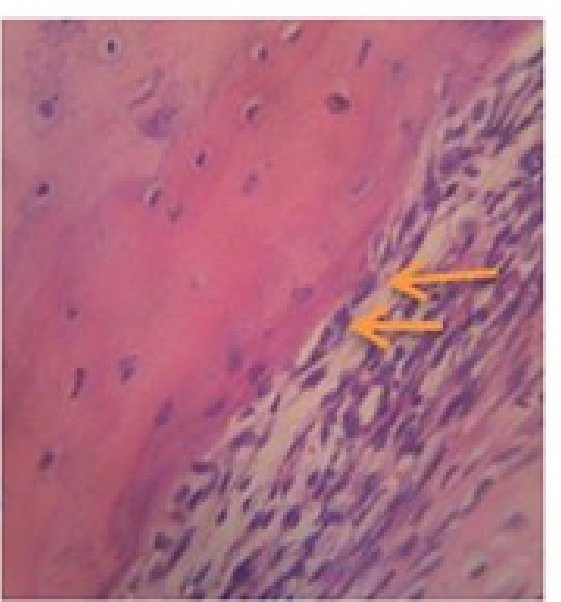
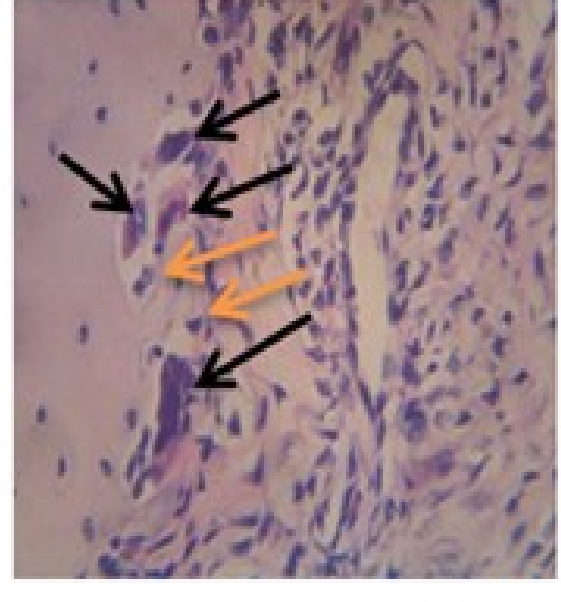
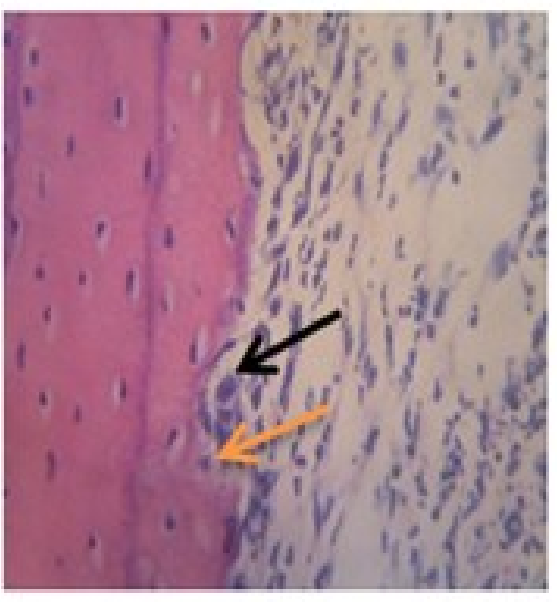
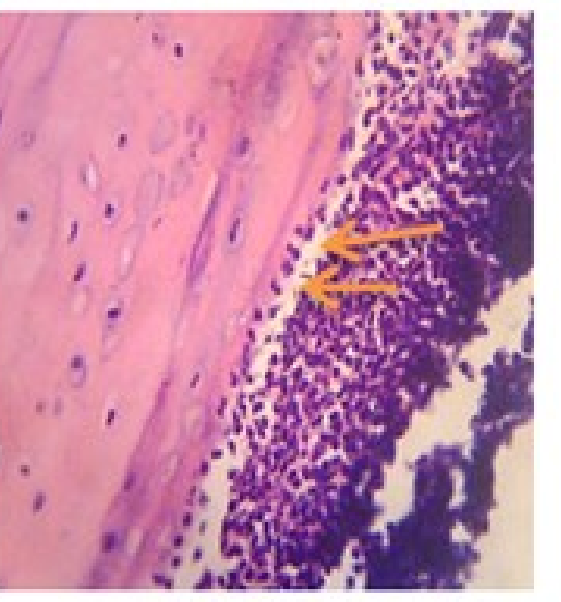
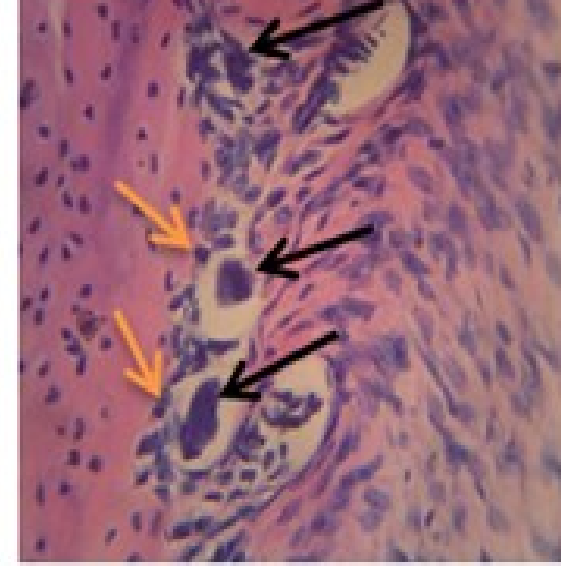
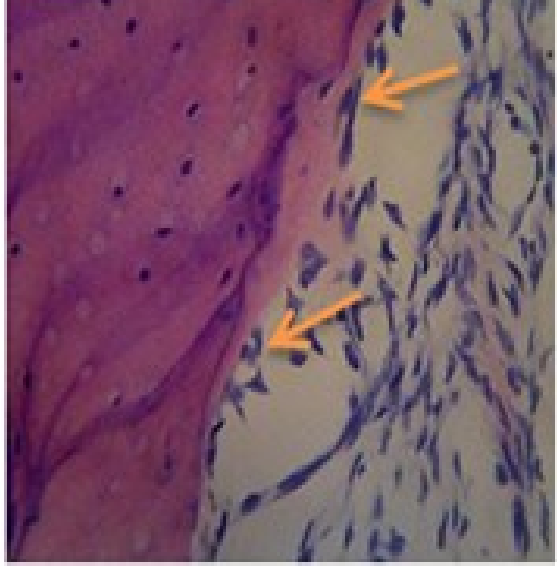
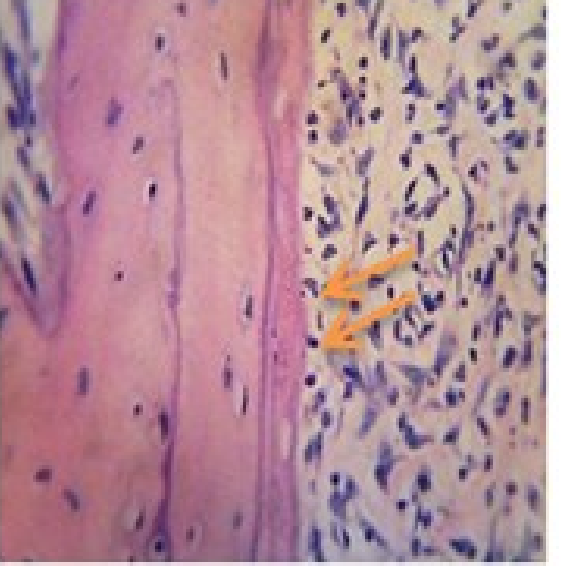
Day	Without Risedronate (A)	Risedronate 250 $\mu\text{mol/L}$ (B)	Risedronate 500 $\mu\text{mol/L}$ (C)
3			
14			
21			

