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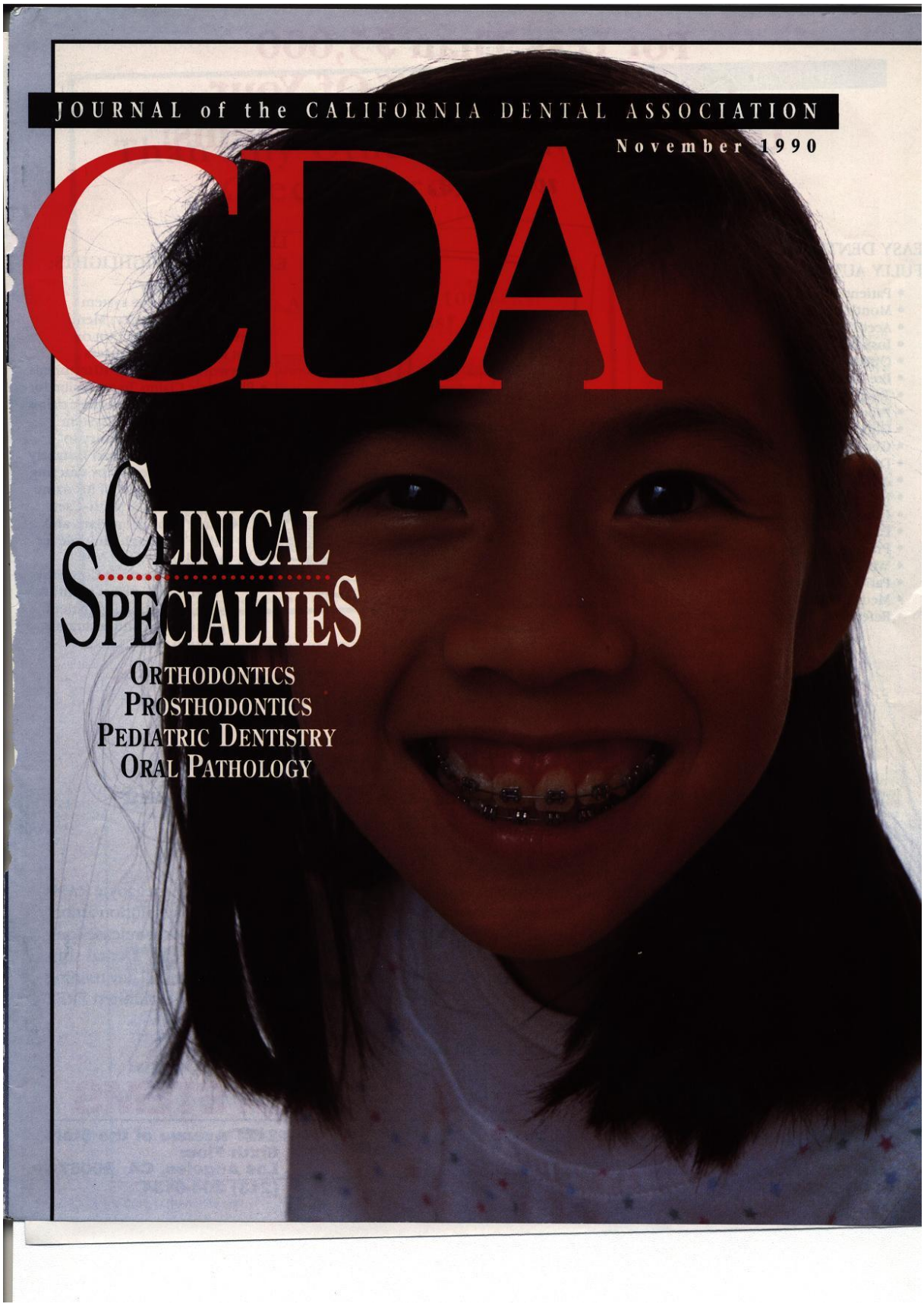
Clinical Specialties

Orthodontics
Prosthodontics
Pediatric Dentistry
Oral Pathology



wishes to prescribe implants (should) develop a rapport with a team of specialists who are experienced in the diagnosis, treatment planning and placement of implants if a successful result is to be achieved."

