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Perspective

Major General George W. Weightman

Welcome to the latest edition of our *AMEDD Journal*. I'm convinced that you will find this issue to be unique, interesting, and professionally stimulating. This quarter's issue is devoted to the Army Dental Corps and we have selected a broad spectrum of articles to demonstrate the breadth and depth of this great Corps. MG Joseph Webb, the Dental Corps Chief and Deputy Surgeon General, starts us off with a history of the Dental Corps. You may be surprised to learn that it was formally established (by law) in 1911. He gives us a very interesting overview of the Corps with a description of its many areas of therapeutics, research, and graduate dental education programs. He also provides insightful comments on three new initiatives: the Oral Health Initiative, Digital Radiography, and the Expanded Function Dental Assistant programs.

COL Tim Jones follows with a great overview of Operational Dentistry in his article titled "Army Dental Service Support in a Theatre of Operations." Many of you will be surprised to realize that historically 20% to 25% of all Soldiers experience dental emergencies within a year while deployed. COL Jones concludes that military dentistry clearly must accompany the Warfighter and is an integral part in maintaining Soldier readiness.

LTC Chaffin reassures us of the top notch quality of dental care in the Army with his "Patient Satisfaction in US Army Dental Treatment Facilities." He provides documentation of excellent care that is being provided from a patient's perspective and also identifies future areas of study. COL John Luciano, tells us of the history and status of "The Expanded Function Dental Assistant Training Program" and stresses the great return on investment and increased access to care that this program has delivered to the AMEDD.

"US Army Dental Command 'Puts More "Bite" Into Health Promotion'" provides us the why and how of putting Health Promotion Programs into dental practice. Pamila Richter explains the partnership between the Dental Command and the Army Center for Health Promotion and Preventive Medicine that

has been very proactive in delivering state of the art health education to our beneficiaries. COL Mark Bodenheim in "Army Reserve Components Dental Readiness — A Historical Review Since the First Gulf War" gives us the unvarnished truth about the poor state of reserve dental readiness prior to the Global War on Terror and documents the recent improvements. He outlines some of the remaining challenges to getting dental readiness parity between the Active and Reserve Components.

In "Evolving Education Trends in Graduate Dental Education" COL Ann von Gonten describes GDE from entry programs all the way through the many dental fellowships. She gives great advice on the service obligations incurred for training and details the selection process. MAJ Jerry Carbone describes a new and potentially better method for detecting caries compared to the traditional bitewings in his article entitled "Investigation Into Use of Digital Fiberoptic Trans-Illumination (DIFOTI) in Caries Detection."

If you're looking for pictures as proof of the miracles our dentists are doing in reconstruction you'll enjoy LTC Minaxi Patel's "Prosthodontic Rehabilitation of a Patient with Amelogenesis Impecta: A Clinical Report." This is an easy read about a rare dental condition and the spectacular results achieved through aggressive reconstruction. CPT Matthew Thunberg gives us some good insights into Dentistry 101 with his "Provisional Restorations: An Overview of Techniques and Materials," describing three of the most common types of materials used and the techniques for using them.

If you're not familiar with the term "Distraction Osteogenesis" then you need to read "Implant Site Preparation with Distraction Osteogenesis" by LTC (Ret) Philip Pandolfi in which he describes a new technique to manage reconstruction of defects of the alveolar ridge. For those of you with (or contemplating having) posterior restorations you'll enjoy LTC Nicholas Coppola's "A Policy Perspective for Army Dentists Performing Posterior Restorations." Dr. Coppola gives us the pros and cons of different restoration material and notes the differences between civilian and military dental practice. A great read.

This is a fantastic edition and I want to take the opportunity to thank all of our great Army Dentists for what they do every day to help maintain the readiness of the fighting force. They are pillars of our AMEDD team and clearly set a high standard for the rest of the Corps to emulate.

WARRIOR MEDICS!

Major General Joseph G. Webb, Jr

MG Webb is Chief, US Army Dental Corps
and Deputy Surgeon General

As the Chief, Dental Corps (DC), I am truly excited to have this special opportunity to contribute a series of articles which showcase our great Soldiers, civilians, leaders, and clinicians, all of whom represent the Army Dental Care System (ADCS). I believe the common thread throughout the Army Medical Department (AMEDD) is the integration of all the Corps (to include the support services) and their synergistic relationships. These relationships produce a synchronized system of effective and efficient health care delivered in support of Soldiers and their commanders. The *AMEDD Journal* is one of many superb partners within the AMEDD and we are appreciative of this opportunity.

From 1775–1901, dental service to Soldiers was provided by hospital stewards (enlisted medics) who by special interest or special training, limited their activities to providing dental care in conjunction with medical officers. In 1901, the Army authorized 30 contract dentists for an Army-wide program of dental care. Ten years later, the contract positions were converted to commissioned officer positions. The Army Dental Corps was officially established on 3 March 1911.

During the past 36 months, the Army's operational tempo has been tremendous and demanded a renewed focus for our personnel and the dental service we provide to Soldiers at home station and deployed in support of the Global War on Terrorism. The ADCS treats over 7,200 patients each day in 173 dental clinics, and is represented by 29 Dental Activities (DENTACs) and 6 Regional Dental Commands, all of which are supported by a single Army Dental Laboratory.

The ADCS professional staff, including our dentists assigned to combat units, consists of 933 dentists, 24 Medical Service Corps officers, 1,115 noncommissioned officers and enlisted Soldiers, 1,788 civilians, and 708 contracted employees. Dental Officers serve in the following Areas of Concentration: General Dentist (63A), Comprehensive Dentist (63B), Periodontist (63D), Endodontist (63E), Prosthodontist (63F), Public Health Dentist (63H), Pediatric Dentist (63K), Orthodontist (63M), Oral and Maxillofacial Surgeon (63N), Oral and Maxillofacial Pathologist (63P), and Executive Dentist (63R).

The ADCS is not limited to clinical care; it is a multi-faceted organization supporting the Army, training dentists, and advancing the science of dentistry. We train combat-ready dental technicians from the Dental Science Division. Through Graduate Dental Education and residency training programs, we provide clinicians ready to treat patients in any environment. Our Dental and Trauma Research Detachment and Combat Development Directorate ensure that our materiel and force structure are ready to support the Soldier wherever the requirement exists.

The Dental Command (DENCOM) is the operational element responsible for providing dental care and is currently implementing the following initiatives to increase readiness, improve access to care, and, ultimately, support Soldiers and their commanders:

- First Term Dental Readiness (FTDR). FTDR ensures that newly assessed Soldiers receive dental care to ensure their deployability upon graduation from Advanced Individual Training, One Site Unit Training, or the Basic Officer Leader Course.

- Oral Health Initiative (OHI). The OHI is a Tri-Service effort designed to provide routine dental care with the express goal of completing all dental treatment for Soldiers. The OHI uses allocated funds to refer service members to the private sector for some routine dental care, thereby increasing the dental wellness of the served population. All three services are in the first year of this initiative. Twelve selected Army DENTACs have established private sector care networks to reduce the backlog of dental needs.

- Digital Radiography. The Digital Enterprise Viewing and Acquisition Application (DEVAA) software was developed by DENCOM. DEVAA supplements existing hardware for image acquisition, manipulation and diagnostic viewing. The image management enhancement allows all Army dental digital radiographs acquired in Army dental clinics to be transported and stored in a central image archive. DEVAA software has been deployed to over 80 of the Army's 173 dental clinics worldwide. Army dental clinics will be 100% digitized within the next 12 months.

- Expanded Function Dental Assistant (EFDA). The EFDA program is based on labor-substitution principles using highly trained dental assistants to increase the output of general dentistry teams. Personnel from the EFDA program are completely embedded in both FTDR and Dental Care Optimization (DCO). DCO is a key initiative aimed at increasing access to care by using the best clinical practices. EFDAs are also used extensively to expedite the surge requirements for dental care generated by mobilizations.

The Department of Defense and Army environment we now face includes challenges of Base Realignment and Closure, Army Modular Force, Quadrennial Defense Review, Integrated Global Presence and Basing Strategy, and the military-to-civilian conversion. Internal to Army Medicine, volatility is increased by constrained resourcing, increased use of private sector dental care, recruitment and retention challenges, and a possible transition to the development of a Joint Medical Command. From my recent conversations with our retired Dental Corps General Officers, I am amazed at the similarity of the challenges and issues they faced.

The history of US Army Dentistry provides a constant reminder that the personnel of the ADCS are our most valuable asset. I am very proud to be a part of a great team, doing tremendous work each day. I am confident we will respond with a renewed vigor to work through the challenges. Together we will reshape the future and remain an integral partner within the AMEDD.

Army Dental Service Support in a Theater of Operations

COL Timothy K. Jones, DC, USA

Warfighters are the centerpiece of the US Army and are the ultimate weapons system. Their health and fitness, including dental health, is the basic guarantor of military success. The further into a deployment, the greater the decrease in opportunities and resources to enhance and maintain Soldier health and effectiveness. This makes the emphasis upon preventive medical steps employed both before departure and during a contingency deployment even more important. Dental care is an integral part of overall Force Health Protection and shares in the Army Medical Department mission to conserve the fighting strength.

IMPORTANCE OF FIELD DENTISTRY

Historically, 20% to 25% of all Soldiers will experience a dental emergency during a 1-year deployment. The largest number of Soldier complaints in 1943 involved lack of adequate dental support.[1] In the Korean War there were 133,720 dental visits that resulted in 493,441 dental procedures.[2] The average time a unit loses a Soldier with a dental emergency which requires evacuation to the rear is 5 days.[3] Liewehr[4] calculates that this fact leads to a potential loss to a division of 18,000 man-days during a 1-year deployment. Payne and Posey[5] found a peacetime field dental emergency rate at Fort Irwin and Fort Drum to be 21% of the total medical sick call in field exercises involving 24,500 Soldiers. They further determined that the dental emergency rate was 167 per one thousand troops in one year. The result was an annual lost duty time of 121.5 days per thousand Soldiers. Ludwick et al[6] found a dental emergency rate of 200 dental emergencies per 1,000 deployed personnel per year in Navy and Marine personnel in Vietnam. Nasser and Storz[7] found that 14% of medical sick call reporting to the 12th Evacuation Hospital during Operation Desert Storm were dental emergencies. The actual percentage of dental emergencies was higher because many Soldiers experiencing dental emergencies reported directly to field dental clinics and bypassed the hospital. Grover et al[8] found an even higher dental emergency rate among Army recruits — 260 per 1,000 Soldiers every 6 months which extends to a rate of 520 dental emergencies per 1,000 Soldiers per year. Swan and Karpetz[9] found a dental emergency rate of Canadian military personnel in Somalia in 1993 to be 232 dental emergencies per 1,000 troops per year. Lost time due to dental emergencies can have a tremendous impact on unit readiness. These historical cases illustrate the necessity that military dentistry must accompany warfighters whenever and wherever they deploy.

DENTAL CARE IN THEATER*

The type of dental care provided to deployed Soldiers is called operational care, which is composed of "essential" dental care (to prevent a Soldier from becoming a casualty) and "emergency" dental care. Relief of oral pain, elimination of acute infection, control of life-threatening oral conditions (hemorrhage, cellulitis, or respiratory difficulty) and treatment of trauma to teeth, jaws, and associated facial structures are considered emergency care. It is the most austere type of care and is available to Soldiers engaged in tactical operations. Common examples of emergency treatments are simple extractions, antibiotics, pain medication, and temporary fillings. Essential care includes dental treatment necessary to intercept potential emergencies. This type of operational care is necessary for prevention of lost duty time and preservation of fighting strength.

TYPES OF DENTAL SUPPORT

There are three levels of dental support in a Theater of Operations; unit, hospital, and area. These levels are defined primarily by the relationship of the dental assets attached to the Combat Health Support supporting the patient population within each level:

*Note: The doctrine of dental operations discussed in this paper is based upon Department of the Army *FM 4-02.19, Dental Service Support in a Theater of Operations*.

Unit — Support provided by a dental team organic to divisional and brigade medical companies and all Special Forces Groups. The dental team provides operational dental treatment to Soldiers during tactical operations. The dental team is composed of one general dentist (comprehensive dentist and dental assistant in the division main medical company) and dental assistant and their field equipment.

Hospital — Support provided by the hospital dental staff to minimize loss of life and disability resulting from oral and maxillofacial injuries and wounds. The hospital dental staff provides dental support to all injured or wounded Soldiers as well as the hospital staff. Each Combat Support Hospital has one oral and maxillofacial surgeon, one comprehensive dentist, one expanded function dental assistant, and one dental assistant. The oral and maxillofacial surgeon uses other hospital support personnel (such as operating room assistants) when required.

Area Dental Support — Support provided on an area support basis by dental companies and dental personnel in area support medical companies. These dental companies also provide operational care. The dental companies are comprised of modular dental teams that are capable of operating separate dental treatment facilities, or by consolidating units and operating one or more large facility, depending upon the particular operation. Other teams may be employed to provide far forward operational dental care. Older type dental companies (medical company, dental support) have one prosthodontist in addition to 14 general dentists. Newer type dental companies (dental company, area support) have one prosthodontist, one periodontist, and one endodontist in addition to the 24 general dentists. Both the old and new type dental companies have far forward teams (one dentist and one dental assistant with their dental equipment) that can deploy wherever needed. The older type dental companies are being phased out as the newer type dental companies are activated. Area dental support may also be provided by the one general dentist and one dental assistant assigned to each area support medical company.

DENTAL STAFF OFFICER POSITIONS

The senior dental officer position in a specific regional combatant command is known as Army Dental Surgeon and Chief, Dental Services in the Army Surgeon Cell (known as the UEy Dental Surgeon until the recent decision on naming conventions of Army Transformation units). This new dental staff position is a wartime Professional Filler System requirement in a dedicated, regionally focused Army. Among other duties, the Army Dental Surgeon is charged with the establishment of an effective and consistent program for dental services and dental operations on a theater-wide basis.

Medical Deployment Support Command (MDSC) (formerly known as the Theater Medical Command (MEDCOM)). There are two dental staff officers in the headquarters company:

1. The MDSC Dental Surgeon establishes and disseminates Army theater policy on dental matters. The Surgeon exercises technical control over all dental units in the theater through the medical brigade Dental Surgeons, directs the dental service element of the headquarters, and provides dental staff support to the MEDCOM commander.

2. The MDSC preventive dentistry officer supports the MDSC Dental Surgeon in all staff actions. Specific duties include:

   - Providing oral health surveillance information in support of policy and procedure development.

   - Developing plans and orders concerning oral fitness and preventive dentistry programs.

   - Recommending treatment policies.

   - Developing programs for dental support of humanitarian and civic action operations.

Medical Support Command (formerly known as Medical Brigade). In the past, the senior dental company commander had the additional designation as brigade Dental Surgeon and was located in the brigade's command section. In Army Transformation, a formal position exists for the Dental Surgeon in the Medical Support Command. He exercises technical control over dental assets in hospitals and dental units subordinate to the Medical Support Command. The Medical Support Command Dental Surgeon also provides technical supervision for unit-level dental support (in Brigade Combat Teams, Armored Cavalry Regiments, and Special Forces Groups) as well as for

dental assets assigned within the Medical Support Command. A senior dental NCO assigned to the security, plans, and operations section assists the Medical Brigade Dental Surgeon.

Division. The senior dental officer in a division is assigned to the division main medical company in the main support battalion. In addition to his patient care responsibilities, he acts as the Division Dental Surgeon and exercises technical supervision over the dental assets in the division forward support battalions. Dental officers in the forward support medical companies of the forward support battalions serve as Dental Surgeons to the supported maneuver brigades. The division main medical company is deleted as part of Army Transformation. As more brigades are activated, the division main medical companies provide the resources for the new brigade medical companies. Therefore, the positions for division dental staff officer and dental officers in division main medical companies will be deleted.

Brigade Combat Teams, Armored Cavalry Regiments, and Special Forces Groups. The dental officer in the medical element of these units also serves as Dental Surgeon for the parent brigade-sized unit.

GENERAL FIELD DENTAL SETS

Dental Instrument and Supply Sets, Emergency Care (DISS) — Assigned to every dental officer in a field clinical position. This small dental emergency kit is contained in a hand-carried medical aid bag. It contains the bare minimum of instruments and materials for simple extractions and expedient temporary restorations. Essential to this kit is the battery-operated handpiece which allows the dental officer to open an infected tooth, prepare a cavity for temporary restoration, or section a tooth for extraction. The DISS is intended for use when the situation does not permit the setup of the dental officer's standard equipment.

Dental Equipment Set, Comprehensive Dentistry (DES) — The backbone for providing operational care. The field dental equipment associated with the DES is compact, rugged, and has a limited power demand. Every dental officer in a field clinical position is issued the DES. This set provides the dental armamentarium used in the diagnosis and treatment of caries, defective restorations, occlusal trauma, tooth luxation/evulsion, gingivitis, early/moderate periodontitis, periodontal absess, traumatic or inflammatory oral lesions, routine endodontics, and postmortem examination. Major items of equipment include one portable field-type dental chair and stool unit, one dental operating and treatment unit, one dental light set, and a compressor.

Dental Equipment Set, Dental Support — Found in both the area support treatment platoon and the medical company (dental services). It contains items which can be shared in a clinical environment (area support treatment platoon), and is issued to each forward treatment team. It provides necessary support items including a curing light, composite resin, an electric pulp tester, a sterilizer, a sink, and a laboratory table.

Dental Equipment Set, Emergency Denture Repair A small set which provides basic materials for expedient denture repairs.

Dental Equipment Set, Dental X-ray, Field — In addition to the standard dental x-ray capability for the dental team, this set includes an associated hand-held x -ray apparatus and new digital radiology capability.

SPECIALIST FIELD DENTAL SETS

Dental Equipment Set, Prosthodontic — Provides clinical and laboratory items necessary to support fixed and removable prosthodontic procedures. The prosthodontic set must be used in conjunction with the general dentistry DES.

Dental Equipment Sets, Endodontic and Periodontic — Recently added to support the new endodontist and periodontist positions in the new dental companies which are replacing the current, smaller dental companies. The sets are also used in conjunction with the general dentistry DES.

