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# DIMENSIONS

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**UCLA DENTAL STUDENTS'**
**HUMANITARIAN ODYSSEY**

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WINTER 2025
VOLUNTEER
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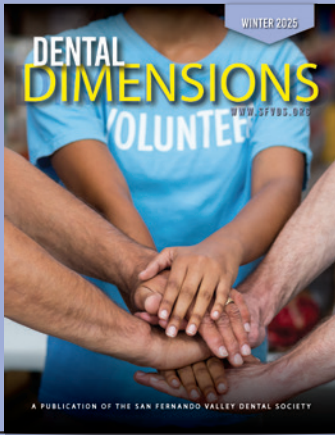
## CALL FOR SUBMISSIONS

Do you have an unusual case study or an interesting article you would like to have published? Dental Dimensions is looking for articles from our members so we can share our collective knowledge. Articles should be 500-1000 words with references where applicable and photos if possible. Send your submissions to: exec.sfvds@sbcglobal.net or contact the dental society office at 818-576-0116.

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# FROM YOUR EDITOR

Getting the Spring Dental Dimensions out has been both challenging and rewarding. As I contemplate the theme for the Fall edition, it's essential to reflect on the pressing issues impacting our community. The economic downturn has taken a toll on everyone. Dental offices are reporting a decrease in patient visits, brick-and-mortar stores are closing at an alarming rate, and professions such as travel agents and librarians are becoming obsolete due to technological advances. While we are evolving into a more sustainable society, these changes are significantly impacting livelihoods and eliminating jobs that many relied on.

Those who have lost their jobs face significant challenges in accessing healthcare for themselves and their families. This situation raises a critical question: How can we, as dentists, support the struggling economy and assist those in need? The answer lies in the spirit of altruism through pro bono care and volunteerism. As dentists, we possess the unique ability to offer our services without charge, providing much-needed care to those who cannot afford it. This commitment to giving back can manifest in various ways.

Some dentists might choose to offer free services within their practices, directly benefiting their local community. Others might find fulfillment in joining dental missions that reach out to underserved populations, both locally and globally. Engaging in volunteer work not only provides immediate relief to those in need but also fosters a sense of solidarity and compassion within our profession.

Numerous large-scale volunteer opportunities exist, such as CDA Cares, Care Harbor, and Healing California. These non-profit organizations are dedicated to providing dental care through the generous participation of volunteers. By joining such initiatives, we can contribute to a collective effort that significantly impacts the lives of countless individuals. These organizations often organize events where dentists can offer their skills to treat a high volume of patients, addressing a critical need in the community. Moreover, as we move forward in a slumping economy, it is crucial to imagine the plight of those who are worse off and cannot afford essential

care. The concept of 'paying it forward' becomes particularly relevant here. By donating our services or time, we can alleviate some of the burdens faced by those who are struggling the most. Volunteering not only benefits those who receive care but also enriches the lives of those who provide it, fostering a deeper connection to our community and enhancing our sense of purpose.

Furthermore, there are numerous ways to get involved beyond direct patient care. Advocacy and education are vital components of addressing healthcare disparities. Dentists can participate in community outreach programs to educate the public about the importance of oral health, preventative care, and available resources. By raising awareness and providing information, we empower individuals to take charge of their health and well-being.

In addition, partnering with local schools, community centers, and non-profit organizations can help create a network of support for those in need. These collaborations can lead to the development of comprehensive programs that address the broader social determinants of health, such as access to nutritious food, safe housing, and employment opportunities. By tackling these underlying issues, we can create a more holistic approach to health and well-being.

As we consider the theme for the Fall edition, let us emphasize the importance of community, compassion, and collective action. The economic challenges we face require a multifaceted response, and as dentists, we have a crucial role to play. Whether through direct care, volunteer work, advocacy, or education, our contributions can make a significant difference. In conclusion, as we navigate these challenging times, let's remember those who are less fortunate and unable to afford essential care. By donating our services or time, we can make a substantial impact on our community. Consider volunteering and being part of a movement that strives to bring positive change to the lives of many. Together, we can help build a healthier, more resilient society.

*Dr. Elbert Tom*

# REFLECTIONS FROM THE IMMEDIATE PAST PRESIDENT

As we turn the page to another exciting edition of our magazine, I want to take a moment to reflect on our collective achievements and the path ahead. This past year has been one of growth, collaboration, and resilience in our dental community. Together, we have navigated challenges, embraced innovations, and continued to prioritize the health and well-being of our patients. I am particularly proud of our recent initiatives aimed at advancing dental education and promoting best practices across our profession.

We, SFVDS, have collaborated with the CDA to create a Dental Assistant Program. Our commitment to continuing education has never been stronger, with numerous workshops and seminars that empower our

members to stay at the forefront of dental advancements.

Looking ahead, we must remain vigilant and proactive. The landscape of healthcare continues to evolve, and it is our responsibility to adapt and advocate for our profession and our patients. I encourage each of you to engage with our upcoming events and initiatives, share your insights, and contribute to the vibrant discussions that shape our association.

Thank you for your unwavering dedication to excellence in dentistry. Together, we will continue to elevate our profession and make a lasting impact on the San Fernando Valley communities we serve.

*Dr. Irubiel Barbosa*

I am honored to step into the role of President of the San Fernando Valley Dental Society (SFVDS) for 2025. With 74 years of history in serving our members and the community, SFVDS has built a strong foundation, and I am eager to carry forward this legacy.

My journey to becoming a dental professional has been filled with inspiration and perseverance. While still in high school in the early 1970s, I experienced a severe toothache that required immediate attention. A family member brought me to the USC School of Dentistry, where a dental student and instructor not only treated me but also convinced me to save my tooth rather than have it extracted. This experience was transformative, as it introduced me to the field of dentistry and inspired me to pursue it as a career. Over the course of a year, during my continued dental treatment, I formed connections with the students and instructors at USC, further solidifying my career aspirations.

After completing high school, I attended WLA Community College and CSULA before being accepted into the UCLA School of Dentistry, graduating in 1982. I began my career as an associate in a small dental practice in Inglewood before purchasing my first dental office in Culver City two years later. In 1996, I established a new practice in Palmdale. During this time, I joined SFVDS and, through the encouragement of board members, became more involved. Six years ago, I joined the board and now take on the honor of serving as President.

I want to express my gratitude to those who have supported me along the way. I extend heartfelt thanks to Dr. Anette Masters, SFVDS's executive director, as well as office staff members Wendy and Bella for their dedication and hard work. I also credit my wife, Mary, for her unwavering support, which has allowed me to embrace the responsibilities of this leadership role.

Under my leadership, SFVDS will continue offering year-round continuing education classes and hosting impactful community events such as Veteran Smile Day, Healing California, and the Dental Assisting Program. These initiatives are designed to provide essential services to underserved populations and reflect our commitment to improving oral health in the San Fernando Valley. The SFVDS charitable foundation will also remain a priority, focusing on providing free dental care, donating supplies, and contributing to causes that promote better oral health.

As I step into this new role, I invite members to share their ideas and feedback, emphasizing the importance of collaboration and communication. Members are encouraged to reach out to me through the SFVDS office with any suggestions or recommendations.

I am excited to lead SFVDS through a year of growth, service, and collaboration. I look forward to working closely with our members to achieve the society's goals and make 2025 a memorable and impactful year for our dental community.

*Dr. Alan Taylor*

## EMBRACING TECHNOLOGY AND AI: THE FUTURE OF SFVDS, CDA, AND ADA

In recent years, technology and artificial intelligence (AI) have profoundly impacted various sectors, and the fields of dentistry and professional associations are no exceptions. As we look to the future, the San Fernando Valley Dental Society (SFVDS), California Dental Association (CDA), and American Dental Association (ADA) are poised to harness the power of these advancements to better serve their members.

One significant leap forward is the adoption of the new management system, Fonteva, which went live in June. This cutting-edge platform is designed to streamline administrative processes and enhance user experience for members. The SFVDS is slated to transition to this new system at the beginning of 2025, marking a pivotal moment in our journey toward technological integration.

The new Fonteva system promises to revolutionize how members interact with SFVDS. One of the standout features is the simplified process for uploading Continuing Education (CE) certificates. Members will no longer need to deal with cumbersome paperwork; instead, they can easily manage their CE credits online. This digital transformation not only saves time but also ensures that records are accurately maintained and readily accessible. Moreover, the new system will offer a comprehensive online portal where members can handle a variety of tasks. From renewing memberships to registering for events, the platform is designed to be user-friendly and efficient. This shift towards a digital-first approach reflects our commitment to leveraging technology to improve member experience and operational efficiency.

The integration of AI within these systems holds even greater promise. AI can help personalize member interactions, providing tailored recommendations for courses, events, and resources based on individual preferences and professional needs. This level of customization ensures that members receive the most relevant and valuable information, enhancing their professional development and overall satisfaction with the association. However, we understand that transitioning to a new system can be challenging. At SFVDS, we are committed to supporting our members every step of the way. We will provide comprehensive training sessions and resources to help you navigate the new platform. Our team will be available to answer questions, offer guidance, and ensure that you are comfortable with the new processes.

As we move towards this exciting future, we invite all members to embrace the changes and take full advantage of the benefits that technology and AI bring. The new Fonteva system is more than just a tool; it is a gateway to a more efficient, personalized, and responsive membership experience.
In conclusion, the adoption of advanced technology and AI by SFVDS, CDA, and ADA signifies a transformative era for dental professionals. By leveraging these innovations, we aim to enhance our services, streamline operations, and provide a superior member experience. We are excited about the opportunities ahead and are here to support you in navigating this new digital landscape. Together, we can embrace the future of dentistry and professional development with confidence and enthusiasm.

*Dr. Annette Masters*

# FROM YOUR NEW DENTIST COMMITTEE CHAIR

It's hard to believe that I've served on the San Fernando Valley Dental Society Board for the past 10 years. For most of that time, I have served as the New Dentist Chair, during which I had the pleasure of engaging with many young new dentists entering the workforce in the San Fernando Valley, as well as helped to coordinate social, networking and CE events. This has been a wonderful opportunity to learn, establish connections, and build relationships.

My tenure as the New Dentist Chair will soon come to an end in 2025, as I have reached the limit allowed to serve in this position. I am looking forward to continuing my service on the Board in a new role, while helping to transition in a New Dentist Chair. I encourage any new dentist who might be interested in this position to contact me or the Dental Society.

Best wishes,

*Dr. Sean Sakhai*

# BCR TRUSTEE REPORT

On May 10, 2024, CDA BCR members had a virtual meeting to discuss issues presented, Members heard the chair report and also received a report on ADA Membership and Model and Value Audit. Some of other items discussed were:

- **CDA Strategic Plan Presentation 2024,** was presented outlining the goals and strategies. See the link below for further details: https://www.youtube.com/watch?v=ofYqaE0wLH0

- **Delta Dental Litigation Update,** BCR members were informed that the court has ruled to dismiss CDA's lawsuit against Delta Dental. CDA BOD has decided to appeal this ruling.

- **Resolution 15-2023-H, CDA Special Committee Composition,** This resolution was referred to BCR by the BOD. BCR has voted to maintain current process for appointment of Special Committees.

- **CDA Council on membership report,** BCR discussed options regarding the composition and future of the council. Final recommendations would be adopted at BCR's August meeting to be presented to the BOD or CDA HOD.

- **CalSavers registration deadline approaching.** Employers who reported having an average of five or more employees in 2023 must register for CalSavers, the state's Roth IRA voluntary retirement savings program, by Dec. 31, 2024, unless they meet and request one of three exemptions such as sponsoring a qualified retirement plan.  Under an expansion of the program by state law, employers with one to four employees must register by Dec. 31, 2025

- **Yes on Proposition 35:** CDA supports this Measure to secure new Medi-Cal funding set for November ballot. Proposal by CDA and health care coalition would protect health care funding, improve dental provider rates for the long term.

- **California Health Care Worker Minimum Wage delayed to start July 1st.** SB 828 will delay implications of the Health care workers minimum wage to July 1st, instead of June 1st. For more details see link https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240SB828

BCR's next meeting is scheduled for August 16, 2024. My role as your BCR rep is to be the point of contact between San Fernando Valley Dental Society members and California Dental Association. If you have any questions, suggestions or you would like to introduce a resolution to California Dental Association's House Of Delegates (HOD), please feel free to contact me.

Thank you all,

*Dr. Mahfouz Gereis*

# LEGISLATIVE REPORT

## UPCOMING FEDERAL LEGISLATION IN DENTISTRY

At the federal level, proposed legislation that could significantly impact dentistry includes the "Medicare Dental Benefit Act." If passed, this bill would expand Medicare to cover dental services, a move that would allow millions of elderly Americans access to affordable oral healthcare. While this expansion could open up a larger patient base for dentists, it also comes with potential challenges, such as lower reimbursement rates and increased administrative burdens. Additionally, revisions to the Occupational Safety and Health Administration (OSHA) standards regarding dental workplace safety are being debated. These updates would modernize infection control protocols in light of the COVID-19 pandemic but may also require substantial investment in equipment upgrades.

## PENDING STATE LEGISLATION IN CALIFORNIA

In California, several bills in the legislative pipeline could influence dental practice. The "California Medi-Cal Dental Reform Act" aims to increase reimbursement rates for Medi-Cal dental providers and streamline the administrative process. This bill, if passed, could incentivize more dental practices to accept Medi-Cal patients, expanding access to low-income communities. However, its effectiveness will depend on the balance between reimbursement improvements and the bureaucratic demands placed on dental offices. Additionally, the "Green Dentistry Act" is under consideration, which would mandate stricter environmental regulations on dental waste disposal, particularly concerning mercury and chemical waste. This legislation could increase operational costs for dental practices as they would need to adopt more environmentally friendly technologies.

In addition, SB1369 is a bill sponsored by the CDA to curtail the usage of Virtual Credit Card as a method of payment possible taking 10% off the payment owed by the plan.

CDA is asking for a yes vote on proposition 35 which increases funding for medi-cal services,  and dental student repayment and health care workforce development.

Orthodontic Assistants no longer have to have work experience to take the OAP Course. This last one is on the Governor's desk for his signature.

