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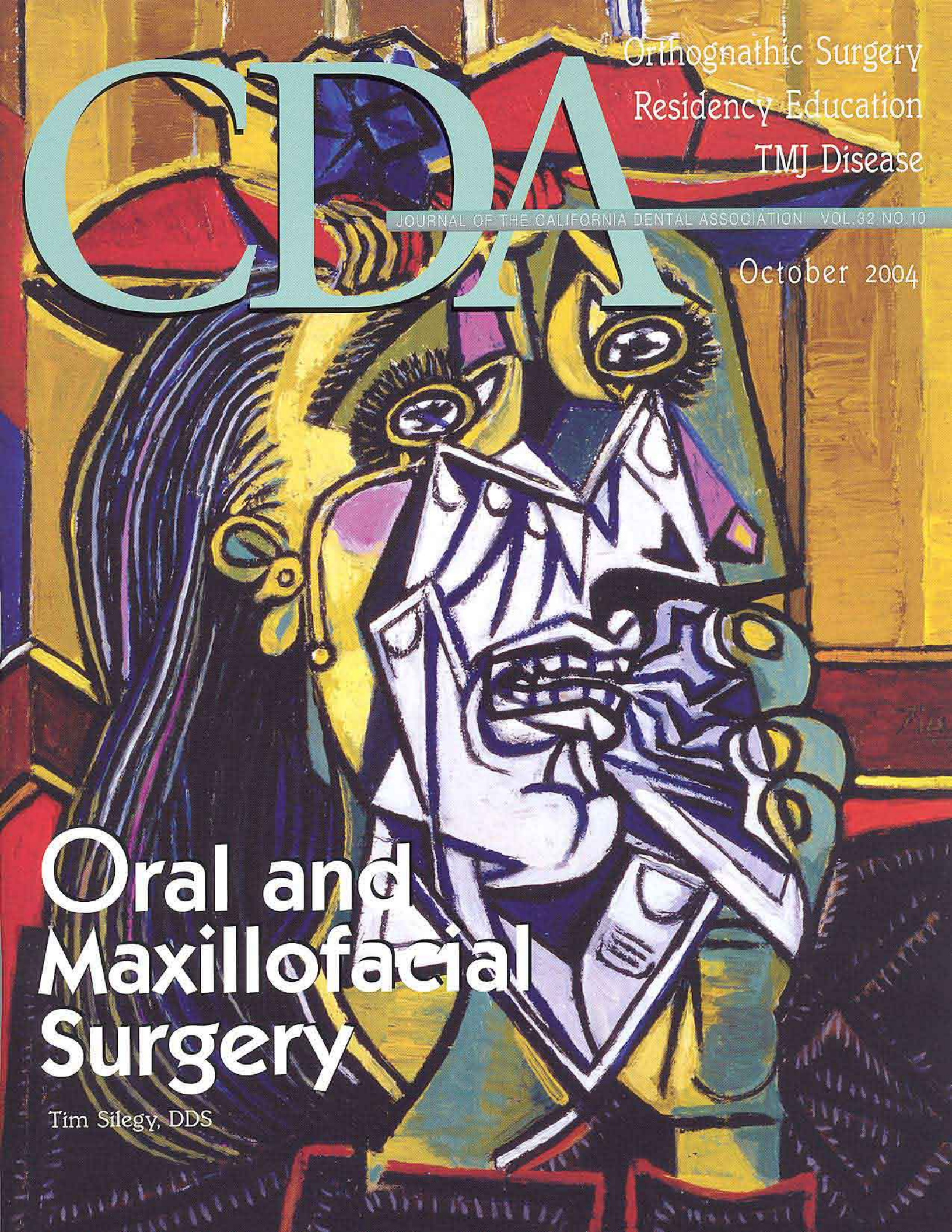

# Oral and Maxillofacial Surgery

Tim Silegy, DDS

OF THE CALIFORNIA DENTAL ASSOCIATION
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# Looking Back on the Journey — Some Highlights

A lengthy position of service with the pre-eminent state dental association in America brings with it the privilege of sharing some personal perspectives on some of highlights in dentistry in California during the past 35 years of our service.

As former *Journal* Managing Editor Susan Lovelace noted in her marvelous history of the California Dental Association that was published in July 1995, the first meeting of the California Dental Association occurred on June 29, 1870, in San Francisco, just 21 years after California was admitted to statehood. That makes California dentistry 134 years old this year.

My journey of service to the profession commenced in 1969 in Los Angeles, just four years prior to the unification in 1973 of the northern California Dental Association and the Southern California Dental Association, forming the California Dental Association as we know it today. It startled us when we calculated that our 35 years of volunteer service represented 26 percent of the lifespan of organized dentistry here in California! We believe that statistic only serves to illustrate that dentistry is still a relatively young profession. I believe that the people we will mention and the events we will review, while only a small sampling of highlights, will illustrate what a memorable journey that California dentistry has traveled in that time.

In 1978, five years after unification, Dale Redig was hired as the third CDA executive director. The association offices had been housed in a relatively small leased office space (compared to today's standards) in the Tishman building complex in the Los Angeles Airport area. His hiring would mark the beginning of an 18-year period of significant and unprecedented growth.

When we first became members in the 1960s, liability insurance was considered by many to be the most important membership benefit. In the mid-1970s, premium levels had started to soar to levels that were of great concern to leadership, not to mention the members. J. David Gaynor, who had the original vision, along with other association leaders, was instrumental in the untiring efforts that ultimately resulted in the formation of The Dentists Insurance Company in 1980, the first dentist-owned liability carrier in the country! The early years of TDIC's existence were not easy. Some of us can still remember the Certificates of Contribution that policy/shareholders purchased to support the company during the trying formative years. Despite the difficult times, including several challenging administrative changes, TDIC has become a major success and a contributor to the financial health of this association. Policyholder dividends have been another highlight in recent years. Aside from the financial benefits derived from TDIC by the association and its members, the "management" of the liability environment by the profession via TDIC and its very existence in the marketplace, helped to slow down and to control the escalating premium costs both short term and to this day. In addition, CDA's subsequent efforts in the legislative arena to support a cap on damages were important to bringing stability to the professional liability marketplace.

In April 1983, the CDA board, meeting in Newport Beach, Calif., voted to move the

CDA's subsequent efforts in the legislative arena to support a cap on damages were important to bringing stability to the professional liability marketplace.

CDA office to Sacramento and appointed yours truly to serve as editor of this publication. In August, 16 of 47 employees employed in Los Angeles moved with Dale Redig to open the CDA office in Sacramento. Dale's vision that CDA needed to be in Sacramento at the seat of state government would be validated over and over during the next 20-plus years. Among those who helped with that move is current Chief Governance Officer Janice Johnson, whose loyalty to this organization has been unsurpassed.

In mid-August 1983, at about the time of the move, a new managing editor, Rich Martin, was hired in Sacramento because the Los Angeles *Journal* staff did not follow the association to Sacramento. Rich had a background in newspaper journalism. Speed of publication and short deadlines were his forte. We were in awe of his ability to put together a quality first issue of the *Journal* in Sacramento, in little more than two weeks. That first issue, with a photo of the 818 K St. headquarters building on the cover was awaiting the Board of Trustees on their desks on the first weekend after Labor Day at the first trustee meeting in Sacramento. To this day, we appreciate the skills we learned from Rich.

In 1988, two things happened of significance to this writer. Rich Martin became ill with cancer and had to leave his position after five years of marvelous service. Earlier that year, feedback from leadership at a strategic planning retreat identified the need for a monthly "newsletter" type of publication. As she had during the transition period between Los Angeles and the new Sacramento *Journal* staff, Cissie Cooper, who served various directorship positions with the association including Scientific Sessions and Communications, again stepped in. She bridged the production gap between Rich Martin's departure and the hiring of Douglas Curley as managing editor, months later in January 1989. She confided to us that she proofread copy for *Journal* issues while waiting to catch flights at the airport while traveling on Sessions business.

We have been amazed time and again at the skills of our professional publications staff, traits that have been there from the very beginning of our tenure. In less than one month after his hiring, Doug Curley launched the first monthly issue of *Update* while overseeing the monthly publication of the *Journal*. We believe that the monthly publication of two first-rate publications by a small, dedicated staff has been a remarkable achievement. *Update* to us has been an important vehicle for CDA publications. It has enabled us to separate the news, information, opinion, and feedback that would be less appropriate to a professional journal. While we don't have a survey to back up our opinion, the belief here is that the reader target audience for the two publications is quite different, underlining the need for the two different publications that validates the judgment of the leadership at that first-ever strategic planning retreat.

We believe that the presence of the association at the 1201 K St. location has been extremely beneficial to CDA in undertaking its various initiatives

In 1996, Susan Lovelace, who provided outstanding skills in the production of the *Journal* following Doug Curley's tenure as managing editor, left to serve San Diego County Dental Society as executive director. The *Journal* experienced a smooth transition to Jeanne Marie Tokunaga who served us with distinction for the next eight years. Patty Reyes has now been managing the day-to-day development of the *Journal* for more than a year while Jeanne Marie has overall responsibility for publications. The quality of the five individuals who have served us in this capacity has been a source of great personal satisfaction. Our successor, Alan Felsenfeld, will find the contributions of Jeanne Marie and Patty to be a source of strength.

By the late '80s, Dale Redig's vision, coupled with his practical realization that CDA in a very few years was already starting to outgrow the 818 K St. offices, pointed to the need to study the potential of a move to one of two buildings under construction in downtown Sacramento. While this decision, like the previous Board of Trustees decision to move the offices to Sacramento, was controversial with some trustees, we believe this move has been the most important event in the 30-year history of the unified association.

Beyond the necessity of additional space, the 1201 K St. address that became the CDA home in 1990, helped to establish CDA as a major player in Sacramento. Even when leadership was faced with some more difficult times after 1996, we believe that the presence of the association at the 1201 K St. location has been extremely beneficial to CDA in undertaking its various initiatives on behalf of the membership and the public.

As many individuals who read this know, the next 6½ years presented some difficult leadership challenges from time to time. A positive perspective to share is that volunteer leadership, and the officer positions in particular, became out of necessity, more engaged in the process of governance. This in no way suggests that we have any less admiration for the performance or representation provided by the many outstanding leaders we served with from

1983 until 1996. But it has been evident that additional demands on an officer's time, opinions, and decisions started to occur out of necessity in the post-1996 period. We believe in retrospect, that the role modification we have witnessed has been an important step in the growth of this organization.

CDA is now in the second year of what we consider the profession's future direction. Peter DuBois, during the past 20 months, has demonstrated that he has a vision, which is at the forefront of his efforts to restructure the association's operation and to direct strategic initiatives. He has demonstrated thus far how important the vision of an administrator can be. He has also incorporated changes in organization structural efficiency that are paramount in the business climate of today. We believe that time will show his administrative style, skills, and contributions, while vastly different than those of Redig and Gaynor, to also be of lasting importance to the future strength of this organization.

The dedicated contributions of "Dr. Bob" Horseman have been critical to the success of the *Journal*. He has been contributing editor "par excellence" for the past 22 years, providing a monthly feature unique to a professional journal. Many colleagues anxiously await Bob's humorous creations every month, and their inclusion provides *Journal* a marvelous balance of features for the reader.

Not to be forgotten are the Scientific Sessions that have continued to grow in size and quality in the period since unification. Staff and volunteers continue to attract the top experts to the northern and southern Sessions every year. In addition to quality educational offerings, exhibitors value the opportunity to participate in these meetings and contribute to their financial success while introducing the latest in materials and technology to the membership.

Next month, "I Believe it IS Time to Go ..." CDA

The Weeping Woman, Pablo Picasso, 1937; Tate Gallery, London, Great Britain/Art Resource, NY; © 2004 Estate of Pablo Picasso/Artists Rights Society (ARS), New York

INTRODUCTION

# Oral and Maxillofacial Surgery: Saving Faces — Changing Lives

Tim Silegy, DDS

Oral and maxillofacial surgery began as, and remains, a specialty of dentistry. As the name implies, oral and maxillofacial surgeons are dentists trained to surgically address diseases and deformities of the mouth, jaws, and face. However, in spite of the descriptive name, many general dentists still see the oral and maxillofacial surgeon as the friendly person down the hall who takes out teeth.

As we enter the new millennium, confusion as to the scope of oral and maxillofacial surgical practice remains. Recognizing this, the American Association of Oral and Maxillofacial Surgeons has begun a nationwide educational campaign designed to educate health care professionals, politicians and the public. More information on their program can be found on their website, www.aaoms.org.

It is the intention of this issue of the *Journal* of the California Dental Association to provide California dentists with an overview of current oral and maxillofacial surgery training and practice.

Drs. Alan Felsenfeld and Angelle Casagrande open this issue with a historical review of the specialty's development. They then summarize current training and accreditation guidelines, and finish with an overview of the oral and maxillofacial surgery residency training programs in California.

Dr. Jack Lytle follows with a paper tracing the development of ambulatory outpatient anesthesia for oral and maxillofacial surgery. Interestingly, many of these anesthesia pioneers practiced in California.

Third molar removal is a mainstay of most oral and maxillofacial surgery practices. Controversy still surrounds the indications for removal of asymptomatic compromised third molars. Dr. Ron Kaminishi and Kurtis Kaminishi illustrate how removal of retained third molars in an ever-expanding aged population is associated with significant risks.

Traumatic maxillofacial injuries can have a profound physical and emotional impact on the individual. For years, oral and maxillofacial surgeons have been instrumental in developing techniques to repair of these injuries. Dr. Peter Scheer and I illustrate the oral and

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# INTRODUCTION

maxillofacial surgeon's role in trauma management.

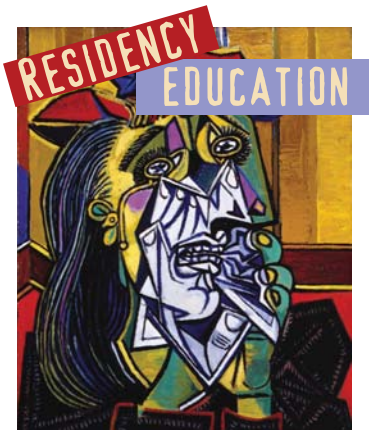
Internal derangement of the temporomandibular joint results in pain, spasm, and hypomobility. While nonsurgical management can be effective in managing symptoms, definitive surgical treatment may be indicated. Drs. A. Thomas Indresano and Casagrande review the indications for, and surgical options available to, patients who fail to respond to conservative therapy.