Oral and Maxillofacial Surgery Set — Another new addition intended to support the oral and maxillofacial surgeon in the Combat Support Hospital. The set contains modern bone drill and plating systems.

Dental Hygiene, Field, Dental Equipment Set — Includes those instruments and materials necessary for preventive dentistry services provided by preventive dental specialists.

NEW FIELD DENTAL EQUIPMENT

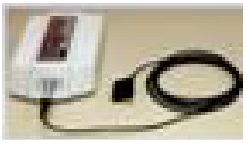
Dental Field Treatment Operating System (DEFTOS) — An innovative new dental system that has the potential to reduce the weight of current dental systems by 50%, volume by 67%, and power requirements by 67%.

The decreases are primarily the result of the development of a miniaturized system which uses electric instead of air turbine dental handpieces. The change eliminates the requirement for a large air compressor. An important second order effect of the system is that it has the potential, if fielded, to increase the mobility of dental teams by the reduction of weight, volume, and power requirements. The reduction of size and increase in deployability and mobility of dental teams are mainly accomplished through the elimination of the requirement for a five kw generator and associated trailer.

The system enables the dental team to operate with a two kw generator, rechargeable batteries, solar energy, or 24–28 volt DC military vehicle system. The DEFTOS is currently under long-term testing by the Army Medical Department Board. It was pronounced clinically acceptable by the DEFTOS Clinical In-Process Review Team in September 2003. It has been approved by the FDA for clinical use and has passed Military Standard 810E environmental tests, which include shock to 40 g, vibration at transportation levels, a drop from four feet, and settling dust.

Electric Motor Handpiece — A slow speed system in the Dental Emergency Aid Bag designed for bone removal, tooth sectioning, and caries removal. It is intended to be used when the standard dental operating unit can not be set up such as during unit movement operations. It adds the ability to provide dental care in austere environments and in highly mobile operations. Two 4-hour batteries are included with the handpiece. Recently a solar panel battery charger was added to the Dental Emergency Aid Bag. This eliminates the need for AC power to recharge the batteries. Full recharge of the batteries is achieved in 3 to 8 hours.

Digital Radiography — Currently being introduced into the field dental environment and will eventually be assigned to all dental teams. Headquarters, Department of the Army, has recently approved an Operational Requirements Document for digital radiography. It will replace current dental x-ray chemical processing systems. A laptop computer is fielded with each digital radiography system as part of the set. The system has been issued to many units deploying to Operation Iraqi Freedom and other operations. Funding has been identified for procurement of more than one hundred digital radiography systems. Feedback from deployed dentists has been positive.



Portable Handheld X-ray System — Currently being issued, the system will be used by all dentists assigned to brigades, divisions, field dental units, and field hospitals. It greatly reduces the weight and volume requirements associated with other x-ray equipment. The system has received very positive clinical feedback from dentists in the field.

Oral and Maxillofacial Equipment Set (M477) — Currently being fielded to oral and maxillofacial surgeons assigned to Army field hospitals, the set contains modern drill sets and titanium bone plating systems. Headquarters, Department of the Army, has approved the Operational Requirements Document for the M477.

Shelter System — Intended for brigade and division dental teams of the near future, the Chemically-Biologically Protection Shelter System (CBPSS) is a lightweight, multipurpose shelter that provides full chemical and biological protection and creates a contamination-free, environmentally controlled area for level 1 and 2 medical treatment units. The CBPSS is mounted to the back of a dedicated heavy HMMWV, has its own auxiliary power and ambient environmental control, is easily employed, has air lock entrances, and is 100% mobile.

The new dental equipment sets and fielding initiatives will increase the capabilities of deployed dental assets in theater while reducing weight and cube. The result is increased deployability of field dentistry.

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Patient Satisfaction in US Army Dental Treatment Facilities

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LTC Bruce Brehm, DC, USA

ABSTRACT

Background. Dental health is an integral part of overall military readiness and patient satisfaction serves as an important motivator for compliance in the provision of dental care to a community.

Methods. Secondary analyses of 17 fiscal quarters of surveys from fourth quarter, FY 2000 through fourth quarter, FY 2004 were conducted for this project. In total, 69,059 surveys with no missing data from Army respondents were analyzed. The report focuses on a descriptive analysis of the results with mean scores of overall patient satisfaction with the clinical experience and their satisfaction with the individual dentist contact.

Results. Overall satisfaction was rated high as the mean score for overall satisfaction with today's visit was 6.49 (SD .91) and overall satisfaction with the clinic's ability to take care of the Soldiers needs was rated 6.38 (SD .91) on a seven point bipolar rating scale. The mean response to rating the number of days waited for an appointment was 3.98 (SD 1.03). The mean satisfaction scores with the dentists were extremely high with the means ranging from 4.48 to 4.64 on a 5-point scale, with five equaling excellent satisfaction.

Conclusions. The results of this study clearly indicate that patients are satisfied with the dental care they receive at military dental clinics. This finding is consistent with previous literature on military dental satisfaction. A training vehicle could be developed to ensure that military dental providers and administrators understand the importance of patient-provider interactions and waiting times to overall satisfaction.

INTRODUCTION

The dental health of a Soldier directly affects the risk of a dental emergency while deployed. Maintaining a high level of good dental health throughout the force is an integral part of overall military readiness as clinical dental resources are not always readily available in the deployed environment. Soldiers must be encouraged to be as proactive in their personal dental health care as they are in other medical areas. Patient satisfaction is a very important element in that effort Satisfaction is widely recognized as a principal outcome measure of quality throughout the healthcare arena. The Assistant Secretary of Defense for Health Affairs has mandated that military dentistry assess the level of patient satisfaction. Since active duty Army Soldiers receive the bulk of their dental care from the 172 US Army dental treatment facilities around the world, monitoring customer satisfaction in those facilities is an important component of maintaining the highest standards of dental health throughout the force. This study assesses levels of satisfaction in military dental treatment facilities.

LITERATURE REVIEW

Traditionally, dental satisfaction has been assessed by the dentist's technical competence and mechanical precision.[1] Patient opinions played no role in this method of measuring quality. However, eventually consumerism became an integral part of the dental patient mindset, and dentists were forced to "compete" for patients. Consequently, consideration of patient satisfaction became an important part of providing dental services.[2]

A large body of work in the field of patient satisfaction exists in the dental literature. Ross and Duff found that patients return to the dentist for subsequent care due to

satisfaction with the interpersonal component of the dental relationship rather than the technical quality of the care received.[3] Evidence for both medical and dental patient satisfaction studies show that desirable interactions lead to more satisfied patients who better understand and more accurately follow prescribed regimens.[4,5] A satisfied patient may have a different set of behaviors that ultimately evolve into not only increased satisfaction, but also a healthier individual.

McKeithen[6] found that personality was the most frequently mentioned feature of an ideal dentist. Collet[7] discovered that the dentist's personality was the major reason that patients became dissatisfied and changed their dentist. In 1974 Koslowsky et al[8] also ascertained that patient concerns focused on the dentist's personality and technical competence, and that fees ranked lowest in importance of those factors studied. These pioneering studies all seemed to directly link satisfaction with the interpersonal relations between the dentist and the patient. Whereas dentists often assume that quality equates to technical expertise, Crall and Morris[9] and Abrams et al[10] found that patient satisfaction did not correlate well to dentists' perception of quality treatment.

In 1999 Newsome and Wright reviewed 46 studies of patient satisfaction and found the factors most commonly identified with dental patient satisfaction were technical competence, interpersonal factors, convenience, costs, and facilities.[11] Davies and Ware developed the Dental Satisfaction Questionnaire and found that access, availability/convenience, cost, pain, and quality were all independent elements of patient satisfaction.[12]

Dental patient satisfaction among active duty service members has not been widely studied. Chisick conducted two studies of dental satisfaction among active duty military members.[13,14] Similar to the civilian studies, Chisick focused on access issues (availability/convenience), provider interpersonal skills, and pain control to determine possible predictors of satisfaction. Costs were not included because active duty military members are not required to pay for dental care. Chisick concluded that active duty personnel were generally very satisfied with military dental care and satisfaction did not vary significantly across demographics. Access was a consistent predictor of decreased satisfaction levels.

METHODS

Survey Instrument

The Department of Defense (DoD) Dental Satisfaction Survey (DSS) used in this project monitors the satisfaction of military beneficiaries who receive treatment in military dental clinics throughout the world. The DSS was developed by a Tri-Service working group in 1998, approved by the DoD Institutional Review Board and implemented in 1999 by the Tri-Service Center for Oral Health Studies (TSCOHS). There is no central dental appointment system, therefore the DSS can not be managed centrally with a traditional mailing of survey instruments to a randomly selected number of patients who have received care in the system. The DSS survey is administered in the individual dental clinics with the use of the Random Appointment Time Slot Generator system which designates the day on which the clinics administer the DSS. On the selected day, front desk personnel administer the survey at the conclusion of the appointment. The surveys are sent to TSCOHS monthly. The surveys are anonymous and do not contain patient identifiers. The survey is composed of 27 questions focusing on access, quality, interpersonal relationships, overall satisfaction with dental care, overall satisfaction with the dental clinic, and demographic data.

This project is a secondary analysis of dental patient satisfaction data. The surveys analyzed for this project were administered between the fourth quarter of FY 2000 and the fourth quarter of FY 2004. A copy of the survey instrument and 17 digitized text files (one per quarter) of data were received directly from TSCOHS.

Variables/Statistics

The 17 text files were imported into Statistical Packages for Social Science, version 12. One master file was created with 658,443 surveys. Those who responded affirmatively about seeing a dentist during the visit and selecting Army affiliation were kept in the study. Those who only saw the hygienist and had a prophylaxis were not included in the study. Questions pertaining to satisfaction with hygienist were deleted. Three questions rating the time patients waited past their appointment were also deleted as there were very few responses to those questions. The result was a data set of 69,059 with no missing data.

This project presents descriptive analyses only. Satisfaction with the individual dentist was rated on a 5-point scale as follows: Poor (1), Fair (2), Good (3), Very Good (4), Excellent (5). Overall satisfaction measures were based on the patient responses to questions concerning their satisfaction with the dental care for "today's" visit and their level of satisfaction with the clinic's ability to take care of their dental needs. These overall satisfaction measures utilized a 7-point bipolar rating scale as follows: Completely dissatisfied (1), Very dissatisfied (2), Somewhat dissatisfied (3), Neither satisfied nor dissatisfied (4), Somewhat satisfied (5), Very satisfied (6), Completely satisfied (7).

RESULTS

A total of 69,059 surveys with no missing data from the fourth quarter of FY 2000 through the fourth quarter of FY 2004 were analyzed for this project. The majority of subjects were male (76.5%) and reported being on active duty (97%). The bulk of active duty respondents were enlisted personnel (83.2%) with the remaining subjects being officers. All demographic information is presented in Table 1.

Table 1. Demographics of Survey Respondents

	n	n%
Gender		
Male	52,862	76.5
Female	16,197	23.5
Beneficiary		
Active duty	66,948	97.0
Active duty dependent	1,814	2.6
Retiree	297	0.4
Rank		
E1 – E4	28,204	40.8
E5 – E9	29,218	42.4
Warrant Officer	2,283	3.3
Officer	9,354	13.5
Age Group		
Up to 17 years	610	0.9
18-19 years	5,300	7.7
20-29 years	34,047	49.3
30-39 years	20,079	29.1
40-49 years	7,491	10.8
50 years and above	1,532	2.2

Overall satisfaction was rated high as the mean score for overall satisfaction with today's visit was 6.49 (SD .908) on a 7-point scale. This indicates a high level of satisfaction classified as between very satisfied and completely satisfied. Overall satisfaction with the clinic's ability to take care of the Soldiers' needs was rated 6.38 (SD .905). This rating is also indicative of a high level of satisfaction. The distribution of responses to these overarching satisfaction questions are shown in Table 2. Another important attribute to assess satisfaction is the patient's predilection to return to the clinic for future needs. Over 97% of respondents cited that, if given a choice, they would return to the Army dental clinic for future care.

Access to care has been shown to be a consistent predictor of satisfaction. This survey contained some surrogate access measures such as waiting times. The mean response to rating the "number of days waited for an appointment" was 3.98 (SD 1.03). Almost 9% of respondents rated the waiting time to be either poor or fair as noted in Table 3. This is a small percentage, but this finding is important as it demonstrates some dissatisfaction with waiting times to make appointments. The survey also revealed that 5.8% (n=4025) were not seen for their appointment on time. The civilian literature has shown that extended waiting times are consistent with lower satisfaction scores.

The mean satisfaction scores with the dentist were extremely high with means ranging from 4.48 to 4.64 on a 5-point scale, with five equaling excellent satisfaction. Table 3 presents all mean scores and frequency distributions for satisfaction with providers and waiting times. Very few respondents had negative ratings for their provider interactions.

DISCUSSION

This is the first time that satisfaction in Army dental clinics has been assessed over an extended period of time. The results of this study clearly indicate that patients are satisfied with the dental care they receive at military dental clinics. The finding is consistent with the literature on military dental satisfaction. The results are positive and the majority of beneficiaries are very satisfied with the care they receive. This is evidenced by the finding that 93.1% of respondents were either very or completely satisfied with the

Table 2. Frequency Distribution and Mean of Responses to Questions Concerning Overall Satisfaction With "Today's" Visit and the Clinic in General

Response	All things considered, how satisfied are you with the dental care from today's visit?	All things considered, how satisfied are you with the clinic's ability to take care your dental needs?
(1) Completely Dissatisfied	0.9% (n=690)	0.6% (n=426)
(2) Very Dissatisfied	0.6% (n=435)	0.7% (n=496)
(3) Somewhat Dissatisfied	0.3% (n=236)	0.6% (n=365)
(4) Neutral	1.1% (n=756)	1.3% (n=897)
(5) Somewhat Satisfied	3.9% (n=2 699)	5.7% (n=3 933)
(6) Very Satisfied	29.9% (n=20 681)	37.4% (n=25 848)
(7) Completely Satisfied	63.2% (n=43 643)	53.7% (n=37 094)
Mean (SD)	6.49 (0.908)	6.38 (0.905)

Note: n(total) = 69,059

Table 3. Frequency Distribution and Mean of Responses to Questions Concerning Satisfaction With the Dentist and Access to Dental Services

	Survey Responses					
Interaction with Dentist	**(1) Poor**	**(2) Fair**	**(3) Good**	**(4) Very Good**	**(5) Excellent**	**Mean (SD)**
Friendliness and courtesy	0.1%	0.7%	6.1%	20.7%	72.4%	4.64 (0.641)
Attention given to what you had to say	0.2%	0.8%	7.2%	22.6%	69.3%	4.60 (0.672)
Thoroughness of treatment	0.1%	0.7%	7.0%	21.9%	70.3%	4.61 (0.658)
Explanation of dental procedures	0.4%	1.8%	9.4%	23.5%	64.9%	4.51 (0.770)
Amount of time with dentist	0.3%	1.5%	10.2%	25.8%	62.2%	4.48 (0.760)
How much you were helped by dentist	0.2%	1.0%	8.9%	24.5%	65.4%	4.54 (0.713)
Overall quality of care from the dentist	0.2%	0.7%	6.5%	20.6%	72.0%	4.64 (0.650)
Access to Care						
Rating of number of days waited for appointment	1.8%	7.1%	21.9%	29.2%	39.9%	3.98 (1.03)

Note: n(total) = 69,059

received care during that day's visit. Similarly, 93.1% were either very or completely satisfied with the ability of the clinic to take care of their dental needs. The scores for access rate satisfaction as good, but the number of negative responses indicate this to be a source of dissatisfaction for military members.

Dentists working in military dental treatment facilities should be aware of the importance of their interaction with the patient in the determination of overall satisfaction. That interaction is the primary driver of satisfaction. Dentists should be aware of this finding to improve the patient-dentist interaction. This project could not assess whether the severity of the dental needs of the military member affected their level of satisfaction. If patients with more severe and/or urgent needs were found to be less satisfied with dental care, they may not be as likely to return for their needed care and thus would have an increased probability of being a dental casualty. Unfortunately, while all military dental clinics use a common dental classification system to identify the patient's levels of urgency for care, the information was not collected in this survey. A study design that incorporates the military's dental classification system ratings for a patient with their level of satisfaction would allow exploration of the correlation of a patient's current dental needs severity with their level of satisfaction.

The results of this study may be generalized to military beneficiaries seeking care in Army dental treatment facilities. There are a few limitations for the results. One limitation is that this survey evaluated satisfaction of those who actually accessed the dental clinics, as opposed to all eligible beneficiaries. The second limitation revolves around the 5-point scale that assessed satisfaction with providers and waiting times. This 5-point scale had no true neutral and thus skewed the responses toward satisfaction. A new survey format has corrected this so a true neutral will be available in the future. Future studies should attempt to focus on all eligible beneficiaries and not only users of military dental facilities.

CONCLUSIONS

Satisfaction with the level and the perceived quality of care provided by dentists in military treatment facilities are high. Access to care measures receive good ratings, but there is some discontent with the ability to make appointments. The authors suggest that a simple training vehicle be developed so that military dental providers and administrators understand the importance of patient interactions and waiting time as factors in overall patient satisfaction.

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The Expanded Function Dental Assistant Training Program

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INTRODUCTION

The purpose of this article is to provide a brief genesis and current status of one of the US Army Dental Command's (DENCOM) most cost-effective strategic initiatives, the Expanded Function Dental Assistant (EFDA) training program. This article provides a historical perspective, describes the needs that drove the program's establishment, and presents a limited background on how the program was organized and funded. This article also addresses the return on investment of the initiative and discusses a number of lessons learned.

HISTORICAL PERSPECTIVE

The EFDA program is a labor-substitution initiative aimed at increasing the output of general dentistry teams. The practice of using specially trained dental assistants to perform reversible dental restorative procedures (placing fillings) and limited oral hygiene procedures came into vogue in the late 1970s[1-3] and early 1980s. At that time the United States faced a national shortage of dentists.