## COUNTY-LEVEL LEGISLATION IN LOS ANGELES

Los Angeles County is currently considering several public health initiatives aimed at improving oral health equity. One proposal, the "Oral Health Equity Act," seeks to establish county-funded dental clinics in underserved areas of the county, particularly targeting communities in North Los Angeles. This initiative, while still under discussion, could relieve pressure on private practices by offering affordable dental services to uninsured populations. However, it also raises concerns about

# THE IMPORTANCE OF HAVING AN AED IN YOUR DENTAL PRACTICE

**BY MARNI KALLESTAD**

What would you do if a patient had a cardiac arrest in your dental practice? Should your dental office be equipped to respond to abrupt cardiac arrest, regardless of the patient's sedation status? Dentists' and their teams' resuscitation knowledge and skills can improve the survival rate in emergencies. Effective management of shockable and non-shockable rhythms, along with current basic life support training and emergency response systems, is crucial.

An automated external defibrillator (AED) is a portable device that assesses an individual's heart rhythm and administers an electrical shock to the heart if it identifies a shockable rhythm. The primary shockable rhythms are ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT).

Automated external defibrillators (AEDs) safeguard individuals who are experiencing sudden cardiac arrest (SCA). If not promptly addressed, cardiac arrest rapidly results in mortality. Defibrillation, the rapid administration of an electric shock via an AED, is the sole effective emergency intervention for SCA.

Each minute a normal heartbeat does not resume, an individual's likelihood of survival diminishes by 7% to 10%. Performing prompt CPR and utilizing an AED can double or triple a person's chances of survival. The most efficacious approach to conserving life is using an AED alongside CPR. Cardiopulmonary resuscitation (CPR) can maintain blood circulation to the brain and heart immediately following such incidents. Defibrillation is the sole method of restoring the heart to its normal state in the majority of cases. The likelihood of survival increases when these treatments are administered concurrently. To ensure effective CPR, lifesaving AEDs must be readily available for use at all times.

A heart attack is the result of a complete or partial blockage or reduction in the blood flow that supplies oxygen to the heart, which leads to the damage or mortality of a portion of the heart muscle. During a heart attack, the heart keeps beating regularly even though it isn't getting enough blood. Having a heart attack, on the other hand, can change the way the heart beats electrically, which can cause sudden cardiac death.

In contrast to a heart attack, cardiac arrest is a separate condition. A blockage is not the cause of sudden cardiac arrest. Sudden cardiac arrest frequently occurs without prior warning. Cardiac arrest occurs when the heart ceases to beat unexpectedly. The sudden interruption of a normal heartbeat defines sudden cardiac arrest (SCA). This arises from a dysfunction of the heart's intrinsic electrical circuitry. The arrhythmia inhibits the heart's ability to pump effectively, potentially leading to cardiac arrest. In order to avert mortality, treatment must be administered within minutes. There is a higher likelihood of preventing permanent injury to the brain and other organs if the heartbeat is restored promptly. Sudden collapse, loss of consciousness, no pulse, and no respiration are all symptoms of cardiac arrest. Other symptoms may manifest before sudden cardiac arrest. These symptoms may encompass chest distress, shortness of breath, weakness, and palpitations, described as a fast-beating, fluttering, or pounding heart.

AEDs are incapable of detecting the absence of cardiac rhythm. During cardiac arrest, when the heart ceases to beat, there is an absence of electrical activity in the heart. The person will need CPR immediately. When the heart is compressed in CPR, oxygenated blood is flushed throughout the body, keeping the brain and vital organs alive. Allowing the chest to recoil fully is essential for the heart to refill with blood. Without full chest wall recoil, endotracheal pressure rises, venous return slows, and mean arterial, coronary, and brain perfusion pressures fall.

Annually, around 350,000 individuals outside of medical facilities suffer from cardiac arrest. When defibrillation is performed quickly, the chances of life and neurological recovery are much higher. According to statistics, the average neurological recovery rate for patients who are defibrillated within five minutes is 58%. According to the American Heart Association, "When defibrillation is delayed, survival rates decrease to approximately 50% at 5 minutes, approximately 30% at 7 minutes, approximately 10% at 9 to 11 minutes, and approximately 2% to 5% beyond 12 minutes." Immediately following cardiac arrest and prior to the advent of emergency services, the utilization of automated external defibrillators (AEDs) can significantly improve treatment outcomes. If defibrillated with an AED within the first minute of collapse, the victim's chances of survival are close to 90%.

Cal. Code Regs. Tit. 16, § 1043.3 requires that dental practices that provide general anesthesia or deep sedation have a defibrillator but are not required for moderate sedation.
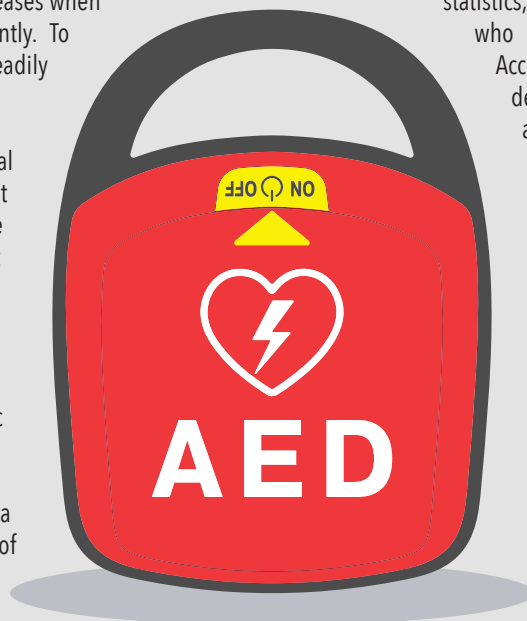
For further information regarding the safety requirements in California, you may contact the Dental Board of California.

## CONCLUSION

The average response time for emergency services in the United States is 4 to 6 minutes. Without oxygen, the brain experiences a complete cessation of function within four to six minutes. Defibrillation with an AED can save a life if an individual experiences cardiac arrest in your dental practice.

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## BIO

Marni Kallestad is the owner of My CPR Lady, offering Basic Life Support, & ACLS courses, AEDs, and AED accessories for the healthcare community. My CPR Lady uses the latest and highest quality teaching materials with top-tier, evidence-based course curricula to train you efficiently and swiftly on how to stay safe and save lives. Marni will collaborate with you to bring the classes to your practice. Additionally, she offers online courses or can arrange for classes to be held at My CPR Lady's premises. My CPR Lady provides complimentary AED consultations for your dental practice. Marni can be contacted at (661)878-4955. Website: www.mycprlady.com

competition, as private practitioners may lose patients to these publicly funded clinics. Another proposal focuses on enforcing stricter health codes for dental practices in the county, particularly regarding patient safety and infection control.

## CITY OF LOS ANGELES PROPOSED LEGISLATION

In the City of Los Angeles, a new "Affordable Dental Care Ordinance" has been introduced, aimed at incentivizing dentists to offer low-cost services to underinsured or uninsured populations. This ordinance would offer tax breaks and subsidies to dental practices that meet certain criteria for providing affordable care. While this could improve access to dental services in low-income neighborhoods, it may also create additional financial and administrative challenges for dentists opting into the program. The city is also proposing stricter zoning laws for new dental offices, focusing on limiting the number of practices in high-density areas to reduce traffic and environmental impact, which could affect where new practices are established.

## HOW DENTISTS CAN GET INVOLVED

Dentists in North Los Angeles County have an opportunity to influence these legislative proposals by getting involved through professional organizations. Working with the California Dental Association (CDA), dentists can participate in advocacy efforts to ensure that new laws are fair and beneficial to both practitioners and patients. On a more local level, collaborating with the San Fernando Valley Dental Society allows dentists to address specific regional concerns, such as the potential impact of county and city legislation on their practices. By attending meetings, engaging in lobbying efforts, and offering testimony to lawmakers, dentists can help shape policies that support both their professional interests and the oral health of their community.

*Dr. Gib Snow*

## PLEASE READ THE UPDATE FROM THE DBC AND CLICK THE LINKS PROVIDED FOR MORE DETAILED INFORMATION. THIS UPDATE CONTAINS RELEVANT INFORMATION TO ALL PRACTICING DENTISTS.

Beginning August 1, 2024, all California dispensers of controlled substances will be required to report dispensations to the Controlled Substance Utilization Review and Evaluation System (CURES) using version 4.2B of the American Society of Automation in Pharmacy (ASAP) format. On and after this date, data submitted using the current CURES ASAP version 4.1 format will no longer be accepted.

Prompt action by licensees who dispense controlled substances is recommended. Technical implementation of this update to data submission software may take considerable time. Contact your data submission software provider and confirm they are preparing for this upcoming ASAP version change.

The Office of the Attorney General (OAG) has shared information about the ASAP format change and suggested action steps for data submitters. Please visit the **OAG's CURES Website** frequently for updates and informational bulletins.

For information about CURES, visit DCA's **CURES information page**.

# WHAT IS A DEEP DENTAL CLEANING?
## DENTISTS REVEAL WHAT TO EXPECT

**BY SARAH JACOBY**

The procedure may sound dramatic, but it's a conservative option that can prevent the need for more gum disease treatment.

Are your gums red, puffy and tender? If so, a deep dental cleaning might be on the agenda at your next dentist appointment.

Your dentist might recommend a deep cleaning when you develop certain concerning signs of gum disease, like receding gums, bone loss or loose teeth, Dr. Sally Cram, periodontist based in Washington, D.C., and spokesperson for the American Dental Association, tells TODAY.com.

"When that gum starts pulling away and the gums are very inflamed, your dentist may say, we need to do more than just a regular cleaning above your gums," Cram says.

Unlike a routine dental cleaning, the techniques used in a deep cleaning get below the gum line to remove bacteria stuck there.

The procedure, which involves local anesthetic to temporarily numb part of the mouth, can sound dramatic. But, experts say, it's a conservative treatment that can help significantly manage gum disease – and help your mouth feel much better.

### WHAT IS A DEEP DENTAL CLEANING?

It's similar to your usual routine cleaning but goes deeper beneath the gum line where brushing and flossing simply can't reach.

Technically, a deep dental cleaning involves two procedures: tooth scaling and root planing, Dr. Elbert Tom, assistant clinical professor and group practice director at the UCLA School of Dentistry, tells TODAY.com.

Tooth scaling removes tartar at and below the gum line, the ADA explains. And root planing smooths out the root of the tooth to help the gums reattach.

"Regular cleanings are generally above the gum and maybe a millimeter or two below the gum," Cram says, but root planing gets down further to remove more tartar that may be irritating the gums.

### SIGNS THAT YOU MIGHT BENEFIT FROM DEEP DENTAL CLEANING

Healthy gums should look pink and tight around the teeth, Cram explains. If you develop gum disease, the look and feel of your gums will start to change.

Gum disease develops when "the gooey, sticky plaque in your mouth starts attaching to your teeth and down under the gum," Cram explains. If plaque is left there undisturbed because you're not brushing and flossing adequately, it hardens within a few days. At that point, you can't brush or floss it out.

That leads to inflammation in the gums and can cause the gums to start pulling away from the teeth, Cram says. You'll also notice your gums start to bleed easily, which are early signs of periodontal disease and suggest that a deep cleaning could be beneficial.

### EARLY SIGNS OF GUM DISEASE INCLUDE:

- Bleeding gums
- Swollen gums
- Bad breath
- Difficulty chewing food
- Pain in the teeth or gums when biting down
- Loose teeth
- Receding gums

Additionally, your dentist might notice bone loss on your X-rays, excessive bleeding during a cleaning or crevices forming between the tooth and gums (also called pockets), Tom says. Deep gum pockets are often another sign of bone loss.

If you or your dentist notice any of these issues, they may have a conversation with you about deep dental cleaning.

Keep in mind that gum disease is common and can arise from many different factors, Tom says, including a genetic predisposition, underlying health conditions (such as diabetes), hormonal changes and poor dental work in the past.

"(But) if the patient does not take care of their teeth – if they do not brush, if they do not floss – they will have a tendency to form hard deposits on their teeth," he says. While you can't control everything contributing to tartar and gum disease, you can stay on top of brushing and flossing.

### WHAT TO EXPECT DURING A DEEP DENTAL CLEANING

When it's time for your deep dental cleaning, your dentist, periodontist or dental hygienist will typically only work on one half of the mouth at a time, Tom says.

For more advanced cases, they may only cover one quadrant of the mouth in an appointment. So it will take at least two 45- to 60-minute appointments to clean your entire mouth, Cram says.

First, you'll get a local anesthetic that will numb whichever part of the mouth is getting the procedure during that appointment, Cram says, "so that the dentist can get down under that gum tissue without making it too uncomfortable for you."

Then, the person performing the procedure will use a familiar tool – an ultrasonic cleaner with a vibrating metal tip – to "chip tartar off the teeth above and below the gum line," Tom explains. "It's accompanied by a water spray that washes the tartar and flushes the plaque from the gum pocket," he adds.

After that, they'll use a manual instrument called a scaler or a curette to "fine tune" their work and "remove the small remaining pieces of tartar," Tom says. They also use the scaler to smooth the area around the root, which allows the gums reattach to the tooth.

Some patients also receive antibiotic medication delivered directly into their gums during the deep cleaning to help reduce the bacteria causing the issue.

Crucially, you should also receive individualized recommendations and demonstrations for how to care for your teeth and gums at home moving forward, Cram says.

### WHAT HAPPENS AFTER A DEEP DENTAL CLEANING?

In the few days following your deep dental cleaning, your gums will likely be a little sore, sensitive and tender. This is perfectly normal and will subside naturally as your mouth heals.

Your dentist will give you instructions for foods to avoid during this time, Tom says, which will likely include anything that's too hot or too cold. And you should try to stick to soft foods, he adds.

But, as quickly as three to five days after a deep dental cleaning, you should start to see and feel improvements, Cram says, such as less bleeding when you brush and floss. Patients often report that their gums feel "strong and not tender" after the procedure, she adds. "They can see a big difference."

You'll likely be called back in for a follow-up appointment a few weeks after the cleaning. Different practices follow different timelines for the follow up appointment, Tom says, but you should

expect it to be somewhere between three to six weeks of the initial appointment.

### WILL I NEED MORE TREATMENT AFTER A DEEP DENTAL CLEANING?

Not necessarily.

"Root planing is really your first line of defense," Cram says. "It's a conservative therapy to try and resolve the issue." Many times, a deep cleaning and improved home care can "solve the problem," she adds.

Even in cases where someone has gone a while without seeing a dentist and may have a more advanced stage of periodontal disease, a deep cleaning can be enough to avert the need for more intense treatment – especially when followed by better oral hygiene at home and a new routine cleaning schedule.