A strong relationship exists between facial growth and dental occlusion. Dr. Robert Relle and I discuss the diagnosis and surgical correction of dentofacial deformities. New technology and techniques have transformed what was once an arduous surgery requiring days of hospitalization into what today is commonly an outpatient procedure.

Dr. Simona Arcan provides an overview of facial cosmetic surgery. Patients seeking cosmetic dental procedures often desire enhancement of other facial structures. Appropriately trained oral and maxillofacial surgeons can draw upon their expertise in facial anatomy to help patients reach their esthetic goals.

Conspicuously missing from this issue is a discussion of dental implantology and bone grafting. While oral and maxillofacial surgeons have been instrumental in developing this technology, it is not exclusive to oral and maxillofacial surgeons, and would require an entire issue to adequately review.

Finally, I would like to dedicate this issue to the many fine men and women in academic oral and maxillofacial surgical practice. Without their sacrifice and dedication, many of the advancements discussed in the pages that follow would not have been possible. CDA




# Oral and Maxillofacial Surgery Residency Education

Alan L. Felsenfeld, MA, DDS, and Angelle Casagrande, DDS, MD

ABSTRACT

Oral and maxillofacial surgery is the recognized specialty of dentistry that is responsible for the diagnosis and surgical and adjunctive treatment of diseases, injuries and defects involving both the functional and esthetic aspects of the bone and soft tissues of the oral and maxillofacial region.[1] This article will present a review of the educational process for residents in oral and maxillofacial surgery as it has evolved and current training standards.

To understand the need for the comprehensive and detailed education of residents, a brief review of the patient care areas provided by oral and maxillofacial surgeons is indicated. Since the earliest days of the specialty, the scope of practice has evolved to include surgery of the entire maxillofacial complex. The knowledge and skills of oral and maxillofacial surgeons make them proficient in the management of bony and soft tissue management of the entire maxillofacial skeleton.[2]

## OMS Procedures

*Dentoalveolar Surgery*

The basis of most clinical practices includes the extraction of diseased or impacted teeth, as well as the surgical exposure of impacted teeth to enable their orthodontic-assisted eruption into a functional and esthetic position. Other traditional office procedures include preparation of the mouth for dentures, including alveoloplasty, soft and hard tissue grafts, and vestibuloplasty procedures. Oral infections and biopsy of suspicious lesions of the hard and soft tissues are also treated.

*Anesthesia*

The oral and maxillofacial surgeon is an expert in all aspects of pain and anxiety control, including general anesthesia or deep sedation, and conscious sedation. A substantial portion of their training focuses on ambulatory anesthesia and patient management, preparing them to administer safe and effective anesthesia services in their offices for the performance of surgical procedures.

*Dental Implants*

A second significant area of modern oral and maxillofacial surgery practice is the planning and placement of dental implants. Patients can be diagnosed and treated for the full range of implant dentistry. Evaluation, prophylactic extraction, site development including bone and soft tissue reconstruction of the oral tissues as well as maintenance are part of the training received and services offered to patients and restorative dentists.

*Dentofacial Deformities and Congenital Defects*

Surgeons can reconstruct and realign the upper and lower jaws to provide improved function and facial

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Angelle Casagrande, DDS, MD, is formerly assistant professor, Oral and Maxillofacial Surgery, University of the Pacific, School of Dentistry, and assistant program director at Highlands General Hospital. She currently is in private practice in Tucson, Ariz.

appearance as they work as a team with orthodontists to align the maxillofacial structures. Many are trained to correct congenital and acquired defects of the maxillofacial region including cleft lip and palate.

*Maxillofacial Trauma*

Oral and maxillofacial surgeons have extensive experience in repairing simple and complex facial lacerations, setting fractured jaw and facial bones, reconnecting severed nerves and ducts, and treating other hard and soft tissue injuries of the face and neck region. They are active participants in the emergency department management of the maxillofacial trauma patient.

*Pathologic Conditions*

The diagnosis and management of patients with diseases of the oral and maxillofacial region, including cysts, benign and malignant tumors, soft tissue, and severe infections of the oral cavity and salivary glands is a service offered to patients by the oral and maxillofacial surgeon.

*Reconstructive and Cosmetic Surgery*

Surgeons are well trained to correct jaw, facial bone and facial soft tissue problems that occur because of trauma or pathology. This surgery to restore form and function often includes transferring skin, bone, nerves, and other tissues from other parts of the body to reconstruct the jaws and face. These same skills are also used when oral and maxillofacial surgeons perform cosmetic procedures for improvement of problems due to unwanted facial features or aging.

*Temporomandibular Joint Disorders*

Training includes the diagnosis and management of temporomandibular joint disorders as well as differential diagnosis of head, neck, and facial pain. Surgeons are educated in multiple treatment options including nonsurgical treatment of TMJ disorders. The surgical management of TMJ abnormalities includes arthrocentesis, arthroplasty and open joint procedures as well as total joint replacement or reconstruction.

## Evolution of Education

Given the complexity and extensive range of surgery, the education program for residents needs to be comprehensive and by definition is quite rigorous. To complement the intensive growth in the depth and range of surgical procedures performed by modern surgeons, the educational process has evolved accordingly. A brief history of how teaching has changed will bring better understanding to the education that is received by residents today.[3]

The earliest recorded notes relative to specialty scientific education for surgery was in 1918 when the American Society of Exodontists, limited to the practice of oral and maxillofacial surgery, and initiated scientific meetings and publications. During the next decade, oral surgery became the first official specialty the American Dental Association recognized, and the name of the organization was changed to the American Society of Oral Surgeons and Exodontists. By 1946, with the establishment of American Board of Oral Surgery, major problems and wide differences in the training and education of the specialty were brought to light. Some programs were university affiliated and were three years in duration. Many however, were one-year programs isolated in hospitals where they lacked full-time directors. All programs were clinically oriented in a "preceptor" type of educational process.

Carl Waldron and Henry Clark at the University of Minnesota designed a correspondence course in oral surgery. John Gunther began a one-year basic science program for oral surgeons at the University of Pennsylvania in 1949 to provide a consistency in the conceptual aspects of surgical training. The quality of educational experiences was beginning to be considered. Evaluation of advanced education programs was superficially conducted by the Council on Hospital Dental Service of the ADA for its Council on Dental Education, with the main concern being space and facilities for oral surgery clinics.

In 1956, the American Society of Oral Surgeons Committee on Graduate Training provided the first description of minimal requirements in the categories of didactic education and clinical training during a three-year period. Standards of education were offered for hospitals that conducted oral surgery internships and residencies. Also in 1956, the ADA House of Delegates passed a resolution transferring responsibility for the accreditation of internships and residencies in hospitals to the Council on Dental Education.

From 1958 to 1964, six conferences were conducted by the ASOS Committee on Graduate Training. The first planning conference on graduate training took place in 1958 and resulted in the publication of *The Essentials on an Adequate Training Program in Oral Surgery*. In 1964, the Council on Dental Education approved the establishment of the Review Commission on Advanced Education in Oral Surgery. The newly constructed review commission held its first official meeting in January 1965. One of the purposes of the commission was to conduct site visits to evaluate training programs.

In May 1965, a second meeting of the review commission was held, and the backlog of site visit evaluations was considered. One of the first efforts of the review commission was to require that all one-year programs

affiliate for a continuous, graduated three-year sequence rather than offer an isolated clinical-only exposure for trainees.

*The Essentials of an Adequate Training Program in Oral Surgery*, used as the blueprint for oral and maxillofacial surgery residency training since 1958, was revised from time to time before a major revision was made in 1982 and 1983. The reworked document was adopted by the Commission on Dental Accreditation in May 1985 and became effective in 1986 as the yardstick for evaluation of oral and maxillofacial surgery training.

In the early 1980s, the length of oral and maxillofacial surgery residency programs was increased from three to four years. This was done to accommodate the increasing amount of educational requirements for surgeons. A blueprint for the curriculum for the four-year training programs was designed by the American Association of Oral and Maxillofacial Surgeons Committee on Residency Education and Training and representatives of the Section on Education.

*The Standards for Advanced Specialty Education Programs in Oral and Maxillofacial Surgery*, which serve as the basic structure of all training programs, were approved for implementation by the Commission on Dental Accreditation on July 1, 1988. These standards are under continuous review and revision by the American Association of Oral and Maxillofacial Surgeons to reflect changes in the education required for modern oral and maxillofacial surgery residents.

## Education of Surgeons

There are 102 accredited surgery residency programs in the United States with approximately 170 open positions available annually. About 850 individuals are in residency programs with half being in MD-integrated training. As in all areas of dentistry and medicine, oral and maxillofacial surgery education has been significantly enhanced during the past 20 years. Training time has been lengthened and a wider range of proce-

dures have been incorporated into the curriculum

The advent of accreditation has assured minimal yet high standards that programs must fulfill to adequately educate surgeons in the profession.[4] The Commission on Dental Accreditation, a nationally recognized accrediting body, is responsible for approving and administering the standards for accreditation. It is an independent group of individuals who are appointed by the ADA as well as the nine recognized specialties, and other dental agencies. Recognition as the ultimate accrediting body is given by the continued inspection and approval by the U.S. Department of Education. In conjunction with the American Association of Oral and Maxillofacial Surgeons, it will set criteria for and approve residency training programs. The standards cover a wide range of institutional, faculty, curriculum, program resources and patient care areas to assure a high level of education in all accredited programs. Each program is subject to reinspection every five years in distinction to the general dental school and all other specialty cycle of seven years.

## Residency Curriculum

Following graduation from dental school, resident surgeons complete a surgical residency of at least four years. A minimum of 30 months is spent on the oral and maxillofacial surgery service providing a broad scope of specific surgical experience for the resident. At least 18 months are spent on off-service rotations on a variety of medical/surgical services, which are applicable to the oral and maxillofacial surgeon. There are several required off-service rotations, including a minimum of four months of hospital anesthesia, two months on the clinical medicine service, and four months on the general surgery service. In addition, at least eight months is spent on a variety of other services, which may include rotations in plastic surgery, otolaryngology, neurosurgery, infectious disease, and pediatric surgery. During this time, residents learn management of both adult and pediatric patients.

The resident's outpatient experience is very broad, as a substantial amount of surgical activity is provided in this setting. Each oral and maxillofacial surgery resident sees more than 3,000 patients per year on an ambulatory basis. This would include at least 100 general anesthetics or deep sedations for adults and children per senior resident position for outpatient, ambulatory surgical procedures.

The oral and maxillofacial surgeon admits and manages a large number of patients to the hospital for major medical procedures. These patients fall into a variety of categories, including trauma, reconstruction, orthognathic surgery, pathology, and esthetic surgery. In support of the hospital-based procedures and general anesthesia training, the residents all become certified in advanced cardiac life support and are trained in advanced trauma life support.

Residents also complete a structured, didactic course in physical diagnosis similar to that provided to medical students. This course is taught early in residency, enabling application throughout training. It is reinforced during rotations to the medical, surgical, and anesthesia services where oral and maxillofacial surgery residents must function at the level of the other residents in the respective services. Because of this specialized education, oral and maxillofacial surgeons are capable of performing significant surgical procedures within a diverse scope of practice.

In summary, upon completion of an accredited oral and maxillofacial surgery program, the surgeon is competent to perform a wide variety of diagnostic and surgical procedures for the comprehensive management of the diseases, injuries and defects involving both the functional and esthetic aspects of the hard and soft tissues of the oral and maxillofacial regions.

## The Medical Degree

Some residency programs provide education to earn a medical degree as an integrated component of oral and maxillofacial surgery training. Regardless of whether a resident decides to complete residency with or without a medical degree, the oral surgical training is similar. In accordance with accreditation standards, all residents must complete the same rotations through the medical, surgical and anesthesia services with the same level of responsibility. While the medical degree does not impact the oral and maxillofacial surgical education, it provides an excellent opportunity for expanded learning in the medical care of patients at all levels.

Because of their specialized education in general, oral and maxillofacial surgeons are trained to perform many procedures that are also performed by physicians, including reconstruction of the nose and orbits, maxillofacial surgery, cleft lip and palate and facial esthetic surgery. Regardless of degree, the oral and maxillofacial surgeon who is trained today is a competent individual who is capable of many surgical procedures to help patients in need.[5]

## California Training Opportunities

Within California, there are seven fully accredited residency education programs for oral and maxillofacial surgery.

*University of California, Los Angeles*

***Earl G. Freymiller, DMD, MD, program director***

The University of California, Los Angeles, has a six-year combined oral

and maxillofacial surgery and MD degree program. Two residents are selected each year and their education consists of the required oral and maxillofacial surgery rotations as well as two years of medical school and one year of general surgery internship.

The residents spend their time on the oral and maxillofacial surgery service by rotating at UCLA Medical Center, Harbor-UCLA, and Kaiser Permanente. They receive training in dentoalveolar surgery, orthognathic surgery, trauma and pathology. Extensive implant and reconstructive surgery education is part of the curriculum as are trips to Mexico for cleft surgery education. Being based in the school of dentistry offers a multitude of opportunities for didactic education as well as significant interaction with all the specialties of dentistry in patient care.

The program allows for a one-year internship in oral and maxillofacial surgery for individuals who would like to experience additional education in that area.

*University of California, San Francisco*

***M. Anthony Pogrel, DDS, MD, program director***

The residency program in oral and maxillofacial surgery at UCSF leads to either an MD degree from the University of California, San Francisco, School of Medicine, or the University of California, Davis, School of Medicine. Both MD programs require a one-year general surgery internship. The length of the residency program depends on the placement of the resident into medical school with advanced training and can last either six or seven years.

