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**Corresponding author:**  
Taksid Charasseangpaisarn,  
E-mail: taksid.c@rsu.ac.th

## Research article

# Reduction of Insertion Torque on Orthodontic Mini-screw Implant by means of Reduced Friction

Chavin Jongwannasiri<sup>1</sup>, Taksid Charasseangpaisarn<sup>2,\*</sup>, Shuichi Watanabe<sup>3</sup>

<sup>1</sup> Faculty of Medicine and Public Health, HRH Princess Chulabhorn College of Medical Science, Chulabhorn Royal Academy, Bangkok 10210, Thailand

<sup>2</sup> Department of Prosthodontics, College of Dental Medicine, Rangsit University, Pathum Thani 12000, Thailand

<sup>3</sup> Department of Applied Chemistry, Faculty of Fundamental Engineering, Nippon Institute of Technology, Saitama 345-8501, Japan

**Abstract** In this article, the reduction of insertion torque on the orthodontic mini-screw implants (OMI) was studied. Three types of diamond-like carbon (DLC) films (DLC, Si-DLC, and F-DLC) were deposited on the OMIs by plasma-based ion implantation technique. The maximum insertion torque (MIT) value was measured using a physiodispenser during insertion on a mandibular pig jaw. Ten OMIs of each condition were used to evaluate the MIT values compared to the Ti-6Al-4V typed OMI. The statistical analysis of data was analyzed by One-way analysis of variance (ANOVA) and Tukey HSD. The results indicated that the Ti-6Al-4V showed the highest MIT but not significantly different from the F-DLC ( $P > 0.05$ ). DLC and Si-DLC showed a significant reduction in MIT comparing to the Ti-6Al-4V ( $P < 0.05$ ). However, the Si-DLC showed the lowest MIT among groups ( $P < 0.05$ ). This phenomenon was due to the decreasing friction coefficient during OMI's insertion on a mandibular pig jaw. Therefore, the DLC coating, especially Si-DLC, could reduce the MIT value of OMI. It is thought that the lowering friction coefficient yields the lowering of MIT value.

**Keywords:** Diamond-like carbon, Friction, Insertion torque, Mini-screw implant

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