Figure 1. Histological view of osteoclasts and osteoblasts day 3, 14 and 21 (x400,HE).

Result

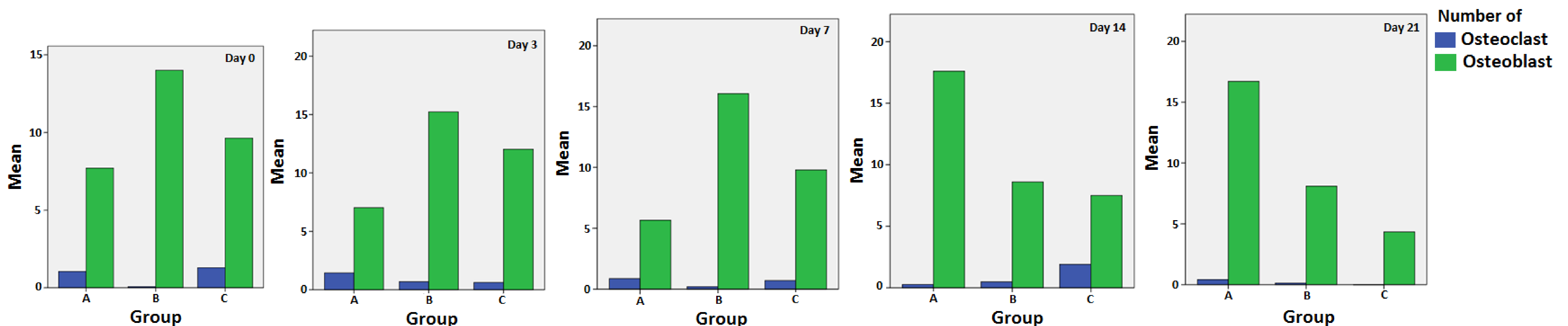


Figure 2. Graphic of Mean ratio of osteoclast and osteoblast in group A, B and C.

⇒Osteoblast was dominant cells between all groups compared with osteoclast.

⇒There was significant difference ratio of osteoclast and osteoblast at day 3 ($p < 0.05$), group A present higher ratio than group B and C.

⇒There was a significant difference in the number of osteoblasts at day 3 and 7 where groups B and C higher than group A.



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Discussion

- Activity of osteoblasts in the process of bone formation is more dominant than activity of osteoclasts during relapse tooth movement. Osteoclast number decrease significantly in three days, it might because of apoptotic and also reduction of blood vessel density (Murell et al., 1996; Noxon et al., 2001). The number of osteoclasts decrease further on the 14th day and began to stabilize in the 14 to 21 periods of relapse (Tanya et al., 2011).

- Bisphosphonates increase the proliferation of BMSC (bone marrow stromal cells) and initiate osteoblastic differentiation. Although the main action of bisphosphonates is the inhibition of bone resorption by osteoclasts (Rodan et al., 2000), Osteoblast maturation after bisphosphonate treatment also involves strong upregulation of gene expression of BMP-2 (Im et al., 2004). BMP-2 is an osteoconductive agent and a potent growth factor that is involved in the recruitment, proliferation and differentiation of mesenchymal progenitor cells, and eventually resulted in the production of bone tissue (Wozney, 1989).