Sometimes, people do need additional intervention after a deep cleaning, which might include antibiotic mouth rinses or a systemic antibiotic (like a pill) to reduce inflammation. Dentists generally decide whether or not a patient needs one of these prescription options if they're not healing properly or at the follow-up appointment, Tom says.

In cases where people need surgery after a deep dental cleaning, the root planing can still help drastically reduce the amount of surgery they'll need, Cram says. For instance, in a patient with more advanced gum disease, "the scaling and root planning may resolve 80% of the problem," she explains, "and so they may only need to have surgery in one or two spots as opposed to their whole mouth."

While some people do end up needing more than one deep dental cleaning in their lifetime, Cram says, others will say, "I'm going to do my home care and I'm not going to get back in that position again."

# UCLA DENTAL STUDENTS'
# HUMANITARIAN ODYSSEY:
## BRINGING SMILES AND ESSENTIAL CARE TO CENTRAL AMERICAN REFUGEES IN TIJUANA

**BY DR. ELBERT TOM, GROUP PRACTICE DIRECTOR, HEALTH SCIENCES ASSISTANT CLINICAL PROFESSOR, UCLA SCHOOL OF DENTISTRY**

In a poignant testament to the power of altruism and the unwavering commitment to humanitarian dentistry, a team of 30 UCLA dental students embarked on a transformative mission to Tijuana, Mexico. This humanitarian endeavor, conducted in collaboration with the Refugee Health Alliance (RHA) and Kids Community Dental Clinic in Burbank, CA (KCDC), aimed to provide crucial dental care to Central American refugees navigating the complexities of seeking asylum.

The backdrop for this noble mission was an isolated and desolate area of Baja California, where the shelter in an undisclosed location, established within the confines of a church, housed refugees in an array of bunk beds, illustrating the challenging conditions these individuals faced as they embarked on a journey toward safety and stability. Among the vulnerable population were numerous children in dire need of essential dental interventions, including extractions, cleanings, silver diamine fluoride (SDF) preventative services, fluoride administration, sealants, and oral health instruction (OHI).

The UCLA dental team, armed with a sense of duty and compassion, threw themselves wholeheartedly into addressing the pressing dental needs of the community. Despite limited resources and the overwhelming demand for services, these dedicated students worked tirelessly, foregoing breaks and overcoming logistical challenges to ensure that each patient received the care they so desperately needed.

As the day unfolded, the line of residents seeking dental care seemed to lengthen, not diminish, as word spread about the vital services being offered. This underscored the stark reality of the unmet dental needs within the refugee community. Even in the face of material shortages, such as running out of essential items like gauze, the dental team demonstrated remarkable resilience and adaptability, finding innovative solutions to ensure the continuation of care.

Collaboration emerged as a cornerstone of the mission's success, with students assisting each other to navigate challenges and deliver optimal care under challenging circumstances. The camaraderie and unity displayed by the dental students exemplified the transformative power of collective effort in the face of adversity.

Beyond the provision of dental services, the team brought a small ray of joy to the children by distributing a handful of toys. The palpable delight on the faces of these young individuals amidst the challenging circumstances served as a poignant reminder of the positive impact that compassionate care can have on even the most vulnerable members of a community.

The families served at the shelter, once acclimated, faced a multitude of uncertain paths. Some would continue their journey to another shelter, while others would make the arduous decision to return to their home countries or venture further north in search of safety and opportunity. The fluidity of their situations highlighted the transient nature of their circumstances and the urgent need for timely and comprehensive healthcare interventions.

For the UCLA dental students, this humanitarian mission served as a profound educational experience, transcending the confines of a traditional classroom. It became a living lesson in the true meaning of altruism, underscoring the profound impact that volunteering can have on the lives of those in need. The mission further deepened their appreciation for the knowledge and skills acquired during their dental school training, reinforcing the pivotal role of healthcare professionals in addressing the pressing needs of vulnerable populations.

In conclusion, the Tijuana mission undertaken by the UCLA dental students, not only provided essential dental care to those in need but also left an indelible mark on the hearts and minds of the entire team. It served as a powerful reminder of the transformative potential of compassionate and dedicated healthcare professionals, whose commitment can bring hope and healing to even the most challenging and remote corners of the world. This remarkable journey will undoubtedly shape the future practice of these dental students, instilling in them a lifelong dedication to the principles of humanitarian dentistry and the pursuit of positive change in the lives of those they serve.

# DENTAL SCHOOLS AND THE FUTURE SUPPLY OF DENTISTS

Dental schools are an integral – if not obvious – factor in filling the shortage of dentists in the United States.

Several recently opened dental schools have cited the insufficient supply of dentists as a key reason why more dental school graduates are needed, according to an ADA Health Policy Institute research brief, "Projected Supply of Dentists in the United States, 2020-2040."

"There was a large cohort of dentists who graduated from U.S. dental schools between 1974 and 1988," according to HPI. "When they started to retire, this dramatically increased the outflows from the workforce from 2015 through 2020 and we projected their retirements will also account for much of the outflows through 2030."

The retirements have largely kept the ratio of dentists per population nearly unchanged in recent years, even as the number of dental schools increased and expanded enrollment. According to HPI, it recognizes that the future number of dental school graduates is subject to intense debate and speculation. Yes, new dental schools continue to open, but the flattening of dentist earnings in recent years, the increases in dental education debt and the reduction in demand for restorative dental care could ultimately impact the number of dental school applicants.

In this by-the-numbers infographic, the ADA News seeks to help visualize the future supply of dentists in the U.S. and dental schools' role in bridging the shortage gap.

# THE IMPORTANCE OF COMPREHENSIVE EDUCATION AND SAFEGUARDS IN THE USE OF DENTAL THERAPISTS

BY KARIN IRANI, DDS, JD

The American Dental Association (ADA) has always upheld the belief that oral health is an integral part of overall health, and that everyone deserves access to quality oral care. Central to this belief is the conviction that dentists, equipped with comprehensive education and training, are the best-qualified professionals to provide patients with the highest standard of care.

As of today, 14 states have implemented the use of dental therapists to help improve access to care, particularly in underserved areas. While the ADA recognizes the role dental therapists can play in expanding access, it is crucial that their integration into the healthcare system is approached with caution and a commitment to maintaining high standards of care. Before moving forward, a detailed study of these 14 states' use of dental therapists is necessary to show whether their participation has improved patient care.

If any state is considering the implementation of dental therapists, there must be robust safeguards in place to ensure that these providers are adequately trained to handle the complexities of oral healthcare. Dental therapists should receive a comprehensive education that equips them to manage challenging situations effectively, including the administration of anesthesia and restorative treatments.

Moreover, it is essential that dental therapists operate under adequate supervision of a licensed dentist to ensure the quality and safety of the care they provide. This supervision is especially important in maintaining the integrity of patient care and ensuring that dental therapists can draw on the expertise of a dentist when needed.

Furthermore, the deployment of dental therapists should be focused on areas where access to care is limited. In these regions, dental therapists can play a critical role in bridging the gap in oral healthcare, ensuring that patients who might otherwise go without care receive the attention they need.

In conclusion, while the ADA supports efforts to increase access to oral healthcare, it is vital that dental therapists are trained and supervised in a manner that upholds the high standards of care that all patients deserve. By ensuring that dental therapists receive comprehensive education and operate under appropriate supervision, we can expand access to care without compromising the quality of that care.

# FULFILLING A VITAL MISSION:
# KIDS' COMMUNITY DENTAL CLINIC
## BRIDGES ORAL HEALTH CARE GAP FOR LOW-INCOME FAMILIES

**BY DR. ELBERT TOM**

In response to a pressing need for accessible oral health care services among children from low-income working families, the Kids' Community Dental Clinic (KCDC) emerged as a beacon of hope. For nearly 35 years, a children's dental clinic in Burbank operated thanks to the generosity of the Sisters of Providence of St. Joseph Medical Center and its affiliates. However, the closure of the hospital's dental clinic in 1997 left a significant void to the community, leaving many working parents struggling to find affordable and convenient dental care for their children.

In 2002, after extensive planning and with unwavering local support, KCDC opened its doors within McKinley Elementary School, to cater to every child in need. Initially known as the Kids' Community Clinic of Burbank, the organization rebranded to Kids' Community Dental Clinic in 2004. This change underscored its commitment to oral health care preventative services and treatment while extending its services to children beyond the Burbank area.

Recognizing the holistic needs of their young patients and their parents, KCDC annually hosts a Parenting Outreach Day. This weekend, the event witnessed resounding success as it catered to the dental requirements of 54 patients. Services ranged from dental check-ups, cleanings, and Oral Hygiene Instruction to fillings and extractions. The event was made possible by the dedicated efforts of KCDC doctors, dental assistants, clerical staff, and the invaluable participation of UCLA dental students. In addition, the Los Angeles County COVID unit was on-site, providing free COVID-19 vaccinations, healthcare information, and COVID kits, further enriching the outreach initiative. The local Kiwanis Club also lent its support by generously providing lunch for all clinic volunteers and patients.

Through initiative like these, KCDC embodies its commitment to community well-being and continues to bridge the gap in oral health care access for underserved families. By fostering partnerships, delivering comprehensive care, and extending its reach through outreach endeavors, KCDC embodies the spirit of collective action in nurturing thriving communities, focusing on children and their parents as well.

# CAN COFFEE CURE GINGIVITIS?

**BY DR. ELBERT TOM**

Howard Schultz, the American businessman and author who served as the Chairman and CEO of Starbucks, had first discovered the complexities of coffee production during his visits to Milan, Italy. He soon became the Chairman and CEO of Starbucks all the while pondering ways in which he could improve on providing a better coffee product. Last year while Schultz was traveling in Sicily, he began enjoying a spoonful of Partanna extra virgin olive oil as part of his daily ritual in addition to his morning coffee, and soon he had the idea of trying the two together. He found that the combination produced a buttery smooth richness.

It has recently been discovered that a toothpaste containing extra virgin olive oil, xylitol and betaine may improve gingivitis better than commercial anti-gingivitis toothpastes as evidenced in Scientific Reports (April 18). Patients with gingivitis who brushed three times daily with a toothpaste containing EVOO experienced less gingival bleeding, reduced supragingival biofilms, and an increase in salivary pH.

So what do these two discoveries mean to us? Not only may we now enjoy a delicious cup of coffee, but it's great to know that we're also staving off gingivitis at the same time!

# SUSPICIOUS ORDERS REPORT SYSTEM (SORS) (JULY 2, 2024)

**CENTRALIZED DATABASE REQUIRED BY THE SUBSTANCE USE-DISORDER PREVENTION THAT PROMOTES OPIOID RECOVERY AND TREATMENT FOR PATIENTS AND COMMUNITIES ACT**

On October 23, 2019, DEA launched the Suspicious Orders Report System (SORS) Online, a new centralized database required by the Substance Use-Disorder Prevention that Promotes Opioid Recovery and Treatment for Patients and Communities Act (**SUPPORT Act, Pub. L. 115-271**). Reporting a suspicious order to the centralized database established by DEA (SORS Online) constitutes compliance with the reporting requirement under 21 U.S.C. 832(a)(3). All registrants who distribute controlled substances (within the meaning of 21 U.S.C. 802(11)) are required to design and operate a system to identify suspicious orders and notify DEA of suspicious orders. 21 U.S.C. 832(a). This obligation applies to all registrants *if they distribute controlled substances*, including the following:

- Distributor
- Manufacturer
- Importer
- Pharmacy
- Hospital/Clinic
- Teaching Institution
- Practitioner
- Mid-Level Practitioner
- Mid-Level Practitioner-Ambulance Service
- Researcher
- Analytical Lab
- Narcotic Treatment Program (NTP)

The SUPPORT Act states the term "suspicious order" may include, but is not limited to: an order of a controlled substance of unusual size; an order of a controlled substance deviating substantially from a normal pattern, and; orders of controlled substances of unusual frequency. Reporting SORS to the Administrator of the DEA and the Special Agent in Charge of the Division Office of the DEA for the area in which the registrant is located or conducts business local DEA Field Office and DEA Headquarters, or to DEA's centralized database, satisfies the requirement to report such orders to the Administrator of the DEA and the Special Agent in Charge of the Division Office of the DEA for the area in which the registrant is located or conducts business. 21 U.S.C. 832.

DEA registrants that are ARCOS Online and ARCOS EDI reporters should utilize their current ARCOS log on information to access the system. DEA registrants that are not currently ARCOS reporters may register on the website in order to report SORS to DEA's centralized database. The registration process is as follows:

1. Go to https://apps2.deadiversion.usdoj.gov/arcos-online and click on **"SORS Registration (for Non-ARCOS Reporters)"** hyperlink.
2. After completing the initial registration, a confirmation e-mail will be sent to the e-mail address provided.
3. Once DEA approves the registration, another e-mail will be sent with a temporary password.
4. Go to https://apps2.deadiversion.usdoj.gov/arcos-online and type in your username and the temporary password. The system will require you to change the temporary password.
5. Upon successfully changing the password, the account will be fully registered to report to the SORS Online system.

**For more information, contact SORS@dea.gov**

# PRESERVING THE STRENGTH AND INTEGRITY OF OUR PROFESSION THROUGH ORGANIZED DENTISTRY:

## WHAT IT MEANS TO BE A MEMBER OF THE AMERICAN DENTAL ASSOCIATION AND AN ADA FACULTY AMBASSADOR

**BY DR. ELBERT TOM**

As a Health Sciences Clinical Assistant Professor at the UCLA School of Dentistry and an active practitioner within our field, I frequently reflect on the multitude of factors that have facilitated my ability to engage in a profession I deeply cherish. It has become increasingly clear that the thriving nature of our profession can largely be attributed to the structured support provided by organized dentistry, specifically through the collaborative framework of the American Dental Association (ADA), the California Dental Association (CDA), and the San Fernando Valley Dental Society (SFVDS). This tripartite arrangement not only empowers us with a potent collective voice in legislative advocacy but also ensures access to a wealth of educational and clinical resources. These resources are instrumental in maintaining the ethical and professional standards that define our field, highlighting the pivotal role of organized dentistry in safeguarding the interests of its members and reinforcing our strength through unity.