The residents may also combine a PhD in oral biology with their certificate in oral and maxillofacial surgery and their MD degree. This program is approximately nine to 10 years in length, allowing for three years of research leading to the PhD.

The residents rotate through University of California, San Francisco Medical Center, San Francisco General Hospital and San Francisco Veteran's Administration Medical Center. The residents get experience in pathology, reconstruction, orthognathic surgery, TMJ surgery, implants, dentoalveolar surgery and anesthesia.

The residents receive intense training in didactic courses and lectures. They participate in the tumor board, journal club and the orthognathic conference.

In their senior year, residents may have the opportunity to exchange positions with a resident program in Great Britain to afford a broad base of education.

*King/Drew Medical Center*

***Richard Leathers, DDS, program director***

The King/Drew Medical Center takes two residents a year for a four-year certificate program in oral and maxillofacial surgery. The facility is a Level 1 trauma hospital where the residents spend the majority of their program. They also rotate to Harbor-UCLA Medical Center for their anesthesia and general surgery training. At Kaiser hospital in Los Angeles, they get experience in orthognathic surgery.

They are currently working on several projects including trauma and wound healing research.

*University of the Pacific/Highland Hospital*

***A. Thomas Indresano, DMD, program director***

The Alameda County Highland Hospital oral and maxillofacial surgery residency program was started in 1926 as an independent program. By 2001, University of the Pacific affiliated with the long-standing Highland residency. At that time, the residency also made an affiliation with Kaiser Permanente in Oakland.

The residency currently accepts two residents per year for a four-year certification in oral and maxillofacial surgery. Next year, the residency will increase to three positions per year. The education of the residents includes didactic courses and hands-on dissection labs.

At Highland Hospital, the residents gain experience in trauma, implants, pathology, dentoalveolar and TMJ surgery. The senior resident rotates at Kaiser for six months during which time they receive extensive training in orthognathic surgery. At University of Pacific, the residents participate in a joint orthognathic conference with the orthodontic residents and get experience with complicated dentoalveolar cases. At both institutions, the residents perform conscious and deep sedation.

In November, a team from the residency goes to Mexico with the Thousand Smiles program to perform surgery on cleft lip and palate patients.

*Travis Air Force Base/David M. Grant Medical Center*

***Lt. Col. David Smith, DDS, MD, program director***

To be a resident in this program, one must be a member of the military. Travis has a four-year program leading to an oral and maxillofacial surgery certificate. They accept two residents per year most of whom have the rank of captain or major.

The residents rotate to Fresno at the University Medical Center for eight months to get their trauma training. The main surgical procedures performed at Travis are orthognathic, cosmetic and dentoalveolar surgery.

*University Medical Center, Fresno*

***Robert Julian, DDS, MD, program director***

One resident is accepted per year to the four-year oral and maxillofacial surgery certification program in Fresno. They do offer a one-year oral and maxillofacial surgery internship and have one of the Travis Air Force Base residents for eight months of the year.

The resident at UMC gets voluminous experience covering the VA, Children's Hospital, Kaiser, St. Agnes and the Community Medical Centers of Fresno. The major areas of focus are trauma, pathology and surgical oncology, orthognathic surgery and some cosmetic surgery.

Current research projects include plating mandible fractures without the use of maxillomandibular fixation, osteomyelitis and endoscopically treated mandible fractures.

*Loma Linda University*

***Alan Hereford, DDS, MD, program director***

The oral and maxillofacial surgery residency at Loma Linda University offers two tracks: a four-year certificate, and a six-year MD program. Residents in the six-year MD program attend the Loma Linda University School of Medicine. At the end of their medical training, residents complete a one-year general surgery internship.

The program has affiliations with the Loma Linda University, School of Dentistry, Loma Linda University Medical Center, Riverside Regional County Medical Center, and Arrowhead Regional Medical Center.

The training the residents receive is full scope oral and maxillofacial surgery including trauma, reconstruction, pathology, orthognathic surgery, esthetic surgery, temporomandibular surgery, craniofacial and dentoalveolar surgery.

*USC/LAC Medical Center*

***Dennis Duke Yamashita, DDS, program director***

The University of the Southern California/Los Angeles County oral and maxillofacial surgery residency program is celebrating its 50th anniversary this year. Yamashita, the residency program director, has seen some changes in the curriculum over the past several years. Ten years ago, the program took the first MD integrated resident. At present, the program takes two residents per year into the six-year MD integrated, and one in the four-year certificate program.

The MD program residents enter residency by doing their four months of anesthesia and integrating with the medical school during their first year. In total, they complete 30 months of medical school. During that time, they integrate some of the clinical rotations on the oral and maxillofacial surgery service. After completing medical school, a mandatory one-year internship is done on the general surgery service at Huntington Memorial Hospital. The residents complete their fifth and sixth year of training on the oral and maxillofacial surgery service at LA County Hospital.

LAC is a Level 1 trauma center where residents spend the majority of their time. They also spend time at Children's Hospital where they get their orthognathic surgery training and are part of a craniofacial team. At the University of Southern California, School of Dentistry, they perform other surgical procedures including implants.

Current research by the faculty and residents include a grant for trauma research and an Oral and Maxillofacial Foundation grant for research on osteodistraction.

There is a one- year internship available. CDA

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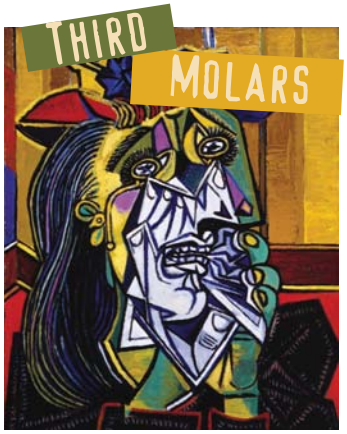


# New Considerations in the Treatment of Compromised Third Molars

Ronald M. Kaminishi, DDS, and Kurtis S. Kaminishi, BA

## ABSTRACT

Management of asymptomatic malposed third molars is a controversial topic. As a result, many malposed or mildly pathologic third molars are not removed. Historical pro and con arguments regarding removal centered around cost and the aspects of the surgical removal itself. Current epidemiology and medical advances address issues not considered before.

There is a large growth of the aging population (over 40 years). More and more of these elderly patients are requiring third molar removal. Over a five-year period, 1997-2002, the incidence almost doubled to 17.9 percent. This age category is known to be high risk for third molar surgery.

An equally or higher risk is the rapidly growing number of patients seeking third molar surgery who are moderately severely medically compromised. This paper reviews how this lack of consensus results in delayed removal of malposed third molars in this population. Preventive dental concepts, removing compromised third molars earlier, would eliminate the high risk to this aging population.

In 2004, there is no clearly defined consensus on how to manage compromised third molars. There is also considerable disagreement on what constitutes a compromised third molar. Third molars may be erupted and carious, or in a variety of partially or completely unerupted states ranging from soft tissue impactions to full bony impactions. While abnormal, in the absence of symptoms, many clinicians follow the edict, "if it's not bothering you, leave it alone."

This substantial variance of professional opinion regarding removal of third molars illustrates a lack of uniformity in care currently provided. The conflicting literature on the necessity for and timing of third molar removal, shows a historical lack of consensus as well. Unfortunately, this lack of consensus creates a credibility gap for the dental profession and confusion in the general public.

As "baby boomers" (the largest mass of the population) approach middle and advanced age, the need to resolve prophylactic third molar treatment issues becomes more pressing. With time, age

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and health status become increasingly significant risk factors. The dental profession must maintain the confidence of the public. A step toward that aim is to ensure that recommended care is consistent amongst dentists and that it is supported by sound evidence-based studies.

It is significant that the largest proportion of the population is entering middle or advanced age. At older ages, the risks and complications of dental surgery become significantly higher as patients are more likely to have severe chronic diseases such as cardiac problems and strokes, or may not heal as rapidly as younger patients may. This increased risk exposes dentists to increased complications in surgery and possibly increased episodes of litigation. For example, fragile cardiac or stroke patients kept alive by medications may not survive a dental extraction.

Important arguments against removal of asymptomatic compromised third molars exist. Economic restrictions involve HMOs, insurance companies, third parties, and some members of the dental profession. Because of these financial restraints, patients may refuse, and third-party payers fail to authorize, removal of teeth regardless of the degree of pathology present.

Tulloch et al[1] states that "this practice (removal of "asymptomatic" compromised third molars) appears neither to be associated with the least expected morbidity to patients nor with the imperative of cost containment." At the 1977 National Institute of Health Consensus Development Conference: Removal of Third Molars, it was concluded that the removal of asymptomatic non-pathologic teeth is nonessential surgery that exposes patients to unnecessary risk.[2] Oral and maxillofacial surgeon, E. Preston Hicks stated that, "routine removal of impacted or unerupted disease free third molars cannot be justified."[3]

What are the indications for removal of asymptomatic compromised third molars? A great deal of information has been generated over the years regarding the timing of third molar removal. In particular, there is a large body of literature documenting the increased incidence of dental complications when third molar surgery is performed on an aging population.[4-12] Consequently, this paper will not address the specific surgical risks and complications but will focus instead on how the aging population is affected by retained third molars.

## Third Molars in the Aging Population

With human life expectancy on the rise, the issue of the aging population mass becomes a major factor in third molar treatment planning. In a study done by the authors, it was found that between 1992 and 1997, 10.5 percent of the patients requiring removal of third molars were middle or advanced age (older than 40). Fifty percent of the patients over the age of 60 had complete bony impactions. From 1997 to 2002, 17.9 percent of patients were older than 40. Of that population, 19.5 percent were older than 60 (60- to 91-years old). One in five patients requiring third molar removal by a dentist is in the high to very high-risk category.

One reason for the increase in the middle to advanced aged population can be attributed to medical advances in treating disease. Current mortality patterns suggest that the mortality rate over age 85 is decreasing to equal the rate under age 85, creating an expanding pool of patients who are at high to critically high risk of having medical complications associated with even minor surgical procedures.[13]

Dentists are not accustomed to treating critically high-risk patients. For example, a 40-year-old patient presents for urgent removal of bilateral periodontally infected third molars. The patient had the lower third molars extracted as a young adult. The upper impacted third molars were not authorized by the insurance company because they were "asymptomatic." The periodontist tried to treat the patient's infected teeth for two months without success. The urgency was caused by a failing heart valve. Cardiac valve replacement absolutely cannot be done in the presence of dental infections, due to bacteremia or septicemia. Consultation with the cardiac surgeon indicated the valve could "blow" at anytime. Because these teeth were not prophylactically removed when the patient was healthy, intra-operative mortality becomes a very real risk.

Many dentists do not consider a 2-millimeter pericoronal radiolucency a concern. Adelsperger, Glosser (1999)[14] and Knights (1991)[15] demonstrate that the absence of radiographic disease in impacted third molars is not evidence of absence of pathology. Biopsy specimens of pericoronal tissue of impacted third molars with no radiographic pathology in patients over 21 years of age show a 75 percent incidence of squamous metaplasia similar to that found in odontogenic cysts.[14]

Odontogenic cysts comprise the majority of major pathologies in compromised third molars. The incidence of squamous cell carcinoma of dental pathologic tissue is commonly considered as being statistically rare.

Very few dentists are aware that malignancies arising from odontogenic cysts have a very high mortality rate.[16-20] Although the incidence of such malignancies is low, Eversol[21] and Schwimmer[21] report a 47 percent and 37 percent mortality two years after treatment.

Preventive dentistry has unequivocally demonstrated that early prophylactic treatment is more cost effective than waiting until potential pathology becomes more severe or symptomatic. Under the "watchful waiting" protocol, the cost of biannual radiographs and clinical exams added to the increased cost of a surgery with infection — considered over a 40 to 50 year time span — easily exceeds the cost of prophylactic or early treatment of compromised third molars.

## Conclusion

The present day lack of consensus regarding compromised yet asymptomatic third molars, creates confusion in diagnosis of patients. Ultimately, each case must be based on individual factors. The pros and cons of early or prophylactic treatment of compromised third molars should be considered.

The aging mass of our population and the surging number of functional but medically compromised patients places a stronger emphasis on timely treatment. Preventive dentistry becomes a more critical issue. In two decades, the population mass of baby boomers will be in their 60s and 70s with even more serious medical handicaps. "Simple" surgical and dental procedures might require the advised consent of "risk of death." It is thus imperative that dentistry develop a consensus regarding treatment of compromised third molars with a sound scientific basis. Third parties and self-serving entities usually assume no liability but strongly try to influence our decisions. Early or prophylactic treatment results of compromised third molars appear consistent with the tried and true experience of preventive dentistry. CDA

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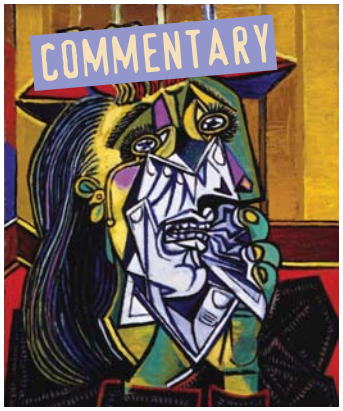


# Fifty Years of General Anesthesia in California Oral and Maxillofacial Surgery

John J. Lytle, DDS

A review of the general anesthesia techniques used in oral and maxillofacial surgery during the last 50 years of the 20th century cannot be fully appreciated without referencing at least briefly, what took place in the previous 106 years that encompassed the discovery and development of general anesthesia to the mid-20th century. Dental students learn with pride that W.T.G. Morton and Horace Wells were two dentists credited with the discovery of general anesthesia in the middle 1840s.[1] Nitrous oxide was the primary agent that found acceptance and widespread use in dentistry, largely through the actions of Gardner Colton, who established a group of dental practices that specialized in tooth extractions. Ether, ethylene, and chloroform were widely used in medicine, but nitrous oxide use was refined by Elmer I. McKesson and Jay A. Heidbrink, who developed anesthesia machines that could deliver precise proportions of oxygen and nitrous oxide.[2]

Oral surgeons in the early 20th century through the 1930s used nitrous oxide as their primary agent to induce general anesthesia. Alfred Einhorn of Germany discovered procaine in 1905 and local anesthesia became common in the United States three decades later for routine dental procedures. But it was the exodontists (later called oral surgeons) who continued to use nitrous oxide to eliminate the pain associated with removal of teeth until intravenous anesthesia became available and popular.

