



Review

A scientometric analysis of bone cutting tools & methodologies: Mapping the research landscape

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ABSTRACT

This study undertakes a Scientometric analysis of bone-cutting tools, investigating a corpus of 735 papers from the Scopus database between 1941 and 2023. It employs bibliometric methodologies such as keyword coupling, co-citation, and co-authorship analysis to map the intellectual landscape and collaborative networks within this research domain. The analysis highlights a growing interest and significant advancements in bone-cutting tools, focusing on their design, the materials used, and the cutting processes involved. It identifies key research fronts and trends, such as the emphasis on surgical precision, material innovation, and the optimization of tool performance. Further, the study reveals a broad collaboration among researchers from various disciplines, including engineering, materials science, and medical sciences, reflecting the field's interdisciplinary nature. Despite the progress, the analysis points out several gaps, notably in tool design optimization and the impact of materials on bone health. This comprehensive review not only charts the evolution of bone-cutting tool research but also calls attention to areas requiring further investigation, aiming to inspire future studies that address these identified gaps and enhance surgical outcomes.

Introduction

Bone-cutting tools have a long history dating back to the advent of Homo sapiens [1,2]. Tools, manufactured from various animal tissues like Bone, antler, ivory, and tooth, have been used by nearly all hunter-gatherer tribes, even when more readily accessible alternatives were available [2]. Tools that can cut Bone are of utmost relevance in orthopedic surgery since cutting and sculpting the Bone is crucial [3]. Surgeons have always had difficulties cutting Bone since Bone is a tough living substance, and many osteotomes are still relatively primitive instruments. The motorization of these surgical instruments is the first major technical advancement [4]. The instruments used for cutting Bone have come a long way in the past few decades. While medical facilities are eager to acquire cutting-edge technology, they often fail to hold the perhaps most important part of these devices to the same high standards [5]. The beginnings of bone tool technology may be traced back to using bones in lithic manufacturing and maintenance, which dates back at least half a million years [6]. Bone-cutting tools have a long and diverse history of use, from hunter-gatherer societies to modern-day surgical procedures. The continued development of cutting-edge technology and

tools will improve the precision and efficacy of bone cutting, which is essential for the success of many orthopedic surgeries [7]. Bibliometric analysis is a powerful research tool that allows researchers to analyze academic literature on a particular topic by quantitatively analyzing citation and publication patterns [8]. Analysing bone-cutting tools using bibliometrics can help understand research trends and gaps. This study aims to identify commonly used materials and types of tools, analyze highly cited articles, track research evolution over time, and identify gaps in existing literature. The research questions that are answered in this bibliometric analysis are:

- RQ1: How did research on bone-cutting tools evolve?
- RQ2: what are the most commonly cited articles on bone-cutting tools?
- RQ3: What types of bone-cutting tools are most frequently studied in the literature?
- RQ4: What are the most commonly used materials for bone-cutting tools?
- RQ5: What are the main gaps or limitations in the literature on bone-cutting tools?

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