The Army trained a number of these civilian, expanded-duty dental assistants, referred to as Dental Therapy Assistants (DTAs), in a formal 1-year program. These individuals, trained in the mid to late 1970s, proved highly effective and tended to stay in government service. Due in large part to the high retention rate of these individuals and the relatively high cost of the formal 1-year training program, DTA training met a relatively quick demise. By the mid 1980s the national shortage of dentists reversed into a glut of dentists as the effects of government-sponsored increases in dental school enrollment began to impact the workforce. This glut of dentists dampened the national enthusiasm for training ancillaries in expanded functions.

Training of enlisted Soldiers in expanded functions, except hygiene procedures, was also terminated, although not until the 1990s. The cost and training time required to bring these Soldiers to a level of clinical competency was not in line with the relatively short utilization period experienced in the field. A common perception among Soldiers was the belief that they would not remain competitive for promotion if their primary duty consisted of direct patient care. This factor may have contributed to their short clinical life as practicing expanded-function dental assistants.

By the late 1990s the majority of DTAs remaining in the system was engaged in providing oral hygiene services in response to the national shortage of dental hygienists. The enlisted expanded-function dental assistants, referred to as X2s, were also providing hygiene services. Using these individuals to provide hygiene support to those patients requiring less extensive hygiene care allowed the number of available registered dental hygienists to focus on patients with more advanced needs.

NEED FOR INCREASED ACCESS TO CARE

Unmet patient needs for access to timely, cost-effective routine care drove the Dental Corps to put in place the Dental Care Reengineering Initiative[4] (DCRI), in 1997. DCRI was designed by a team of dentists at the direction of MG James J. Cuddy, then the Deputy Surgeon General and Chief of the Dental Corps. The DCRI team conferred with a number of civilian consulting groups as well as the Indian Health Service (IHS). The resulting dental care delivery model incorporated a number of best practices from the private sector and lessons learned from the IHS.

One of the more salient features of the DCRI delivery model was the use of multichair, multiancillary primary care teams led by general and/or comprehensive dentists. Even using conventional

dental assistants, the literature documents significantly higher production for providers using multiple dental care delivery units (dental chairs) and multiple ancillaries.[5,6]

As DCRI matured and incorporated lessons learned, enhanced optimization opportunities emerged. In 2001, a site visit to the US Navy dental facilities at Pearl Harbor served to greatly refine the optimization concept. The Navy dental commander, CAPT Robert Hutto, was experimenting in training Navy enlisted dental technicians in expanded duties. These assistants were then placed in multiancillary teams consisting of two EFDAs and one conventional dental assistant. When compared to conventional treatment teams of one provider and one dental assistant, the EFDA teams showed productivity increases of between 92% and 155% over baseline.[7] The increased productivity translated to faster access to care for beneficiaries at Pearl Harbor. The information gleaned from the observations and briefings allowed DCRI to evolve into a new program named Dental Care Optimization (DCO).

THE NEW ARMY EFDA PROGRAM

The Navy experience re-energized the DENCOM into pursuing the reintroduction of expanded duty dental assistants into primary care teams. Unlike the Navy, the Army decided to focus on training civilians. As past experience with the DTAs trained in the 1970s indicated, Army trained civilian ancillaries tend to remain in government service, fully engaged in patient care for their entire career. The Army experience with enlisted ancillaries had proven to be just the opposite. To ensure the maximum return on training dollars, the Army decided to train civilian ancillaries in advanced functions.

The DENCOM looked at various options for training a Beta test cohort of students. After investigating a number of civilian training options, the DENCOM partnered with the IHS, who had trained EFDAs since the 1970s. The IHS training model calls for a basic skills, 1-week didactic course followed by a year of on -the-job training and utilization. Following mastery of the basic skills and one year of experience, the student was eligible to attend another week-long course focused on placing more advanced dental restorations.[8]

This was a major change from the year-long training model used by the Army to train the earlier generation of EFDAs/DTAs. The fact that the IHS had been using this model successfully for so long did not lessen the anxiety of the staff in the Department of Dental Sciences at the Army Medical Department Center and School (AMEDDC&S).

Dr. Terry Haney of the IHS taught the Beta test course in August 2001. The Department of Dental Sciences staff observed the training and was pleasantly surprised at the initial skills developed by students. The students returned home to a locally designated training mentor. The mentor, a practicing dentist, was charged with evaluating all the restorations placed by the student and ensuring safe, quality care for the patient. Students performed only those procedures that were clinically reversible.

In partnership with the MEDCOM Civilian Personnel Office and the Department of Dental Sciences, the DENCOM developed its own EFDA training program with the IHS program as the model. The training flow is depicted in Figures 1 and 2.

A business case analysis seeking funding from the MEDCOM Venture Capital Program (VCP) was compiled and submitted almost simultaneously with the DENCOM-funded Beta test. The rules of engagement for VCP provided 3 years of funding for initiatives that would prove self-sufficiency at the end of the 3-year period, or for initiatives that did not necessarily move to self-sufficiency but that did correct a clinical deficiency.

The DENCOM's VCP submission targeted the production of a pilot program cohort of 60 EFDAs. The program also sought to build multiancillary primary treatment teams by funding a replacement dental assistant once the student selected for training successfully reached the first EFDA promotion point. The Navy's experience and previously cited references stressed the importance of having multiple ancillaries on the team. A team with an EFDA and a dentist and no other ancillaries proved to be ineffective.

RETURN ON INVESTMENT

The success of the EFDA program is demonstrable through the program's return on investment (ROI). During FY 2005, the DENCOM's centrally-managed EFDA program produced 235,719 Dental Weighted Values (DWVs) of treatment. This is equivalent to $23.5 million of dental treatment. DENCOM spent $3.84 million to support the program. The DENCOM

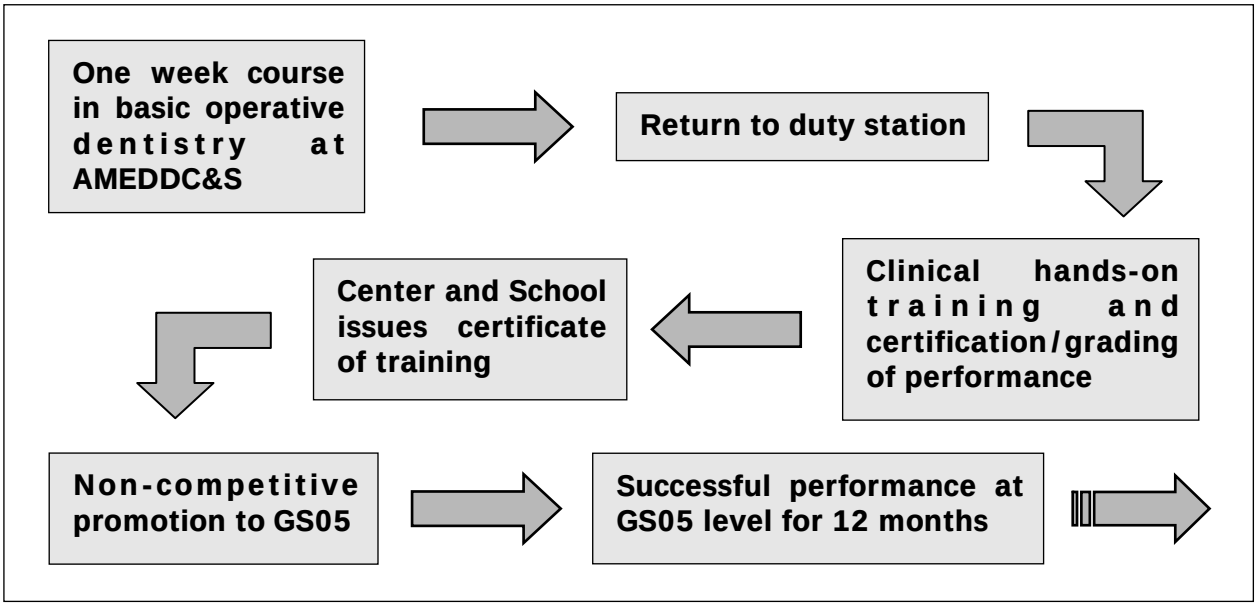

Figure 1. Phase 1 of the EFDA training program. Adapted from the Workload and Scheduling Database of the US Army Dental Command, Ft Sam Houston, TX

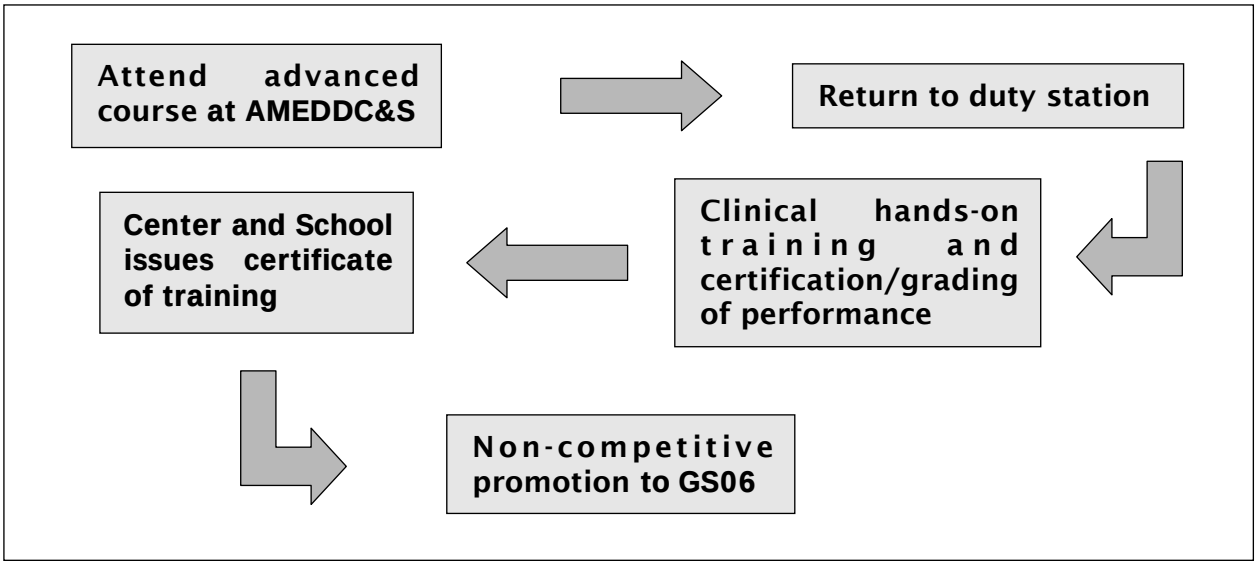

Figure 2. Phase 2 of the EFDA training program. Adapted from the Workload and Scheduling Database of the US Army Dental Command, Ft Sam Houston, TX

acquired approximately $6 of dental care for every dollar funding the program. The ROI was even larger during FY 2004. DENCOM received about $10 in productivity for every dollar funding the program.

The Dental Corps' EFDA program has proven itself to be so extremely cost-effective that it was fully funded via the Program Objective Memorandum (POM) for FY 2006-2011 which covers training costs for over 140 EFDAs as well as a number of backfill contract, conventional dental assistants. The demonstrated ROI provided an undeniable case for POM insertion. The summary of consolidated EFDA productivity for October 2005 is presented in the Table.

EFDA-trained personnel are completely embedded in several key Army dental initiatives. EFDAs are used extensively in Dental Care Optimization (DCO). DCO is an initiative aimed at increasing access to care by using best clinical practices. The First Term Dental

Summary of EFDA* Productivity for October 2005 (Source: DENCOM Workload and Scheduling Database)

Total DWVs†	23,670.68
Number of EFDAs	142
DWVs attributed to dental prophylactic services	2,985.91
DWVs attributed to dental restorative services	20,689.77
Average workload per EFDA per month	166.69 DWVs
Average dollar value of prophylactic care provided per EFDA per month	$2,103.00
Average dollar value of restorative care provided per EFDA per month	$14,567.00

*Expanded function dental assistant
†Dental weighted values of treatment

Readiness Program ensures that newly accessed Soldiers from all three Army components receive dental care that will allow them to be deployable upon graduation from Advanced Individual Training. EFDAs are also used extensively to expedite the surge requirements for dental care generated by mobilizations.

The current Army EFDA inventory is 142 employees dispersed among various CONUS installations. DENCOM plans to train up to 32 new EFDAs in FY 2006. The planned future end point for EFDA program sustainment is approximately 200 EFDAs used throughout DENCOM.

LESSONS LEARNED

The short length of this article precludes presentation of the numerous lessons learned. The following are three of the more significant of those insights that might be applicable to other clinical strategic initiatives:

1. Fairness of the selection process must be ensured for any competitive program that offers a limited number of training seats. The DENCOM used central selection boards held in San Antonio versus a local selection process at the operational level. The EFDA selection boards have clearly defined procedures designed to select those who will both successfully complete this challenging training and work well in multiancillary treatment teams. The board consists of five or six voting board members and two nonvoting members. The nonvoting member representatives from the MEDCOM Equal Employment Opportunity Office and the MEDCOM Civilian Personnel Division ensured a fair and consistent selection process.

2. The EFDA program relies heavily on the clinical mentor/designated trainer to refine and expand the student's clinical skills. To guarantee the success of this critical relationship, the provider selected for this important role must believe in the value of the program, fully understand the training requirements, and be willing to commit the time and effort required to train the students. The local command must ensure that students have educational continuity through an individual designated trainer, rather than be shifted from clinician to clinician.

3. Rather than start de novo, DENCOM elected to build on an existing, already highly successful IHS program. This partnership with another federal service allowed for the rapid development and fielding of the Army program. Other federal services face healthcare issues similar to those of the Army. When addressing corporate healthcare challenges, it is always worthwhile to investigate how other federal healthcare organizations are responding to the same situations.

CONCLUSION

All three DoD dental services face the twin challenges of preparing large numbers of service members for deployment with a shrinking pool of general dentists. The DENCOM's EFDA program has been and continues to be a proven, highly successful method for leveraging the productivity output of general and comprehensive dentists to better meet the needs of our service members.

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US Army Dental Command "Puts More 'Bite' Into Health Promotion"

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ABSTRACT

In 1998, the Army Dental Care System launched a campaign to revitalize health promotion termed "Put More 'Bite' Into Health Promotion." This article discusses the content, rationale, and evidence base for the original health promotion program. The initiatives of the introductory program include mouthguard fabrication and counseling, sealant placement and education, and skin, lip and oral cancer. Considering today's operational tempo and recruit health, prevention and promotion are integral components of a nation at war. As such, the program has been expanded to include caries and tobacco risk assessment, and the supporting prevention interventions.

INTRODUCTION

This article provides program background and updates the status of the current US Army Dental Command's (DENCOM) Health Promotion Program. In 1994, The Surgeon General of the United States launched a campaign to improve the delivery of preventive health services in the US. The intent of the initiative was to increase preventive screenings and immunizations, counseling for health behavior change, the delivery of age and sex risk-specific preventive services, and the promulgation of health education and promotion messages.[1] Prevention messages are typically received at Army Troop Medical Clinics (TMC). While utilizing the TMC to promote health is the conventional method of practice, Army leaders recognized a problem — young healthy troops were not receiving the important health promotion messages. Young, healthy Soldiers typically spend limited time in the TMC where health promotion messages are available. Although the majority of Army Soldiers are young and healthy, inherent risk factors are associated with military service. Soldiers often face dietary changes which are often high in sugar content. This risk factor is compounded by long-term deployments which places them in stressful situations. Both diet and stress adversely affect both oral and general health. Military routines and regulations ensure certain healthy behaviors such as vigorous exercise, seat belt use, helmet use for motorcyclists, and annual dental examinations. However, other behaviors such as tobacco use, binge drinking, and high blood pressure control have large gaps between Soldiers' behaviors and the Healthy People 2010 goals.[2] For example, about 34% of Army Soldiers have smoked cigarettes within the past 30 days, whereas the Healthy People 2010 goal is 12% or less.

The key to successfully increasing patient awareness about health problems and risk factors is the repetitive delivery of a simple, well-focused message through multiple channels. A major solution set includes expansion of the TMC's health promotion programs to Army dental clinics. All Soldiers are required to have an annual dental examination, and many Soldiers require subsequent appointments. Every patient encounter presents an opportunity to advise Soldiers about health risks and good health practices in a positive, encouraging manner. The value of a dental appointment is exponentially enhanced by increasing Soldiers' health awareness and promoting healthy lifestyle practices.

The success of such a program requires commitment and behavioral change, not only on the part of patients, but also on the part of dental health care providers. Studies have shown the difficulty of changing health care providers' delivery of preventive services. Targeted group discussion and interactive workshops are more effective than simply distributing educational material to providers or having large formal lectures.[3]

With these factors in mind, the DENCOM partnered with the US Army Center for Health Promotion and Preventive Medicine in 1997 to develop and

implement a preventive campaign: "Put More 'Bite' Into Health Promotion." The campaign puts more dental health into health promotion, and health promotion into the Army Dental Care System. The ultimate goal of the campaign is to improve the health of Soldiers by increasing the delivery of preventive health services and screenings, enhancing Soldiers' awareness about disease risk factors, and encouraging behavior change through health promotion and education.

INITIAL PROGRAM IMPLEMENTATION

"Successful implementation of any health promotion initiative requires behavioral change, not only on the part of patients but also on the part of health care providers."[4] The program's objective was to develop a narrow, well-focused, evidence-based set of clinically delivered health promotion initiatives that would be easy for dental health practitioners to implement and ultimately would significantly enhance the oral and general health of Soldiers. The initial program included four dental-clinic-based, patient-oriented, health promotion initiatives:

1. Sealant education and placement
2. Mouthguard education and fabrication
3. Tobacco cessation and interdiction counseling
4. Skin, lip, and oral cancer screening and counseling

The introductory program was intentionally limited to only four initiatives to make the program manageable for busy clinicians and ensure their acceptance. Patient handouts, fact sheets and posters were designed to reinforce each of the initiatives. Training which provided an opportunity to introduce both the initiatives and supporting materials was conducted at each of the 29 Army Dental Activities located worldwide.

