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cosmetic dentistry beauty & science

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interview
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Dr Sushil Koirala

Editor-in-Chief

Welcome to the latest issue of cosmetic dentistry magazine!

In the ever-evolving field of cosmetic dentistry, technological advancements continue to redefine possibilities and outcomes. From innovative artificial intelligence (AI) applications enhancing diagnostic precision to state-of-the-art materials revolutionising aesthetic treatments, the landscape of dental practice is undergoing profound changes.

The Dental Innovation Center—Nepal, a joint initiative of the MiCD Global Academy and National Dental Hospital, has recently partnered with a team of AI-focused engineers in Nepal. Together, they are developing AI-based dentistry products aimed at benefiting clinicians and patients alike. This venture into AI in dentistry provides fresh insights into its core concepts and vast potential, particularly in Nepal, where delivering dental care in rural areas is challenging.

As a dedicated clinician, collaborating with innovative AI professionals has been both stimulating and rewarding. It has deepened my understanding of the pivotal role of machine learning and big data analysis in modern dentistry. My interest in dental AI stems from a desire to enhance clinical efficiency and treatment quality at National Dental Hospital, Nepal's first dental hospital. I also aim to expand promotive and preventive dental services to remote Nepalese regions via AI-driven teledentistry through our hospital's skilled team.

This issue of cosmetic **dentistry** explores these transformative trends and their impact on modern cosmetic dentistry. We delve into topics such as ethical communication and brand building, highlighting the importance of patient trust and professional integrity in practice. The flowable injection technique takes centre stage as a minimally invasive tool, showcasing its role in achieving precise and aesthetically pleasing results in treatments that promote practice growth.

We also present a detailed guide on the aesthetic restoration of discoloured anterior teeth using feldspathic porcelain veneers, offering technical insights into achieving bleached shade perfection. Exploring the nexus between occlusion and single-tooth replacement, we discuss conservative approaches that optimise functional and aesthetic outcomes. Furthermore, a compelling case report examines the intersection of technology and emotion in a porcelain veneer procedure, illustrating how advanced techniques can elevate patient satisfaction and emotional well-being.

Currently, our interdisciplinary team of dental experts, IT specialists and AI professionals is developing eDental Sewa, a non-profit dental platform. This platform will offer comprehensive dental information in Nepali and provide free teledentistry services, connecting patients with their chosen dentists. Additionally, we are finalising a smart dental platform designed for individual practitioners, groups and institutions. This tool will serve as a customised practice management, educational and care quality monitoring system. I believe it will facilitate global networking among dental practitioners, fostering collaboration and knowledge exchange for mutual benefit.

As we navigate through these innovations and clinical insights, our goal remains clear: to empower dental professionals worldwide with knowledge and tools that enhance patient care and practice success. We invite you to explore these articles, gain valuable insights and discover practical strategies to elevate your cosmetic dentistry practice.

Enjoy this issue of cosmetic **dentistry** magazine, where innovation meets excellence in pursuit of transformative patient outcomes.

Sincerely,

Dr Sushil Koirala
Editor-in-Chief

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Study evaluates whether AI can craft a universally aesthetically pleasing restoration

Anisha Hall Hoppe, Dental Tribune International

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Digital smile design (DSD) programs have become instrumental in dental treatment, enabling dentists and patients to plan treatments in harmony with the entire face. A recent innovation in DSD is the integration of artificial intelligence (AI). A study in Turkey has compared aesthetic preferences among dental professionals, dentistry students and laypeople regarding smile designs created manually and using AI, considering factors such as sex, professional experience and specialty. The findings offer insights into the potential of AI in DSD.

For the study, four cases representing major smile design groupings were selected. They were chosen based on relationships between the trichion, glabella, subnasale and menton, these being crucial for smile designs, employing the concept of "facial flow", which refers to the direction of facial structures. Case 1 showed a facial flow towards the right side, case 2 showed a facial flow towards the left side, the nose and chin pointed in different directions in case 3, and case 4 was a symmetrical face.

Two smile designs were created for each case using Smile Designer App: one via AI mode and another manually. The app utilises the Microsoft Face API, a robust AI tool with facial recognition capabilities. The API identifies 68 facial landmarks essential for determining the patient's facial type and appropriate tooth sizes, ensuring a precise and personalised treatment plan.

To gather perceptions on these designs, an online survey was conducted. The 807 participants were classified into three occupational groups—dentists, dentistry students and other professionals (laypeople)—and were asked about their professional knowledge, expertise in smile design and usage of a smile design program, in the case of dentists. They were then asked to choose whether they found the AI-created or the manually created design more attractive for each case.

The socio-demographic breakdown showed that the majority of the dentists had 0–4 years of experience and were general practitioners. Almost half the laypeople and over half the dentistry students were familiar with aesthetic smile design. Age, education and clinical experience did not influence aesthetic preferences.

For cases 1–3, both dentists who used smile design programs and those who did not favoured the manually created designs. However, for case 4, dentists who used a smile design program preferred the manually created design, whereas those who did not preferred the AI-generated design. For case 3, orthodontists notably favoured the AI-generated design. The authors suggested that this might have been due to their familiarity with AI values or experience with treatments based on the landmarks used.

