

Surgical drill bit design and thermomechanical damage in bone drilling: A review

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ABSTRACT

As drilling generates substantial bone thermomechanical damage due to inappropriate cutting tool selection, researchers have proposed various approaches to mitigate this problem. Among these, improving the drill bit design is one of the most feasible and economical solutions. The theory and applications in drill design have been progressing, and research has been published in various fields. However, pieces of information on drill design are dispersed, and no comprehensive review paper focusing on this topic. Systemizing this information is crucial and, therefore, the impetus of this review. Here, we review not only the state-of-the-art in drill bit designs—advances in surgical drill bit design—but also the influences of each drill bit geometries on bone damage. Also, this work provides future directions for this topic and guidelines for designing an improved surgical drill bit. The information in this paper would be useful as a one-stop document for clinicians, engineers, and researchers who require information related to the tool design in bone drilling surgery.

KEYWORDS

Thermal osteonecrosis; Bone necrosis; Torque; Force; Bone drilling; Bone temperature; Drill bit geometry; Drill bit design; Osteonecrosis region

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