RESULTS

A 2004 program evaluation survey of Army dentists who provide clinical care shows that the frequency of delivery of health promotion and preventive dentistry services provided by US Army dentists increased significantly since an initial survey in 1997. The percentage of providers who performed individual oral hygiene instruction on a daily or weekly basis increased from 88% to 92%. The percentage of providers who counseled Soldiers daily or weekly on tobacco use and periodontal health increased from 75% to 81% and from 69% to 80%, respectively. Over half (56%) of all clinical dentists now provide fluoride and nutrition counseling. About one third (33%) educate Soldiers on the need for mouthguards, up from 24%.[5]

CURRENT HEALTH PROMOTION INITIATIVES

The health promotion program has evolved since initial implementation. The initial program focus on general health promotion has expanded to include dental health education and prevention. The expansion was needed to address the high levels of dental disease among Army recruits and dental degradation during frequent deployments. New components to the original program include caries risk and tobacco assessments and the supporting prevention interventions such as fluoride.

Caries Risk Assessment

Dentists often use Caries Risk Assessment (CRA) in their clinical practices, but usually only on an intuitive level. CRA is a simple and quick method of determining a Soldier's risk for future caries and easily translates into the development of personalized prevention programs. The scientific literature has long suggested that a risk-based assessment of an individual patient's dental history and oral health status is an important prerequisite for appropriate prevention and treatment.[6-9] Dental studies of the epidemiology of dental disease over the past 20 years consistently show that the prevalence of dental disease is not uniform within our population but is actually skewed.[10,11] These studies demonstrate that 20% to 25% of the population harbor the majority of oral disease.[12] The 1994 Tri-Service Center for Oral Health Studies on Recruits and Active Duty revealed that the military population's oral disease levels parallel what is seen within the US; however, the severity may actually be amplified.

In conventional caries management, the suspicion of caries often leads to a restoration without an attempt to determine if caries is active, static, or remineralizing. The latest information on caries diagnosis and treatment suggests the need to review traditional strategies used in dental caries management. Caries risk assessment and management typically approach dental caries as an infectious disease process and

address the individual patient's risk of disease. Interventions are based on the patient's risk and known disease patterns. A relatively new practice in dentistry includes remineralization of incipient or noncavitated lesions. Where in the past such lesions would have been restored, the use of caries risk assessment can help identify those patients who would be best treated with traditional restorative dentistry versus those who would benefit from a remineralization program.

The literature espouses many different CRA methodologies. DENCOM utilizes the CRA program and prevention strategies developed by the American Dental Association (ADA).[13] This system relies heavily on past caries activity. Studies show that the best indicator for future caries is past caries experience.[14,15] At each periodic oral examination, Soldiers are classified as being at low, moderate, or high risk for dental caries. Dental care providers must also take into account modifying factors in conjunction with the CRA parameters when placing a Soldier into a caries risk category. The guidelines advocated by the ADA are designed to assist the practitioner, but the practitioner's professional judgment becomes paramount in the ultimate decision to place the Soldier into a specific category. Modifying factors for CRA classification include, but are not limited to:

- cariogenic diet,
- white spot lesions,
- unusual tooth morphology including the presence of deep uncoalesced pits and fissures,
- fluoride exposure,
- oral hygiene,
- frequency of dental visits,
- medical conditions, especially those physical and mental conditions that limit personal oral hygiene,
- medications, particularly those that predispose patients to decreased salivary flow, and
- systemic conditions.

Once patients are identified as high risk for dental disease, practitioners implement prevention activities tailored to the facilities and the supported populations. Education is a key component to prevention. Without proper knowledge, patients remain unable to affect a change in their personal activities. Deployed Soldiers face increased risk due to changes in diet and personal oral hygiene practices. In theater, challenges exist to access dental resources. For some patients at high risk for caries, dietary analysis and counseling prove very beneficial. Each treatment encounter provides the opportunity for basic oral hygiene instructions and nutrition counseling. These instructions are paramount as many incoming Soldiers have never received education on oral heath, and others benefit from educational reinforcement.

Fluorides have proven beneficial for all at-risk patients, regardless of age. Perhaps the best prevention regimens in the dentist's arsenal are community water fluoridation, home-applied fluorides, and professionally applied fluorides. Fluoride remains the single most important factor responsible for the decline of caries prevalence in children and adults.[16] The proper frequency of professionally applied fluoride is determined through an assessment of fluoride exposure and the patient's caries risk category. All moderate and high caries-risk Soldiers should receive a 4-minute fluoride treatment or a fluoride varnish application. All deploying Soldiers are considered high risk due to theater conditions. The degree of oral health degradation seen in redeployed Soldiers makes it imperative that dental personnel do everything possible to reduce the risk of oral health issues prior to deployment.

Other noteworthy caries prevention tools include xylitol and chlorhexidine. Xylitol is a natural alternative sweetener used to sweeten gums and candies. Xylitol possesses antimicrobial actions and effectively reduces caries incidence when used regularly.[17] Chlorhexidine is a topical rinse that kills *Streptococcus mutans* which can be professionally prescribed after removing active caries.

Tobacco Risk Assessment

Tobacco use is the single leading preventable cause of death in the US, accounting for 430,000 deaths each year.[18] A study prepared by the Centers for Disease Control reported that tobacco was responsible for more deaths in the United States than AIDS, alcohol-related deaths, homicides, and automobile accidents combined.[19] Tobacco serves as a risk factor for many diseases, including oral cancer, periodontal disease, heart disease, lung cancer, and other respiratory diseases. Tobacco use in any form potentially results in serious effects on human health. Tobacco control

and intervention are consistent with the mission of military readiness. Smoking has also been shown to increase the risk of injury in a number of military populations, possibly due to unfavorable effects on the immune system.[20-22] Healthcare providers have both professional and moral obligations to practice preventive medicine by encouraging tobacco cessation. Dental providers are afforded a unique opportunity to educate and influence patients on the hazards of tobacco use due to the frequency of Soldiers' visits to the dental clinics, the preventive nature of dentistry, and the trust that patients place in dental providers. Additionally, the oral cavity is the usual site for the inhalation or ingestion of tobacco. Dentists' unique knowledge of the portal of tobacco entry creates a prime opportunity for the diagnosis of pathology and education of patients.

The total expense of tobacco use to the military and its impact on readiness may be underestimated. A recent study of Air Force recruits identified smoking as the best predictor for premature discharge from the military.[23] Smoking was not necessarily the cause of the discharges, but was indicative of a general lifestyle that was not compatible with military life. The study concluded that Air Force recruits who smoke were responsible for $18 million of excess training costs per year. When this data was extrapolated to the Department of Defense (DoD), over $130 million per year was spent on excess training costs due to the early discharge of smokers from training. Two other Navy studies concluded that cigarette smoking was related to attrition from Naval basic training in a dose-response manner. In one study, smoking 0, 1, 2, and 3 packs per day was associated with attrition of 8%, 12%, 23%, and 28%, respectively.[24] The other study found that smoking 0, 1, 2, and 3 packs per day were associated with attrition of 18%, 32%, 43%, and 54%, respectively.[25]

Dental providers must appreciate the value of counseling patients on tobacco use and the risks involved. Tobacco education is not limited to current tobacco users. Ensuring that tobacco-free Soldiers remain tobacco-free is equally as important as cessation education. Since so many Soldiers take up the habit once they join the military, every patient, whether they are a tobacco user or nonuser, requires counseling. Counseling both users and nonusers can be as simple as *"Not using tobacco products is the single most important decision you can make for your health."*

Dental clinics may opt to tailor their own tobacco cessation protocol or refer patients to other cessation activities on post. Tobacco education comes in multiple formats and can be participatory in nature as well. Providers need to identify that there are "teachable moments" in almost any dental encounter and utilize those moments to impart the tobacco message. As such, dental providers act as vital messengers of the tobacco cessation message. The recently released Veterans' Affairs/DoD Tobacco Clinical Practice Guidelines for the Management of Tobacco Use suggest that individual tobacco interventions may be more successful than the traditional tobacco cessation classes for some Soldiers.[26] At each annual dental examination, dentists classify a patient as a smoker, a user of smokeless tobacco, a user of multiple forms of tobacco, or not a user of tobacco. Time constraints and frustration with perceived low success rates often present a deterrent to tobacco counseling. Nonetheless, our Army greatly benefits from this health promotion program.

The Agency for Healthcare Research and Quality (AHRQ) recommends the use of "The 5As" — ask, advise, assess, assist, and arrange — which were designed for simple counseling steps. Tobacco screening is the most important step to cessation. All patients should be asked if they use tobacco products and be advised of the hazards of tobacco. It is crucial to address tobacco use to all patients, whether they are currently using the products or not, because they may start. Tobacco users are strongly advised to quit. At this point, the Soldier's willingness to quit is assessed. If they have no desire to even address quitting, the provider can utilize the AHRQ's "5Rs" which will be discussed later. Once the patient is assessed, the provider can assist in setting up a quit date and then arrange for either a follow-up appointment or referral to a tobacco cessation class. If the patient is not ready to consider tobacco cessation, the "5Rs" — relevance, risks, rewards, roadblocks and repetition — are used. The information given to Soldiers must be relevant and motivational. The negative impact both financially and health wise are addressed as risks. Rewards are the potential benefits, both financial and health related.

Roadblocks are potential problems that may cause a patient to be unsuccessful. Finally, all "Rs" must be repeated each time a Soldier visits the clinic.

Meals Ready to Eat (MRE)

Other health promotion efforts focus on efforts to reduce degradation of dental readiness during deployment. MREs contain carbohydrate-rich foods essential for energy in a field environment, but which also contribute greatly to the potential for tooth decay. An oral health survey of a combat arms unit conducted in January 2004 confirmed that the amount of oral disease in Soldiers in a deployed combat arms unit doubled in 6 months.[27] In February 2004, the Joint Services Operational Rations Forum approved the replacement of the sugared chewing gum currently in the MREs with a xylitol-containing variety. Defense Supply Service Center now uses xylitol gum in the current MRE version. Also, powdered drink mixes made with alternative sweeteners are replacing the sugar-sweetened drink mixes in the MREs.

CONCLUSION

Health promotion continues to be a vital part of Army health care. The dental health promotion program has evolved to include significant initiatives to maximize Soldier health. The results of the prevention program easily translate into the ability to deploy healthier Soldiers and directly increase the readiness of the force.

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Army Reserve Components Dental Readiness — A Historical Review Since the First Gulf War

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INTRODUCTION

As distinguished from Component 1, which is the Army Active Component (AC), the Army Reserve Components (RC) consist of Component 2, the Army National Guard (ARNG), and Component 3, the US Army Reserve (USAR). During the First Gulf War, over 150,000 Army RC Soldiers were mobilized for active duty. In the largest call up since the Korean War, over 350,000 Army RC Soldiers have been mobilized since 9/11 for the Global War on Terrorism (GWOT). In March 2001, the American Forces Information Services News Articles quoted an Army Reserve source stating "roughly 35 to 45 percent of Army Reservists activated during the Gulf War needed dental work before they could deploy."[1] In February 2004, The Military Coalition, a consortium of nationally prominent uniformed services and veterans' organizations, presented testimony to the Total Force Subcommittee of the House Armed Services Committee stating "the number one deployment problem in the First Gulf War was dental 'un-readiness,' and the same is true today."[2] This article provides a brief review of improvements in the dental readiness and dental mobilization processing of the Army RC between the first Gulf War and present GWOT operations.

HISTORICAL PERSPECTIVE

In 1968, the Army implemented the Oral Health Maintenance Program which targeted younger Army Active Component Soldiers by requiring an annual dental exam and appointments to eliminate adverse dental conditions. This was in response to dental nonbattle injury emergency rates that averaged 16% during Vietnam.[3,4] The Army identified dental readiness as a deployment priority for commanders during the 1980s and initiated the Oral Health Fitness Program. The program identified Army AC Soldiers at the highest risk of being a dental casualty through the use of a Dental Fitness Classification (DFC) numbering system of DFC 1 thru DFC 4. This system, which is in use today, labels a DFC 1 Soldier as needing no examination or treatment procedures within the next 12 months. Soldiers in DFC 2 do require routine treatment but the conditions present are not expected to cause a dental emergency within the next 12 months. Soldiers classified as DFC 3 have dental disease conditions that will likely cause a dental emergency within the next 12 months. Classification DFC 4 indicates that an annual exam is required to determine a DFC.[5] Commanders began receiving monthly reports on the dental readiness of their troops and only Soldiers in a DFC 1 or DFC 2 status were recommended for deployment into theatre. Soldiers in DFC 4 cannot be deployed until a DFC is determined. Soldiers in DFC 3 are not considered deployable because studies have identified that deployed DFC 3 Soldiers experience significantly higher dental emergency rates than Soldiers in DFC 1 or DFC 2.[6,7] During this period, the US Army Dental Command (DENCOM) set goals to maintain 95% of the Army AC in DFC 1 or DFC 2, contributing to the rapid deployability of these forces.

In contrast, the Army RC, which now consists of over 550,000 Soldiers, did not have a command directed or funded dental readiness program during this same period. This contributed to the previously noted poor states of dental readiness during the First Gulf War. US Army Reserve Dental Service Detachments were activated in August 1990 to augment the Army AC dental corps in preparing Army RC Soldiers for deployment. During the 1990s, the poor state of Army RC dental readiness identified during the Gulf War mobilizations did not bring substantial changes in addressing the issues. In 1998, the Department of Defense (DoD) issued HA policy 98-021 which directed that Active Duty (i.e., Active Component) and

Selected Reserve personnel (excluding members of the Individual Ready Reserve or IRR) undergo a periodic dental examination on an annual basis.[8] Although this policy created an examination requirement for all DoD RC personnel, it did not fund a contracted method to meet that requirement. By the close of the 20th century, the introduction of the Army RC Tricare Dental Program provided the first funded program for Army RC dental readiness. However, it was an optional program requiring monthly premiums and treatment copayments from the Soldier, thereby resulting in a poor participation rate. Small Army RC units mobilized between 1997 and 2001 continued to present to deployment stations with DFC 3 rates ranging from 14% to 36%.[9-11]

INITIAL GWOT MOBILIZATIONS

The terrorist attacks of September 11, 2001 once again brought the spotlight on the state of Army RC dental readiness. The beginning of a command directed and funded dental readiness program with no cost to the Army RC Soldier began to take shape in 2002 when premobilization annual dental "screenings" to remove Soldiers from DFC 4 status were provided by Army RC military and contracted dental personnel. The key word here is "screening." Army RC dental exam regulations only required a tongue blade dental screening without radiographs — regulation relics of World War II. On the other hand, Army AC Soldiers treated within DENCOM facilities received an annual dental examination to include radiographs, which meet existing standards of care.[12] The large scale Army RC mobilizations that began in January 2003 for Operation Iraqi Freedom revealed the folly of this double standard when DENCOM facilities had to repeat examinations of nearly all Army RC Soldiers to the AC standard of care. In addition, DFC 3 rates showed little improvement from the First Gulf War operations. From January through August of 2002, Army RC Soldiers mobilized for Operation Noble Eagle and Operation Enduring Freedom presented to mobilization platforms with DFC 3 rates of 25%.[13] In January 2003, over 20 Medical Support Units, the Army's new processing support unit consisting of USAR medical and dental personnel used to augment MEDCOM AC personnel, were mobilized. Even with this augmented support, internal DENCOM statistics indicated that 65% of the workload needed to deploy the Army RC was performed by AC Dental Corps personnel. Once again, precious manpower was diverted from maintenance of the Army's AC dental readiness goals for Component One Soldiers.

CHANGES IN POLICY

In June 2003, the DENCOM commander, COL Sidney Brooks, directed his mobilization staff to begin exploring Army RC dental readiness deficiencies and ways to improve the dental readiness processing of Army RC Soldiers arriving at mobilization platforms. This included creating a "One Army" dental readiness examination and documentation standard that would be applied to all three Army components. Working through policy changes implemented by the dental surgeons of the ARNG and USAR, use of the "One Army" dental exam standard by the Army RC began in April 2004. By February 2005, the revised Army RC dental examination standards were published in Army Regulation 40-501.[14] According to internal DENCOM statistics, increased funding appropriated to the Army RC to improve dental readiness combined with command emphasis and published Army RC examination standards significantly reduced the Army RC examination rate at mobilization platforms from 87% in December 2003 to 48% by December 2005.

The next directive focused on reduction of the Army RC DFC 3 rate presenting to Army dental stations at the mobilization platforms. DFC 3 dental treatments performed at mobilization platforms consume time that could be spent on predeployment training. Studies have indicated that DFC 3 treatment time ranges from 2 to 2.75 hours.[15,16] This lost time factor does not include the loss of training time due to transportation for appointments or Soldiers assigned to quarters or light duty in order to recuperate from some dental treatment procedures. Beginning in November 2002, Army RC Soldiers receiving mobilization orders were permitted to receive DFC 3 treatment at no cost in order to improve premobilization access to DFC 3 dental treatment. Due to the short time between receipt of the mobilization order and the report date at the mobilization platform, DFC 3 rates did not improve. This situation precipitated a change in law authorizing treatment upon receipt of an alert order. The change permitted more time for completion of treatment prior to arrival at mobilization platforms. However, in the arena of DFC 3 rates, less dramatic improvements occurred during GWOT operations. According to internal DENCOM statistics, Army RC Soldiers presenting to mobilization platforms in a DFC 3 status

improved from 22% in December 2003 to 16% in December 2005.

DENCOM MOBILIZATION OPERATIONS

In comparison to the First Gulf War, the numbers and duration of Army RC Soldiers mobilized through the Army Dental Care System (ADCS) during the present GWOT operations are significantly greater. The increased workload and its duration identified issues within the Soldier Readiness Processing (SRP) dental station operations located at each mobilization platform. During the First Gulf War, mobilization operations affected the ADCS for less than a year and standardization of processing procedures was not a priority. With the present duration of GWOT mobilization operations, it was necessary to implement long-term standardized processing protocols at SRP dental stations. This action was necessary to improve processing efficiency, create accurate data measuring tools, and reduce duplication of Army RC premobilization dental readiness services. Using lessons learned and input from SRP dental station personnel, DENCOM issued initial operational standards for all SRP dental stations in July 2005.