In Southern California, Lock Hales, DDS, started an exodontia practice in Glendale in 1929. He first worked with Frank Chandler, DDS, in Hollywood and learned the nitrous oxide, oxygen desaturation method that was introduced and popularized by McKesson 30 years earlier.[3] He learned that orally administered pentobarbital (Nembutal) improved his working time and did not require hypoxic levels of nitrous oxide. Orlan K. Bullard, DDS, in San Diego and Dr. Barkley Wykoff in Santa Barbara began using a new intravenous agent, hexobarbital (Evipal) in 1936, but both oral surgeons subsequently changed to thiopental (Pentothal) because of its greater versatility.[4]

ORALLY ADMINISTERED PENTOBARBITAL (NEMBUTAL) IMPROVED HIS WORKING TIME AND DID NOT REQUIRE HYPOXIC LEVELS OF NITROUS OXIDE.

Adrian Hubbell, DDS, learned about the studies being done at the Mayo Clinic with thiopental, and he spent three years in a surgical fellowship there to learn as much as possible about this technique. He returned to Los Angeles in 1940 and worked in Hollywood with Frank Chandler's successor in practice, Berto Olson, DDS. In one year, he converted that nitrous oxide practice to a thiopental practice. He then moved to Long Beach where he opened his own practice, which eventually became a dominant force in Southern California and throughout the nation in popularizing the technique of intravenous thiopental and later methohexital (Brevital) for general anesthesia in oral surgery.[5]

Six of Hubbell's students, Frank M. McCarthy DDS, MD; Bill Bogart, DDS; Howard Davis, DDS; Bill Wagner, DDS; Ralph O'Brien, DDS; and Robert Steiner, DMD, staffed the first hospital-based outpatient thiopental dental general anesthesia training program at the Los Angeles County General Hospital in 1956. Marsh Robinson, DDS, MD, had become chief of oral surgery in 1954 and was able to enlist the support of Sam Denson, MD, head of medical anesthesia at the hospital at that time. That program continues today at the Los Angeles County/USC Medical Center, where future oral and maxillofacial surgeons are learning the latest techniques in office general anesthesia.

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Hubbell introduced the use of succinylcholine into oral surgery practice in order to treat laryngospasm. He described administering increasing doses to himself and colleagues. They discovered that 5 mg was sufficient to "break" most spasms and that a full depolarizing dose was not necessary. He developed an administration device that allowed him to administer a small dose of thiopental rapidly, which he called the "surge technique." The "Hubbell Bubble" is still used by a few oral surgeons. It was possible for an oral surgeon to begin practice as Hales did using nitrous oxide and to progress through the use of oral barbiturates in combination with nitrous oxide, and then to go on to use intravenous thiopental and finally methohexital in a 30-year span of practice. Our predecessors in practice from 1930 to 1960 lived through a period when revolutionary changes took place.

The 1950s encompassed a period when refinement of techniques for intravenous general anesthesia occurred. The use of thiopental alone came under criticism from proponents of balanced anesthesia techniques in which meperidine (Demerol) was given as an adjunctive agent to raise the pain threshold, reduce the amount of thiopental needed, and reduce unpleasant and painful emergence from general anesthesia. It became common to administer local anesthesia after the patient was asleep to provide postoperative pain relief and to reduce intraoperative bleeding. Atropine and scopolamine were sometimes added to the balanced techniques to reduce secretions, and block the vagus nerve thus preventing bradycardia. Monitoring was still in its infancy, and no oral surgery office used intra-operative electronic monitoring. Monitoring was common although rudimentary in hospital general anesthesia.

Two schools of thought developed in dentistry and oral surgery regarding anesthesia techniques, represented by the "purists" or single agent proponent — most prominently the Hubbell group and his disciples — and the "balanced technique" group, who used atropine, a narcotic such as meperidine, methohexital, and local anesthesia. Each group claimed superiority for their preferred technique, and gave convincing arguments for their favorite method.

The 1960s saw the introduction of benzodiazepines, principally diazepam (Valium), which was first administered orally and then intravenously. Some surgeons used diazepam as their only intravenous agent along with local anesthesia, nitrous oxide/ oxygen, and found this technique successful. Many surgeons began using methohexital as their principal barbiturate. The onset of methohexital anesthesia was similar to thiopental but the duration of action was shorter and the occurrence of laryngospasm less frequent. Methohexital was given in a 1 percent solution, and thrombophlebitis seemed less frequent than with the more concentrated 2.5 percent solution of thiopental. This unpleasant complication again became more frequent when diazepam was injected in small veins, with or without other drugs.

EACH GROUP CLAIMED SUPERIORITY FOR THEIR PREFERRED TECHNIQUE, AND GAVE CONVINCING ARGUMENTS FOR THEIR FAVORITE METHOD.

In the 1970s, fast-acting, short-duration synthetic narcotics were introduced. Fentanyl (Sublimaze) was being used in hospital general anesthesia cases often as the sole intravenous agent along with nitrous oxide/oxygen, and was found to be very safe for debilitated patients undergoing major procedures. One complication, "rigid chest syndrome," occurred infrequently and only when higher doses of fentanyl were used. In the hospital environment, this complication can be easily treated with muscle relaxants, but this is not practical in office oral surgery. When given in amounts up to 100 micrograms, Fentanyl has rarely been associated with this complication, and smaller doses were established for use in office general anesthesia. Fentanyl continues to be used in many practices. Fentanyl clearly raises the pain threshold, works quickly, and is short acting. Other synthetic narcotic agents such as pentazocine (Talwin) and oxymorphone (Numorphan) were introduced, but for the majority of surgeons they were not as useful as fentanyl.

Meanwhile, new monitoring devices were being introduced, and older progressive surgeons and young surgeons finishing training were more comfortable using these electronic devices to assess patients under anesthesia. Simple monitors to indicate pulse rate were first introduced. The electrocardiograph (ECG) was being used commonly in hospitals but was thought by oral surgeons to scare patients. Consequently, many surgeons were reluctant to use this device. It would be another decade before oral surgeons added the ECG to their monitoring armamentarium and then only after state regulations made possession and use of the device mandatory.

During that decade, the public became more aware of the ECG and chest leads through the entertainment media and television shows. The automatic sphygmomanometer was introduced and became well accepted. It is easy to use, gives the pulse rate in addition to the blood pressure, and alerts surgeons to sudden changes in blood pressure preoperatively, intraoperatively, and postoperatively.

In the 1980s even better things were in store for oral surgeons monitoring their patients. The pulse oximeter was introduced, displaying blood oxygenation as a percent of oxygen-saturated hemoglobin. Moment-to-moment

changes were revealed and at last, a monitor was available that could answer the most critical question, "Is the patient getting sufficient oxygen?" This device soon became the single most important monitor and is required to be present in every office utilizing pediatric oral sedation, intravenous sedation, or general anesthesia.

Today, the pulse oximeter, the ECG, and continuous blood pressure devices form the basis for monitoring patients undergoing office general anesthesia in oral surgery practices in California and throughout the United States.

A new benzodiazepine agent midazolam (Versed) appeared in this decade. This agent was found to have a rapid onset of action, much faster metabolism than diazepam, and above all was not a cause of thrombophlebitis. Midazolam has become the standard intravenous benzodiazepine for the vast majority of surgeons who utilize these drugs.[5]

By the 1990s, research in anesthesia had seen the development of another class of intravenous anesthetic agents. The new drug propofol (Diprivan) is a white liquid that looks much like milk when seen in the syringe. Propofol has a smooth, rapid onset of action and duration of action similar to methohexital. However, many patients exhibit a markedly rapid emergence when the drug is used alone. Since methohexital was being used primarily by oral and maxillofacial surgeons (a relatively small market segment) and not by medical anesthesiologists, the manufacturer sold the rights to produce the drug and during the early 2000s, methohexital was intermittently unavailable. Some surgeons returned to using thiopental, but many took the lead of medical anesthesiologists and began using propofol as their main intravenous agent.[6]

A few surgeons began to rely on ketamine (Ketalar), an intravenous or intramuscular drug that had been available since the late 1960s but which displayed hallucinogenic side effects that many felt were unacceptable. Emergence hallucinations, which were not prominent in children, were very distressing to adults. Very often, ketamine acted much like an LSD experience that persisted in some individuals for a prolonged period.

In very much reduced dosage, ketamine has been used in children and adults to produce a dissociative state, where the patient appears awake but is cooperative and retains protective reflexes. The drug is commonly used in medical emergency rooms in the management of the very young. Still, one-third of dentists using this drug report that they have seen emergence hallucinations in their patients.[5]

VERY OFTEN, KETAMINE ACTED MUCH LIKE AN LSD EXPERIENCE THAT PERSISTED IN SOME INDIVIDUALS FOR A PROLONGED PERIOD.

During the 50 years that oral and maxillofacial surgeons were depending on intravenous agents, the search for an ideal inhalation anesthetic continued. In the late 1950s halothane (Fluothane) was introduced. This potent agent displayed rapid onset, a relatively pleasant odor, and the ability to produce a surgical plane of anesthesia quickly. It became very popular in hospital-based anesthesia and was the standard until newer gases in the same class displayed better characteristics. The reason halothane did not become more popular in the office environment was that it had the potential to cause cardiac arrhythmias and death if not carefully monitored and precisely given.

In 1996, a new inhalation anesthetic was introduced and again was initially used in hospital-based operating rooms. This agent, sevoflurane, has most of the properties of an ideal inhalation anesthetic.[7] It is pleasant to smell, nonirritating to the airway, and does not increase pharyngeal secretions or stimulate laryngospasm. The onset of anesthesia is rapid and when used in children, there is usually very little or no excitement phase. Most important, sevoflurane does not cause myocardial irritability common with Halothane. The major disadvantage to its use at this time is cost.

Presently, sevoflurane is used primarily in children to produce a smooth induction of anesthesia before placement of an intravenous line and in some very short cases, as the sole anesthetic agent. In adults, sevoflurane has the potency to permit the removal of four third molars while providing for a rapid and smooth emergence. Postoperative nausea has been very infrequent with sevoflurane. It has been predicted that this agent will become increasingly popular with oral surgeons during the coming decade.

## Summary

In summary, the advances of the last half of the 20th century in general anesthesia delivery by oral and maxillofacial surgeons are the following:

**1.** Oral and maxillofacial surgeons in training are exposed to significantly more hospital general anesthesia training and in addition spent much of their residency training performing general anesthesia on outpatient dental patients undergoing dentoalveolar surgery. Training programs increased from one year to three years, then to four years and finally, many six-year programs were developed that award the MD degree during or following completion of the residency program.

**2.** Self-evaluation programs were initiated in the late 1960s and evolved into mandatory in-office evaluation by peer practitioners and later into state-regulated evaluation. These programs began in Southern California and spread to encompass the entire United States.

**3.** Intravenous ultra-fast acting bar-

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biturate office anesthesia became very refined and several combination drug "balanced" techniques developed.

**4.** Benzodiazepines, first diazepam then midazolam were introduced and gained wide acceptance by the dental profession.

**5.** New synthetic narcotic agents were introduced, which give the oral surgeon another pain control and anesthesia supplement. The new agents were short acting but very effective for the period necessary to complete most office surgical procedures. Fentanyl is the prototype for these agents.

**6.** Monitoring devices were incorporated into practice, and currently all oral surgeons use the pulse oximeter, the electrocardiograph, and blood pressure monitoring devices. All of these monitors are required by the California general anesthesia regulations.

**7.** Propofol, an entirely new type of intravenous agent, was introduced and is used by more than half of oral surgeons reporting in a survey of drugs used in 2003.[5] Propofol may be used by incremental injection or by continuous infusion incorporating an automatic infusion pump.

**8.** Sevoflurane, a potent inhalation anesthetic that has many properties of an ideal agent — rapid onset, potent, easily delivered by calibrated vaporizers, rapid emergence, infrequent postoperative nausea, and favorable acceptance by almost all patients about to undergo general anesthesia — is gaining acceptance and use by oral and maxillofacial surgeons. CDA

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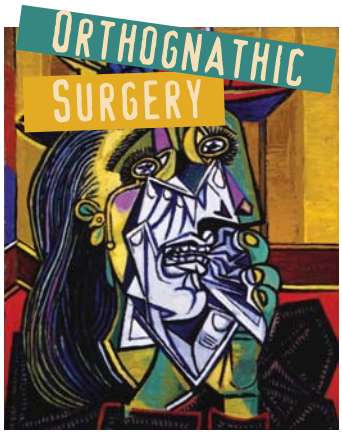


# Orthognathic Surgery: Diagnosis and Treatment of Dentofacial Deformities

Robert Relle, DDS, and Tim Silegy, DDS

ABSTRACT

Corrective jaw (orthognathic) surgery is indicated for patients with a malocclusion caused by a skeletal deformity. This paper will discuss current concepts in patient evaluation and review contemporary surgical treatment.

**Figure 1a.** Profile radiograph of a patient with a significant facial skeletal growth disturbance. *Courtesy of Dr. Donald Montano, Bakersfield, Calif.*

**Figure 1b.** The resulting dental malocclusion. *Courtesy of Dr. Montano.*

The concept that "form follows function" is a notion universal to all aspects of dentistry.[1] For many it is something learned early in didactic dental education. Nowhere is this concept more plainly demonstrated than in the science of facial growth and development.

Maturation of the facial skeleton and dentition through childhood and adolescence most often results in balanced facial features in harmony with a functional dental occlusion. Whether the product of an inherited condition or a developmental disorder, disturbances in growth of the facial skeleton may lead to a discrepancy that manifests as a dental malocclusion (**Figure 1**).

Problems associated with imbalances of the facial skeleton and the dental occlusion are so inseparable, that they are commonly described as dentofacial deformities. Orthodontic therapy is effective in managing most problems by camouflaging the skeletal deformity. However, individuals with the most severe facial skeletal discrepancies will benefit from orthognathic surgery to restore facial balance and establish a functional dental occlusion (**Figure 2**).