In October of last year, I was honored with an invitation from Dr. Karin Irani, our esteemed ADA Trustee from California, to serve as an ADA Faculty Ambassador on behalf of the UCLA School of Dentistry. This opportunity led me to meet with Dr. Brendan Dowd, the ADA's Second Trustee and the visionary founder of the ADA Faculty Ambassador Program. During our discussions, Dr. Dowd provided a comprehensive overview of the program's objectives and its pilot initiatives designed to foster ADA engagement at the dental school level. The prospect of participating in a program that not only aligns with my professional values but also strives to make a meaningful impact was profoundly motivating.

In my role as ADA Faculty Ambassador, I was warmly welcomed by both the faculty at UCLA's School of Dentistry and the cabinet members of the American Student Dental Association (ASDA). My responsibilities include facilitating seamless communication between our ASDA chapter and the ADA, and delivering critical information on resources that are vital for the advancement of our profession. This role is especially significant as it supports the next generation of dental professionals, who are undoubtedly the future of our field. By providing them with essential knowledge and opportunities, we help shape the trajectory of dental practice and its contributions to patient care.

Although personal commitments prevented my attendance at this year's Lobby Day in Washington, DC, the feedback from our ASDA chapter members who participated was overwhelmingly positive. They shared their enriching experiences of engaging with influential legislators and learning about pertinent bills that could impact our profession. Such interactions underscore the importance of advocacy at all levels of organized dentistry–from local dental societies to national associations.

Moreover, the ADA offers numerous benefits to its members, including professional liability and disability insurance , ADA student loan refinancing, assistance in job placement, setting the bar on safety as the FDA uses 81 ADA standards to assess the safety and efficacy of dental products, practice building resources to aid in establishing and sustaining our practices, and a Well-Being Program that provides confidential support not only to our professionals but also to their families and staff. The vitality and integrity of the ADA, and by extension our profession, rely heavily on active and engaged membership.

I am immensely grateful for the opportunity to contribute to our profession as a member of the ADA, ADA Faculty Ambassador and Editor for the San Fernando Valley Dental Society and to advocate for our collective interests and advancement. The experiences and insights gained through these roles reinforce my commitment to dental education and practice, underscoring the significant impact that organized dentistry has on both individual practitioners and the community at large.

# MEM BER SHIP

## *diary*

### BY DR. ANETTE MASTERS

# APRIL 2024





**APRIL 17TH: GENERAL MEETING 4**
General Meeting #4 where Dr. Steven Gold shared valuable insights on preventing enamel cruelty, and Dr. Jaewoo Cho addressed the growing epidemic of cracked and fractured teeth. This event focused on key strategies for restoration and prevention in dental practice, offering practical solutions to enhance patient care and preserve long-term dental health.

# MAY 2024

**MAY 16TH: CDA PRESENTS ANAHEIM**
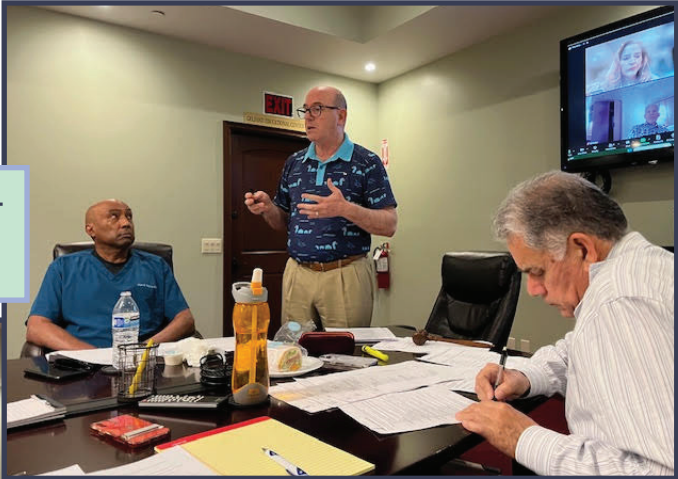Dentist networking & Learning to build a strong community

**MAY 28TH: ZONE MEETING 4**
Social Media training for Leveraging ai and social media for empowering dental marketing with Adrian Lefler

# JUNE 2024



JUNE 4TH: EXCOM/ BOARD OF DIRECTORS AT
SFVDS CENTRAL OFFICE



# AUGUST 2024

**AUGUST 22ND: SPEED PAIRING**
Speed Pairing hosted by Provide: learning key factors
in practice transition and roadmaps to practice
purchases and sales

# SEPTEMBER 2024

### SEPTEMBER 14TH: LA DENTAL MEETING
Opportunity to network with fellow professionals, explore new technologies, and discover innovative solutions for growing dental practices. Left with valuable insights from the workshops and new connections with industry Leaders

# OCTOBER 2024

### OCTOBER 2ND: HEALING CA DONATION
The Healing CA Donation event in Oxnard is a charity-driven gathering for dentists to contribute to local communities in need. It focuses on providing dental care and support to underserved populations. Dentists participate by donating time, resources, or services to help improve oral health and make a positive impact on the community.

# OCTOBER 2024



**OCTOBER 5TH: AFTERNOON TEA-HEALTH & NUTRITION:**
12th Annual Afternoon Tea Party where we had the privilege of learning about Health & Nutrition from Dr. Sanda Moldovan, renowned author of Heal Up and host of The Holistic Dentistry Show. Her expertise provided valuable insights into how nutrition plays a crucial role in overall health and dental wellness over breakfast and tea.



**OCTOBER 9TH: GENERAL MEETING 7**
Dr. Mo Kang, Dr, Yara Berdan, and Dr. Rafael Roxas educating on the topic of Endodontics

# OCTOBER 2024

## OCTOBER 19TH: SCHLEP & SHRED

The Schlep and Shred event in Santa Clarita is an annual gathering for dentist members that combines document shredding with networking and community involvement. Participants can safely dispose of old records while connecting with colleagues, sharing industry insights, and enjoying a more casual, social atmosphere. It's a fun way for dental professionals to engage and stay informed.

# OCTOBER 2024



**OCTOBER 26TH: ZONE MEETING 8**
Dental Symposium at the Odyssey hosted by Provide, McNeeley, Galvis, Dumm





# NOVEMBER 2024

**NOVEMBER 7TH: CDA HOUSE OF DELEGATES AT LOS ANGELES MARRIOTT**
Annual CDA House of Delegates meeting, where crucial discussions were held to shape the future of dental policy and practice. It was a great opportunity to connect with colleagues and leaders, and be part of the decisions that will influence the direction of our profession.

# NOVEMBER 2024

# Dental implant planning using artificial intelligence:
# A systematic review and meta-analysis

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Dental implant placement is a meticulous process that requires careful planning in order to minimize surgical risks and achieve the best esthetic and functional results.[1] This planning includes several sequential stages, such as identifying the edentulous area, locating and evaluating vital anatomic structures, measuring bone dimensions, and virtually placing the dental implant using specialized planning software programs.[2,3] However, human shortcomings, which can result from subjective judgment, anatomic variations, limitations in visualization, and individual interpretation, can contribute to surgical complications and a less-than-optimal outcome.[2]

## ABSTRACT

**Statement of problem.** Data on the role of artificial intelligence (AI) in dental implant planning is insufficient.

**Purpose.** The purpose of this systematic review with meta-analysis was to analyze and evaluate articles that assess the effectiveness of AI algorithms in dental implant planning, specifically in detecting edentulous areas and evaluating bone dimensions.

**Material and methods.** A systematic review was conducted across the MEDLINE/PubMed, Web of Science, Cochrane, and Scopus databases. In addition, a manual search was performed. The inclusion criteria consisted of peer-reviewed studies that examined the accuracy of AI-based diagnostic tools on dental radiographs for dental implant planning. The most recent search was conducted in January 2024. The Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool was used to assess the quality of the included articles.

**Results.** Twelve articles met the inclusion criteria for this review and focused on the application of AI in dental implant planning using cone beam computed tomography (CBCT) images. The pooled data indicated an overall accuracy of 96% (95% CI=94% to 98%) for the mandible and 83% (95% CI=82% to 84%) for the maxilla in identifying edentulous areas for implant planning. Eight studies had a low risk of bias, 2 studies had some concern of bias, and 2 studies had a high risk of bias.

**Conclusions.** AI models have the potential to identify edentulous areas and provide measurements of bone as part of dental implant planning using CBCT images. However, additional well-conducted research is needed to enhance the accuracy, generalizability, and applicability of AI-based approaches. (J Prosthet Dent xxxx;xxx:xxx-xxx)

To address these challenges and to optimize the implant planning workflow and simplify the digital treatment procedures, a wide range of technological tools are currently marketed to facilitate the integration of digital processes in dental implant planning. These tools include cone beam computed tomography (CBCT), intraoral scanners (IOSs), facial scanning equipment, computer-aided design and computer-aided manufacturing (CAD-CAM) systems, and

## Clinical Implications

In clinical settings, AI technology can help identify edentulous areas and measure bone using CBCT. However, the technology does not cover all planning procedures at present, and further development is recommended.

implant planning software programs.[2,3] Recently, artificial intelligence (AI) has been suggested as a tool in different aspect of implant dentistry applications.[4] AI refers to the ability of computer systems to perform tasks that are similar to those executed by humans. Within this framework, deep learning arises as a methodology rooted in the learning of neural networks using artificial neural networks to extract features from intricate sets of data.[4,5] Implant planning using AI algorithms has the potential to significantly transform clinical practice through its ability to enhance the accuracy and safety of implant placement, achieved by automating the process of identifying missing teeth, measuring bone dimensions, and detecting vital structures. The integration of AI technology has the capacity to decrease dependence on subjective human judgment, mitigate the potential for errors, and optimize treatment outcomes.[6–8]

Recent studies[6–9] have reported the effectiveness of AI algorithms in detecting areas of missing teeth for implant planning. These models are trained on large datasets of CBCT images and can offer a time-efficient solution for automated dental implant planning.[10] Notable AI algorithms used in implant planning in dentistry include Convolutional Neural Networks (CNN), DenseNet Support Vector Machines (SVM), and Artificial Neural Networks (ANN).[10,11]

The authors are unaware of a systematic review assessing the current scientific literature regarding the role of AI in dental implant planning procedures. Therefore, the aim of this systematic review was to analyze the available literature and provide evidence-based recommendations on the accuracy of AI in implant planning. Specifically, this review aimed to evaluate the effectiveness of AI in detecting the edentulous area and assessing bone dimensions. By synthesizing the findings from multiple studies, this review aimed to determine the overall accuracy and reliability of AI technologies in these areas and provide valuable insights for clinical practice. The research hypothesis was that the integration of AI technologies in implant planning could improve the accuracy of edentulous area detection and bone dimension assessment.

## MATERIAL AND METHODS

This systematic review assessed the effectiveness of AI algorithms in dental implant planning procedures. The review followed the Joanna Briggs Institute (JBI) methodology for diagnostic test accuracy[12] and adhered to the preferred reporting items for the systematic reviews and meta-analyses of diagnostic test accuracy (PRISMA-DTA) guidelines.[13] The systematic review protocol is available in the International Prospective Register of Systematic Reviews (PROSPERO): CRD42023482364.

A search for relevant studies was conducted without time or language restrictions; the most recent search was conducted in January 2024. Supplemental Table 1 (available online) provides the PIRD syntax formulated for each of the databases. The search results were imported into a software program (EndNote; Clarivate) to eliminate duplicate records. The review question, population, index test, reference test, diagnosis of interest criteria (PIRD) framework, eligibility criteria, online databases searched, keywords used for searching, and manual search sources are presented in Table 1.

Two reviewers (A.Y.A., R.A.) screened the titles and abstracts of identified articles using predetermined eligibility criteria. If additional information was required, the reviewers assessed the full text of the articles. The reviewers examined potentially relevant articles and agreed on the final selection for further analysis. In the event of divergent opinions between the 2 reviewers at any point during the process, a third reviewer (W.I.) facilitated conflict resolution through discourse. Based on the JBI recommendation, the quality assessment of diagnostic accuracy studies-2 (QUADAS-2) tool was used to assess the quality of included articles against the predefined criteria to consider individual sources of risk of bias. The QUADAS-2 evaluates the risk of bias and applicability concerns in 4 key domains: patient selection, index test, reference standard, and flow and timing (Supplemental Table 2, available online). The QUADAS-2 questions were answered by "Yes," "No," or "Some concern," helping to evaluate the quality of the included studies and the risk of bias in each domain. A reviewer (R.A.) conducted the initial assessment in the data extraction process, followed by a separate evaluation by a second reviewer (A.Y.A.). A third reviewer (D.E.) resolved any conflicts or discrepancies during the assessment.

The data from the included studies were extracted by using a standardized data extraction form. Information included study identity, radiographic modalities, data set size (training, validation, test), and the individuals responsible for executing and interpreting the index tests (including numbers and expertise). Additionally, dental implant systems and AI models, AI model performance (including sensitivity, specificity, precision or accuracy) and data related to quality assessment were extracted.

The meta-analysis involved calculating the pooled accuracy proportion and 95% confidence intervals (CIs) using the available data. Heterogeneity among studies was assessed using statistical tests. A fixed-effects model was used for low/moderate heterogeneity, while a random-effects model was used for significant heterogeneity. No sensitivity

**Table 1.** Review question, PIRD framework, eligibility criteria, online databases searched, and keywords used for searching and manual search sources

| Item | Description |
|---|---|
| Review question | What is the accuracy of artificial intelligence models in identifying and measure the missing tooth or teeth area for the purpose of dental implant planning using dental radiographs? |
| PIRD framework (Population, Index test, Reference test, Diagnosis of interest) | Population: CBCT radiographs of patients who required dental implant treatment; Index test: a diagnostic tool based on AI; Reference test: experts' judgment; and Diagnosis of interest; effectiveness of AI model (such as, accuracy of dental implant planning procedure) |
| Eligibility criteria | − Inclusion criteria: diagnostic clinical, retrospective, or cross-sectional studies that examined the accuracy of diagnostic tools using artificial intelligence algorithms on dental radiographs. These studies assessed automated dental implant planning procedures (such as, identifying and measure the missing tooth or teeth area)<br>− Exclusion criteria: review articles, letters, expert opinions, and articles discussing AI applications in dental fields other than dental implant planning. |
| Database searched | PubMed, Web of Science, Scopus, and Cochrane |
| Keywords used for searching | (" algorithm* " OR " algorithm " OR "artificial intelligence" OR "AI" OR "automatic" OR "automated" OR "semi-automatic" OR "semi-automated" OR "deep learning" OR "Convolutional neural network" OR CNN OR "machine learning") AND ( "Dental implant" OR "oral implant" OR "osseointegrated implant" OR " implant*") AND ("cone beam computed tomography" OR "cone beam computed tomography" OR "CBCT" OR "imaging, three- dimensional"" OR "edentulous area" OR "bone diamension" OR " bone measurement " OR " planning" or plan)) |
| Additional manual searches | − The reference lists of all related articlesw<br>− Relevant journals.<br>− The System for Information on Grey Literature in Europe (OpenGrey) |

CBCT, cone beam computed tomography.

test or subgroup analysis was conducted because of the limited number of included studies. The analysis was performed using a software program (R for Windows; The R Project for Statistical Computing). Charts were used to present the differences in measurements of the implant site between AI and manual methods. The statistical significance of these differences was calculated by using a software program (MedCalc; MedCalc Software Ltd).[14] The mean and standard deviation (SD) were calculated based on the median, range, and sample size ($\alpha$=.05 for all tests).