CONCLUSION

Although significant progress in Army RC dental readiness has been accomplished between the First Gulf War and present GWOT operations, a continuation of improvements must occur in order to reach the DoD goal of 95% dental readiness (Dental Class 1 or 2) for the RC as reaffirmed in DoD HA policy 06-001.[17] The Army RC is no longer the second or third line of the deploying force. The RC now deploys with the first line operational force alongside their AC counterparts. The DENCOM has initiated the First Term Dental Readiness program which ensures that DFC 3 AC and RC Soldiers are treated before graduation from AIT training. The future conversion to electronic dental records will greatly reduce the incidents of missing examination and treatment documentation which currently cause re-examination of Soldiers at the SRP dental stations. Reducing DFC 3 rates after the Soldier has graduated from AIT is a more complicated subject. Since treatment is authorized only during the time between the alert of the unit and its arrival at the mobilization platform, a unit commander and staff may find it difficult to coordinate multiple dental appointments for significant percentages of the unit's Soldiers who are DFC 3 while attending to those numerous other premobilization requirements. As one of the possible solutions to this problem, the Army should explore a dental plan to provide Soldiers with no cost DFC 3 treatment throughout the year rather than only upon a mobilization alert. A major paradigm shift concerning the dental readiness of its Reserve Components has occurred within the Army. Stakeholders should be pleased and understand the importance of continuing this improvement into the future.

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Evolving Education Trends in Graduate Dental Education

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The Army Dental Corps is recognized for its outstanding dental graduate training opportunities. The availability of appealing Graduate Dental Education (GDE) programs serves as a powerful recruiting and retention tool and enhances the quality of our team and the dental care we provide to maintain the force. Congress established the F. Edward Hébert Armed Forces Health Professions Scholarship Program (AFHPSP) for Dentistry which significantly increased the number of obligated new accessions and created tremendous new opportunities for recent dental school graduates eligible for postgraduate dental education. The residency and fellowship programs vary from year to year and are designed to both optimize Dental Corps force management and offer its officers educational and financial incentives. This article describes these recent changes in the GDE application and selection process.

PROGRAM PARAMETERS

The selection of specialty programs and number of residents trained are validated annually by the Dental Corps representative of the Army Medical Department (AMEDD) Personnel Proponent Directorate (APPD). In this role, APPD is responsible for building the AMEDD of tomorrow by designing officer career fields that support the Army's mission. Modifications in the selection process for GDE opportunities significantly affect life cycle management and assist the Corps in its recruiting and retention initiatives. A climate of opportunity has been created which matches the individual officer's expectations with the needs of the Army Dental Corps.

Educational standards for dental professionals in the US are maintained by periodic postgraduate program accreditation by the Commission of Dental Accreditation (CODA) in association with the American Dental Association (ADA). Advanced training in general dentistry is available through 1-Year Advanced Education in General Dentistry (AGD-1) Programs at the following sites: Fort Benning, GA; Fort Campbell, KY; Fort Carson, CO; Fort Lewis, WA; Fort Jackson, SC; and Fort Sill, OK. AGD-1 programs provide additional clinical training for dentists in the performance of increasingly complicated clinical procedures. Students are accepted on the basis of their grades in dental schools, class rank, their scores in the National Dental Board Examination Parts I and II, and letters of recommendation.

Postgraduate dental education programs include residency programs in the ADA-recognized specialties of dental public health, endodontics, oral and maxillofacial pathology, oral and maxillofacial surgery, orthodontics, pediatric dentistry, periodontics, and prosthodontics.

FELLOWSHIP AND PHD TRAINING

Fellowship and PhD training in the Army Dental Corps produces highly qualified dental officers for utilization in specific specialized areas of dentistry. For example, an Oral and Maxillofacial Surgery Fellowship is offered which allows oral and maxillofacial surgeons an opportunity to attend a 1-year course of instruction for the purpose of obtaining advanced clinical skills. In the past 5 years, these fellowships have included advanced training primarily in the fields of trauma and cosmetic surgery. Following training, graduates typically are assigned as Program Directors, Assistant Program Directors, or mentors in one of the Army's six Oral and Maxillofacial Surgery residency programs, thus further propagating their newly acquired special skills.

Fellowships with sister federal services are also available. In 2004, the first Army resident went to the Orofacial Pain Fellowship at the Orofacial Pain Center, Naval Postgraduate Dental School, National Naval Medical Center, Bethesda, MD. This specific area of dentistry is concerned with the diagnosis and

management of pain and dysfunction of the motor and sensory components of the trigeminal nerve system. In the past, these types of disorders were referred to as "temporomandibular disorders." However, growing evidence in the field indicates that patients may have signs and symptoms external to the masticatory system that refer pain to the head and neck area. The fellowship affords Army dentists a unique opportunity to obtain the merged set of skills required to manage a patient population that formerly fell outside the realm of traditional medicine and dentistry. Graduates of this program are typically assigned to an Oral and Maxillofacial Surgery Residency Program to better facilitate a team approach for the management of complex issues presented by orofacial pain patients.

Another fellowship program offered through sister federal services is the 1-year Maxillofacial Prosthetics Fellowship. A maxillofacial prosthodontist (AOC 63F) has completed a 1-year fellowship in the field of maxillofacial prosthetics. Maxillofacial prosthetics encompasses the rehabilitation of patients presenting with congenital or acquired head and neck defects. Acquired defects include those defects resulting from surgical treatment, trauma, or pathology. Nonliving tissue substitutes in the form of prostheses may be used in extraoral prostheses involving the ear, nose, eye, or other head and neck structures. Intraoral prostheses are used to reconstruct oral cavity defects of the maxilla and mandible as well as associated structures. The maxillofacial prosthodontic training emphasizes a team approach to rehabilitative services with other medical specialties. Areas of concentration include palatopharyngeal function, radiation therapy, chemotherapy, and oculofacial defects. The Army Dental Corps has approximately five utilization tours for maxillofacial prosthodontists. These assignments are typically located at the Army's major medical centers.

Specialists are also offered PhD and fellowship training opportunities in dental materials. Program graduates participate in a utilization tour at the US Army Dental and Trauma Research Detachment which conducts research and development in military dentistry and the treatment of combat maxillofacial injuries. This includes research to devise new and improved methods of emergency surgical management of maxillofacial wounds on the battlefield and to develop improved methods of treating oral and maxillofacial wound infections. Graduates will also be involved in epidemiological investigations of field dental needs and in the development of dental materials, equipment, devices, methodologies, and materials that enhance combat dental services. Especially significant work is being done to lower the 14% to 19% deployment dental emergency rate.

NEUTRAL YEAR

DoD Instruction (DODI) 6000.13[1] specifies key active duty service obligation (ADO) information for Health Professions Scholarship Program (HPSP) recipients. Section E2.1.15 addresses Graduate Professional Education (GPE), of which GDE is a subset, and defines ADOs for internships such as the Army's 1-Year Advanced Education in General Dentistry Program. DODI 6000.13 notes that "while internship (GPE-1) is included in the definition of GPE, it is obligation neutral; i.e., an ADO is neither incurred nor discharged during internship."

In 2001, the Dental Corps issued the following policy in compliance with DODI 6000.13:

> "All personnel who entered the HPSP on or after 1 Oct 2002 will not discharge nor incur any obligation while participating in AGD-1. Personnel who entered the HPSP or have military service obligations incurred through subsidized or pre-professional education or training (i.e., HPSP, ROTC) prior to 1 Oct 2002, will discharge obligation while participating in AGD-1. ROTC obligors who enter the AGD-1 prior to 1 Oct 2006 will also discharge obligation while participating in AGD-1."[2]

EXPANDED DENTAL GRADUATE TRAINING OPPORTUNITIES

Traditionally, senior dental students and newly accessed officers could apply only for the AGD-1 program. Selection to attend an Army dental specialty training program was limited to dentists who were currently serving on active duty with the Army. However, dental accessions entering the Army Dental Corps in FY 2002 with an active duty service obligation were allowed to apply for specialty training as well as the AGD-1 program. Thus, FY 2002 accessions competed for training slots with current active duty dental officers. Accelerated opportunities for earlier board certification increases availability of incentive pays to a larger number of officers early in their careers — a critical retention tool. Residents

enrolled in 2-year or greater specialty training programs are not eligible to receive Dental Additional Specialty Pay (DASP). However, these officers have the opportunity to become board certified following successful completion of the program and thereby will be eligible for Board Certified Specialty Pay (BCP) very early in their careers. Officers selected for training will also have an accelerated opportunity to execute Dental Multiyear Retention Bonus incentive contracts. The personal financial implications of loss of DASP during the initial entry years, when payment schedules are at a minimum, can quickly be offset by early qualification for BCP. The Dental Corps benefits from early training opportunities by producing an increased number of highly trained dentists providing quality dental care for eligible beneficiaries.

The HPSP and otherwise obligated accessions are eligible to apply for dental specialty training programs in the following specialties: 2-Year Advanced Education in General Dentistry Program (AGD-2), periodontics, endodontics, prosthodontics, pediatric dentistry, orthodontics, oral, and maxillofacial surgery, and oral and maxillofacial pathology. FY 2002 accessions selected for the AGD-2 residency training by the December 2001 board were scheduled to begin training as early as July 2002 in lieu of attending an AGD-1 program. New accessions for all other specialty training were selected 18 months in advance of the residency start dates to enter the July 2003 training programs. These officers were either pre-positioned for duty at the installation where they would train, or they may have attended a planned AGD-1 program in the US and were then reassigned for residency training.

Two annual selection boards are held: (1) The December dental specialty board administered by the GDE administrators and the Army Human Resources Command, and (2) the February AGD-1 board administered by the US Army Recruiting Command (USAREC). The AGD-1 board also accepts applications for any available unfilled FY specialty training positions. Officers not selected for residency training in an ADA-approved dental specialty are not precluded from applying to the February AGD-1 board. Students not selected or who do not desire to compete for 2-year (or greater) GDE programs are still eligible to apply for the traditional AGD-1 training programs.

DUAL TRAINING

In 2001, a policy was implemented which provides general dentistry officers (AOC 63B) the opportunity to apply for a second graduate dental specialty training program. Officers must meet the following criteria: (1) successful completion of a primary residency in a dental specialty recognized as such by ADA and/or federal services, (2) achievement of certification by the recognized specialty board in the officer's primary specialty, and (3) service for a period of 5 years in the active component US Army Dental Corps in their primary specialty. While the policy in no way guarantees selection for a second residency, opportunities to compete for secondary training in another specialty will exist as long as the policy is in effect.

DIRECT ACCESSION TRAINING OPPORTUNITIES

Despite many requests, prior to 2002 GDE policy prohibited direct accession application to advanced education training opportunities. In FY2002, USAREC allowed direct accessions to apply for both the AGD-1 and AGD-2 programs. The policy does not extend to those under current obligation to another branch of federal service. A direct accession officer incurs a 3-year initial ADO which is not concurrent with residency training. If the officer attends a civilian training program, the remainder of the initial 3-year ADO and the newly incurred training ADO will be consecutive (additive).

CHANGE IN PREREQUISITES REQUIREMENTS FOR RESIDENCY PROGRAMS

Other changes in prerequisite requirements for residency programs have occurred in certain dental specialties. In April 2001, the ADOs for orthodontics and endodontics increased from 2 years to 3 years. Effective May 2004, Dental Corps policy was amended to recognize those qualified applicants with significant active duty service experience. The current criteria for residency selection states that “When sufficient numbers of active duty applicants exist, applicants to endodontics, orthodontics, and pediatric dentistry must have a minimum of 2 years active duty service prior to the first day the residency selection board convenes.”[2]

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Investigation Into Use of Digital Imaging Fiber-Optic Trans-Illumination (DIFOTI®) in Caries Detection

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Caries is an infectious disease process caused by bacteria. The bacteria involved are primarily *Streptococcus mutans* and *Lactobacillus*.[1,2] The process is dynamic, characterized by periods of demineralization and remineralization.[1,3] If demineralization is allowed to continue, the enamel surface will eventually lose its integrity, resulting in a hole formation (cavitation). As Steinberg[4] points out, "Prior to cavitation, the caries process is considered to be reversible."

Caries diagnosis remains a difficult task. In North America, caries is often diagnosed using tactile (often with use of a dental explorer), visual (light and magnification), and radiographic means. The use of an explorer to diagnose caries is not considered to be consistently accurate and may lead to a false positive diagnosis or to the unnecessary destruction of tooth structure.[5] Technological advances such as the DIAGNOdent Caries Detector (KaVo America Corp., Lake Zurich, IL 800/323-8029) have shown promise in the diagnosis of occlusal caries.[1,6] Compared to traditional examination methods for the detection of occlusal caries (use of mirror, explorer, and magnification loupes), DIAGNOdent has been shown to have a higher sensitivity (0.92) than traditional methods (0.82).[6]

Use of the electronic caries monitor (ECM) has also shown some promise for the detection of enamel and dentin caries in occlusal surfaces of posterior teeth. Sensitivity values for ECM regarding the detection of noncavitated occlusal caries have been shown to range from 0.65–0.78.[7] Visual inspection methods for the detection of occlusal enamel caries resulted in a sensitivity of 0.60. Use of bitewing radiographs or fiber-optic trans-illumination have been shown to be inefficient for the diagnosis of occlusal caries.[7]

Dentists routinely rely on bitewing radiographs to help diagnose interproximal caries. Unfortunately, while radiographs do provide information about variations in mineral density, they provide no clue as to whether or not a lesion is cavitated.[8] Also, radiograph imaging exposes patients to ionizing radiation.[9]

Recently, use of Digital Imaging Fiber-Optic Trans-illumination, (DIFOTI®, registered trademark of Electro-Optical Sciences, Inc., Irvington, NY 800/729-8849) for the diagnosis of interproximal caries has been evaluated and has shown promise in the detection of interproximal, occlusal, and smooth surface carious lesions. DIFOTI has been shown to have a sensitivity value of 0.56 compared to 0.21 for bitewing radiographs when used for the detection of interproximal caries. DIFOTI has also been shown to be three times more sensitive than radiographs for the detection of occlusal caries.[10]

DIFOTI uses a fiber-optic illuminator in a disposable mouthpiece to deliver light to a tooth surface. The light travels through tooth structure and is captured by an electronic charged coupling device (CCD) camera. The camera digitally images the light and projects the image on a computer monitor in real time (Figure 1). Carious tooth structure scatters and absorbs more light than the surrounding healthy tooth structure. Demineralized areas will appear darker compared to the more translucent brighter background of surrounding caries-free tooth structure.

DIFOTI received FDA approval in 1999. This promising technology has potential to allow a dentist to evaluate demineralization on all tooth surfaces as well as inspect for tooth fractures and defective restorations.[1]

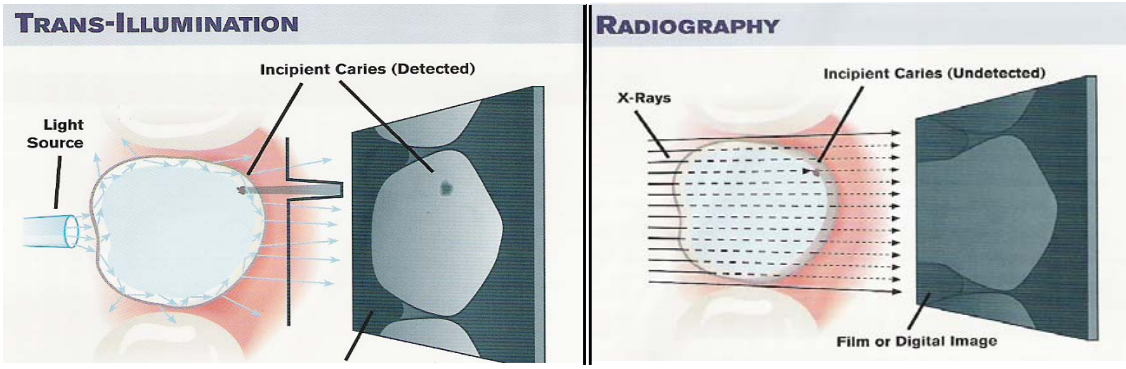

Figure 1. Differences in imagery obtained using trans-illumination and radiography (Reprinted with permission from Electro-Optical Sciences).

This study was conducted to determine sensitivity and specificity of detecting the presence and extent of interproximal carious lesions using both traditional examination techniques (bitewing radiographs) and DIFOTI on 32 extracted maxillary and mandibular teeth.

MATERIALS AND METHODS

Extracted human adult teeth were collected from three US Army dental clinics. Teeth were examined for inclusion in the study; any teeth exhibiting gross decay, missing tooth anatomy or large restorations were excluded. Eventually, 32 teeth which showed possible signs of the presence of caries based on visual inspection were selected. Teeth were stored in 5% neutral buffered formalin. The selected teeth were mounted in pairs with interproximal surfaces in contact to simulate the relationship found in the dental arch. Teeth were mounted in medium pink baseplate wax for support and numbered. The wax was melted into a 1-inch cube formed around the paired teeth with only the clinical coronal portion of the teeth visible above the wax. The blocks of teeth were photographed from the buccal side (Figure 2).

Figure 2. Teeth mounted in wax photographed from the buccal side.

The project consisted of four phases. During Phase 1, the visible surfaces of each tooth were cleaned with prophy paste and a rubber cup as recommended prior to use of the DIFOTI system. The DIFOTI system was used to image each set of mounted teeth showing both buccal and lingual views (Figure 3). Each image was

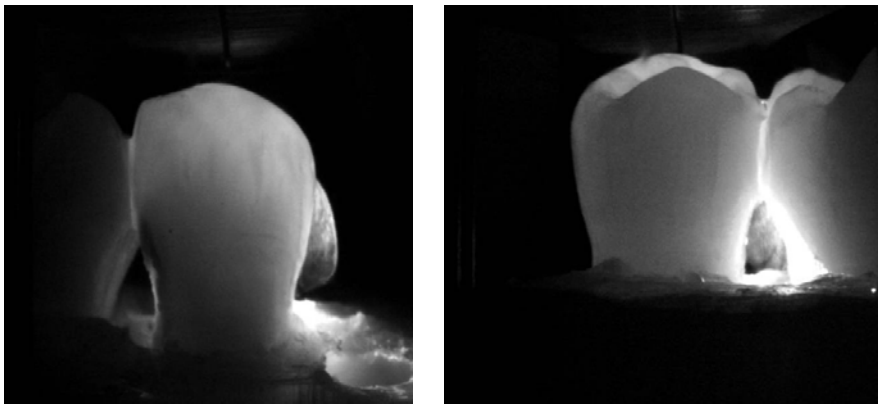

Figure 3. Buccal and lingual DIFOTI images of specimen 24.

identified with appropriate tooth numbers. All DIFOTI images were made by the primary author (Carbone).