Untreated, dentofacial deformities can create problems with many aspects of oral function, including difficulties with speech, swallowing, and mastication (**Figure 3**). They may also cause occlusal trauma from dental occlusion that is not mutually protected (**Figure 4**).

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**Figure 2a.** Profile of patient in Figure 1 prior to combined orthodontic and surgical treatment.

**Figure 2b.** Profile of patient after surgery to advance the maxilla and set back the mandible.

**Figure 2c.** Finished dental occlusion.

**Figure 3.** Patient with a dentofacial deformity. Note the anterior cross bite. This malocclusion is often associated with difficulty tearing and chewing food. *Courtesy of Dr. Merilynn Yamada, Burbank, Calif.*

**Figure 4a.** This traumatic occlusion has caused attrition at the occlusal edge of the lower right premolar. *Courtesy of Dr. Yamada.*

**Figure 4b.** Finished dental occlusion after combined orthodontic and surgical treatment for correction of mandibular hyperplasia with mandibular set back. *Courtesy of Dr. Yamada.*

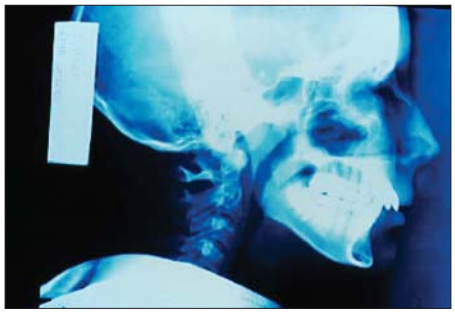

**Figure 5.** Radiographic profile of a patient with mandibular hypoplasia. The upper incisors are resting on the lower lip.

**Figure 6a.** Patient with mandibular hypoplasia displaying increased facial convexity and a retruded chin. Note the chin position relative to a vertical line passing through the base of the nose. *Courtesy of Dr. Montano.*

**Figure 6b.** Profile changes after surgery to advance the mandible. *Courtesy of Dr. Montano.*

The dentist is uniquely trained to identify a disturbance in growth of the facial skeleton and to understand how it may be the foundation of a dental malocclusion. With this awareness, he or she can educate patients and discuss the appropriate available treatment.

## Diagnosis

Most clinicians are adept at properly diagnosing dental malocclusion and applying the correct classification, i.e. Angle's Class I, II, and III, open bite, and deep bite.[2] However, the skeletal imbalances that produce the more pronounced dental malocclusions are sometimes difficult to appreciate. This is because these dentofacial deformities often represent a combination of problems in multiple spatial planes. A systematic, compartmentalized evaluation of the dentofacial deformity will bring the problem to the forefront.

Many clinical evaluation schemes attempt to evaluate anterior-posterior discrepancies and vertical discrepancies independently. Some of the more common deformities are described in this paper.

*Horizontal Discrepancies*

### *Mandibular Hypoplasia*

Anterior-posterior mandibular hypoplasia (mandibular retrusion) is usually associated with Class II dental malocclusion. Individuals with this condition usually have increased facial convexity and a retruded chin. They tend to display an everted lower lip and a deep labiomental fold, especially if the dental malocclusion is large enough to cause the upper incisors to rest on the lower lip (**Figure 5**).

To evaluate the facial profile, the patient is instructed to assume a relaxed head posture tilting neither up nor down. This may be facilitated by having him or her gaze into a mirror placed at eye level across the examination room. The clinician is positioned to examine the patients profile and an imaginary vertical line passing through the base of the nose is constructed.[3,4] With mandibular hypoplasia, the point of the chin will be positioned well behind this reference line (**Figure 6**).

When mandibular hypoplasia is significant it causes the nose to appear relatively prominent. In fact, many patients seeking cosmetic surgery consultation for what they perceive as an excessively prominent nose have in reality, a hypoplastic mandible (**Figure 7**).

Natural dental compensations are usually observed in individuals with mandibular retrusion. The lower anterior teeth are often tipped forward and extruded. The upper incisors are crowded and positioned relatively upright. (**Figure 8.**)

### *Mandibular Hyperplasia and Maxillary Hypoplasia*

Mandibular hyperplasia is generally associated with Class III dental malocclusion. The characteristics common to this condition include a concave facial profile and a prominent chin. Using the same vertical line passing through the base of the nose, one will find the lower lip and chin positioned in front of this reference (**Figure 9**). The natural dental compensations include retrusion and crowding of the lower incisors and flaring of the upper incisors. This may occur with diastemas, if the maxilla is sufficiently wide, or there may be dental crowding if the maxilla is narrow (**Figure 10**).

Care must be taken to differentiate mandibular hyperplasia from maxillary hypoplasia because both conditions are associated with Class III dental malocclusion. With isolated maxillary hypoplasia, the upper lip will appear deficient and from the profile, the angle between the upper lip and the nasal base will be acute. There is often deficient projection of the face to the side of the nose and in the area of the cheekbones. Independent evaluation of mandibular projection will reveal that the chin is actually in an acceptable position relative to the vertical reference line (**Figure 11**).

Quite commonly, both mandibular hyperplasia and maxillary hypoplasia

**Figure 7a.** Patient with mandibular hypoplasia who has a relatively prominent nose.

**Figure 7b.** Same patient after surgery to advance the mandible. Straightening of the profile reduces the relative prominence of the nose.

**Figure 8a.** Class II malocclusion of a patient with mandibular hypoplasia. Note the upper incisor crowding.

**Figure 8b.** Same patient after combined orthodontic and surgical treatment that involved a mandibular advancement.

**Figure 9.** Patient with mandibular hyperplasia. Note the position of the chin relative to the reference line.

**Figure 9b.** Surgery to set back the mandible lessens the facial concavity.

**Figure 10.** Note the natural dental compensation for this patient with mandibular hyperplasia. The upper incisors are flared forward and the lower incisors are retruded and slightly crowded.

**Figure 11a.** Vertical reference line reveals this patient's chin to be in correct position and maxilla to be retruded. *Courtesy of Dr. Mario Paz, Marina del Rey, Calif.*

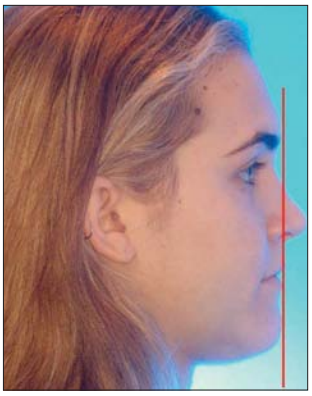

**Figure 11b.** The same patient after maxillary advancement. *Courtesy of Dr. Paz.*

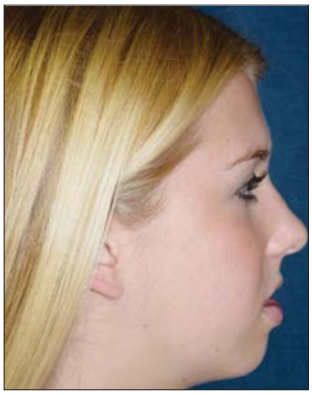

**Figure 12a.** The profile of this patient shows a retruded chin and lip incompetence. *Courtesy of Dr. Montano.*

**Figure 12b.** Preorthodontic occlusion showing open bite. *Courtesy of Dr. Montano.*

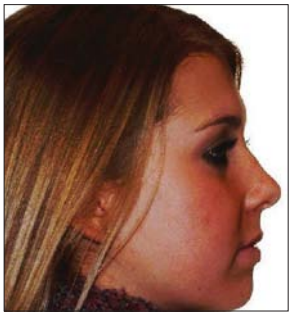

**Figure 12c.** Profile after a maxillary impaction. Note prominence of chin. *Courtesy of Dr. Montano.*

**Figure 12d.** Post-treatment occlusion. *Courtesy of Dr. Montano.*

**Figure 13a.** Preorthodontic occlusion showing with minimal room for skeletal movement.

**Figure 13b.** Occlusion after orthodontic treatment. Eliminating dental compensation created the space for optimal movement of jaws.

occur simultaneously. In this instance, features common to both deformities will be evident.

### *Vertical Discrepancies*

The face is typically divided into thirds when performing a vertical analysis. The upper facial third is measured from the hairline to the midbrow. The middle third is measured from the midbrow to the base of the nose. The lower facial third is measured from the base of the nose to the bottom of the chin. Most vertical dentofacial discrepancies are manifest in the lower facial third.

Vertical discrepancies have a profound effect on facial projection. One example of this condition is the patient with an anterior open bite (**Figure 12**). This condition will accentuate facial convexity and cause the mandible to appear more retrusive and the chin to appear vertically elongated. These individuals will have a long slender face, as downward and backward rotation of the mandible causes jaw line definition to be weak. This appearance is further accentuated as the patient draws the lips together to produce a seal. This causes flattening of the labiomental fold and the characteristic "orange peel" effect of mentalis muscle strain.

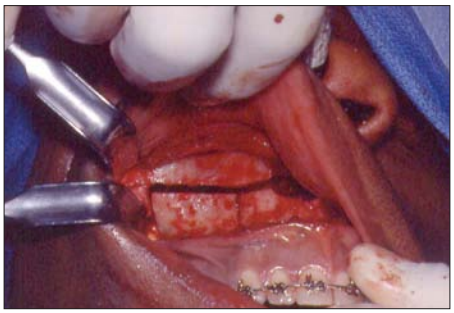

**Figure 14a.** Le Fort I osteotomy.

**Figure 14b.** Sagittal osteotomy of mandibular ramus.

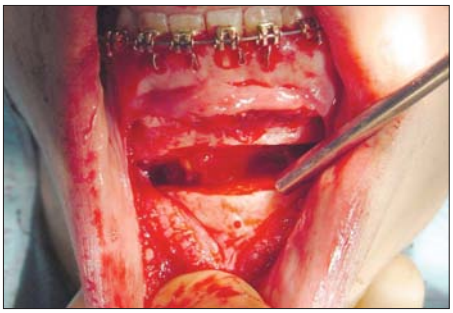

**Figure 14c.** Horizontal osteotomy of anterior mandible below mental foramina.

**Figure 15.** Small power saw used to perform osteotomy.

**Figure 16.** Titanium plate and screws used to rigidly fixate osteotomy.

## Treatment

*Orthodontic*

With few exceptions, the correction of a pronounced dentofacial deformity requires combined orthodontic and surgical treatment. As mentioned earlier, patients with dentofacial deformities usually present with some degree of dental compensation. An important goal of orthodontic therapy is to eliminate these compensations so that the magnitude of the dental discrepancy is equivalent to the magnitude of the skeletal discrepancy. When presurgical orthodontic treatment has been completed, the occlusal discrepancy will be more pronounced.[5]

This critical part of the treatment is the key that allows orthognathic surgery to provide a balanced face in harmony with a Class I dental occlusion (**Figure 13**).

*Surgery*

Modern orthognathic surgery is safe and predictable. In many cases the surgical procedures can be done in an outpatient setting, eliminating the inconvenience and expense of a hospital stay. Patients are far less inconvenienced by modern surgery owing to technological advances such as rigid internal fixation, a method of stabilizing the bony cuts (osteotomies) such that immobilization of the jaws with wire is avoided.[6] This permits speech and a soft diet soon after surgery. Patients often return to light activities in as little as one or two weeks.

Modern general anesthesia, a requirement for orthognathic surgery, has also greatly facilitated patient recovery and comfort immediately after surgery. Rapidly metabolized anesthetic agents, effective non-narcotic analgesics, and powerful antiemetic drugs have been instrumental in shortening recovery time, frequently permitting the orthognathic surgery patient to return home only two or three hours after the procedure has been completed.

With intimate knowledge of the facial anatomy, the oral and maxillofacial surgeon is able to move components of the facial skeleton into the desired relationships using precise bone cuts (osteotomies) and controlled fractures. Most dentofacial deformities are corrected with one or a combination of the following osteotomies: Le Fort I (maxillary) osteotomy, sagittal osteotomy of the mandibular rami, and osseous genioplasty[7,8,9] (**Figure 14**). Additional cosmetic procedures may be employed to enhance the result. A power saw with a fine blade is the primary surgical instrument for these procedures (**Figure 15**).

Once the osteotomies have been completed, the skeletal part can be repositioned as desired and then rigidly fixated using small titanium plates and screws (**Figure 16**).

## Conclusion

This article demonstrates basic principles in the diagnosis and correction of dentofacial deformities. Early recogni-

tion by the general practitioner and referral to an oral and maxillofacial surgeon can provide patients with a stable, functional occlusion and enhanced facial esthetics.

CDA

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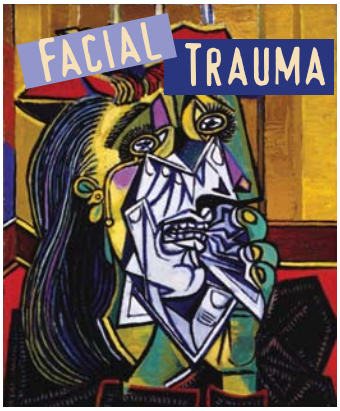


# Management of Traumatic Facial Injuries

Tim Silegy, DDS, and Peter Scheer, DDS, MS

## ABSTRACT

Whether minor or major, traumatic injuries to the maxillofacial area have far-reaching physical and emotional effects. Because the dentition dictates facial form and function, the oral and maxillofacial surgeon, a dental specialist with a minimum of four years of hospital-based surgical training, is uniquely qualified to manage these injuries. At times, the expertise of the general dentist and other dental specialists may be needed to provide definitive care. Several cases are provided to illustrate management of facial trauma.

Trauma remains a major health and social issue throughout the world. In the United States alone, every year thousands of people of all ages sustain facial injuries from automobile and other various vehicular accidents, firearms, athletic activities and altercations.[1,2,3] Regardless of the mechanism, traumatic maxillofacial injuries can significantly affect the physical and psychological health of the individual. Because oral and maxillofacial surgeons have a broad educational base in dentistry and medicine, they are uniquely qualified to mange traumatic injuries to this area. This paper reviews the role of the oral and maxillofacial surgeon in providing care to these patients.