Aesthetic preferences varied significantly between all three occupational groups for cases 1–3, but notably not for case 4. The authors suggested that dentists' aesthetic perception may be different from that of laypeople in complex cases. There were significant differences between dentists and both dental students and laypeople for certain cases. The survey revealed an overall perceptual gap between dentists and laypeople, however, for symmetrical faces, AI-generated designs were acceptable to both dentists and laypeople, suggesting a potential time-saving tool for clinicians in such cases.

The challenge of incorporating AI lies in recognising that faces and smiles are not always symmetrical. Studies have found a link between facial symmetry and perceived beauty, but crucial landmarks used in smile designs on asymmetrical faces still need research for using AI. AI relies on mathematical models to create symmetrical smiles. However, because facial flow takes into account human perception, it allows for more natural smile designs for both symmetrical and asymmetrical faces. While AI-driven DSD works well for symmetrical faces, manual techniques may be better for asymmetrical cases. Given AI's infancy in healthcare, there is potential for misinterpretations owing to algorithmic constraints. The authors thus recommended ongoing research to optimise AI in DSD and understand aesthetic perception.

Editorial note: The study, titled "Evaluating the facial esthetic outcomes of digital smile designs generated by artificial intelligence and dental professionals", was published online on 6 August 2023 in Applied Sciences.

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Botulinum toxin in dentistry: Study shows trends in applications

Dental Tribune International

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The use of botulinum toxin (BT), commonly referred to as Botox, is gaining traction in the dental field, offering both therapeutic and cosmetic benefits. Although initially known for its cosmetic applications, BT has evolved into a versatile tool in dentistry, addressing a range of oral health issues. A recent study from India has reviewed its current applications, and its findings reflect a broader trend towards holistic patient care.

Current applications in dentistry

BT is primarily known for cosmetic treatments such as facial and jawline contouring as well as wrinkle reduction, but the drug is now also commonly used in dental care to treat a number of oral conditions. The study from India highlighted a notable increase in BT treatments among dental professionals.

For example, the authors highlighted that BT is used to treat bruxism and temporomandibular disorder (TMD) by relaxing the masseter muscles, reducing clenching and grinding and leading to significant improvements in pain relief and jaw function. For bruxism and TMD patients who have not responded well to typical therapeutic alternatives, BT injections can provide a minimally invasive therapy that helps suppress soft-tissue activation, lessen muscle tonicity and significantly diminish the severity of symptoms.

Moreover, the authors reported that BT can support favourable outcomes for dental implants for this same reason. A primary cause of implant failure is the lack of osseointegration, sometimes resulting from strong masticatory forces in patients with abnormal masticatory habits.

BT injections also have application in surgery for oral and maxillofacial fractures, alleviating tension in hyperactive muscles of the periodontal apparatus during periodontal procedures. Additionally, the authors noted that intraoperative BT injections reduce muscular activity, lowering tension and promoting better healing at the surgical site.

The study also reported the use of BT to reduce the appearance of excessive gingival display by relaxing the upper lip muscles and to address a number of conditions involving the salivary glands and trismus.

"In situations where the patient is unresponsive to, or in conjunction with, less intrusive therapy methods, BT has unquestionably been demonstrated to offer substantial utility in the care of the patient," the researchers concluded. "However, the dentist in practice must make sure that the procedure falls within his or her area of expertise and that he or she is qualified to handle any possible side effects, in addition to administering it," they cautioned.

Market trends

According to iData Research, the global market for BT A, the most commonly used type of BT for medical and cosmetic treatments, was valued at nearly US$6.6 billion (€6.1 billion)* in 2022. It is projected to grow at a compound annual growth rate of 6.5%, reaching approximately US$10.2 billion by 2029. This growth is mainly being driven by the increasing popularity and acceptance of minimally invasive cosmetic procedures, such as injectable fillers.

Guidelines and regulations

The legal framework for BT treatments varies worldwide, influenced by regional regulations and professional guidelines. In the US, state dental boards regulate use, and requirements differ significantly from one state to another. In Texas, for example, only oral and maxillofacial surgeons are allowed to employ BT for both therapeutic and cosmetic use. In California, the use of BT by general dentists is limited to dental treatment purposes only. Only oral surgeons who hold an elective facial cosmetic surgery permit can provide these services solely for cosmetic purposes. According to the American Academy of Facial Esthetics, approximately 7 to 8% of dentists in North America are currently providing BT treatment to patients for cosmetic reasons, and this number is steadily increasing.

In many European countries, the administration of BT by general dentists is permitted, provided they meet stringent training and regulatory requirements. In Germany, dentists are authorised to perform only treatments that fall within the scope of dentistry. Specifically, this means that dentists may administer treatments with BT only if they do not extend beyond the vermilion border of the lips. Similar regulations are in place in Australia, for example.

As BT treatments become increasingly integrated into dental practice, understanding the legal and practical aspects is crucial for practitioners. With its broad therapeutic and cosmetic applications, BT offers a valuable addition to dental care, promoting a holistic approach to patient well-being.

Editorial note: The study, titled Botox: Current and emerging trends for dental practitioners in esthetic dentistry, was published online on 8 July 2024 in Cureus.

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