Images were saved on CD-ROM for future viewing. After completion of DIFOTI imaging, each block of teeth was radiographed. Exposures were made at 70 kVp (kilovoltage peak) and 7 mA (milliamperage) on Kodak DF58 Ultraspeed periapical film using the Gendex GX 770 Intraoral X-ray System. The source-to-film distance for each radiograph was 21 centimeters. Each pair of specimens was exposed. Films were developed at the same time using the A/T 2000® XR film processor (Air Techniques, Inc., Hicksville, NY, 800-247-8324). Each pair of specimen numbers was exposed on film for use later in the assessment phase (Figure 4).

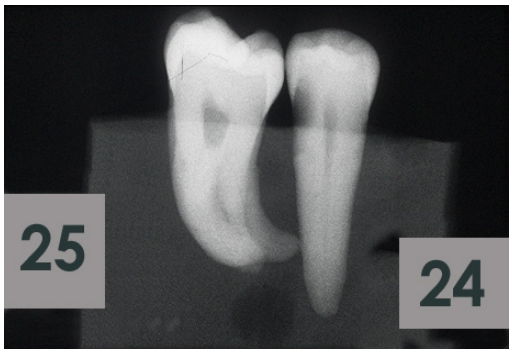

Figure 4. Radiographic imagery of mounted specimens 24 and 25.

Phase 2 involved five dentists, each of whom was participating in a 1-year Advanced Education in General Dentistry Program and had less than 9 months experience as a practicing dentist. None of the dentists participated in Phase 1 of the study. Prior to participating in Phase 2, each dentist received approximately 2 hours of hands-on familiarization with the DIFOTI equipment. This training was conducted by a sales management consultant who was not a dentist or a trained technical consultant. During Phase 2, each of the five dentists independently assessed the presence, location, and extent of interproximal lesions in the experimental teeth mounted in wax cubes as described previously. The examinations were all performed under identical conditions. The examining dentists evaluated both the mounted teeth and corresponding radiographic and DIFOTI images using the same ambient lighting and light box. Initially they examined mounted tooth blocks and corresponding DIFOTI images. Each tooth block and the corresponding radiographic image were assessed 3 days later. On both occasions, the examiners were asked to record suspected lesions on standardized diagrams in ink, noting the exact location and size using the following arbitrary categories:

1. No caries
2. Caries in enamel only
3. Caries extending to dentino-enamel junction
4. Caries extending just past the dentino-enamel junction
5. Caries well into the dentin (encroaching pulp)

For purposes of determining sensitivity and specificity, categories 1 and 2 were defined as “no caries” and categories 3, 4, and 5 were defined as “yes caries”.

During Phase 3 of the study, all experimental teeth were removed from the wax mountings and sent to the US Army Dental Materials Laboratory at Fort Gordon, GA for sectioning. The teeth were sectioned mesiodistally through the suspected carious sites using a Isomet low speed saw (Buehler Ltd., Lake Bluff, IL; 800-283-4537) with a 0.30 mm thick diamond wafering blade (no. 11-4244, Buehler Ltd.).

During Phase 4, each of the 64 sections was viewed using a surgical microscope at 15x power (model M705-115, Global Surgical Corporation, St. Louis, MO; 800/861-3585). Each buccal and lingual section was evaluated for caries depth and assigned to one of the same five arbitrary categories as used in Phase 2. The sectioned teeth were photographed using a Minolta DiMAGE 5 digital camera (Konica Minolta Photo Imaging, Mahwah, NJ 201/574-4000) mounted on a tripod with a source distance of 25 mm (Figure 5).

Figure 5. Photograph of specimen 24.

RESULTS

As illustrated in the Table, sensitivity ranged from 0.09–0.55 for radiographs and from 0–0.45 for DIFOTI for all examiners. Specificity ranged from 0.86–1.0 for radiographs and from 0.90–1.0 for DIFOTI. Consensus sensitivity and specificity values were determined by three or more examiners agreeing on a caries category.

Sensitivity and Specificity Values from Experimental Examiners

	Examiner 1		Examiner 2		Examiner 3		Examiner 4		Examiner 5	
Method	X	D	X	D	X	D	X	D	X	D
Sensitivity	0.36	0.27	0.09	0	0.55	0.45	0.09	0.18	0.36	0.27
Specificity	0.86	1.0	1.0	1.0	0.95	0.90	1.0	1.0	1.0	1.0

***** X – Radiograph; D – DIFOTI

A comparison of the consensus results for all examiners determined that the sensitivity for DIFOTI was 0.18. Consensus sensitivity for radiographs was determined to be 0.45.

Specificity values were also determined. Experimental results for use of radiographs showed a specificity of 1.0. Experimental use of DIFOTI as a diagnostic tool also resulted in a specificity value of 1.0. The Kruskal-Wallis test was calculated to determine a statistical difference in caries diagnosis between radiographs and DIFOTI. The test showed a significant difference in the diagnosis of caries using radiographs vs. DIFOTI (ρ = 0.003). The χ^2 test was used to show statistical differences between sensitivity (as represented by categories 1 and 2 [no caries]) and specificity (categories 3, 4, and 5 [yes caries]) data for radiographs and DIFOTI (ρ = 0.017).

Correlation and regression analysis revealed that the diagnosis of positive caries increased as the depth of the caries increased for both consensus X (radiographs) and consensus D (DIFOTI). The correlation was positive but not strong: consensus X (radiograph) r = 0.62 (ρ = 0.0002); consensus D (DIFOTI) r = 0.63 (ρ = 0.0001).

DISCUSSION

Digital Imaging Fiber-Optic Trans-illumination has been introduced as a diagnostic system for the early detection of caries. The technology allows image formation without the use of ionizing radiation; images can be immediately viewed by both dentist and patient. DIFOTI has shown promise in the detection of interproximal, occlusal, and smooth surface carious lesions. In 1997, Schneiderman et al[10] assessed the use of DIFOTI to diagnose caries on 50 extracted human teeth. In their study, 5 clinicians "experienced in oral diagnosis" were asked to assess radiological images of extracted teeth. Four of the clinicians received 2 hours training in DIFOTI, after which their performance using both technologies (radiographic evaluation and DIFOTI) was scored to determine sensitivity and specificity values. Sensitivity for interproximal surfaces was determined to be 0.56 for DIFOTI and 0.21 for radiographs. Specificity for DIFOTI was 0.76 compared to 0.91 for radiographs.

In 2002, Young[1] reviewed the literature to evaluate caries detection technologies and modern caries treatment methods. In this review DIFOTI was referred to as a "diagnostic instrument for early and reliable detection of caries without the need for ionizing radiation." Young cautioned that clinicians who use DIFOTI (and compare results from radiographic analysis) must understand differences between interpreting radiographs and DIFOTI images. Unlike radiographs in which the "incident beam is transmitted through the entire tooth" resulting in an image which can show the extent of carious lesion penetration into a tooth, DIFOTI images only the light emerging from the surface of the tooth closest to the CCD camera. DIFOTI images surface changes and not necessarily the depth of lesion penetration. It is important to note that the manufacturer of DIFOTI does not claim the device measures the extent of caries penetration.

In this study, 5 relatively inexperienced general dentists (each with less than 9 months of clinical

practice experience at the time of the study) received minimal instruction in the use of DIFOTI. Specifically, each dentist was given hands-on familiarization as previously described and then afforded the opportunity to use the equipment in a full mouth survey on one or two subjects. No attempt was made to measure any of the dentist's proficiency with the equipment. Approximately 2 weeks later each of the dentists served as examiners in this study and attempted to diagnose caries in both conventional radiographic images and DIFOTI images. As shown in the Table, one of the examiners, Examiner 3, performed considerably better in diagnosing caries from radiographic images and DIFOTI compared to the other examiners. Experimental sensitivity values for Examiner 3 were 0.55 for radiographs and 0.45 for DIFOTI in comparison to the consensus experimental sensitivity of 0.18 for DIFOTI and 0.45 for radiographs. Our experimental results do not compare well with previously documented experimental results. In a study using five clinicians "experienced in oral diagnosis," Schneiderman et al[10] found DIFOTI to have sensitivity more than twice that of radiography for the diagnosis of interproximal caries. Prior to participating in the study the "experienced" clinicians calibrated their performance against a known standard. The manufacturer of DIFOTI claims a sensitivity value of 0.69 for the diagnosis of interproximal caries.

Clearly the results of the current study may reflect errors due to both the inexperience of the examiners in caries diagnosis and possible inexperience in interpreting DIFOTI images. Both Cortes et al[11] and Lavonius et al[12] report that extensive training with fiber-optic trans-illumination equipment is required to use the method successfully. Young[1] points out that "interproximal lesions can be picked up using DIFOTI only by careful angulation." This suggests that the DIFOTI system may have been more effective in detecting caries if the experiment examiners had been more proficient in manipulating the fiber-optic handpiece to effectively view interproximal tooth structure.

Although the results of this study suggest that our examiners needed more instruction in the efficient use of DIFOTI, the technology has great potential as a powerful patient education tool. The DIFOTI technology can show subtle surface changes associated with potentially demineralized tooth surfaces. Demineralized tooth structure can be documented. Then, after successful treatment designed to remineralize the tooth, the areas can be reviewed again by both the dentist and the patient. The technology also shows promise in evaluating anterior teeth for potentially defective interproximal restorations or early interproximal demineralization, all without the need to expose a patient to ionizing radiation.

CONCLUSIONS

1. DIFOTI can be a useful diagnostic adjunct, particularly when used to confirm the absence of disease (specificity).
2. A significant training period is necessary to ensure effective use of this technology. Such training will allow the dentist to properly handle the DIFOTI handpiece to expose all potential carious surfaces and to properly interpret DIFOTI images.
3. The DIFOTI technology may be most useful in identifying demineralized areas of tooth structure and monitoring the results of remineralization therapy.

ACKNOWLEDGEMENT

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Prosthodontic Rehabilitation of a Patient with Amelogenesis Imperfecta: A Clinical Report

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ABSTRACT

This clinical report describes the prosthodontic treatment for a 28-year-old male diagnosed with Type 1 hypoplastic amelogenesis imperfecta. The patient presented with considerable sensitivity and attrition of the teeth. The goal of the treatment was to restore masticatory function and aesthetics. A combined dental therapy approach was used, and canine protected occlusion was developed in the final restorations to decrease lateral forces on the posterior dentition. Functional and aesthetic results were achieved.

OVERVIEW: AMELOGENESIS IMPERFECTA

Amelogenesis imperfecta (AI) is defined as a rare developmental hereditary abnormality caused by autosomal or X-linked dominant or recessive genes. Witkop and Backman reported that the occurrence of AI in the western population is between 1:4,000 and 1:14,000.[1] AI appears to affect primary and permanent dentition in both the maxillary and mandibular arches with no racial or gender predilection.[1,2] Lench and Crawford[3] reported a structural abnormal gene mapped to the loci on the short and long arms of the X chromosome which causes X-linked AI while Forman[4] reported autosomal dominant AI located to chromosome 4q.

The normal process of amelogenesis in tooth development involves the formation of normal enamel and occurs in three stages: the formative, calcification, and maturation stages. During the formation stage, the organic enamel matrix is synthesized. During the calcification and maturation stages, the organic enamel matrix begins mineralization while the enamel crystal matures. Clinically, AI appears as an alteration of enamel formation resulting in hypoplasia, hypocalcification, and hypomaturation. Enamel hypoplasia results in a decreased quantitative enamel formation. The enamel in hypocalcification appears normal but poorly mineralized while hypomaturation results in an abnormal mineralization in the final stages of tooth formation.[5] The most common form, the hypoplastic type, is deficient in normal enamel. The crown of the teeth appear blanched, "snow-capped," yellow-brown, pitted, or grooved. Radiographic examination usually shows a full complement of teeth, but the crowns of the teeth either have very thin enamel or lack enamel completely. The teeth actually resemble crown preparations with characteristic excessive interdental spacing.[6]

Cosmetic rehabilitation of patients with AI has been open to a variety of treatment options. Complete coverage restorations are often recommended. The complications presented by teeth with short clinical crowns demand a comprehensive treatment plan and proper sequencing of therapy to achieve function and aesthetics without compromising the periodontium.[7] Early intervention can prevent later restorative problems. However, some patients may not seek treatment until young adulthood, leading to the need for complex restorative treatment.[8]

CLINICAL REPORT

A 28-year-old male presented with the chief complaints of considerable sensitivity of his teeth, difficulty chewing, and displeasure with his present dental appearance. Oral examination revealed smooth enamel hypoplasia, a skeletal open occlusal relationship, a dental midline discrepancy, short clinical crowns, occlusal wear, and aesthetic disharmonies (Figure 1).

Figure 1. Preop anterior occluded view of 28 year-old-male with smooth enamel hypoplasia, skeletal open occlusal relationship, dental midline discrepancy, short clinical crowns, occlusal wear, and aesthetic disharmonies.

The patient's medical history was unremarkable and he reported that his sister had similar clinical findings. A diagnosis of AI was made from the clinical and radiographic features. Although dental treatment had been previously provided, the composite resin restorations were inadequate to maintain the dentition in stable occlusion (Figure 2).

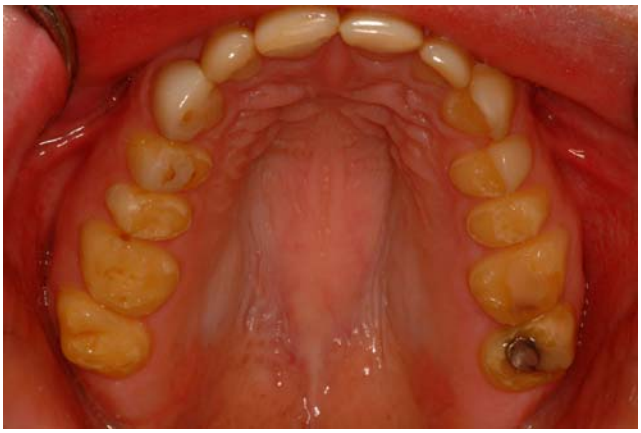

Figure 2. Preop maxillary occlusial view of resin composite restorations which were inadequate at maintaining the dentition in stable occlusion.

Photographs, radiographs, and dental casts were made. Diagnostic casts were duplicated and mounted in a semiadjustable articulator (model 2240; Whip Mix Corp, Louisville, KY) at the vertical dimension of occlusion (VDO). The interocclusal distance was evaluated phonetically to be about 3 to 4 mm, therefore, the patient's vertical dimension was not altered. A Broadrick occlusal plane analyzer was used as a guide for determining an acceptable plane of occlusion. Diagnostic preparations were made on the stone casts and a diagnostic waxing was completed with a mutually protected concept of occlusion.

From the diagnostic waxing procedure, it was determined that the mandibular right and left first and second molars would need crown lengthening, and the occlusion distal to the mandibular right canine would have to be restored with reverse articulation (Figure 3).

Figure 3. Preop mandibular occlusal view showing the mandibular right and left first and second molars which need crown lengthening. Also, the occlusion distal to the mandibular right canine will need restoration with reverse articulation.

The patient exhibited mild localized gingivitis and was referred for a comprehensive periodontal evaluation. Initial treatment involved scaling and root planning to include oral hygiene instructions. A 0.2% chlorohexidine mouth rinse was also prescribed.

Complete rehabilitation of the dentition was based on patient desires, clinical findings, radiographic evaluation, periodontal consultation, and evaluation of diagnostic casts. Fabrication of gold restorations for maxillary and mandibular posterior teeth and metal ceramic crowns for maxillary and mandibular premolars and anterior teeth was planned. The treatment plan was presented and discussed with the patient, who accepted it.

Surgical periodontal therapy consisted of clinical crown lengthening procedures for mandibular right and first and second molars. All other teeth had the necessary minimum 5 mm of clinical crown length. Good initial healing was noted at 2 weeks and the

prosthodontic phase of the treatment was begun after at least 6 weeks. All the teeth were prepared and provisionalized at the determined VDO. The planned occlusion was evaluated clinically and final impressions for maxillary right and left second molars and mandibular right and left first and second molars were made with vinyl polysiloxane material in stock trays. Impressions were also made of provisional restorations for fabrication of a new custom incisal guide table. Gold crowns were fabricated and evaluated for fit on the teeth and then luted with resin-modified glass ionomer cement (Vitremer; 3M Dental Products, St. Paul, MN). Impressions for all other prepared teeth were made, and a definitive maxillary and mandibular cast was formed and mounted in an articulator with trimmed dies of prepared teeth at the VDO. The maxillary and mandibular completed restorations were evaluated in bisque bake (Figures 4, 5). All restorations were characterized, glazed, polished, and then luted with Vitremer cement. Home care instructions were given, and the patient was scheduled for periodic maintenance care.

Figure 4. Completed maxillary restoration.

SUMMARY

The treatment of patients with AI presents an interesting challenge to the restorative dental team. The main clinical characteristics are extensive loss of tooth tissue, poor aesthetics, and tooth sensitivity.[9] The complexity of the management of patients with AI should start with early diagnosis to prevent later restorative problems and the key participation of the prosthodontist in overall treatment planning. This clinical report describes a treatment sequence based on a multidisciplinary approach.[10] Treatment is usually combined to meet biologic, restorative, and aesthetic requirements imposed by short clinical crowns. Preoperative treatment planning included an accurate diagnostic wax-up, evaluation of clinical crown lengths, and a visualization of the desired result. For the patient described above, enhanced aesthetics was possible because the clinical crown and root form were favorable for complete-coverage restorations (Figure 6). Canine-protected occlusion was developed in the final restorations to decrease lateral forces on the posterior dentition.

Figure 5. Completed mandibular restoration.

Figure 6. Enhanced aesthetics was possible because the clinical crown and root form were favorable for complete coverage restorations.