There are many ways to categorize facial injuries. For the purposes of this paper however, traumatic facial injuries will be divided into minor trauma and major trauma.

Minor trauma refers to localized injuries that typically lack the potential to be life threatening. These include isolated lacerations, fractured and subluxed teeth, and non-complex facial fractures such as isolated fractures of the zygomatic arch, maxilla and mandible and alveolar processes. Surgery to correct these problems can frequently be carried out in the office or surgical center environment.

Major trauma usually involves more than one body system. Because of the severity of the injury, multiple health professionals generally manage the patient in the hospital environment.

Trauma in general has many mechanisms. Blunt trauma is the result of an unstoppable force meeting an immovable object. Falls, physical assaults and motor vehicle accidents are examples. Resultant soft tissue injuries can range from contusion to avulsion. Hard tissue injuries may be relatively minor and include subluxed and fractured teeth and non-displaced facial fractures. More severe injuries range from isolated mandible fractures to panfacial fractures.

When sharp or fast moving objects pierce the soft tissue of the maxillofacial area, significant injuries can result. Gunshot wounds, knives, and foreign bodies are common mechanisms of penetrating injury. Penetrating injuries can quickly become life threatening due to vascular and respiratory compromise.

## Patient Assessment

Forces sufficient to cause even minor damage to the maxillofacial complex can also harm the central nervous system.[4] The brain and spinal chord are most susceptible to injury and a com-

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plete neurological exam is indicated in these patients. Patients with altered mental status and/or neck pain should have head and cervical spine injuries ruled out by CT scan.

## Management of Minor Traumatic Injuries

The oral and maxillofacial surgeon will frequently be called upon to manage minor traumatic injuries. Many of these cases can be handled expeditiously in the office environment. **Figures 1a-d** show a 9-year-old female who sustained blunt trauma as a result of falling off a pogo stick.

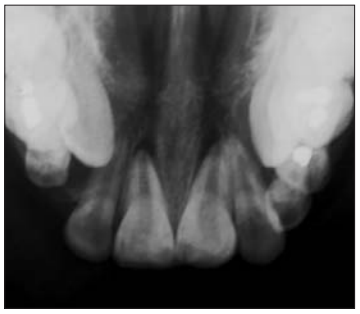
The patient was referred to her general dentist by her pediatrician for management of an upper lip laceration and damaged central incisors. The general dentist subsequently referred her to one of the authors for definitive care. There were no associated neurological findings and her head and neck exam was normal.

After reassuring the patient and reducing anxiety with nitrous oxide/oxygen, local anesthesia was administered. A more thorough intraoral examination revealed Ellis Class III fractures of teeth Nos. 8 and 9. The same teeth were also subluxed palatally. The anterior labial gingival was slightly degloved and the maxillary labial mucosa macerated. An occlusal radiograph showed widening of the periodontal ligament space at the apex. There was no evidence of root fracture.

A straight forceps was used to reposition the central incisors labially. The teeth were then splinted to the adjacent lateral incisors using 24-gauge round wire. Calcium hydroxide was placed on the exposed pulp and topped with a thin layer of composite. The gingival lacerations were closed using 3-0 gut suture. The splint was removed two weeks later and the patient was referred to an endodontist for management of pulpal necrosis.

**1a.** Abrasion on chin and lip laceration.

**1b.** Lip laceration and subluxed teeth Nos. 8 and 9.



**1c.** Occlusal radiograph showing root displacement.

**1d.** Teeth reduced and splinted with thin wire.

**Figures 2a-2c** show a 5-year-old female who presented to the emergency room after having been bitten by a dog. Due to the age of the child, this complex laceration was managed in the operating room under general anesthesia.

After thoroughly irrigating the wound with a triple antibiotic solution, the vermillion border was re-approximated. The oral mucosa was closed using 4-0 gut suture. The orbicularis oris muscle was closed with resorbable suture and the skin closed with 5-0 nylon suture. Because of the potential for infection, the patient received antibiotics.

## Management of Major Traumatic Injuries

At some point during their professional careers, most oral and maxillofacial surgeons are part of a trauma management team. Patients who sustain severe maxillofacial injuries frequently are victims of other body trauma and as such, are generally brought to hospital emergency departments by way of paramedic ambulance. On presentation, their airway, breathing, and circulation are evaluated and managed. Life-threatening injuries are identified and emergency surgery performed. Once stabilized, their maxillofacial injuries can be addressed.

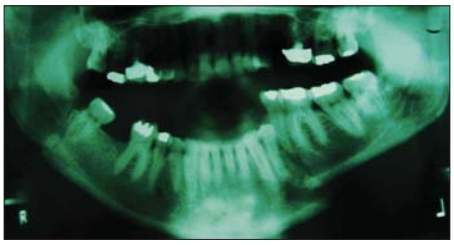
In the last 20 years, two medical advances have revolutionized the way traumatic facial injuries are managed. Most commonly, the extent of the injuries are determined by computerized tomography (CT) scanning.[5,6] Images obtained allow the surgeon to visualize a complete 3-dimensional reconstruction of the facial skeleton. This enhances his or her ability to detect the full extent of injuries and formulate a precise surgical plan.[7]

The development and use of rigid

**2a.** Through and through lip laceration extending to left nares.

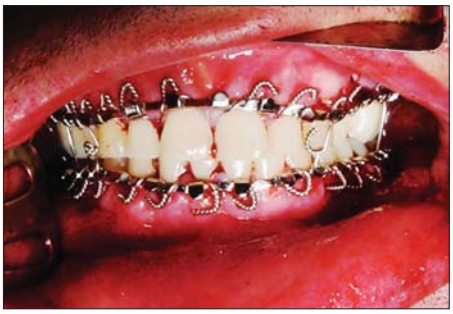
**2b.** Postoperative view.

**2c.** Three-month follow up.



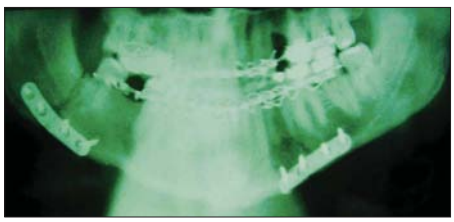
**3a.** Panoramic showing severely displaced fractures.

**3b.** Displaced mandibular body fracture.



**3c.** Patient placed in maxillo-mandibular fixation.

**3d.** Titanium plate rigidly fixating body fracture.



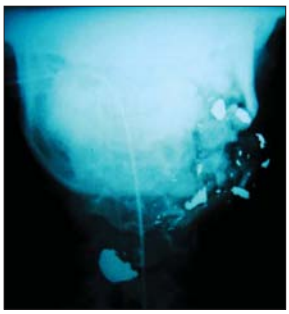
**3e.** Postoperative panoramic radiograph.

**3f.** Postoperative PA radiograph.

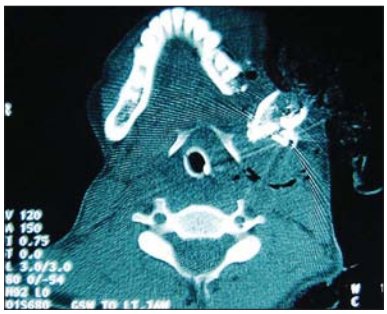
internal fixation to stabilize facial fractures is the second advancement.[8-13] Well-tolerated titanium plates and screws have replaced stainless steel wire and provide absolute immobilization of fractures decreasing the incidence of postoperative complications and eliminating the need for long-term inter-dental wiring. Consequently, the patient can return to normal function earlier without compromising healing. The cases that follow illustrate the practical application of these technologies.

Physical altercations frequently result in mandible fractures. **Figures 3a-3f** show a 41-year-old man who was assaulted during an argument. He received a single blow to the left chin, the force of which fractured the left mandibular body and the right mandibular angle. Muscle pull further displaced the fracture. The patient had no other injuries.

The patient was taken to the operating room where his surgery was performed under general anesthesia. His airway was protected by passing a breathing tube through his nose and into his trachea. Arch bars were then placed on the maxillary and mandibular teeth to provide for maxillo-mandibular fixation. With the patient's pre-morbid occlusion reproduced, the fractures were accessed via skin incisions in natural neck creases. Once the fracture segments were aligned, rigid titanium plates and screws were used to hold the segments in the correct position. The inter-dental fixation was removed just two weeks after surgery, which allowed the patient to consume a soft diet.

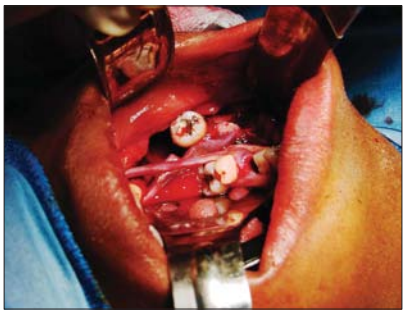


**4a.** PA radiograph showing bullet and bone fragments.

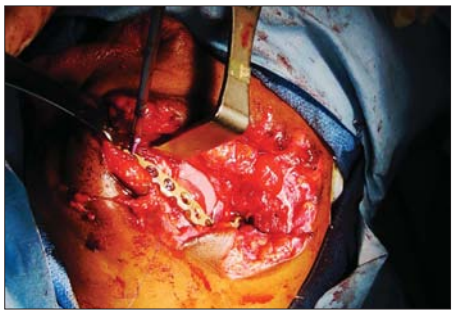


**4b.** CT scan (axial view).

**4c.** Entrance wound left cheek.



**4d.** Intra-oral view.



**4e.** Locking titanium reconstruction plate.

**4f.** Primary closure of entrance wound.

**4g.** Fifteen-month follow up showing minimal scarring.

**Figures 4a-g** represent a 20-year-old female who was the victim of a large caliber gunshot wound at close range. The patient was stabilized by the trauma team and admitted to the surgical intensive care unit.

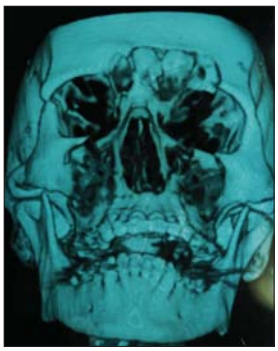
The wound was debrided in the operating room while the patient was under general anesthesia. Nonviable bone, tooth, and bullet fragments were carefully removed. Intact teeth were used to place the patient into maxillo-mandibular fixation assuring the postoperative occlusion would be consistent with the preoperative occlusion. The large boney defect was then bridged by a locking titanium reconstruction plate. After copiously irrigating the wound, a drain was placed and the oral mucosa and extra-oral sites were closed primarily.

The patient is presently undergoing orthodontic treatment. Once complete, the boney defect of the left mandibular body will be reconstructed with bone harvested from the iliac crest. After a period of healing, her missing teeth will be replaced with dental implants.

The final case illustrates the effect of severe blunt facial trauma. (**Figures 5a-g**.) This 21-year-old male, was the victim of a single car rollover accident in the early morning hours. He sustained multiple severe craniofacial, maxillofacial, and orthopedic injuries. He was airlifted to a regional trauma center where his condition was stabilized. A CT scan was performed which revealed a classic Le Fort III fracture involving the naso-orbito-ethmoid (NOE) complex and left and right zygomatic buttress. The frontal sinus was also fractured. He then underwent extensive surgery to repair his fractures and complex facial lacerations.

The patient's dentition was utilized as a guide for the initial facial fracture reduction, using maxillo-mandibular fixation. Titanium plates and screws were then used to rigidly fixate his fractures and were placed through his existing facial lacerations, as well as a modified coronal flap.

The frontal sinus was then debrided. The sinus membrane was removed in its entirety, and the defect was obliterated with autologous fat obtained from the abdominal wall superior to the umbilicus. Once the hard tissues were repaired, attention was turned to the soft tissue defects. The transected right facial nerve and parotid duct were repaired. Lastly, his facial lacerations were closed and his nearly avulsed ear repaired. The patient remained in the hospital for several

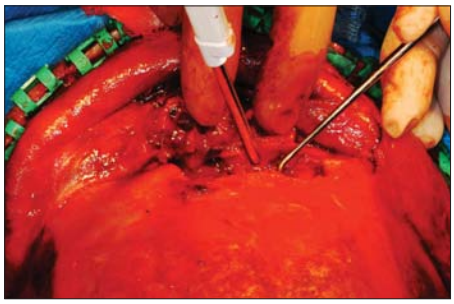


**5a.** Three-dimensional CT scan showing fractures.

**5b.** Partially avulsed left ear.

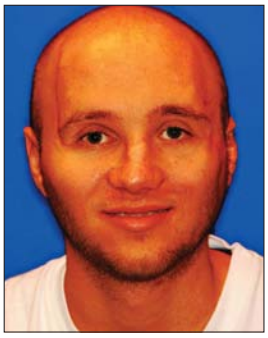
**5c.** Scalp laceration extending to right eyelid.

**5d.** Titanium mini-plates used to repair fractured orbit.



**5e.** Coronal flap used to access orbits and frontal sinus.

**5f.** Left ear reattached.



**5g.** Frontal view 11 months after injury.

days postoperatively.

Since the initial surgery, he has undergone multiple scar revisions utilizing $CO_2$ and YAG lasers, as well as primary excision of residual scar tissue. This fall, the final refinements will be completed by performing a corrective septo-rhinoplasty to finalize his post-traumatic rehabilitation.

## Conclusion

The cases presented in this paper represent in part, the wide variety of maxillofacial injuries the oral and maxillofacial surgeon may be called upon to manage. A comprehensive education in dentistry, medicine, and surgery provides these dental specialists with the skills necessary to give trauma victims excellent care. CDA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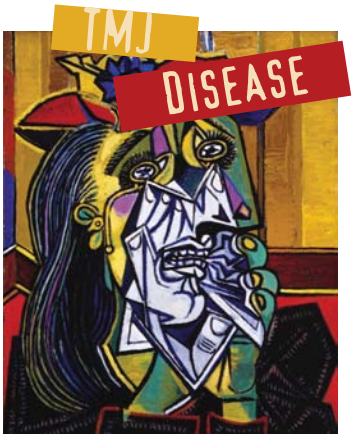


# Temporomandibular Joint Disease: An Update of Surgical Treatment

A. Thomas Indresano, DMD, and Angelle Casagrande, DDS, MD

## ABSTRACT

The temporomandibular joint is one of the most complicated joints in the human body. Because signs and symptoms of TMJ problems often disrupt mastication, the general dentist may be the first health care provider the patient sees. Cases that are refractory to nonsurgical treatment are frequently referred to an oral and maxillofacial surgeon. This paper provides an overview of the surgical procedures used to manage internal derangement of the TMJ.