With "increasing numbers of completely and partially edentulous patients enjoying an improved quality of life" due to dental implants, according to John B. Holmes, DDS, ACP president, what should dentists expect in the 1990s?

"The next decade will be a period of competition, claims and confusion," predicts Loos. "Numerous new implant systems will enter the market. Each will be a little bit different...totally untested...and will quote predicted success based on previous systems. Some of the systems will not survive their own results. However, dental implants will continue to be an important and predictable treatment choice."

Others agree that new systems will be introduced. Holmes mentions modalities for augmenting severely atrophied residual ridges. Binon is enthusiastic about the coming availability of single and double disk-implants for "the previously untreatable maxillary ridge. Developed by Dr. Gerard Scortecci of France, these implants have demonstrated an impressive 7-year success rate in excess of 90 percent."

"I predict that in the coming decade osseointegrated implants will become the treatment of choice for replacing missing teeth or teeth with a questionable prognosis," says Landesman. "It will not be unusual for...teeth with questionable prognoses (to) be extracted and implants used to replace them. Furthermore, single tooth implants will be perfected. It seems realistic to say that, before the middle of the 21st century, the use of removable prostheses will be a thing of the past."

> **"The advent of a predictable bone anchored root analog has broadened the capabilities of prosthodontic treatment to a level not yet fully appreciated."**
>
> Paul P. Binon, DDS

CAD/CAM Technology

CAD/CAM technology is brand new, still in the early development stages. In fact, says Loos, "Most dentists are only recently aware of this technology."

CAD/CAM stands for computer-aided design/computer-aided manufacturing. The system allows a computer to design and a milling machine to form a crown, inlay or posterior bridge in a single office visit.

Dr. Francois Duret, a French dentist currently working at USC, is one of the leading researchers in this area. His system uses a laser scanner to produce images of a patient's mouth. Data are processed by shape recognition software, visualized on a video display and transferred to special software which creates a 3-D model of the mouth. The dentist can then access a library of "theoretical teeth," choose and adapt them to the patient's mouth and design a three-dimensional, rotatable model of the proposed prosthesis on the screen. Specifications for the prosthesis are then transferred to a computer-controlled micro-milling machine, which shapes the finished restoration from a block of prestructured material.

Still in a "stage of infancy," CAD/CAM is not yet widely accepted. Experts differ on the future of the technology. As a USC colleague of Duret, Landesman is predictably positive. "Like Dr. Branemark did twenty-five years ago, Duret is carefully developing a system, testing it, and in due time — when the research ensures a system that will be better than what we now can provide for patients — Dr. Duret will introduce CAD/CAM technology to the profession as a practical means for providing superior care for patients."

Dr. Loos notes that the products currently available are too limited in capabilities and costly to be in general use. He predicts (and Dr. Holmes concurs), however, that as technology improves and cost decreases in the next decade, CAD/CAM will emerge as a major component of prosthetic dentistry, dramat-

Master cast for fabrication of 4-unit implant-supported fixed partial denture. courtesy of Dr. Larry Loos

Implant-supported fixed partial denture #18 through #21. courtesy of Dr. Larry Loos

ically changing its technical parameters.

But the future is not assured, as Dr. Binon explains: "The marginal discrepancies at present are not within the range that most conscientious practitioners are willing to accept. You don't need a $250,000 machine to produce an imperfect-fitting inlay or crown ... it's done every day with far less effort and expense! In addition, the ART of the ART and SCIENCE of dentistry will not be replaced with a machine."

Binon admits, though, that "CAD/CAM will produce a limited life replacement that fits much better into our disposable lifestyle than the preparations we create in the mouth. If the system is time-efficient and affordable, I will most likely get a unit to make my temporaries and provisionals."