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Provisional Restorations: An Overview of Techniques and Materials

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Provisional restorations play a critical role in the successful treatment of the prosthodontic patient. An interim restoration that meets the functional and aesthetic requirements of the patient can mean the difference between success and failure of a treatment plan. Clinicians have often made the mistake of regarding the provisional as being merely "temporary" and thus do not devote adequate time and effort to this phase of treatment. This may result in the fabrication and cementation of an interim restoration, which is inadequate functionally and/or morphologically. According to Shillingburg,[1] aside from meeting the individual patient's aesthetic desires, the restorations should also meet the following requirements:

1. Provide pulpal protection.
2. Provide positional stability.
3. Provide the patient with the proper occlusal function.
4. Be easily cleanable.
5. Be strong and retentive.
6. Be aesthetically pleasing.
7. Margins should not impinge upon the gingival tissues.

Campagni and Caponigro[2] accurately describe the requirements of a successful provisional as one that mimics the planned restoration(s) in occlusal and axial morphology as well as aesthetics, while fulfilling its requirements for maintaining tooth position and protecting the tooth structure during function.

Numerous techniques and materials for fabrication of single-unit or multiple-unit provisional restorations have been described in the literature to meet these requirements. This article seeks to provide the clinician with an overview of various techniques and materials which have proven to be useful and thus have endured over the years.

THE DIRECT TECHNIQUE

This technique utilizes a prefabricated stent or matrix filled with the practitioner's choice of provisional material, which is placed directly onto the patient's prepared teeth. After initial polymerization, the material/matrix assembly is removed from the mouth, trimmed, and polished.

Kaiser and Cavazos[3] describe the following technique:

1. On the patient's diagnostic cast, wax in any missing teeth.
2. Duplicate the cast and fabricate a matrix from a material of the clinician's choosing.
3. Prepare the teeth.
4. Lubricate the teeth.
5. Place autopolymerizing resin into the matrix and seat onto the prepared teeth. Use a pumping motion to ensure that the provisional restoration will not get locked into any undercuts.
6. After initial set, remove the matrix from the mouth and allow the provisional restoration to completely polymerize.
7. Trim, contour, and polish.

Nayyar and Edwards[4] also describe a direct technique for use with a single unit using a commercially available metal crown in which the crown is relined directly on the tooth with autopolymerizing resin :

1. Measure the mesial/distal width of the tooth to be prepared.
2. Pick out a corresponding commercially available metal provisional crown.
3. Seat the crown, trim any excess material below the margin to the proposed finish line.
4. After preparation, lubricate the prepared tooth and coat with cavity varnish.

5. Pour acrylic resin into the crown, seat it and have the patient bite into the centric occlusion.
6. After initial set, lift the crown 3 mm and reseat. Repeat this action three or four times.
7. Remove, trim, and contour after the acrylic resin reaches final set.

One of the disadvantages of using a commercially available metal provisional crown is that the patient may complain about metallic taste when chewing food. Polycarbonate crowns may also be used in the preparation of an anterior tooth for a single-unit restoration. However, the aesthetic demands of patients often prevent their use in this region of the mouth.

Christensen[5] describes another method for direct fabrication of a single-unit using wax as a stent:

1. Fabricate a baseplate wax impression of the tooth to be prepared plus one to two teeth mesial and distal.
2. Prepare the tooth.
3. Place acrylic resin in the wax impression and seat it onto the lubricated prepared tooth.
4. As polymerization occurs, pump the wax matrix up and down a few times.
5. After initial polymerization, remove the wax matrix from the mouth and allow it to completely polymerize extraorally.
6. Trim and polish.

Psichogios et al[6] describe a direct technique for provisionalizing multiple single-units and three- or four-unit fixed partial dentures:

1. Fabricate a diagnostic waxing.
2. Construct a dual arch custom impression tray.
3. Take an impression using an addition silicone.
4. Trim the impression material 3 – 4 mm apical to the gingival margins of the diagnostic waxing and only include cusp tips or incisal edges of the opposing arch.
5. Prepare the teeth and coat with a lubricant.
6. Use a BisGMA restorative material to fill the impression.
7. Have the patient close into the custom tray.
8. Remove the tray after two minutes.
9. Bench polymerize for another two minutes.
10. Trim and polish.

Many clinicians are familiar with and readily employ these direct techniques. The matrix material used may differ from clinician to clinician, but the general techniques are similar. While the direct technique reduces chair time, it has two major disadvantages:

- Evidence exists indicating that an adverse pulpal reaction occurs caused by the free monomer and heat generated by the polymerization reaction.
- Distortion can occur due to the "pumping" of the matrix on and off during polymerization of the resin.[7]

Despite these disadvantages, the direct technique continues to be a very popular and highly utilized method for provisional fabrication. When performed properly, this method can produce very aesthetic and functional provisional restorations.

INDIRECT METHOD

This method of provisional restoration fabrication, which is taught in most dental schools, has several advantages:

- The pulp is protected due to polymerization occurring on a stone cast. Shillingburg[1] states that any vital tooth that is being relined should be done so via the indirect method because of this exothermic heat increase.
- Moulding[8] found that the indirect method had significantly less marginal discrepancy than the direct technique that utilizes a pumping motion. Crispin et al[9] found that marginal fit could be improved by 70% using the indirect method to fabricate provisional restorations.
- Auxiliaries are able to fabricate the majority of the provisional restorations in the lab, leaving the practitioner free to treat other patients.

The techniques described by various authors for fabricating provisional restorations via the indirect method are very similar. Differences occur in the

acrylic resin used and whether pressure pots are utilized. Chee et al[10] found that pressure curing polymethyl methacrylates reduced porosity and increased transverse strength when compared with the technique of bench curing. The indirect technique is described as follows:

1. Prior to preparing teeth, form a matrix on diagnostic casts.
2. Prepare the teeth.
3. Take an irreversible hydrocolloid impression of prepared teeth. If two retraction cords are used, make the alginate impression after placement of the first cord.
4. Pour impression up with quick-set plaster.
5. Place the matrix onto the stone cast to ensure proper fit. Lubricate the stone model with a tin foil substitute and then add acrylic resin. For optimal aesthetics, place an incisal shade of resin into the matrix and feather the resin up the facial side of the teeth. Then add the body shade of resin.
6. Rubber band the matrix to the stone cast to ensure complete seating and place in a pressure pot with hot water at 20 psi for five minutes.
7. Remove and mark the gingival margin on the provisional restoration with a sharp lead pencil.
8. Trim and contour.
9. Polish the restoration with pumice on a rag wheel, followed by a diamond stone on a rag wheel.

For provisional restoration of a fixed partial denture, it is recommended that the practitioner place a ball of completely polymerized acrylic resin into the pontic space. (The ball should fill at least 50% of the pontic space). This will help offset the significant amount of shrinkage that frequently occurs in the pontic area to due to excessive bulk of material.

Davidoff[11] describes an indirect method that uses heat-polymerizing acrylic resin. In this method, all steps are similar to those described above, except that a heat-polymerizing acrylic resin is used. The filled matrix is placed on the cast and placed in a pressure pot at 250 degrees Celsius at 30 psi for 30 minutes. If required, a chairside reline with autopolymerizing acrylic resin can be performed. Although the indirect method has been shown to produce provisional restorations of superior strength and marginal integrity, few clinicians use the strictly indirect method.

INDIRECT/DIRECT METHOD

This is probably the most popular method used for the provisionalization of fixed partial dentures. It combines the advantages of both the direct and indirect methods thus capturing the best of both techniques. One of the main benefits of this technique is that the clinician must reline the prefabricated shell. Barghi and Simmons[12] showed that relining of provisional restorations fabricated via the direct method substantially improved marginal adaptation. Campagni and Caponigro[2] also list the following advantages for the indirect/direct method:

- Decreased chair time.
- Auxiliaries can fabricate the shell.
- The provisional restoration can be relined intraorally with the patient in centric occlusion, thereby minimizing the amount of occlusal adjustment necessary

Several techniques for this method of provisional fabrication are presented below.

Campagni and Caponigro[2] describe the following method:

1. Add a bulk of wax to the gingival area of the teeth to be prepped on casts. This ensures an adequate amount of provisional material in the marginal area.
2. Duplicate the cast.
3. Make a clear matrix.
4. Minimally prepare the teeth included in the provisional restorations. Reductions should be half that of actual preparations.
5. Gingival extensions should be 2 mm apical to the expected gingival finish line. This results in a 2 mm gingivectomy.
6. Place a tin foil substitute on the cast.
7. Methyl methacrylate is placed in the matrix. The matrix is then seated on the cast and the whole apparatus is placed into a pressure pot at 20 psi for five minutes.

8. The shell is trimmed slightly then tried in the patient's mouth after preparations have been completed.
9. Reline is accomplished using polyethyl methacrylate and a pumping motion.
10. Trim, contour, and cement the provisional restoration.

Christensen[5] also advocates using the above method with one slight variation. He suggests removing the shell at the first detection of exothermia and cooling it under running water. The shell is then replaced and a pumping motion is used until complete polymerization has taken place.

Chiche[13] describes the following technique:

1. A preformed shell is made in the lab and tried on the patient after preparations of the abutment teeth are completed.
2. Acrylic resin is added to the shell and then seated onto the preparations under occlusal pressure at the patient's vertical dimension of occlusion.
3. The shell is lifted 1–2 mm to prevent it from being locked into any undercuts below the margins.
4. Spray the abutment teeth with water to retard the heat generated during polymerization.
5. Reseat the shell.
6. When the bulk of material is at the doughy stage, remove the shell and lightly adapt a fresh mix of acrylic resin over the margins.
7. Quickly reseat the shell and have the patient gently close into centric occlusion.
8. Again lift the shell 1–2 mm so water can be sprayed onto the abutment teeth.
9. Reseat the shell.
10. Repeat this procedure three times until the acrylic resin is set.
11. Mark outer edge of margins with a pencil.
12. Trim, contour, and polish the provisional restoration.

Vahidi[14] advocates an indirect/direct method utilizing light cured composite resins for the shell and then relining on the tooth preparation with autopolymerizing acrylic resin:

1. Prepare the teeth on the cast.
2. Apply a thin coat of die isolation material to the cast (Visio-Gem die isolation material, ESPE Premier Dental Products, Norristown, PA).
3. Build up a core of body shade resin and then follow with a layer of incisal shade resin.
4. Light cure for 90 seconds.
5. Remove cured restoration, trim excess, and add to deficient areas.
6. Polish using pumice and composite polishing paste.
7. Complete intraoral tooth preparation and reline the provisional shell with autopolymerizing resin.

It is the clinician's responsibility to determine which of the three described techniques works best in his/her hands. Success by the standards established by Shillingburg[1] can be achieved by using any of the above techniques with proper training and adequate practice. If this high standard is met, the final prosthesis will have a greater chance of success. The dentist will know better how the patient will tolerate the final prosthesis. The provisional restoration is also used as an important diagnostic tool to determine the patient's aesthetic expectations.

PROVISIONAL MATERIALS

Equally important as technique in provisional fabrication is the material the clinician employs in the technique. A clinician may choose from numerous materials. Oftentimes the choice depends on what works best in the clinician's hands. This is perhaps the most important characteristic when deciding upon the material to use, however, research has shown some materials to be superior to others. The remainder of this article focuses on a simple overview of some of today's most popular materials in use for provisional restoration fabrication. It should be noted that any brand names of material are listed for example purposes only.

Polymethyl Methacrylate (PMMA) – Jet® (Lang Dental Mfg. Co. Inc.)

Advantages

- Good marginal fit, especially if the indirect technique is used.
- Polishes to a high shine.
- Very durable.
- Can achieve a high transverse strength, especially with use of a pressure pot during polymerization.

Disadvantages:

- High exothermic heat that can stress the pulp.
- PMMA exhibits low abrasion resistance.
- Acrylic resin monomer is toxic to the pulp.
- PMMA experiences a high volume of shrinkage (about 8%).

(Source: Shillingburg[1])

Jet polymer comes in many different shades, which allows the clinician to obtain excellent aesthetic results. Wang et al[15] conducted a study that measured certain characteristics of the following provisional materials: PEMA, PMMA, Bis-GMA, light-cured composites, and polyvinyl methyl methacrylate. The authors found that Jet (PMMA) had the worst wear resistance of the materials, but had one of the highest transverse strength values. Due to its high exothermic heat, the authors of this article agree with others that PMMA should be used only in the indirect method, or in the fabrication of the shell for the indirect/direct method.

Polyethylmethacrylate – Snap™ (Parkell, Farmingdale, NY), Trim® II (Harry J. Bosworth Co., Skokie, IL)

Advantages

- Polishes to a good shine.
- Minimal exothermic heat increase.
- Good stain resistance.
- Low percentage shrinkage compared with PMMAs.

Disadvantages:

- PEMA exhibits low transverse strength compared to the PMMAs.
- Poor fracture toughness.
- Durability is less than that of the PMMAs.

(Source: Shillingburg[1])

In their study, Wang et al[15] found that Snap was significantly less hard at one week than the PMMAs, but marginal fit was similar to Jet. The authors also found that Snap was not as color stable as the composite resins, but significantly more color stable than the PMMAs. Krug[16] stated that the PEMAs provided the clinician with more working time and induced less chemical and exothermic irritation to the pulp. He also stated that the PEMAs were less color stable than the PMMAs, but heat processing the resin at 135 degrees Fahrenheit for five minutes at 20–25 psi will alleviate the problem of hardness and color stability. Christensen[5] states that PEMA has a low cost and relatively good fit, however, the material should not be used for long span provisional restorations (insufficient strength) or left in the mouth for over 2 weeks (color instability). Tjan et al[17] found that Splintline™ (Lang Dental Mfg. Co. Inc, Wheeling IL.) had better marginal adaptation than that of PEMA.

Christensen[5] also lists cost as a disadvantage of the bisacryl composites. Wang et al[15] found in their study of six different materials that Protemp exhibited the least amount of temperature increase upon curing and, along with Alike™ (Coe Laboratories, Inc., Chicago) had the best marginal adaptation. Another advantage of this material is that light-cured composite can be added to correct any deficiencies and this can reduce

Microfill Resin – Durafill VS™ (Heraeus Kulzer, Armonk, NY)

Advantages

- Light cured.
- Excellent polish results.
- Putty-like consistency makes them user friendly.
- Only a slight exothermic reaction.

Disadvantages:

- High cost.
- Brittleness limits use to single tooth restorations or to veneers.

(Source: Christensen[5,19])

potentially marginal porosity that is sometimes found with the use of autopolymerizing resins.[18]

The microfill resins are highly useful for inlays and onlays. Christensen[19] also promotes their use for certain veneer cases, but did not specify which cases are better suited for the microfill resins.

SUMMARY

Three types of provisional restoration materials and techniques were described in this article. Many other methods and materials are available to the clinician. The material and technique of choice should be based not only on scientific evidence, but also by what works best in the hands of the individual clinician. The ultimate goal is to fabricate a provisional restoration that is aesthetic, functional, and similar in contour to what is desired in the final prosthesis. If the clinician is able to achieve this in the provisional stage, achieving success in the final prosthesis will be that much easier.

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Implant Site Preparation With Distraction Osteogenesis

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LTC G. Morris Gibson, DC, USA

INTRODUCTION

Management of the deficient alveolar ridge has always presented an aesthetic as well as a functional problem for the restorative dentist. Various nonsurgical treatment options have been attempted to manage this problem. Removable partial dentures have traditionally been used to mask the problem by extending the denture base to cover the defect. Tissue-colored porcelain on a fixed partial denture or acrylic resin augmentation on a removable partial denture may be used if the deficiency is minimal. The end result is usually restoration of function for the patient with some improvement in aesthetics. Surgical options have varied from ridge augmentation with alloplasts to reconstruction with autologenous bone. Although both options have been widely used with success, there are some disadvantages. Alloplasts are not absorbed and sometimes tend to migrate from their original position. Autologenous bone continues to be the gold standard in reconstruction but does have unpredictable resorption patterns along with possible donor site morbidity. A fairly new technique called distraction osteogenesis has been developed to help manage this problem.

REVIEW OF THE LITERATURE

In 1902, Alessandro Codivilla used a method of external fixation to lengthen a femur.[1] Throughout the century, the works of Putti[2] in 1921, Haboush and Finkelstein[3] in 1932, and Ilizarov[4-7] in 1951 have lead to development of distraction osteogenesis in the craniofacial skeleton. McCarthy[8] applied the technique developed by Ilizarov to the mandible in patients diagnosed with craniofacial microsomia, Nager syndrome, and developmental micrognathia. Building on the success of distraction osteogenesis in the mandible along with the advances in science and technology, the technique was applied to the midface. Molina and Ortiz-Monisterio[9] along with Polley and Figueroa[10] successfully distracted the maxilla. Hidding and Zoller[11] from the University of Cologne, Germany, developed a device and method for distraction of the deficient alveolar ridge. This technique is described in this article.

CASE # 1 — ANTERIOR MANDIBLE

A 22-year-old male presented to the dental clinic with complaint of missing teeth. He had sustained a mandibular fracture at age 6 which resulted in the loss of his maxillary central incisors, 3 mandibular incisors, and delayed eruption of the mandibular left canine (Figure 1). The patient was evaluated by the prosthodontic, orthodontic, and oral and maxillofacial surgery departments. The orthodontist suggested that an attempt be made to orthodontically move the mandibular canine into occlusion if the tooth was not ankylosed. The patient did not want to commit to orthodontic treatment. The prosthodontic treatment plan was to extract the lower left canine and remaining incisor and restore the maxilla and mandible with implants. Following extractions, a vertical defect was present which could be corrected with alveolar distraction osteogenesis.

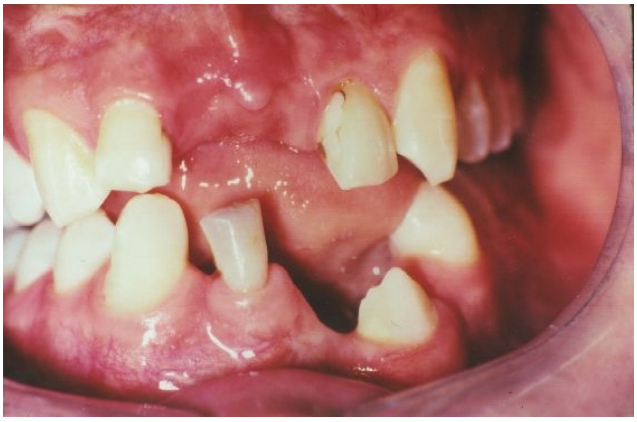

Figure 1. View of 22-year-old male — mandibular fracture at age 6; missing maxillary central incisors and three mandibular incisors; delayed eruption of the mandibular left canine.