Temporomandibular disorders is a set of symptoms (that may or may not have pathology) that can be treated surgically. Surgical treatment is typically employed only when the established diagnoses are amenable to surgical treatment. Unfortunately, many times "failure of conservative treatment" has become a reason for surgery. This exclusionary diagnosis is fraught with failure. Pain is not a diagnosis that can be treated with surgery. The goal of surgical intervention is to correct demonstrable pathology.

Many pathologic conditions have surgical solutions. These include internal derangement, degenerative arthritis, inflammatory arthritis, and iatrogenic joint destruction. Other conditions that may contribute to TMD can be treated with techniques performed by oral and maxillofacial surgeons. These include dentofacial deformities, myalgia, and myositis.

## Botox Injections

While not a surgical procedure, Botox can be very helpful for refractory pain due to muscle problems in surgical and nonsurgical cases. Patients with muscle pain from primary myositis respond to injection of Botox into the masseter, and temporalis muscles. Injection of the drug decreases the muscle activity in discreet areas. The agent must be injected using an electromyographically directed needle. A tuberculin syringe attached to the EMG needle is used to inject 10 to 70 units of Botox per side, usually 40 to 50 units in five divided doses in the masseter and 20 to 30 units in the temporalis.

This treatment causes a decrease in the contractility in certain areas of the muscle, which decreases the hyperactivity and allows for rest and repair. Patients do not notice a decrease in chewing strength. One would expect the results to last about six weeks (the duration of Botox), but the effects seem to last much longer, possibly because the cycle of muscle parafunction is broken. The patient may remain asymptomatic if no inciting event resumes. Botox has been used on very refractory patients with very good success, lasting

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**Table 1**

## Wilkes Staging of Internal Derangement[7]

| STAGE | CLINICAL | IMAGING | SURGICAL |
|---|---|---|---|
| I. EARLY | Painless clicking<br>No restricted motion | Slightly forward disc, reducing<br>Normal osseous contours | Normal disc form<br>Slight anterior displacement<br>Passive incoordination (clicking) |
| II EARLY/ INTERMEDIATE | Occasional painful clicking<br>Intermittent locking<br>Headaches | Slightly forward disc, reducing<br>Early disc deformity<br>Normal osseous contours | Anterior disc displacement<br>Thickened disc |
| III. INTERMEDIATE | Frequent pain<br>Joint tenderness, headaches<br>Locking<br>Restricted motion<br>Painful chewing | Anterior disc displacement, reducing early progressing to non-reducing late<br>Moderate to marked disc thickening<br>Normal osseous contours | Disc deformed and displaced<br>Variable adhesions<br>No bone changes |
| IV. INTERMEDIATE/LATE | Chronic pain, headache<br>Restricted motion | Anterior disc displacement, non-reducing marked disc thickening abnormal bone contours | Degenerative remodeling of bony surfaces<br>Osteophytes Adhesions, deformed disc without perforation |
| V. LATE | Variable pain<br>Joint crepitus<br>Painful function | Anterior disc displacement, non-reducing with perforation and gross disc deformity<br>Degenerative osseous changes | Gross degenerative changes of disc and hard tissues; Perforation<br>Multiple adhesion |

as long as one year, with repeated success on subsequent injections.[1,2]

### Arthrocentesis

The introduction of a needle into the superior joint space is an outgrowth of arthroscopy. Experience with arthroscopic lysis and lavage showed the benefits of irrigation. Therefore, since there seemed to be no reason to actually look inside the joint in many situations, arthrocentesis was derived.[3,4] The technique has become the first line treatment for newly diagnosed patients with internal derangement and has been used for all stages of ID and DJD. However, the literature best supports its use for locking joints. Irrigation is deemed useful to remove "breakdown" products like kinins which have been shown to cause pain.[5,6] The technique can be used as a means of placing medications in the joint which may prove to be the best reason for performing it in the future. Various forms of steroids have been used to reduce inflammation. Hyaluronic acid has been used to increase joint lubrication. NSAIDS have been tried to give long-acting pain relief as well as reduced inflammation. Narcotics have been used to break the pain cycle, and sclerosing agents have been used to stabilize loose joint ligaments (**Figure 1**).

**Figure 1.** Arthrocentesis of right TMJ.

### Arthroscopy

Arthroscopy is a very useful technique with a wealth of supportive literature.[11] An arthroscope is passed into the inferior joint space allowing the surgeon to visualize the joint. Arthroscopy can be diagnostic or therapeutic. It was first used to treat closed lock and is presently used for all stages of ID and DJD. Those who developed the technique refined it so that full arthroscopic arthroplasty could be performed. Unfortunately, triangulation and complicated maneuvers like laser

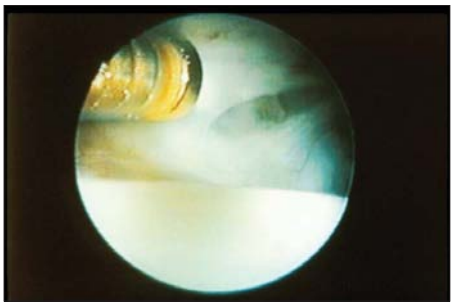

**Figure 2.** Arthroscopic anterior release performed with YAG laser.

**Figure 5.** CAD Cam construction model of custom TMJ replacement.

usage are technically difficult, causing arthrocentesis to be used more frequently. The value of arthroscopy is that an arthroplasty can be performed without surgically opening the joint, thereby reducing the potential for scarring and limitation of motion. Those who can perform arthroscopic arthroplasty do so quickly with minimal trauma, but this takes extraordinary skill and must be performed frequently to keep up the skills of the surgeon (**Figure 2**).

## Open Arthroplasty

Open arthroplasty is a technique widely used in the 1970s to repair various stages of internal derangement. The intention of this operation is to repair and reposition a damaged and displaced articular disk. However, studies using postoperative MRIs have shown that this repaired position does not hold over time (**Figure 3**).

**Figure 3.** Open arthroplasty showing the superior joint space with hypervascular disc prior to wedge resection.

## Discectomy

The most written about and most successful surgical technique related to TMJ surgery since the early part of the 20th century, discectomy (surgical removal of the articular disk) has been used in the United States and in Europe to deal with advanced degenerative joint disease.[8] Silver has a follow up greater than 50 years on these patients.[9] Removing the disk in its entirety, the surgery gets patients out of pain and improves function. Eventually the patient exhibits radiographic changes in the bone and joint crepitance. These signs were accepted in Europe and explained as accelerating the "natural history of the disease" or taking a Wilkes Stage 2 or 3 and advancing it to a Stage 4. This was deemed acceptable as the patient returned to a state of pain free mobility.

In this country, these changes were not deemed acceptable and consequently, spurred a number of attempts at disc replacement, which included using dermis, ear cartilage, femoral head cartilage, temporalis muscle and a variety of alloplastic materials as substitutes for the missing disk (**Figure 4**).

## Condylotomy

This technique stemmed from the reports that patients who underwent vertical ramus osteotomies for orthognathic correction improved their TMJ symptoms. First used in Britain by Ward-Booth, it has been championed by Hall.[10] The theory is that instead of placing the disc over the condyle, one allows the condyle to find

**Figure 4.** Discectomy without replacement.

itself under the displaced disc. Outcomes are similar to other surgical treatments, but acceptance has been limited.

## Total Joint Replacement

Replacement of bone substance for severely degenerated joints has been available for many years. Autogenous grafting with hip or rib has been used along with a number of more unusual donor sites. Most autogenous grafting has the problem of previous scarring and limited blood supply. Rib grafting is often used for growing children since growth can be continued at the costochondral interface.

Replacement using allogeneic systems has increased since Mercuri published outcome studies over 20 years showing excellent retention and correction of severe DJD[12] (**Figure 5**).

## Distraction Osteogenesis

Developed for orthognathic procedures, it recently has been used for the replacement of condyles that have been severely degenerated as well as for failed allogeneic total joints. The theory is appealing since slow distraction causes bone deposition and soft tissue growth, including new vascularity. While a small number of surgeons have reported success, long-term results have yet to be reported.

## Conclusion

A wide variety of surgical procedures are available to correct pathologic temporomandibular joints. Over the years, the authors have performed all of the

listed procedures. Generally speaking, the authors' experiences have paralleled the literature.

Following conservative treatment, arthrocentesis is an effective first intervention for internal derangement. If an arthroplasty is needed, arthroscopy with Ho:YAG laser, is preferential because it causes less scarring than open procedures. In cases where the disk cannot be repaired/repositioned, discectomy without placement of interpositional material has withstood the test of time.

For adults with severe DJD or multiply operated degenerated joint allogeneic total joint replacement is indicated. In growing children, costochondral grafting is preferential due to increased blood supply and potential for growth. CDA

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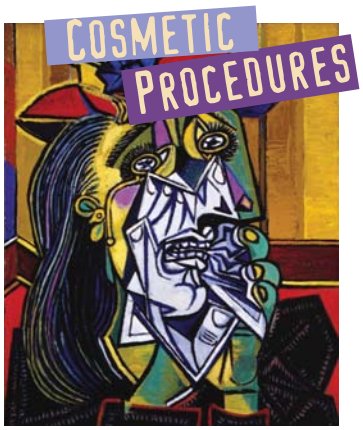


# Overview of Facial Cosmetic Surgery

Simona C. Arcan DMD, MD

ABSTRACT

Dentists routinely refer patients to oral and maxillofacial surgeons for dentoalveolar surgery, however few of these dentists are fully informed as to the full scope of surgical practice. Appropriately trained oral and maxillofacial surgeons may also offer cosmetic facial surgery to their patients under certain circumstances. This paper will provide an overview of cosmetic facial surgery.

The specialties of oral and maxillofacial surgery and plastic surgery share common origins. The first plastic surgery organization in the world was formed at the Chicago Athletic Club in 1921, and was called the American Association of Oral and Maxillofacial Surgeons. Of the 20 founding members, 18 had both MD and DDS degrees.[1]

In 1926, the name changed to the American Association of Oral and Plastic Surgeons, and the requirement for a dental degree was dropped. They subsequently became the American Association of Plastic Surgeons in 1941. A subgroup of these members created a new organization in 1947 called the American Society of Maxillofacial Surgeons, including members with both MD and DDS degrees once more, and focusing their interest on maxillofacial surgery.[1]

Oral and maxillofacial surgery as defined by the American Dental Association includes the diagnosis, surgical and adjunctive treatment of diseases, injuries and defects involving both the functional and esthetic aspects of the hard and soft tissues of the oral and maxillofacial regions.[1]

Oral and maxillofacial surgeons have long been involved in changing or improving people's skeletal features through orthognathic surgery, reconstructive surgery, and repair of facial fractures.[2] While many of these surgeries are carried out through small intraoral incisions, others require incisions to be made in visible areas of the face.

Additionally, because changes of the facial skeleton have corresponding soft tissue changes, oral and maxillofacial surgeons are keenly aware that an esthetic result can only be achieved if attention is paid to both of these factors. It is, therefore, a natural progression to extend this expertise into cosmetic surgery procedures.

Most oral and maxillofacial surgery residencies now teach esthetic surgery of the face as part of their curriculum.[3] Today, candidates for certification by the American Board of Oral and Maxillofacial Surgery are examined on the evaluation, diagnosis, and treatment of the patient with cosmetic concerns. Additional, concentrated training, is also available at several post-residency fellowship programs.

Cosmetic facial surgery can be grouped into three categories: soft tissue, osteocartilagenous, and minimally invasive procedures. Soft tissue procedures include blepharoplasty (eyelid surgery), rhytidectomy (facelift), browlift, submental lipectomy (liposuction) and deep chemical peels or laser skin resurfacing.[4]

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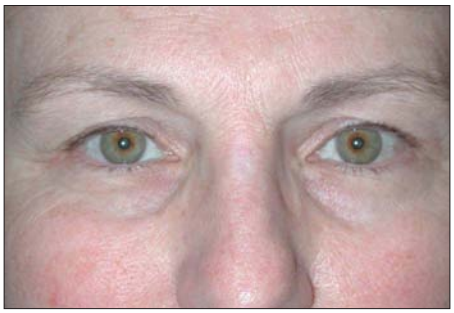

**Figure 1.** Preop upper and lower lids.

**Figure 1b.** Postop upper and lower lid blepharoplasty.

**Figures 2a and b.** Premandibular/chin advancement and submental liposuction.

**Figures 2c and d.** Postmandibular/chin advancement and submental liposuction

Osteocartilagenous procedures include rhinoplasty, otoplasty, cheek implants, and chin implants or sliding genioplasty. These surgeries may be performed independently or in conjunction with orthognathic surgery.[5]

Minimally invasive procedures include botulinum toxin injection of the muscles of facial expression, lip augmentation, treatment of deep smile lines or prominent nasolabial folds with various tissue fillers or autologous fat injections, light to medium facial peels and photofacials.

## Soft Tissue Procedures

In the aging face, the eyelid skin becomes less elastic and tends to form excessive folds on the upper lid. The orbicularis oculi muscle also become weakened, allowing the orbital fat to herniate through it. This gives the appearance of "bags" under the eye.

Blepharoplasty is the surgical rejuvenation of the upper and lower eyelids. This procedure entails the removal of excess skin and orbicularis oculi muscle, and either repositioning or removing a portion of the fat pads (**Figure 1**). In order to avoid a gaunt, skeletinized look, less fat removal and more superior repositioning may be indicated.