## RESULTS

Of 5003 records obtained through an electronic database search, 2656 remained after removing duplicates. After title and abstract screening, 62 articles were selected; a second screening resulted in 15 eligible records, of which 5 were excluded after full-text screening and 2 articles were added via hand searching, resulting in 12 eligible studies.[6,10,11,15–23] The number of articles identified at the various review stages can be seen in the PRISMA flowchart (Fig. 1). The detailed characteristics of the included studies are summarized in chronological order from 2021 to 2023 in Table 2. Table 3 presents the main findings of the included studies. The artificial intelligence models used in the included studies are presented in Table 4.

The meta-analysis included 4 studies[6,10,16,17] that provided data on the accuracy of detecting missing areas in the maxilla or mandible. Other studies were excluded from the meta-analysis for various reasons. One study[11] measured the combined accuracy of both arches without distinguishing between the maxillary and mandibular measurements. Additionally, several studies[19,20,22,23] used different parameters, such as precision, while others used the dice similarity coefficient (DSC)[18,21] or the area under the curve[15] to evaluate the effectiveness of AI models. Because of these

variations in measurement parameters, the results could not be combined in the meta-analysis. The different metrics for measuring the effectiveness of AI models are summarized in Table 5. The combined accuracy of AI models from 2 studies[6,10] in detecting the mandibular edentulous area was found to be 96% (95% CI=94% to 98%) (Fig. 2). Similarly, the combined accuracy of AI models from 4 studies[6,10,16,17] in detecting the maxillary edentulous area was 85% (95% CI=79% to 92%). However, a wide range of prediction intervals spanning from 56% to 100% with a high degree of heterogeneity ($I^2$=96%; $P$<.01) was found (Fig. 3A). To determine the impact of outlier results, a sensitivity analysis was conducted by excluding 1 study.[6] The analysis revealed an accuracy of 83% (95% CI=82% to 84%) with no heterogeneity ($I^2$=0%; $P$=.7), and a narrower prediction interval ranging from 79% to 87% (Fig. 3B).

Regarding bone measurement, Widiasri et al[19] compared the AI and manual measurements of bone width and length in maxillary and mandibular implant areas. The AI measurements generally aligned with manual measurements, but notable differences were observed in specific implant areas. For instance, AI showed higher bone width in some areas compared with manual measurements. Figure 4A shows the measurements of the bone height of the implant site as revealed by the AI and manual methods, while Figure 4B shows the measurements of the bone width of the implant site as revealed by the same methods.[6] Significant differences were found for all regions except for the mandibular premolars ($P$=.07) in the measurement of bone height. Generally, the AI method recorded higher values than the manual measurements.

An assessment of the risk of bias for each domain in every included study is presented in Figure 5, while Supplemental Table 3 (available online) provides a detailed analysis. The critical appraisal, conducted using the QUADAS-2 tool for diagnostic accuracy studies, indicated an overall low risk of bias among 8 included
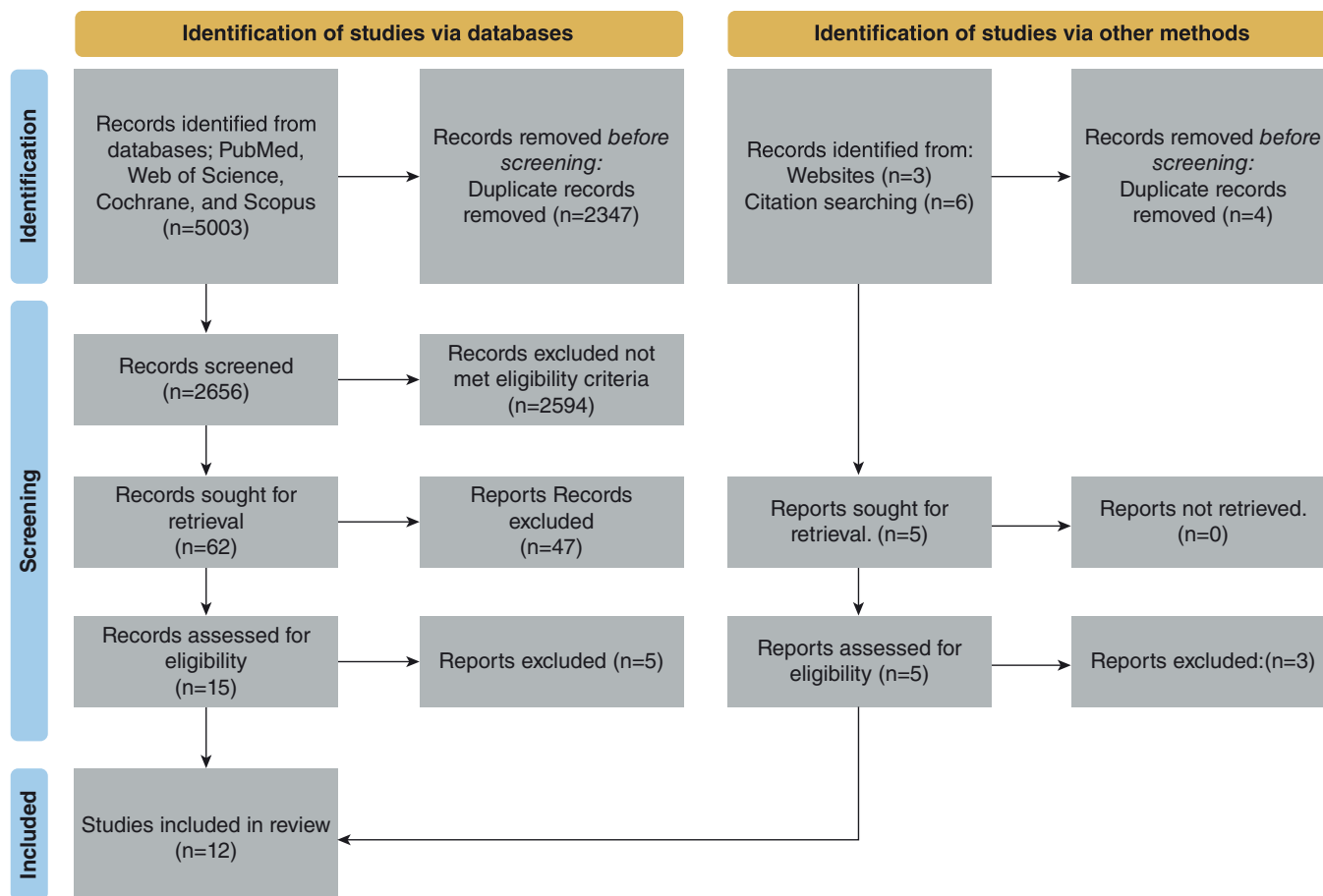
**Figure 1.** Flow diagram illustrating study selection phases based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA).

studies.[10,11,15–19,21] However, 2 studies were judged to have some concerns regarding bias,[20,23] and 2 studies were rated as having a high overall risk of bias.[6,22] Specifically, in the patient selection domain (D1), the Yang et al[20] and Yang et al[23] studies raised concerns regarding bias, while the Bayrakdar et al[6] and Alotaibi et al[22] studies were identified as having a high risk of bias. In the index test domain (D2), no specific concerns were found, but the study by Alotaibi et al[22] had a high risk of bias. However, all included studies[6,10,11,15–23] were deemed to have a low risk of bias in the reference standard domain (D3) and the flow and timing domain (D4).

## DISCUSSION

Advancements in AI techniques have shown potential to revolutionize implant planning through the use of AI models. This systematic review examined 12 relevant studies[6,10,11,15–23] to explore the use of AI techniques in identifying edentulous areas and assessing bone dimensions for implant planning. Promising results were found in automating tasks such as identifying edentulous areas, detecting tooth regions, assessing bone

dimensions, and localizing radiographic markers. These AI techniques have demonstrated a high level of accuracy, consequently presenting valuable benefits for implant planning.

The combined accuracy of AI models was found to be 96% (95% CI=94% to 98%) in detecting the mandibular edentulous areas and 83% (95% CI=82% to 84%) in detecting the maxillary edentulous areas. Furthermore, AI has the potential to serve as a valuable tool in the detection, segmentation, and labeling of teeth and edentulous regions, effectively reducing time consumption. In terms of time required for analysis, dental experts spent an average of 98 seconds, whereas AI achieved the same task in a significantly shorter median time of 1.5 seconds[11] These results support the research hypothesis that the integration of AI technologies in implant planning has the potential to identify and delineate the required areas for implant placement.

All included studies used CBCT images for the purpose of dental implant planning. Previous studies on the AI-based detection of edentulous areas in panoramic images have shown limited effectiveness, possibly because of variations in oral anatomy and tooth size.[7] The accuracy of identifying radiographic markers in CBCT