Other Electronic Technology

Video imaging techniques to predict a cosmetic result, voice-activated computer charting, computer assisted diagnosis and treatment planning: all are now a reality, albeit a primitive one, available to all of dentistry.

Computer assisted diagnosis will help to eliminate variables that prejudice and influence personal interpretation. It also will permit the use of mathematical models to select the number of crown and bridge abutments and the best treatment design.

A particularly prosthodontic-related new electronic technology is computer-enhanced measurement of bone density, which will make implant treatment more predictable. Given the capability of reading increases in bone density that result from incremental loading of the fixtures, it will be possible to determine when definitive restorations are best placed in the upper arch, when the implant is being overloaded and to what extent osseointegration is present at various time intervals for optimum fixture exposure.

Practical implementation of these technologies into the treatment room will require further miniaturization and a powerful, affordable, centralized processing unit that can integrate all these functions into one unit. Binon predicts that the treatment room of the future will incorporate this multifunctional computer console, along with a new, very technically sophisticated auxiliary at the helm.

These and other technological advances, entering the mainstream of routine use, will radically alter the way dentistry is practiced in the next decade and beyond.

CAD/CAM will emerge as a major component of prosthetic dentistry, dramatically changing its technical parameters.

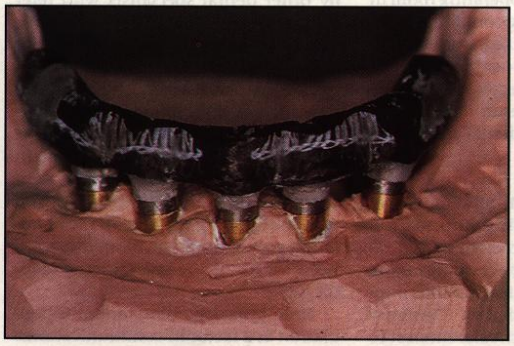
New Materials and Techniques

As in all areas of dentistry, indeed, of science in general, the last decade has seen a dramatic increase in the development of more sophisticated materials and techniques in the specialty of prosthodontics.

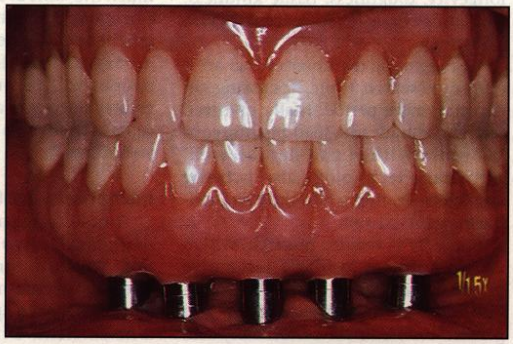
The age of "adhesive dentistry" is here, according to Landesman. "The continuing perfection of various systems of laminates and methods to bond these laminates to enamel has had a great impact on the profession. It is now possible for the prosthodontist to remove less tooth structure and place porcelain laminates which are measured in tenths of millimeters in situations which, a few years ago, would dictate full coverage of teeth with metal and porcelain."

More and more emphasis will be placed on porcelain laminates as the restoration of choice for anterior teeth, adds Binon. Loos cautions that demand for porcelain veneers and inlay/onlays, rising because of growing patient awareness of esthetics, has been ahead of available technology. "Luting resins are currently the weak link in the process, but the next decade will provide predictable and long-lasting luting cements."

In conjunction with adhesives development, cosmetically-acceptable ceramics which meet the long-term strength requirements of the mouth without a metal substructure are being



Experimental carbon fiber reinforced poly-methylmethacrylate for a Branemark implant-supported lower fixed-detachable lower bridge.
courtesy of Drs. Patrick Henry and Paul Binon



The completed fixed-detachable restoration on 5 implant fixtures.
Reference: Ruyter, I., Ekstrand, K. and Bjork, N., Dent. Mater. 1986, 2:6-9.
courtesy of Drs. Patrick Henry and Paul Binon