

# Factors Affecting Heat Generation during Bone Drilling and Implant Surgery

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Bone drilling is a complicated process and creates deformations on the hard and soft tissues, as well as surrounding organs during the implant surgery and drilling process. The drills used in surgeries must have sharp cutting edge, rake angle, specific stiffness and adequate toughness along with high precision. The drill should also provide excellent heat dissipation to keep temperature below 47°C on applied area to reduce the damage as well as healing time of the patient. It is discovered that structural shape of drills has an important impact on the drilling temperature of commercial as well as medical drills. The purpose of this study is to investigate the effects of cutting parameters and cooling modes on bone drilling temperature. From the cutting parameters we concentrated on the shape and material composition of the drills. Mostly, thermocouples are employed for experimental determination of temperature rise during the bone drilling and cutting. The maximum drilling temperatures were noted for different drill heads and drilling temperatures at different drill speeds, which were calculated under different drilling parameters. As a result, shape of the drills, feed rate, drill speed and type of the cooling lubricants highly affect the drilling temperature of the bone. Appropriate drill must be collaborated to reduce the drilling temperature. The shape of the drill also affects temperature greatly. The maximum drilling temperature of diamond spherical grinding head is 46.31°C, while the maximum temperature of common twist drill is 42.1°C. The diamond bullet like grinding head is 38.29°C, which is relatively low. It is very important to select an appropriate drill to reduce the drilling temperature as much as possible during drilling and cutting the hard tissues.