**Table 2.** Characteristics of included studies

| Study ID | Radiographic Modality/ Source of Radiographs | Area of Interest | Purpose of Training | AI Method | Software Program used for Reference Test Method | Validation Method | Data Set Size (Training, Validation, Test) | Reference Test. Interpretation No. (Expertize) | Results | AUC |
|---|---|---|---|---|---|---|---|---|---|---|
| Bayrakdar et al 2021[6] | Cone-Beam Computed Tomography(CBCT) images/ Faculty of Dentistry of Eskişehir Osmangazi University | Alveolar bones and missing tooth regions | locate the missing tooth and determine the implant location according to the neighboring teeth' location and tilt. determinations of canals/sinuses/ fossae and calculation of bone length/ width in missing teeth areas. | 3D U-Net DCNN (Diagnocat, Inc.) | InvivoDental 6.0 (Anatomage Inc. San Jose, CA, USA) | Internally modified fully convolutional 3D U-Net architecture from | 580 (NR, NR, NR) | 1 (oral and maxillofacial radiologist) | Accuracy:<br>– Canal 77.2%,<br>– sinus and fossae 66.7%,<br>- missing tooth region 95.3% (mandible 96.2 and maxilla 94.5) | 93% |
| Liu et al 2021[15] 2021 | CBCT images & intraoral scanning/ Guanghua School of Stomatology, Hospital of Stomatology, Sun Yat-sen University | Missing mandibular left 1st molars | Detect implant site according to various points that divided into 3 groups; group 1=8 points, group 2=9 points and group 3=10 points. | Single shot multibox detector (SSD) and Voxel-to-voxel prediction network for pose estimation (V2V-PoseNet) based AI system | NR | V2V-PoseNet method | 2567 (97.3%, NR, 2.7%) | NR (NR) | Accuracy of 10 points yielded the best accuracy | 100% |
| Roongruangsilp and Khongkhunthian 2021[16] | CBCT images/ Center of Excellence for Dental Implantology, Faculty of Dentistry, Chiang Mai University | Missing posterior maxillary teeth | Dental implant planning in the posterior maxillary region. | faster R-CNN algorithm | DentiPlan Pro version 3.7; NECTEC, NSTDA, Thailand | IBM PowerAI Vision platform | 316 (94.9%, 5.1) 300 training, 16 testing | 1 (Dentist) | Accuracy: 81.25%. | NR |
| Alsomali et al 2022[17] | CBCT images/ King Saud University, College of Dentistry (KSUCD) and the College of Computer and Information Sciences (CCIS) | Maxillary edentulous regions | Implant treatment planning. Using radiographic stent gutta percha (GP) markers to identify proposed implant sites | Mask R-CNN | Romexis® 3D (Planmeca Romexis® 5.2.0. R, Helsinki, Fin- land) | | 16,272 (90.2%, 9.8%, NA) 18441 (79%, 8.6%, 12%) | NR (NR) | The AI model had an 83% true positive rate for identification of the GP markers | NR |
| Gerhardt et al 2022[11] 2022 | CBCT images/ Center of Dentomaxillofacial Radiology of the University Hospitals | Teeth and small edentulous regions | Detection and labeling of teeth and small edentulous regions | Deep learning CNN (Virtual Patient Creator) | Impax viewer (Agfa Healthcare v6.5.5, Mortsel, Belgium) | Split-sample validation | 221 (63.3%, 20.8%, 15.8%) | 1 ( Dental specialist) | Accuracy: teeth 99.7%, missing teeth 99% general accuracy of 99.7%, 99.7% of recall and 100% of precision.<br>Accuracy: small edentulous areas 99%. Recall 100% and precision 98.7%. | NR |
| Al-Sarem et al 2022[10] | CBCT images/ Taibah University Dental Hospital, K.S.A | Missing teeth's position | Enhancing 3D missing tooth area detection for dental implant planning | A. Detection and Classification Using the Pretrained DL Models 6 types CNN models AlexNet, VGG16, VGG19, ResNet50, DenseNet169, and MobileNetV3.<br>B. U-Net model using teeth segmentation and Confusion matrix of U-Net model | C.S. 3D Imaging (Carestream Dent L.L.C., Atlanta, GA, USA) | 10-fold cross-validation technique | 500 (70%, 20%, 10%) | 2 (Implantologist and professional dentist) | Precision:<br>DenseNet169; 98%. MobileNetV3; 95% VGG19; 94, ResNet50; 94%, VGG16; 93%, and AlexNet; 92%<br>The DenseNet169 segmentation accuracy of 93.3% missing tooth regions detection accuracy of 89%.<br>U-Net best performing training, validation, and testing results (Accuracy, precision, recall):<br>U-Net Training; 93.40%, 99%, 97%.<br>U-Net Validation; 92.92%, 93%, 98%.<br>U-Net Testing; 90.81%, 96%, 97%.<br>Confusion matrix of U-Net model (precision, recall):<br>Class 0 (Normal teeth)=93%, 98%.<br>Class 1 (Missing teeth) =99%, 97%. | 95% |
| Cui et al 2022[18] | CBCT images/ China: Stomatological Hospital of Chongqing Medical University (CQ-hospital), the First People's Hospital of Hang- zhou (HZ-hospital), the Ninth People's Hospital of Shanghai Jiao Tong University (SH-hospital), and 12 dental clinics | Central incisor Lateral incisor Cuspid 1st premolar 2nd premolar 1st molar 2nd molar 3rd molar Maxillary bone Mandible bone | Individual teeth and bone segmentation | To segment individual teeth and a filter-enhanced network to extract alveolar bony structures from the input CBCT images - V-Net | Imaging Sciences International, Planmeca, Vatech; Sirona, Instrumentarium Dental; LargeV; Bondent Imaging; Carestream Health; Trophy; | Binary cross-entropy loss | Internal set; 4531(70%, 30%) 70% External set; 407 (24.5%, 75.4%) Testing, validation | 2 (Dental radiologists) | Dice similarity coefficient (DSC): tooth 91.5% alveolar bone 93.0% Individual teeth and bone segmentation on internal and external testing sets' Teeth; Internal testing set; DSC (%)=94.1%, Sensitivity (%)=93.9%. External testing set; DSC (%)=92.5%, Sensitivity (%)=92.1%. Bone; Maxillary bone, Mandible bone Internal testing set; DSC (%)=94.5%, Sensitivity (%)=93.8%. External testing set; DSC (%)=93.8%, Sensitivity (%)=93.5%. | NR |
| Widiasri et al 2022[19] | 2D grayscales CBCT images/ Universitas Airlangga Academic Dental Hospital | Alveolar bone (AB) and mandibular canal (MC) | Detect the alveolar bone and mandibular canal to determine the height and width of the alveolar bone, which determines the implant position | Dental-YOLO network model, YOLOv3, YOLOv3-tiny, YOLOv4 | ITK SNAP version 3.8 | | 1064(70%, 30%) training and testing | 2 (Dental radiologists) | Precision: for alveolar bone and mandibular canal using Dental-YOLO network model=99.46%., Comparison with YOLOv3=99.15%, YOLOv3-tiny=97.58% YOLOv4=98.99% | NR |
| Yang et al 2022[20] | CBCT images/ Shenzhen University General Hospital | The implant position at the tooth crown area | Identification of edentulous area for implant position | - Anchor-free (Deformable DETR, ImplantFormer), - Transformer-based (CenterNet, ATSS, VFNet, RepPoints, ImplantFormer) | KaVo 3D eXami machine, manufactured by Imagine Sciences International LLC | five-fold cross-validation | 3045 (80%, 20%) 2436 training, 609 testing | 3 (Dentists) | Precision:<br>- Anchor-free (Deformable DETR=12.8%, ImplantFormer=13.7%.<br>- Transformer-based (CenterNet=10.9%, ATSS=12.1%, VFNet=11.8%, RepPoints=11.2%, ImplantFormer=11.5%) | NR |
| Moufti et al 2023[21] | CBCT images/ University Dental Hospital Sharjah | Any case of missing lower teeth, it being single or multiple, anterior or posterior, uni- or bilateral bounded saddle | Identify and delineate edentulous alveolar bone on CBCT images before implant placement | "U-Net"convolutional neural network (CNN) in the Medical Open Network for Artificial Intelligence (MONAI) framework | ITK-SNAP | | 43(76.7%, 23.3%) 33 training and 10 testing | NR (NR) | DSC; 89% for training and 78% for testing. Unilateral edentulous areas, DSC (91%) than bilateral cases (73%). | NR |
| Alotaibi et al 2023[22] | CBCT images/ King Saud University, College of Dentistry (KSUCD) | Identify the proposed implant (s) position | Training YOLOv3 model to detect and place a bounding box around the fiducial markers and adjacent bone within the CBCT images | YOLOv3 model | Darknet53 model | | 2213(80%, 20%) | | Precision, Sensitivity, IoU Experiment A (testing images 'no markers on implant position) = 46.78%, 60%, 40.83% Experiment B (have at least one marker)=75.30%, 74%, 69.14% | NR |
| | | | Planning for implant size and position to classify different intra-osseous lengths (6, 8, 10) and different intraosseous diameters (3.3, 4.10) | Six models (apical: Y, X, Z; occlusal: Y, X, Z) | Romexis®, 5.2.0. R, Planmeca, Helsinki, Finland | | 530 (59.2%, 20.3%, 20.3%) | | Accuracy, precision, Sensitivity A. Implant lengths 76%, 64%, 59% B. Implant diameter 59%, 79%, 77% | NR |
| Yang et al 2024[23] | CBCT images/ Shenzhen University General Hospital | | To train a two-stream implant position regression framework (TSIPR) | TSIPR (Implant Region Detector (IRD) and a multi-scale patch embedding regression network (MSPENet) compared with Yolov7, Yolov7-X, Yolov7-W6 | KaVo 3D eXami machine, manufactured by Imagine Sciences International LLC | five-fold cross-validation | 3045 (80%, 20%) 2436 training, 609 testing | 3 (Dentists) | Precision: MSPENet=15.4% IRD=15.7% Yolov7=78.1% Yolov7-X=86.9% Yolov7-W6=86.8% Precision: Tooth Crown vs. Tooth Root ImplantFormer using crown images achieves Tooth Crown 34.3% Tooth Root 13.7% | NR |

AI, artificial intelligence; AUC, area under curve; CBCT, cone beam computed tomography; CNN, convolutional neural network; DSC, dice similarity coefficient; GP, gutta percha; IRD, implant region detector; mAP, mean average precision; NR, not reported; VGG, visual geometry group; YOLO, you only look once model.

images to locate potential dental implant sites was affected by the choice of image type. Relying solely on axial images to train an AI program to locate these markers was not sufficient because there were no clear marker shapes in the images.[17] Moreover, the accuracy of detection of edentulous areas was affected by structures such as dense areas within trabecular bone that can be identified as teeth in partially edentulous patients.[11]

The review results showed that AI models performed better in detecting missing areas or measuring bone in the mandibular arch compared with the maxillary arch. This difference can be explained by the complexity of incorporating structures like the maxillary sinus, nasal cavity, and incisal fossa, which can affect the accuracy of segmentation.[21] Likewise, patients with distal extensions were difficult to analyze because of the challenges in accurately annotating the boundaries.[24]

CBCT images with varying edentulous spans and positions in the mouth, including posterior and anterior and unilateral and bilateral, were included to ensure generalizability. However, the increased variability in such situations leads to a decrease in the accuracy of the model. Bilateral edentulism had the most significant impact on the performance of the model. The lower performance observed in patients with bilateral edentulous areas could be attributed to the relatively smaller proportion of these patients in the training sample compared with the testing sample. Additionally, the images needed to be individually rotated, exported, segmented, and then merged computationally.[21] While the AI model correctly identified the amount of bone available between adjacent teeth, its segmentation did not exactly match human segmentation. Manual segmentation produces a cuboid shape with parallel anterior and posterior border cuts, whereas the segmentation of the AI model produced a trapezoidal area adjacent to the edentulous area because of the inclination of the posterior teeth. Implant selection is primarily based on the available bone in the narrowest space (that is, the upper zone), given that implants are usually cylindrical in shape.[21]

AI systems are limited in their ability to measure bone height and thickness in certain areas associated with incorrect evaluation of bone thickness angles which hindered accurate measurements. The insensitivity of the system resulted in some inconsistencies in the measurement of bone height in the anterior region. Although the system successfully identified the mandibular canal, it was unable to accurately determine the bone height in these areas, possibly because the system did not account for the diameter and thickness of the implant. Consequently, the system may have overlooked the canal from the buccal or lingual aspect during measurement, resulting in higher reported measurements in that area.

**Table 3.** Main findings regarding effectiveness of AI models in included studies

| Study ID | Main Findings on Effectiveness of AI Models |
|---|---|
| Bayrakdar et al 2021[6] | Achieved accuracies of 77.2% for canal detection, 66.7% for sinus and fossae detection, and 95.3% for missing tooth region (96.2% for mandible and 94.5% for maxilla). |
| Liu et al 2021[15] | Reported best accuracy for detection of 10 points, although specific value was mentioned. |
| Roongruangsilp and Khongkhunthian 2021[16] | Obtained accuracy of 81.25%. |
| Alsomali et al 2022[17] | Achieved true positive rate of 83% for identification of GP markers. |
| Gerhardt et al 2022[11] | Obtained high accuracies, including 99.7% for teeth detection, 99% for missing teeth detection, and 99% for small edentulous areas. |
| Al-Sarem et al 2022[10] | Achieved high precisions for different models, such as 98% for DenseNet169, 95% for MobileNetV3, and 94% for VGG19 and ResNet50. Also reported segmentation accuracy of 93.3% for missing tooth regions. |
| Cui et al 2022[18] | Achieved DSC of 91.5% for tooth segmentation and 93.0% for alveolar bone segmentation. |
| Widiasri et al 2022[19] | Obtained precision of 99.46% for alveolar bone and mandibular canal detection using Dental-YOLO network model. |
| Yang et al 2022[20] | Achieved precision values ranging from 10.9% to 15.7% for different transformer-based models. |
| Moufti et al 2023[21] | Reported DSC of 89% for training and 78% for testing, with better results for unilateral edentulous areas (91%) compared with bilateral situations (73%). |
| Alotaibi et al 2023[22] | Reported precision values of 46.78% and 75.30% for experiments without and with implant markers, respectively, along with other accuracy metrics for implant lengths and diameter. |
| Yang et al 2024[23] | Achieved precision values ranging from 10.9% to 15.7% for different transformer-based models. |

DSC, dice similarity coefficient; YOLO, you only look once model

**Table 4.** Artificial intelligence (AI) models used in included studies

| AI models | 3D U-Net DCNN,[6] SSD and V2V-PoseNet,[15] Faster R-CNN,[16] Mask R-CNN,[17] deep learning CNN,[11] Dental-YOLO network models,[19,22] AlexNet, VGG16, VGG19, ResNet50, DenseNet169, and MobileNetV3,[10] V-Net,[18] U-Net within MONAI framework,[21] anchor-free methods like Deformable DETR and ImplantFormer, transformer-based methods such as CenterNet, ATSS, VFNet, RepPoints, and ImplantFormer, and their proposed TSIPR method compared with Yolov7, Yolov7-X, and Yolov7-W6.[20,23] |
|---|---|

AI, artificial intelligence; CNN, convolutional neural network; VGG, visual geometry group; YOLO, you only look once model

**Table 5.** Metrics for measuring effectiveness of AI Models

| Metrics | Description |
|---|---|
| Accuracy[6,10,11,15–18,21,22] | Measures proportion of correct predictions made by model over total number of predictions made. One of most widely used metrics to evaluate performance of classification model. |
| Precision[10,11,17,19,20,22,23] | Measures how many of predicted positive instances actually positive, A high precision score means that model has low rate of false positives |
| Recall[10,11] | Measures how many of actual positive instances correctly predicted. High recall score means that model has low rate of false negatives. |
| Dice similarity coefficient (DSC)[18,21] | The Dice score, often referred to as Dice similarity coefficient, quantifies overlap between two datasets, typically expressed as binary arrays, to assess their similarity. |
| F1 Score[10] | Measure of model's accuracy that takes into account both precision and recall, where goal is to classify instances correctly as positive or negative. |
| Area under curve (AUC)[6,10,15] | Metric used to evaluate performance of binary classification models. |
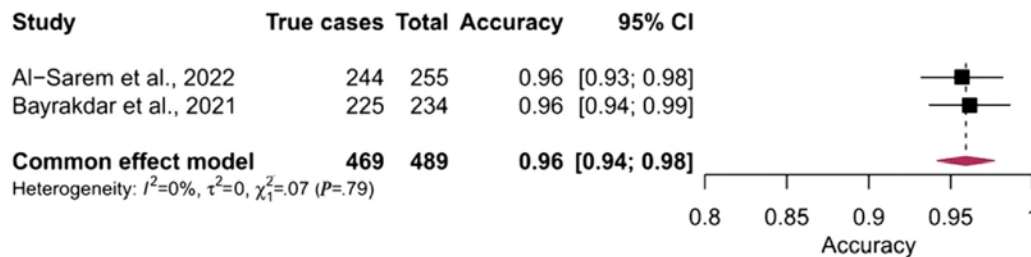


**Figure 2.** Forest plot of included studies showing accuracy and CI of AI model accuracy in detecting edentulous area in mandible.
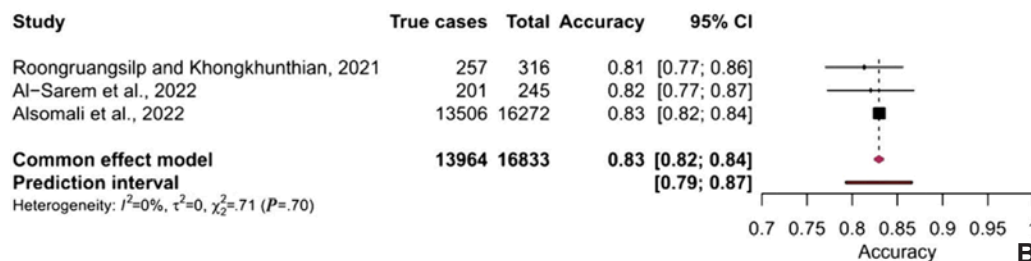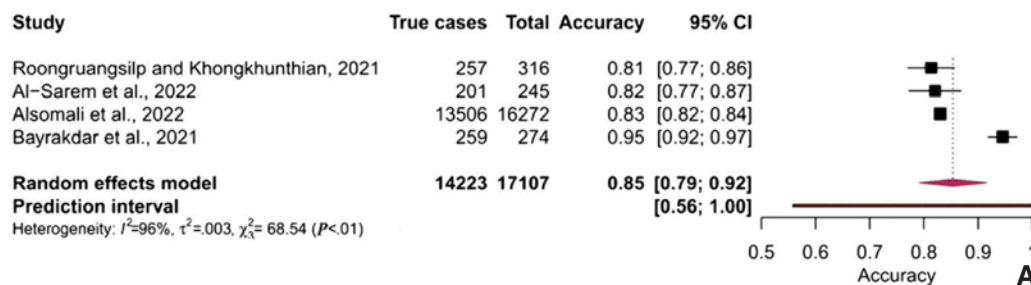


**Figure 3.** Forest plot of included studies showing accuracy and CI of AI model accuracy in detecting edentulous area in maxilla. A, before sensitivity analysis. B, After conducting sensitivity analysis.

