

## Comparison between Torsional Ultrasonic Assisted Drilling and Conventional Drilling of Bone: An in vitro Study

**Authors :** Nikoo Soleimani

**Abstract :** Background: Reducing torque during bone drilling is one of the effective factors in reaching to an optimal drilling process. Methods: 15 bovine femurs were drilled in vitro with a drill bit with a diameter of 4 mm using two methods of torsional ultrasonic assisted drilling (T-UAD) and convent conventional drilling (CD) and the effects of changing the feed rate and rotational speed on the torque were compared in both methods. Results: There was no significant difference in the thrust force measured in both methods due to the direction of vibrations. Results showed that using T-UAD method for bone drilling at feed rates of 0.16, 0.24 and 0.32 mm/rev led for all rotational speeds to a decrease of at least 16.3% in torque compared to the CD method. Further, using T-UAD at rotational speeds of 355~1000 rpm with various feed rates resulted in a torque reduction of 16.3~50.5% compared to CD method. Conclusions: Reducing the feed rate and increasing the rotational speed, except for the rotational speed of 500 rpm and a feed rate of 0.32 mm/rev, resulted generally in torque reduction in both methods. However, T-UAD is a more effective and desirable option for bone drilling considering its significant torque reduction.

**Keywords :** torsional ultrasonic assisted drilling, torque, bone drilling, rotational speed, feed rate

**Conference Title :** ICBE 2019 : International Conference on Biomedical Engineering

**Conference Location :** Montreal, Canada

**Conference Dates :** May 23-24, 2019