Introduction: Tricalcium phosphate (TCP) cement is a bioabsorbable material used in clinical applications as bone substitute material. In orthodontic treatments the presence of bone cement over miniscrew is an alternative approach to fix the screw and enhance bone healing. In this study, the effect of TCP cement treatment over miniscrew was investigated both on different bone healing stages and primary stability of orthodontic miniscrew.

Method: 36 male of New Zealand white rabbits were used and 4 miniscrews were implanted on each tibia of both legs. Animals were divided into four groups (in each group n=9) based on post-operation periods, and the cement treated (a) and untreated (b) miniscrews were implanted on right and left tibia in all groups, respectively. Tibias were dissected after 24h (Group 1), 2 weeks (Group 2), 4 weeks (Group 3), and 8 weeks (Group 4) of implantation. Samples were decalcified for 14 days after fixation. Sections of samples were stained with hematoxylin-eosin to evaluate histomorphometrical analysis based on thickness, number and areas of trabecules by image analysis system. Biomechanical stability was evaluated by measuring maximum torque, maximum pull-out load and tensile strength. Specimens were loaded at a cross-head speed of 1 mm/min using a universal testing machine. The force needed to remove the miniscrew was measured using a digital torque by DID-05-E Digital Torque Screwdriver.

Results: Histopathological evaluations revealed any inflammation, foreign substance reaction and necrosis in all groups. According to histomorphometrical analysis based on thickness, number and areas of trabecules, the measurements of Group 2, 3 and 4 for untreated and cement-treated tissues were almost similar. In Group 1 vascularization was prominently higher in the untreated tissues compared to the cement-treated tissues. Specimens were loaded at a cross-head speed of 1 mm/min using a universal testing machine to evaluate the pull-out strength and shear strength. The force needed to remove the miniscrew was measured by DID-05-E Digital Torque Screwdriver. A statistically significant difference was found between the pull-out strengths of the groups (p<0.01). The pull-out strengths of the miniscrews placed with TCP were significantly greater than the untreated groups. In shear tests, there was no statistically significant difference among the groups.

In conclusion, the usage of bioabsorbable cement on the miniscrew could be recommended to be used in orthodontic treatments. Eventhough the bone healing stages were similar among all groups according to histopathological evaluation, the mechanical test results revealed that the treatment of cement with miniscrew enhances the stability of the implant.