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Original Articles

## Effects of the Taper Shape, Dual-Thread, and Length on the Mechanical Properties of Mini-Implants

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### Abstract

**Objective:** To analyze the mechanical effects of the length and the various shapes such as cylindrical shape, taper shape, and dual-thread shape on the insertion and removal torque of mini-implants.

**Materials and Methods:** Mini-implants (diameter 1.6 mm and length 6 mm and 8 mm) consisting of cylindrical, taper, and dual-thread groups were inserted and removed in Sawbones while measuring the torque and time. Mechanical analysis was done of maximum insertion torque (MIT), maximum removal torque (MRT), torque ratio (TR; MRT/MIT), insertion angular momentum (IAM), removal angular momentum (RAM), and time of MIT. Measurements were statistically evaluated to analyze any differences of shapes and lengths.

**Results:** The cylindrical shape had the lowest MIT and MRT in each length. Although taper shape showed the highest MIT in each length, dual-thread shape showed significantly higher MRT, TR, and RAM in each length ( $P < .05$ ). Dual-thread groups showed a gentle increase of insertion torque and a gentle decrease of removal torque in contrast to the other shape groups. However, it had higher IAM and time of MIT. The long length group showed significantly higher measurements except for TR.

**Conclusions:** Dual-thread shape provided better mechanical stability with high removal torque on the broad range than other shapes. However, dual-thread shape may need improvement for reducing the long insertion time to decrease the stress to the surrounding tissue.

**Keywords:** [Mini-implant](#), [Shape](#), [Dual-thread](#), [Mechanical](#), [Torque](#)

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