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College of Dentistry

Study the role of Lisinopril / Collagen type- I on ossteointegration of titanium dioxide implant in rabbits

(Histological, Histomorphometrical & ELISA test on Osteocalcin &bone specific alkaline phosphatase)

A Thesis

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By

Abdulsattar Salim Mahmood

B.D.S., High diploma in oral diagnosis, M.Sc. in oral histology

Supervised by:

Ass. Prof. Dr. Eman Issa Altememe

B.D.S, M.Sc., Ph.D. in Oral histology & Biology

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ABSTRACT

Abstract:

Back ground: There are very few data about the effect of angiotensin converting enzyme inhibitors (Lisinopril) locally on the osseointegration around titanium implants. There is wide controversy about its effects on the osseointegration in addition to its effect on the smooth muscle fibers of blood vessels and control blood pressure.

Aim of the study: This study was carried out to evaluate the histological behavior of Lisinopril as one member of ACEI family on the osseointegration to titanium surface and detect any synergistic effects after combination with collagen fiber type I and titanium dioxide that coat implant surfaces

Materials and methods: Eighty four rabbits (60 rabbits for decalcified section and 24 rabbits for ground section study) were used for fixation of titanium screw in the femur bone of all rabbits. Each 84 screws were machined in a diameter about 3.5 mm, length of 8mm (5mm was threaded and 3mm was flat). All implant surfaces were oxidized by 900^{o}C and 2.2 mbar pressure to produce titanium dioxide layer over surface of implant.

Sixty rabbits used for decalcified section were subdivided into 3 groups(20 rabbits for each). Twenty rabbits subjected to implant fixation alone as control groups. Other 20 rabbits, the cavity of implant filled with Lisinopril in a dose of 1mg /kgm before fixation of implant as an experimental group. The last 20 rabbits, the cavity of implant filled with collagen type- I with Lisinopril powder in a dose of 1mg /kgm. All groups are sacrified in intervals of 1, 2, 3 and 4 weeks then examined histomorphometrically for bone trabecullar thickness and

osteoblasts number. Then blood sample was taken from each 60 rabbits for examination of bone specific Alkaline Phosphatase serum level and rabbit Osteocalcin serum level by enzyme link immune sorbent assay (ELISA) test.

The other twenty four rabbits used in this study were also subdivided into 3 groups (8 rabbits for each) in the same manner used for previous 60 rabbits and also sacrified in 1, 2, 3 and 4 weeks intervals. But these rabbits used for preparation of bone-implant block to study under fluorescent microscope for ground section that labeled with oxytetracycline as fluorescent dye that injected during rabbit life to assist counting of osteoblasts and bone trabecular thickness.

After scarified rabbits the femur bones, especially the implantation area, were examined radiologically to assist bone density of new bone formation around implant by densometric analysis soft wear of digital dental radiological machine.

Results: Histological and hisomorphometrical result revealed significant elevation in the number of osteoblast adhered to the implant surface and new bone trabecular thickness in the two experimental groups than that of control one mainly at the end of first week, with higher osseointegration activity were seen in Lisinopril and collagen – I group.

The difference between the osteoblasts number at the end 2nd and at the end of 3rd weeks in the two experimental groups reduced until reach constant levels at the end of 4th week.

These results were supported by the level of Bone specific Alkaline Phosphatase and Osteocalcin enzyme serum levels as it highly elevated at first week in experimental group than control group. This elevation reduced gradually with progression of osseointegration around titanium screw. The levels of alkaline phosphatase and osteocalcin were higher in a mixture of Lisinopril and collagen type-I than that of addition Lisionpril alone. These

changes allow to immediate bone formation and mineralization of new bone that obviously increase bone density.

Conclusion: This study was illustrated that Lisinopril enhanced and accelerate osseointigration around titanium implant with marked synergistic effect after combination with collagen fiber type I by facilitating bone cells activation, differentiation and increase bone formation.