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Editorial

Special Issue on New Techniques, Materials and Technologies in Dentistry—Second Edition

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1. Introduction

The continuous evolution of dentistry is closely linked to advances in materials science, digital technologies, and innovative clinical techniques [1,2]. Contemporary dental practice increasingly relies on interdisciplinary research that bridges engineering, biology, and clinical sciences, enabling more predictable, efficient, and patient-centered treatments. In parallel, the growing demand for minimally invasive procedures, enhanced esthetics, and long-term functional outcomes has accelerated the translation of laboratory-based innovations into daily clinical practice [3].

In recent decades, dentistry has undergone a profound transformation driven by the integration of digital workflows, advanced manufacturing processes, and data-driven technologies. Computer-aided design and manufacturing (CAD/CAM), additive manufacturing, and high-resolution imaging have redefined diagnostic accuracy, treatment planning, and restorative precision [1,2]. Simultaneously, the development of novel biomaterials—ranging from bioactive ceramics to multifunctional polymer-based systems—has expanded the therapeutic possibilities available to clinicians, fostering a shift from passive restorative approaches toward biologically interactive and preventive strategies [3].

Another defining feature of contemporary dental research is the increasing convergence between clinical dentistry and emerging technological fields such as artificial intelligence, computational modeling, and image analysis. These tools not only enhance diagnostic capabilities and treatment predictability, but also generate large volumes of data that require rigorous validation, ethical oversight, and clinical interpretation [4]. As a result, modern dentistry faces the dual challenge of embracing innovation while ensuring that new techniques and technologies are supported by robust scientific evidence and aligned with patient safety and clinical relevance.

In this context, the Second Edition of the Special Issue "New Techniques, Materials and Technologies in Dentistry" in *Applied Sciences* aims to further explore and consolidate recent scientific progress shaping modern oral healthcare. This Second Edition goes beyond a descriptive overview of technological advances, highlighting how recent innovations are reshaping clinical decision-making, material selection, interdisciplinary research paradigms, and educational models in contemporary dentistry. By bringing together fundamental research, applied clinical studies, and emerging digital methodologies, this Special Issue seeks to provide a comprehensive snapshot of current trends while identifying future directions for research and clinical practice.

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2. New Techniques, Materials and Technologies in Dentistry

This Special Issue gathers original research articles and reviews addressing key challenges and opportunities across multiple dental disciplines. A strong emphasis is placed on dental materials and their biological, mechanical, and clinical performance. Several contributions focus on endodontic materials, evaluating both their biological response and clinical behavior. In vitro investigations into the cytocompatibility of endodontic sealers with human gingival fibroblasts highlight the importance of biocompatibility in material selection (Contribution 1), while studies on push-out bond strength and irrigation protocols provide clinically relevant insights into adhesion and sealing performance (Contribution 2). In parallel, surveys of clinical practice patterns offer valuable perspectives on the real-world use of endodontic materials (Contribution 3). Collectively, these contributions also expose persistent challenges, including the translational gap between in vitro findings and long-term clinical outcomes, as well as the need for standardized protocols and the robust clinical validation of emerging materials and technologies.

Another prominent theme of this Special Issue is the development and optimization of restorative and digital dental materials. Systematic analyses of digitally manufactured materials enriched with functional compounds underline current trends toward enhanced performance and bioactivity (Contribution 4). Experimental studies addressing the surface roughness, gloss, and color stability of ceramics and resin-based materials after brushing, repolishing, or whitening procedures contribute to a deeper understanding of material longevity and esthetics (Contributions 5, 6). Additionally, innovative approaches to the design of antibacterial dental adhesives, including the incorporation of ionic liquids, illustrate the growing focus on preventive and bioactive restorative solutions (Contribution 7).

The issue also reflects the expanding role of advanced technologies and digital methodologies in dentistry. Image-based diagnostic tools, including texture analysis applied to CT and MRI data, demonstrate the potential of quantitative imaging for the assessment of temporomandibular joint changes (Contribution 8). Furthermore, the integration of artificial intelligence into dental research and practice is addressed through bibliometric and multidisciplinary analyses, emphasizing AI's increasing impact on diagnostics, treatment planning, and decision support systems (Contribution 9). At the same time, these developments underline the importance of ethical frameworks, data quality, and clinical validation to ensure that artificial intelligence acts as a decision support tool rather than a substitute for clinical judgment.

Clinical innovation is further represented by contributions exploring novel therapeutic and surgical approaches, such as modified lip repositioning techniques for the management of gummy smile, reinforcing the importance of minimally invasive and esthetic-driven treatments (Contribution 10). From an engineering perspective, computational fluid dynamics simulations applied to dental handpieces highlight efforts to improve device performance and patient comfort by reducing operational noise (Contribution 11).

Collectively, the articles included in this Special Issue illustrate the dynamic and multifaceted nature of contemporary dental research. By combining fundamental material studies, applied clinical research, and emerging digital technologies, this collection aims to support evidence-based practice and stimulate further interdisciplinary collaboration. We hope that this Second Edition will serve as a valuable reference for researchers, clinicians, and industry professionals, and will inspire continued innovation in dentistry.

Beyond their clinical and technological relevance, the studies included in this Special Issue also have important implications for dental education. The growing complexity of materials, digital workflows, and data-driven tools reinforces the need for updated training models that integrate evidence-based practice, digital literacy, and critical appraisal skills in undergraduate and postgraduate curricula.

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3. Future Perspectives

Several important topics could not be addressed in this Special Issue, and others will require further research. Technical and technological developments in dentistry continue to progress at an extraordinary pace.

Although this Special Issue has now concluded, its success has encouraged us to launch a third edition of "New Techniques, Materials and Technologies in Dentistry." Submissions are currently open, and we warmly invite researchers to contribute and share their work.

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Conflicts of Interest: The authors declare no conflicts of interest.

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