**Figure 4.** AI and manual measurements of implant site. A, Bone height. B, Bone width.
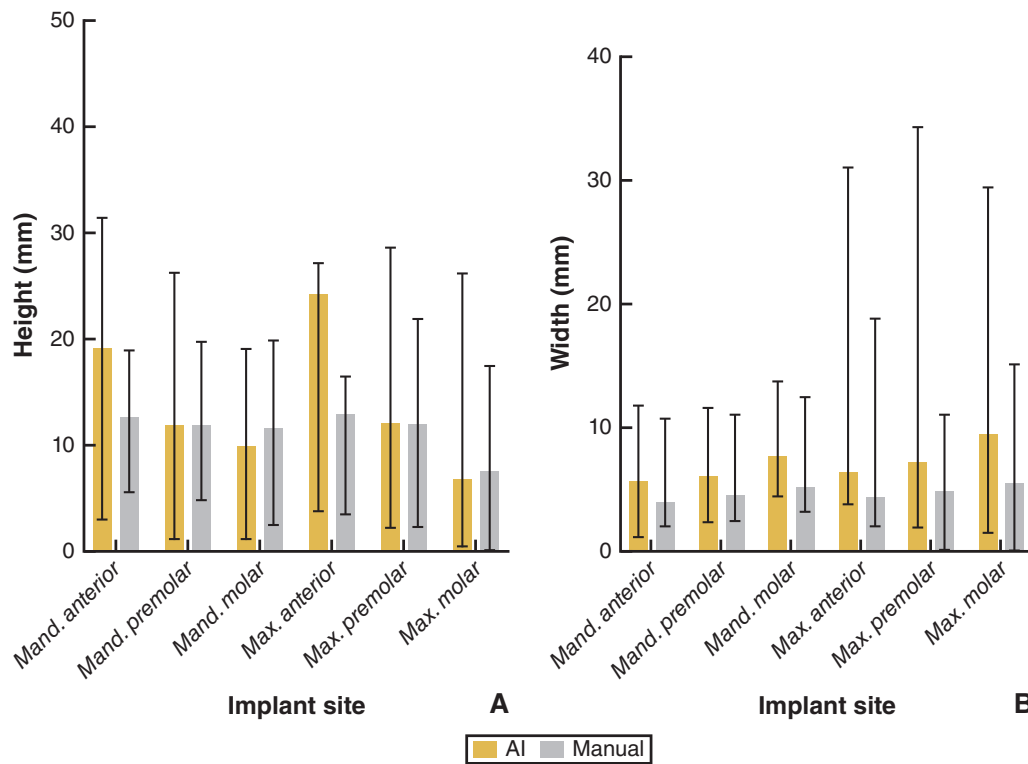
However, the AI system demonstrated consistency with manual measurements in the maxilla molar or premolar region and mandible premolar region.[6]

Similarly, a study[19] conducted a comparison between the AI and manual measurements of bone width and length in the implant areas of the maxilla and mandible. The AI measurements were generally found to be comparable with manual measurements, although notable discrepancies were observed in certain areas, possibly attributed to the inherent limitations associated with manual measurements, which are susceptible to human error from variations in technique and subjective interpretation. Additionally, differences in operator experience and skill levels can also contribute to the variability observed in manual measurements.

The findings of the meta-analysis indicated high overall accuracy of the included studies. However, the wide range of the prediction interval suggests substantial uncertainty in the accuracy estimates for future studies. This variability could be associated with differences in the study design, sample characteristics, and diagnostic methods used across the included studies. Furthermore, the high percentage of heterogeneity observed in the meta-analysis indicates significant variation among the studies. Heterogeneity can arise from variations in study populations, outcome measures, and other study characteristics. The presence of high heterogeneity can affect the generalizability and reliability of the pooled accuracy estimates. These findings highlight the need for caution when interpreting the overall accuracy estimate.

Despite the promising results, several challenges should be acknowledged. First, the lack of standardized protocols and datasets makes it difficult to compare the performance of different AI models across studies. The heterogeneity in imaging modalities and image quality further complicates the development of universally applicable AI algorithms. Secondly, the reliance on large amounts of annotated data for training AI models can be a time-consuming and resource-intensive process. Furthermore, most of the discussed studies focused on the identification of edentulous areas, but there is a need for research on other aspects of implant planning, such as bone quality and quantity assessment, virtual implant placement, and prediction of surgical outcomes. Acknowledging these limitations can help overcome some of these obstacles and facilitate AI's safe and successful integration into clinical practice. The availability of high-quality annotated datasets is crucial to further improve the accuracy and generalizability of AI-based approaches. The standardization of imaging protocols and datasets is essential to ensure consistency and comparability across different studies. Additionally, the integration of AI-based approaches into clinical practice requires validation and regulatory approval.

**Risk of bias domains**

| Study | D1 | D2 | D3 | D4 | Overall |
|---|---|---|---|---|---|
| Bayrakdar et al 2021 | X | + | + | + | X |
| Liu et al 2021 | + | + | + | + | + |
| Roongruangslip and khongkhunthian 2021 | + | + | + | + | + |
| Alsomali et al 2022 | + | + | + | + | + |
| Gerhardt et al 2022 | + | + | + | + | + |
| Al-Saram et al 2022 | + | + | + | + | + |
| Cui et al 2022 | + | + | + | + | + |
| Widiasri et al 2022 | + | + | + | + | + |
| Moufti et al 2023 | + | + | + | + | + |
| Yang et al 2023 | − | + | + | + | − |
| Alotaibi et al 2023 | X | X | + | + | X |
| Yang et al 2024 | − | + | + | + | − |

Domains:
D1: Patient selection.
D2: Index test.
D3: Reference standard.
D4: Flow & timing.

Judgement
X High
− Some concerns
+ Low
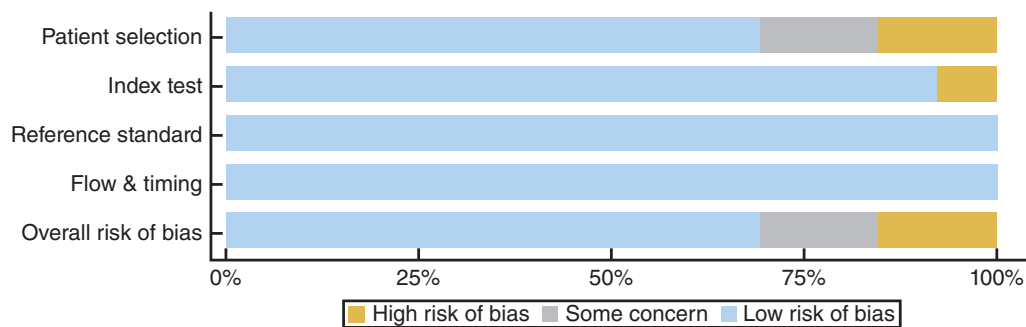
**Figure 5.** Risk of bias summary: review authors' judgments about each risk of bias item.

## CONCLUSIONS

Based on the findings of this systematic review with meta-analysis, the following conclusions were drawn:

1. AI-based approaches have demonstrated encouraging outcomes in the identification of edentulous regions as a component of dental implant planning with an accuracy of 96% and 83% for maxillary and mandibular arch, respectively.

2. The AI technology demonstrated potential in providing accurate and consistent bone measurements, but it should undergo additional validation and refinement to ensure its reliability in clinical practice.

3. Challenges such as the absence of standardized protocols and datasets, training that requires considerable resources, and insufficient research on other aspects of implant planning need to be addressed in future research to enhance the accuracy,

generalizability, and applicability of AI-based approaches.

## APPENDIX A. SUPPORTING INFORMATION

Supplemental data associated with this article can be found in the online version at doi:10.1016/j.prosdent.2024.03.032.

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# DR. JORGE ALVAREZ
## (BOARD OF DIRECTORS)

### LENGTH OF TIME INVOLVED WITH ORGANIZED DENTISTRY

I have been involved in organized dentistry for about 45 years, first in my country of origin, Mexico, I was a member of Asociacion Dental Mexicana, Cuernavaca city chapter. Later, a member of the Colleges of Dentists in Ensenada and then in Tijuana, Baja California Norte.

In the US I have been a member and held different leadership positions in the Hispanic Dental Association of Los Angeles (HDA of LA, founder), The America-Italian Dental Association(AIDA, founder),  The San Fernando Valley Hispanic Dental Society (founder), The San Fernando Valley Dental Society part of the tripartite with the American Dental Association and the California Dental Association.

### HOBBIES/INTERESTS:

Music is one of my hobbies, classical music , opera, jazz, salsa. Love to play Latin percussion.

Gastronomy, living in Los Angeles gives us the opportunity to connect with all the diverse ethnicities that share a fantastic gastronomy, through food and culture we find more similarities than differences.

Cinematography, you never can go wrong in Los Angeles, the mecca of the movie industry.

Reading all kinds of books, journals and magazines.

And sports, bicycle riding, swimming, golf and soccer.

### PERSONAL/FAMILY LIFE:

Married for 45 years to my loving wife Eva, two children both professionals, three grandchildren and a son in law.

Not to forget a whole bunch of wonderful in laws.

### WHAT MAKES YOU UNIQUE?

Through all the years the qualities I have been able to develop and continue to, not only from living life but being with people that are or were leaders in their own right, first the respect to myself and others.

To prepare on advances as much as I can, to be able to solve the different challenges life and our profession bring to us.

It is a continuum. Never ends.

# EVIDENCE BASED SUMMARY OF SUCCESS RATES OF CUSTOM CAST POST VS FIBER POST

BY MEGHA RAO, D.D.S., ELBERT TOM, D.D.S., RAM VADERHOBLI, D.D.S., SEAN MONG, D.D.S.

## INTRODUCTION

The true success of endodontic treatment is determined by the longevity of the tooth in the oral cavity.(1) Endodontic treatment commences with root canal treatment and ends with proper reinforcement of the tooth, rehabilitation to proper form and function.(2) A root canal treated tooth is considered to be at a higher risk to tooth fracture under masticatory load.(3) This could be attributed to multiple reasons, including - devitalization of the tooth, invasive intraradicular instrumentation, dehydration of radicular dentin and the use of various caustic intracanal irrigants that weakened tooth structure.(3–6) The reinforcement of weak tooth structure thus plays an extremely crucial role in ensuring long-term success of the tooth. (2)

The introduction of posts in endodontics dates back to the use of "dowels" back in the 18th century. Pierre Fauchard introduced the use of metal screws as intracoronal retention aids for posterior crowns and bridges.(7) The evolution of post and core systems have come a long way since. Custom cast metal posts made of noble metals as well as other alloys were the gold standard of care until the late 1990s.(8) The customizability of the cast post to mimic the varied anatomy of the post space contributed to exacting fit has been reported in literature as immense success.(9) The procedure of fabrication of these posts, however is extremely technique sensitive and cumbersome. It involves recording an intra-coronal post space impression using direct wax or pattern resin. This pattern is then invested into a gypsum bonded or phosphate bonded investment material followed by a dewaxing procedure, to create a mould. The alloy to be used is made molten by heating in a furnace, and casted into the mould under pressure and centrifugal force.(9,10) This elaborate procedure allows numerous possible procedural errors such as – improper post space preparation, presence of undercuts in the post space, pattern deformation during transportation to the lab and multiple casting defects. Fabrication of a wax pattern or resin

is very technique sensitive, the accuracy of which depends significantly on the skill of the operator. Wax patterns if not manipulated properly can undergo dimensional changes during transportation to the lab. The retention of the cast post is attributed to the mechanical retention provided by the luting cementum used (Zinc Phosphate, GIC, etc.) and hence, numerous patients report back to the dentist with dislodged restorations.(8–11) The excessive removal of tooth structure during post space preparation in combination with placement of a bulky metal post (with a modulus of elasticity very different from that of radicular dentin) has shown to distribute forces onto the root of the tooth resulting in root fractures.(11) The physics of favorable stress distribution along the tooth root is influenced by the presence of a ferrule.(12) Achieving a uniform circumferential ferrule of 2mm around the coronal aspect of the tooth becomes extremely challenging in teeth with inadequate coronal tooth structure.(13) Naumann stated that the success of a tooth restored with an indirect restoration significantly depends on the achieving the ferrule effect.(14)

The short comings of cast posts as well as the advances in bonded restorations led to the development of the fiber post.(15,16) The fiber post combated the challenges of the cast post in that, it was a simple chairside technique requiring significantly less clinical time. Prefabricated fiber posts were first made of carbon fiber, an excellent material with the ability to withstand transmitted masticatory forces as well as flexural forces.(17,18) Fiber post kits usually come with pesso reamers with correspondingly sized posts which fit canals of varying sizes. The ability to chemically bond to achieve micromechanical retention to radicular dentin, aesthetic properties and ease of use have made fiber posts very popular.(19) Despite of these advantages, many practitioners still fear the use of fiber posts as it makes endodontic retreatment extremely challenging. Other clinicians believe

against the notion that one size fits all, and that the use of stock shapes and sizes does not complement the varying anatomy of the root canal in terms of shape and taper.(20)

Several systematic reviews have been published comparing the long-term success of cast post versus fiber post. Zhou, et al., compared the fracture resistance of cast post and fiber posts through a meta-analysis and concluded metal posts showed greater fracture resistance compared to teeth restored using fiber posts.(21) In contrast to this, Xiaodong Wang concluded that fiber posts displayed higher medium-term (3 to 7 years) overall survival rates in comparison to metal posts when used in the restoration of endodontically treated teeth.(22) The systematic reviews and meta-analyses conducted by Martins and Mendonca stated that there was no difference between cast posts and fiber posts in terms of long-term clinical success.(20,23) Taking into consideration the disparity in a consensus in present day literature, in terms of clinical success of the two techniques of post systems, this systematic review and meta-analysis aimed to evaluate the difference in success rates between cast post and core and prefabricated fiber posts. The research hypothesis assumed was that there was no difference between cast post and core and prefabricated fiber posts in terms of clinical success rates.

## METHODOLOGY

The major databases, including Pubmed/MEDLINE and Science Direct, were searched for the last 5 years, 2017–2022, including randomized control trials, cohorts, and in vitro studies, which showed 81 results.