Endoscopic browlift is the procedure whereby the forehead skin and brows are elevated through three to five small scalp incisions, using a camera to visualize the underlying structures. This is a procedure most often recommended with an upper blepharoplasty, thereby minimizing the amount of skin removal necessary to obtain a refreshed look of the eyes. An open coronal approach can also be used to elevate the brow and resect the corrugators and procerus muscles.

Rhytidectomy or facelifting procedures are more extensive rejuvenation surgeries, involving the use of a surgical incision extending from the temporal region anterior to the ear, to the post-

auricular area curving around the earlobe. There are multiple schools of thought as to which flaps are more successful, and this usually correlates with the invasiveness of the procedure. These surgeries can be quite extensive and have known complications including blood loss, facial nerve injury and scarring.

Submental lipectomy involves the reshaping of the mentocervical angle. It can be used in conjunction with orthognathic surgery in more severe Class II or Class III skeletal deformity patients.[5] In severe Class II skeletal patients, this procedure can be used to further achieve a more esthetic mentocervical angle (**see Figure 2**). In a severe Class III mandibular hyperplastic patient, when doing a mandibular setback, the mentocervical angle can become less defined and a lipectomy may be necessary to avoid compromising this esthetic unit. A small submental incision and two additional postauricular incisions are used to insert a liposuction microcanula. Removal of lobules of fat is achieved through a suctioning and vacuuming technique. This procedure can also be performed as an isolated surgery in an office setting.

Laser skin resurfacing is achieved with either the $CO_2$ laser, Erbium-YAG laser or a combination of both. Skin resurfacing removes the top layer of the skin and allows a new layer of skin to develop. This improves appearance of sun-damaged skin, smoothes out rhytids (wrinkles), improves mild scarring, destroys epidermal lesions (e.g. actinic keratosis and lentigines), ameliorates underlying skin diseases (e.g. acne and rosacea) and blends the effects of other resurfacing procedures.

Chemical peels and dermabrasions have been used in the past to achieve the same results that laser resurfacing does today. There may still be some indications for these procedures in certain patients. There are different types of peels available, depending on the degree of penetration into the skin layers. They are divided into light, medium and deep skin peels, with the deep peels being equivalent to the laser resurfacing. Dermabrasion is still very effective in smoothing out severe acne scars.

**Figures 3a and b.** Premandibular setback, chin reduction and rhinoplasty.

**Figures 3c and d.** Postsetback of mandible, chin reduction and rhinoplasty.

## Osteocartilagenous Procedures

Rhinoplasty is one of the most popular procedures performed on the facial skeleton. It can be as simple as reducing a prominent dorsal hump or as complicated as reconstructing a cleft nose. The most common procedures performed to reshape the nose are dorsal hump reduction, refining and/or rotating of the nasal tip and narrowing of the base of the nose (**Figure 3**). Septoplasty, along with rhinoplasty is sometimes indicated in straightening of the severely deviated nose. Surgery on the nose can be performed separately or concurrent to an orthognathic procedure.[5]

Otoplasty entails the correction of the floppy ear by removing part of the conchal bowl and reconstruction of the antihelix. This surgery can be done on patients as young as 5- to 6-years old, prior to entering first grade, to help avoid developing a stigma from constant teasing from other children.

Cheek implants can be used to augment mid-face deficiencies in patients who are unwilling to undergo ortho-

dontics and/or a maxillary osteotomy to correct their skeletal discrepancy. They can also be used in conjunction with maxillary osteotomy to achieve a fuller mid-face in those patients with severe mid-face deficiencies, as those encountered in certain syndromes.

Chin implants vs. sliding genioplasty has always been a hot topic of controversy.[6,7] With a sliding genioplasty, one can achieve a 3-dimensional movement of the chin, rather than just the single forward movement obtained with a chin implant.[6,8,9] The patient in **Figure 2** had a mandibular deficiency which was treated with a mandibular advancement and advancement genioplasty. The patient in **Figure 3** had a mandibular hyperplasia in a horizontal and vertical dimension. She was treated with a mandibular setback and a reduction genioplasty. Occasionally, a patient with severe mandibular micrognathia may require a mandibular osteotomy with forward movement, advancement genioplasty and later a chin implant.

**Figures 4a.** Pre-Botox injections forehead.

**Figure 4b.** Post-Botox injections forehead.

## Minimally Invasive Procedures

In light of the FDA approval of new products like Botox Cosmetic, Restylane

**Figure 5a.** Pre-implant surgery.

**Figure 5b.** Post-implant surgery/pre-Restylane.

**Figure 5c.** Post-Restylane nasolabial fold and lip

and other collagen fillers, there has been a change toward these less invasive types of procedures being performed. This also has been attributed to patient unwillingness to take weeks off of work to heal.

More patients are interested in doing "preventative" cosmetic surgery, rather than large overhauls. The more common of these are used to temporarily freeze movement of the muscles of facial expression with botulinum toxin (Botox Cosmetic, **Figure 4**).[10] Various tissue fillers (i.e. Restylane and collagen) are used to restore lost volume in the face, and plump up deep nasolabial folds, smile lines and marionette lines in the corner of the lips (**Figure 5**), as well as augment thin lips (**Figure 6**).

Another emerging method to stimulate collagen production, minimize fine wrinkles, as well as improve the sun-damaged skin is the photofacial therapy. This non-invasive procedure involves the use of intense pulse light (IPL) and results are more permanent than those obtained with just Botox and tissue fillers.[11] The IPL treatment can also be used to treat telangiactasias (broken capillaries) of the face, rosacea (a common dermatological condition of the face) and rhinophyma (red, thick-skinned nose), as well as remove unwanted hair.

## Summary

There is a great amount of emphasis on appearance these days. Hollywood continues to be a major source of obsession with appearance. Patients always wanted to look like the movie stars they see on TV or on the big screen, but until recently, the "average Joe" most likely stayed the "average Joe." With the advent of television programs such as "Extreme Makeover" and "The Swan," the public is now aware of what it takes to make them beautiful and youthful looking and may seek the advice of their dentist. Consequently, it is important for dentists to inform their patients of the dental and surgical procedures available to address their esthetic concerns. CDA

**Figure 6a.** Pre-Restylane lip augmentation.

**Figure 6b.** Post-Restylane lip augmentation.


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Robert E. Horseman, DDS

# Putting the Strain on *S. Mutans*

There is a revolution coming and whether you accept it or start decamping for Canada, YOU are part of it.

There is something going on at the University of Florida. This is FYEO (For Your Eyes Only) stuff, so unless you have TSC (Top Secret Clearance), you are to SRRN (Stop Reading Right Now).

Jeffrey Hillman, DMD, PhD, of Oragenics knows about it; so does Kenneth Burrell, DDS, senior director of the American Dental Association, Council on Scientific Affairs. Because we are among a very select group of scientific elitists, we have access to all this hush-hush material discreetly issued periodically OAM (Once a Month) by a privately funded publication called PS (*Popular Science*). One-year subscription (12 issues), pay $12.95 (save 73 percent).

If you pass the gimlet-eyed scrutiny of security, this is the skinny: There is a revolution coming and whether you accept it or start decamping for Canada, YOU are part of it. There are 15 to 30 volunteers already enlisted according to dental researcher Hillman at the University of Florida. These intrepid souls who possibly were under the impression that they were to be given some SPF 45 to test on their bared epidermis at South Beach while lavishly ensconced at the Miami Hilton for 30 days are, instead, to be lavishly swabbed with *Streptococcus mutans* on their bare teeth!

Would you be foolish enough to volunteer for this? Of course not! As a scientific tooth-oriented health professional, you know the story of *S. mutans*. These mean-spirited bacteria grow on human teeth, converting sugar into lactic acid that rots those very same teeth. That *S. mutans* are largely

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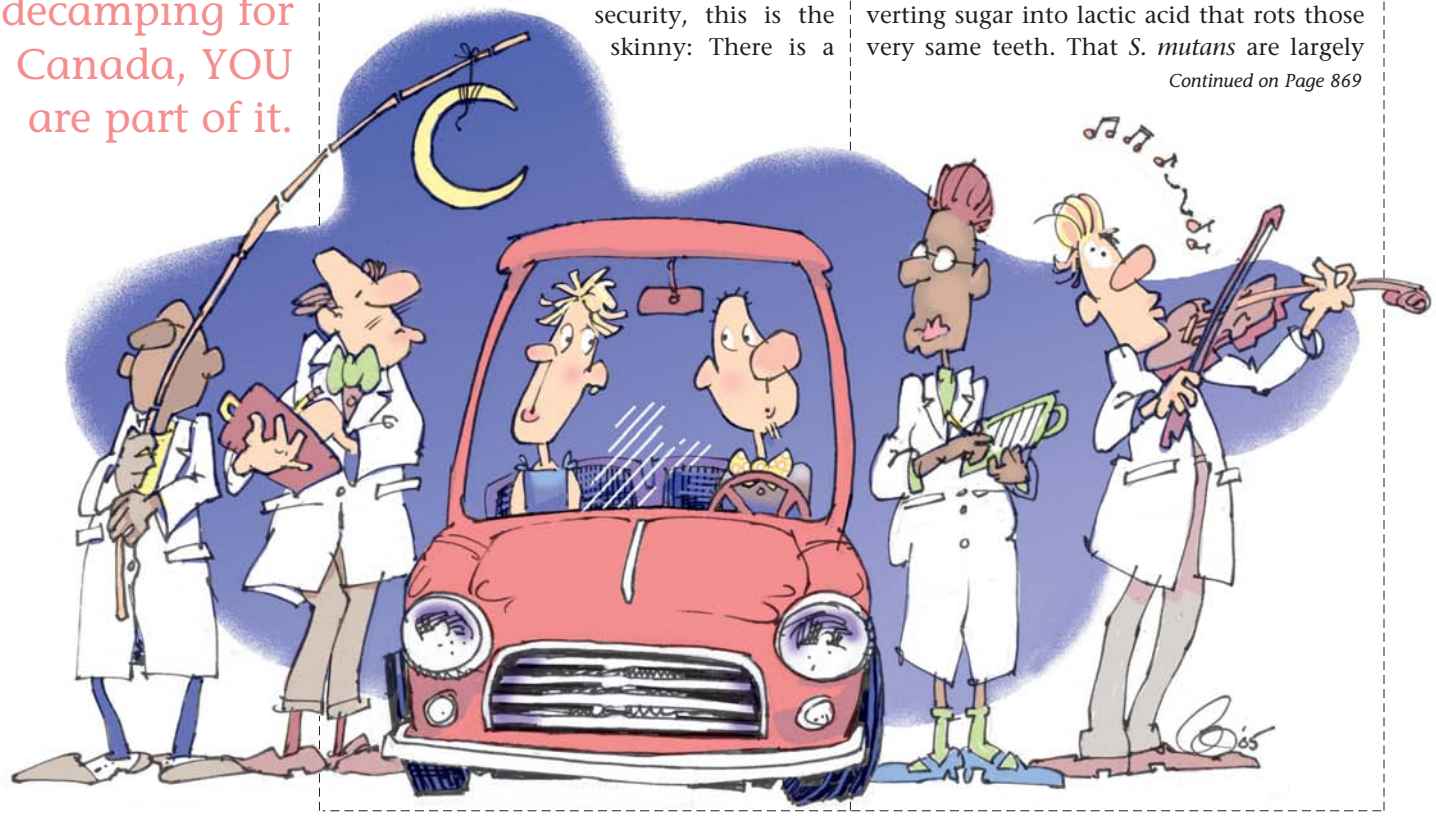

*Continued from Page 870*

responsible for providing us with a living is beside the point. The point is that Hillman has engineered a new strain of these bacteria that *doesn't produce lactic acid*. How Hillman was able to convince even one *S. mutans*, let alone an entire test tube of them, to eschew the production of lactic acid is on a NTK (Need To Know) basis for which even *Popular Science* is not privy.

There's more. Instead of lactic acid, this newly engineered *S. mutans* has been outfitted with an antibiotic "that helps it displace the indigenous cavity-inducing strain." Here's where you come in. Armed with nothing more than a Q-Tip and maybe a SIG-Sauer 9 mm, you swab your volunteer's teeth with Hillman's mutant bacteria. Offering any explanation that seems even remotely plausible, the swabee is given a sack full of Tootsie Rolls and Gummi Bears, and dispatched home to eat even more sugar. If this advice sticks in your craw, maybe Hillman himself will have to put in a personal appearance to explain in simple terms that the ingested sugar will help colonize the new *S. mutans* strain. These new confused bacteria, instead of creating a cavity as they had been trained to do since early childhood, are now unwittingly forming a tooth security guard. This will revolutionize the practice of dentistry in terms of drilling and filling. Who knows what engineered bacteria can be trained to do or not do next? How about eating fat?

What the revolutionized practice will be like is not clear, but it underlines the necessity of not letting this information leak to the nation's restorative dentists who will immediately try to confiscate and horde all Q-Tip supplies. Hillman is ecstatic. "If there was a market for preventing cavities in rats, I'd be a millionaire," he exalted.

Hillman should be made aware that there wasn't a market for bleaching teeth until a relatively short time ago, so anything is possible.

Burrell, ADA's man, is equally blown away, although he doesn't seem to hold any patents on these new model streptococci. Both these spokesmen are thinking outside the box, because they are not sure whether the new strain can be transferred to others with, say, a kiss. Should this occur, the Bureau of Osculatory Interdiction, under the aegis of the Food and Drug Administration, will most certainly delay the revolution by at least 20 years. Hillman, however, is confident there will be no "horizontal transmission" as he delicately put it. Just to make sure, however, spouses of the volunteers will be monitored. Should the volunteer not have a spouse, one will be provided. If the strain has the decency to stay put, not wandering willy-nilly from mouth to mouth, the dental revolution could get airborne commercial-wise within five to six years. If it doesn't, there could be a lot of kissing going on and the Q-Tip market would bottom out.

> "If there was a market for preventing cavities in rats, I'd be a millionaire."
>
> —Jeffrey Hillman, DMD, PhD

If you are interested in some intensive osculatory experimentation in the name of science, contact the University of Florida at their research facility in Kissimmee, Fla. CDA