The following descriptors and keywords were utilized: "Prefabricated post", "Fiber post", " fiber glass post", " fiber-post", " pre-fabricated post", "Cast

post", "Post and core", "Customized post", "customized metal post", "core buildup", "post & core", "cast-post". The keyword "dietary" was indicated not to be searched on the databases.

The literature retrieval and evaluation were carried out by 6 independent researchers. Titles and abstracts were examined by the reviewers, and related articles were selected by only the title in the first step. Then in the second step articles, irrelevant articles were rolled out based on their abstracts. Therefore researchers identified the relevant articles, excluding in-vitro studies, which showed 10 results pertinent to the subject. Full articles were evaluated independently by all the researchers for the studies to converge on the area of interest, and articles with incomplete information in the title or abstract were excluded in order to facilitate an informed conclusion.

The following considerations have been included in the paper, fracture resistance comparison between fiber post and cast post; survival rate of both cast post and fiber post; surface modification; and cement utilized to enhance the strength of the post.

## RESULTS

A total of 617 endodontically treated teeth received intraradicular posts, with 320 treated using Fiber posts and 297 treated using Metal posts. The mean age of the patients was 41.3 years with an average follow-up period of 36.54 months. However, two studies (Karteva et al. and Naumann et al.) did not report the age of the patients.

Four studies assessed both the Anterior and Posterior regions, while two studies (Cui et al. and Karteva et al.) evaluated only the Posterior region. Of the total evaluated teeth, 227 were in the Anterior region, and 299 were in the Posterior region. One study did not report the region of their assessment (Naumann et al.).

Most of the studies used metal and ceramic as the material of choice for restoration, while two studies (Cui et al. and Cloet et al.) used all-ceramic crown. One study used direct composite as their restoration material.

Root fracture was the most commonly reported type of failure (n=29), other causes of failures were core fracture, secondary caries, endodontic failure, tooth mobility, loss of retention of the post, post debonding, and other types of failures. However, two studies (Naumann et al. and Karteva et al.) did not report their failures.

While 3 out of seven studies shows higher success

Flow diagram describing search strategy
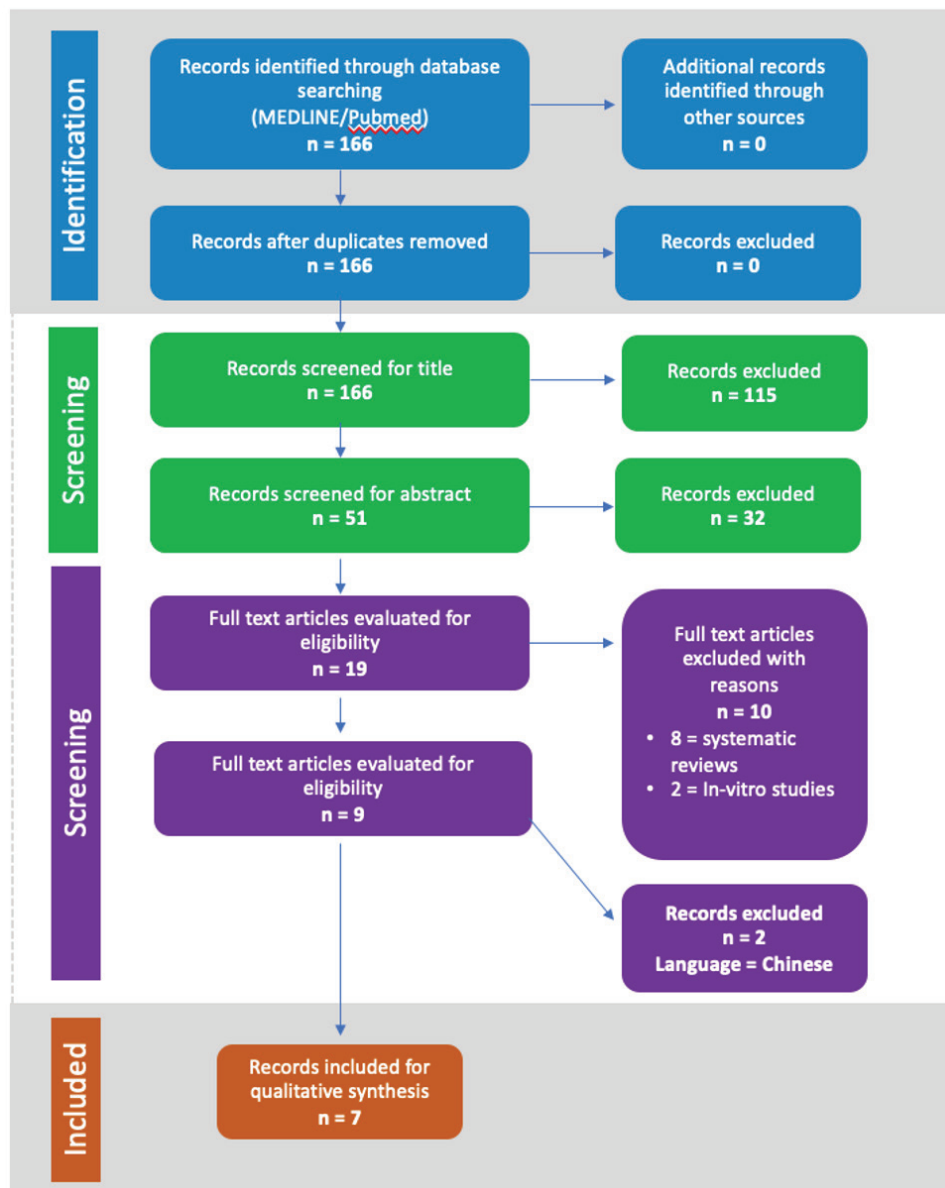
rates in Cast Post than Fiber Post, there were no significant difference between the success rates of Fiber Post and Cast post in all 7 studies (see table). 2 studies (Karteva et al and Cui et al.) reported 100% success rates for both Cast Post and Fiber post.

## DISCUSSION

The results obtained in our study proved that the null hypothesis assumed, stating that- there was no difference in the clinical success of endodontic teeth, was proven true. Our results were consistent with the results obtained in a systematic review by Martins et al, where in an analysis of 10 studies up to the year 2020 was studied.(20) Taking into consideration the recent advances in adhesive materials, our search included studies from the past 5 years, 2017 onwards. Our study was different from other studies because it included clinical trials

that were conducted during the COVID-19 pandemic including the years 2020 to present. Furthermore, our study was also unique in that it included all studies with different follow up periods, different post systems as well as both anterior and posterior teeth.

The post-restoration success of a tooth is determined by its longevity in the oral cavity.(24–26) This is majorly influenced by the ability of the tooth to bear masticatory forces. The success of teeth is hence directly dependent on the remining tooth structure.(27) Cast post restorations require overzealous preparation of the canal space as well as reshaping of the coronal tooth structure to accommodate adequate space for the metal core structure as well as for the final crown.(9) Fiber posts on the other hand are thinner in diameter and make use of the luting agent to fill the canal space

| Author/Year | Study Design | Patient numbers, Gender | Type of Post | Remaining Coronal Walls | Type of Crown | Follow up months | Success Rate(%) | Significant difference |
|---|---|---|---|---|---|---|---|---|
| Sarkis-Onofre, et al, 2020 | RCT | 119<br>96 F<br>23 M | FP: 111<br>CP: 72 | No walls or 0.5 mm of enamel | Metal-Ceramic | Mean: 62 | FP:84.7%<br>CP:91.7% | NO |
| Cui et al 2020??? | CT | 17<br>NR | FP: 7<br>CP:10 | Extensive coronal destruction | All-Ceramic | Mean: 12.2 | FP:100%<br>CP:100% | NO |
| Naumann et al 2017 | RCT | 91<br>45 F<br>46 M | FP: 45(1 dropout)<br>PMP: 46 | 0, 1 or 2 remaining cavity walls | Metal-Ceramic | Mean: 98 | FP: 75.6%<br>PMP:84.8% | NO |
| Cloet et al 2017 | RCT | 143<br>76 F<br>67 M | FP: 91<br>PMP: 100 | Less than 2 dentin walls | All-Ceramic | Mean: 69.6 | FP: 80.2%<br>PMP: 76% | NO |
| Karteva et al, 2016 | RCT | 22<br>10 F<br>12 M | FP: 9<br>MP:14(1 dropout) | One or two missing proximal walls | Direct Composite | Mean: 12 | FP: 100%<br>PMP: 100% | NO |
| Gbadebo et al, 2014 | RCT | 30<br>NR | GFP:20<br>SSMP:20 | Minimum of 2-mm coronal tooth structure cervically For ferrule effect | Metal-Ceramic | 1 and 6 months | FP:97.50%<br>Metal stainless steel: 100% | NO |
| Sarkis-Onofre, et al, 2014 | RCT | 54<br>45 F<br>9 M | FP: 37(4 dropout)<br>CP: 35(2 dropout) | no coronal wall or ferrule height, 0–0.5 mm | Metal-Ceramic | Up to 3 years | FP:97.1%<br>CP: 91.9% | NO |

while maintaining the original canal anatomy.(28) Studies conducted by Sarkis et al., disproved this theory stating that there was no significant difference in the success of these two techniques. (29)

Posts tend to transmit forces along the root up to the level of the post tip. Due to the wedging effect of cast posts, root fractures are common.(30) Some studies however, have stated that an equal number of root fractures are also seen in teeth restored with fiber post.(21) This could imply that the mechanics of root fractures in teeth restored with posts could be attributed to the interface created at the

post-obturation interface rather than the nature of the post material because of a change in elastic modulus between the tooth and restorative material resulting in an accumulation of forces at the weakest point of the root. (31,32)

The masticatory forces being distributed differently across the anterior and posterior regions significantly impact the longevity of the tooth. It hasbeen found that anterior teeth are less prone to fractures when compared to posterior teeth since anterior teeth do not come in contact during centric movements.(32) Other studies did not categorize teeth based into anterior(central incisors, lateral

incisors and canines) and posterior teeth(premolars and molars) thus subjecting the results to bias and questionable success rates.(29,33,34) A comparison between studies that categorized teeth with those that did not may have created a bias between the success rates analyzed.

Fiber posts have a lesser post to cement ratio and gain retention through micro-mechanical bonding to the dentin.(35) They debond only if the bonding procedure is not done accurately – moisture contamination, inadequate manipulation of the resin or inadequate curing.(36) Cast posts are retained through mechanical retention of the luting cement.(37,38) The design of the cast post however is not mechanically retentive.(39) Different cements like GIC, Zinc Phosphate, etc. have varying film thickness as well as retentive properties. The variation in type of luting cements used as well as the cementation techniques across the studies could have an effect on the long term success of cast posts and fiber posts.

The COVID-19 pandemic affected both the number of restorative cases being performed as well as follow up of restorations. Thus, the studies taken into consideration, having most of the follow-up periods in the pandemic would have made it difficult to monitor. We thus increased our search period from 3 years to 5 years to include studies that commenced prior to the pandemic and to include studies having longer follow-up periods. It was also noted that there were significantly fewer number of studies published in this topic within the last 3 years when compared with the previous time periods prior to the pandemic.(40)

While addressing the heterogeneity of the studies, it was noted that variations were present in - the duration of the follow up period, the age groups taken into consideration, the categorization of teeth into anterior and posterior, alloys used for cast posts, types of fiber post systems, luting cements and techniques of bonding. Considering these significant variations and the high level of heterogeneity across the studies, a meta-analysis was chosen not to be performed.

## CONCLUSION

Within the limitations of our study, the following conclusions were drawn –

1. There was no clinically significant difference in the success rates of restoring endodontically treated teeth with cast posts and fiber posts.
2. The COVID-19 pandemic played a

significant role in the publication of clinical trails pertaining to post endodontic restorative success.

Further studies need to be performed to include more homogenous clinical trails with longer follow up periods for a better understanding of clinical success rates. However, it can also be concluded that both cast posts and fiber posts are an excellent treatment option for post endodontic restorations.

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**LEUKOPLAKIA** – white fuzzy patches on the tongue that cannot be scraped off. It is of unknown etiology but tobacco may be a major risk factor. 3-17.5% of people with leukoplakia develop Squamous Cell Carcinoma (SCC) within 15 years.

**ORAL HAIRY LEUKOPLAKIA** – is a type of leukoplakia that commonly afflicts people who have the Epstein-Barr virus and a weakened immune system (especially from HIV). It does not cause cancer at all. Is also associated with people who have had organ transplants or are taking medications to suppress their immune system. It may resemble oral thrush (candidiasis) but candidiasis CAN be wiped off.

**HIV HAIRY LEUKOPLAKIA**



**GINGIVAL CYST** – is an uncommon cyst of the gingival soft tissue occurring in either the free or attached gingiva. This odontogenic epithelial cyst is most frequently seen near the mandibular canine and premolar region, believed to represent the soft tissue counter part of the lateral periodontal cyst. They usually occur on the facial gingiva as a single small flesh colored swelling, sometimes with a bluish hue due to the cystic fluid. Rarely, it may occur in multiples, either unilaterally or bilaterally or on the lingual surface of the alveolar process. The incidence of gingival cysts of adults show a racial predilection, with Asians revealing a much lower prevalence of the lesion than Caucasians; however, there is no gender difference in the incidence of the disease.



## CBCT VS. PERIAPICAL RADIOGRAPHY: IDENTIFYING LONGITUDINAL TOOTH FRACTURES

**Cone-beam computed tomography** imaging may be more effective at detecting longitudinal tooth fractures compared with periapical radiographs, according to a study published in The Journal of the American Dental Association.

Investigators examined the teeth of 98 patients diagnosed with longitudinal tooth fractures following direct visualization. They used CBCT imaging and periapical radiographs to detect cracked teeth, split teeth, vertical root fractures and bone loss patterns associated with these types of fractures.

The investigators found that compared with periapical radiographs, CBCT imaging more accurately identified periradicular bone loss linked to longitudinal tooth fractures. Further, they noted a correlation between the type of tooth fracture and root canal treatment, deep probing depth and the extraction of more than eight teeth.

The findings suggested that CBCT imaging could facilitate the correct diagnosis of longitudinal tooth fractures through bone loss analysis.

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# Healing California

**SFVDS** San Fernando Valley DENTAL SOCIETY



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Safety, Health, and Dignity of our patients is our utmost urgent priority

### Positive experience
We provide positive volunteer and employee experience to get the absolute best from them.

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