The patient was taken to the operating room and administered a general anesthetic. A vestibular incision was made and both mental foramen and nerves were identified. Minimal soft tissue dissection was completed to ensure maximal blood supply to the transport segment. The distractor was adapted to the mandible and the vector was established. The distractor was secured with four screws and then removed to ensure that the original position of the distractor was maintained (Figure 2).

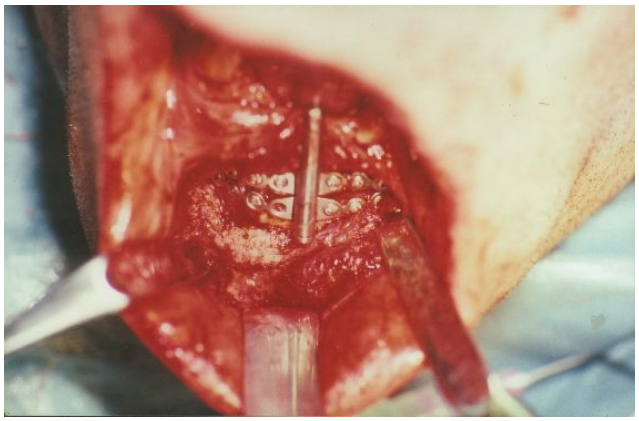

Figure 2. The distractor was secured with 4 screws, then removed to ensure that the original position of the distractor was maintained.

An anterior osteotomy was made with a 701 fissure bur and completed with fine osteotomes to avoid disruption of the lingual mucosa (Figure 3).

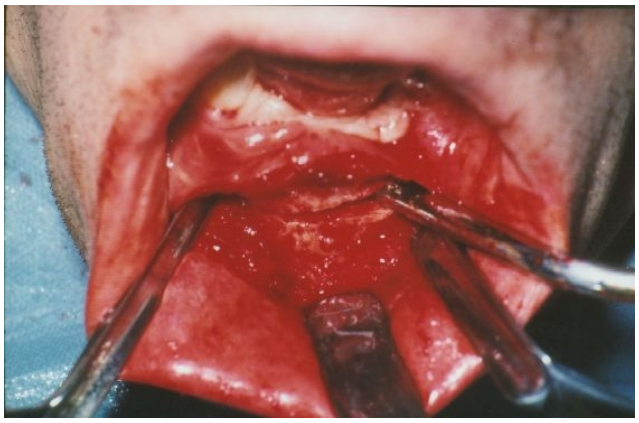

Figure 3. An anterior osteotomy was made with a 701 fissure bur and completed with fine osteotomes to avoid disruption of the lingual mucosa.

Once the distractor was repositioned and fixed with screws, it was activated to ensure there were no interferences, then returned to the original position. A postoperative panoramic radiograph was made (Figure 4). The distractor was then passively left in place for 1 week to enable a stable clot to form in the osteotomy site and the mucosal incision to heal.

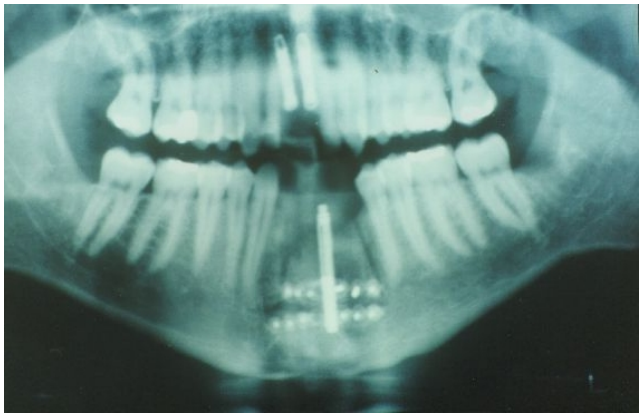

Figure 4. The distractor was repositioned and fixed with screws, activated to ensure there were no interferences, then returned to the original position.

After 1 week the distractor was activated at a rate of 1 mm per day until the established height was obtained (Figures 5 and 6). When the final vertical height was reached, the distraction process was terminated and left in place for 3 months to enable bone healing. The distractor was removed and implants were placed (Figure 7).

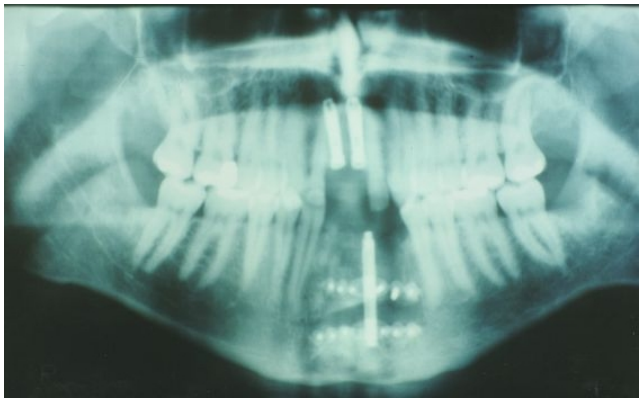

Figure 5. Frontal view – distractor activated at a rate of 1 mm per day until established height obtained.

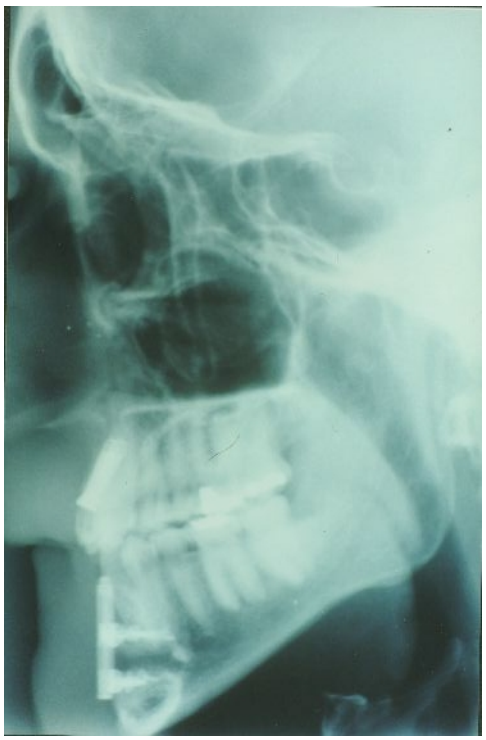

Figure 6. Profile view – distractor activated at a rate of 1 mm per day until established height obtained.

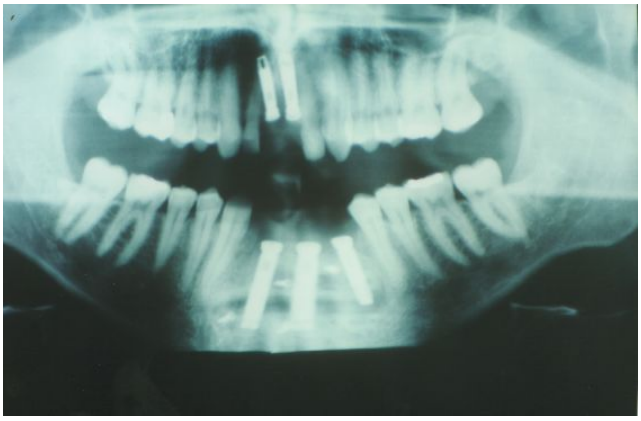

Figure 7. The distractor was removed and implants were placed after 3 months to enable bone healing.

CASE # 2 — POSTERIOR MAXILLA

A 50-year-old male presented seeking implant replacement of a missing a maxillary first molar. The radiograph (Figure 8) showed deficiency of vertical bone height. In this situation an increase of vertical bone height was necessary prior to implant placement. Alveolar distraction was completed in this area and the implant was placed (Figures 9, 10).

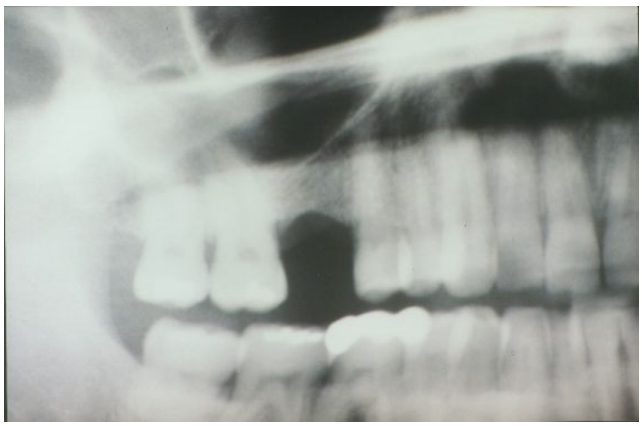

Figure 8. Deficiency of vertical bone height in 50 year-old male with missing maxillary first molar.

Figure 9. Completed alveolar distraction.

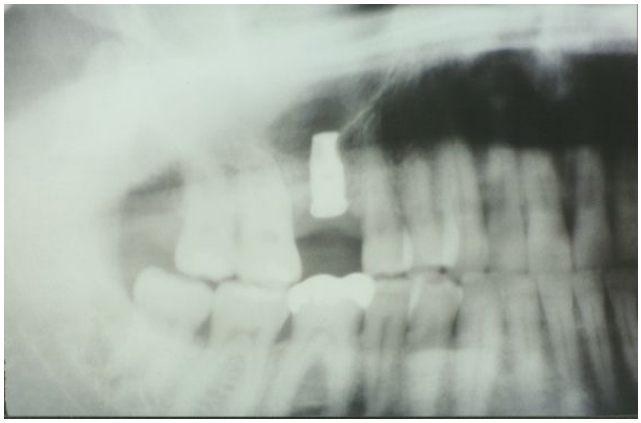

Figure 10. Implant in place.

CASE # 3 — ANTERIOR MAXILLA

A 24-year-old male presented with a history of anterior maxillary trauma. Teeth 9 and 10 had been avulsed, reimplanted, and stabilized with a nonrigid splint. The

teeth received endodontic treatment and the area was observed over several months (Figure 11).

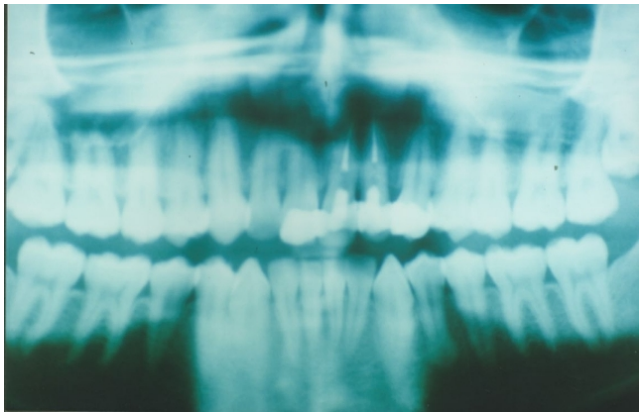

Figure 11. A 24-year-old male. Teeth 9 and 10 had been avulsed, reimplanted, and stabilized with a nonrigid splint. The teeth received endodontic treatment and the area was observed over several months.

The interdental bone subsequently became exposed and was removed as a 3 mm by 6 mm sequestrum leaving a bony and soft tissue defect. Further evaluation revealed that teeth 9 and 10 had become ankylosed. The decision was made to remove the teeth and restore with implants after site preparation. Distraction osteogenesis was completed in the anterior maxilla (Figure 12).

A passive orthodontic appliance with two acrylic resin denture teeth was used to allow the patient to have replacement teeth during the distraction and implant process (Figure 13).

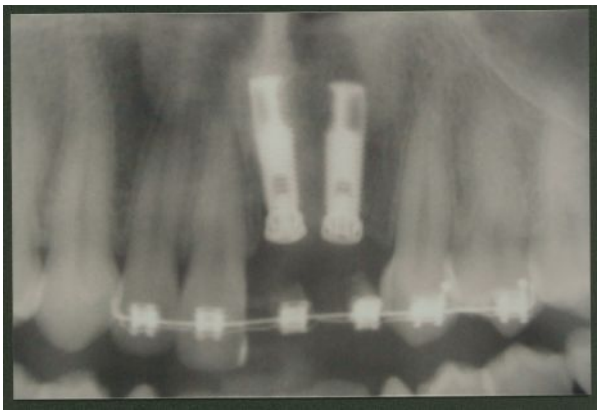

Figure 12. Distraction osteogenesis completed in the anterior maxilla.

Figure 13. A passive orthodontic appliance with 2 acrylic resin denture teeth was used to provide replacement teeth during the distraction and implant process.

DISCUSSION

Distraction osteogenesis has undoubtedly enhanced the treatment of oral and maxillofacial deficiencies. However, as with any other procedure, patient selection and education is of paramount importance. Distraction osteogenisis is another treatment option in reconstruction of deficient bony areas. There are, however, limitations to this procedure. Large defects may still be more effectively treated with autologenous bone grafting. Anatomic structures such as the maxillary sinus, nasal floor, and inferior alveolar nerve may limit the technique.

Although distraction osteogenesis has been used successfully in many areas, the basic principles developed by Ilizarov[4-7] must be followed. Ilzarov identified certain factors such as rigidity of the bone fragment, preservation of soft tissue, rate, and rhythm as important in the success of distraction. Based on the findings of Hidding and Zoller,[11] a 7-day latency period is observed after the osteotomy is completed and the distractor is placed. This latency period allows soft tissue wound healing along with clot formation in the surgical site. After 1 week the distraction process is started at a rate of 1 mm per day until the desired height is reached, followed by a 3-month stabilization period.[5] After the stabilization period, the distractor is removed and the implants are placed. We have found that distraction can be started in younger patients after 5 days with a stabilization period of 2 months. In contrast, some older patients may require an extended time frame.

CONCLUSION

Horizontal and vertical defects of the alveolar ridge present an aesthetic challenge to the restorative dentist. With the introduction of alveolar distraction osteogenesis the problem of vertical bone height can be controlled. Although the vertical defect can now be corrected, the horizontal deficiency may remain. A solution to this problem is to overdistract the ridge, then reduce it to the desired height at the time of implant placement. In most cases this technique has produced sufficient results. In those situations where horizontal deficiency persists, autogenous bone from the chin or ramus may be adequate. Most procedures can be safely performed as an outpatient procedure with intravenous sedation. Postoperative patients are managed similarly to third molar surgery patients, but with less discomfort.

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Xylitol Chewing Gum: A Recommended Addition to the MRE Package

LTC Albert E. Scott Jr, DC, USA

INTRODUCTION

MREs (Meals, Ready-to-Eat) are packaged meals that are provided to US military personnel in a field environment or whenever hot cooked meals are unavailable. The contents of one MRE meal bag provides an average of 1250 kilocalories, 13% protein, 36% fat and 51% carbohydrate. It includes a main entrée, a side dish, dessert, a bakery item, crackers, candy, spread, coffee, beverage mix, snacks, chewing gum pellets and an accessory pack. It provides one-third of the military recommended daily allowance of vitamins and minerals determined essential by The Surgeon General of the United States. MREs are high in fermentable carbohydrates. The daily consumption of 3 MREs, along with snacks and sweetened drinks, creates an ideal environment for caries causing bacteria to thrive. The increased use of smokeless tobacco also adds additional sucrose to be consumed and fermented.

There is great emphasis placed on dental readiness in today's military. The importance of annual dental examinations and prompt treatment of potentially serious dental conditions cannot be overstated. Deployment can occur in a matter of weeks and the Soldier must be dentally fit to deploy with the unit. Once arriving at their destination, Soldiers should be given every opportunity to maintain their dental health in a field/combat environment, which includes providing them with oral supplements to provide dental benefits.

CARIES FORMATION

In general, the oral hygiene practices of military personnel decline in a field/combat environment for a number of reasons. Some of the reasons offered are no running water, too busy, long duty hours, no floss, no toothpaste, no toothbrush, and on and on. Couple those reasons with high carbohydrate meals and these personnel become a high risk for developing new dental caries.

Dental caries is a dietary carbohydrate-modified, bacterial infectious disease. Caries result from the demineralization of tooth structure due to the acid produced by bacteria metabolizing fermentable carbohydrates. High sugar/carbohydrate intake and low levels of fluoride exposure, will lead to higher levels of caries causing bacteria, i.e., *Streptococcus mutans*. As a result, enamel becomes demineralized and caries develop. The longer a fermentable carbohydrate stays around teeth, the greater the acid formation and caries activity. The critical pH of plaque is 5.5. Below this level, hydroxyapatite begins to dissociate, leading to mineral loss and caries formation. The drop in pH itself will not produce caries unless it is coupled with other parameters, such as bacteria, susceptible tooth, time, and a food source. All carbohydrates, starches, maltose, glucose, lactose, fructose and sucrose are used by *S mutans* and other plaque bacteria to produce organic acids as metabolic by-products that result in a drop in pH. It is important that this high risk population be provided with a daily oral supplement with an effective and proven record in lowering the incidence of dental caries by decreasing levels of *S mutans*, increasing plaque pH, as well as other anticariogenic effects. The data proves that xylitol chewing gum provides a superior efficacy in reducing caries rates in high-risk populations.[1]

XYLITOL GUM

Xylitol is found in nature in a variety of fruits, berries, and vegetables. It is a 5 carbon-sugar molecule that cannot be utilized by *S mutans* and has been documented to reduce levels of this bacteria if used long enough. It is not fermented by bacteria and is considered to be non-cariogenic.[2] It is extracted from the bark of birch trees for commercial use. The dental benefits of xylitol was discovered in Finland in 1970. The preventive and partly remineralizing effect of xylitol was shown in the Turku Sugar Studies in Finland in 1971-1973.[3] Numerous studies over the past 25 years have suggested that a 5-10 gram daily consumption of xylitol in the form of gum can result in

a 30% to 85% reduction in caries. The specific effects of xylitol are:

1. Enhances remineralization
2. Decreases plaque formation
3. Decreases oral levels of *S mutans*
4. Anticariogenic properties
5. Increases plaque pH

Xylitol gum showed a superior effect with respect to remineralization and plaque reduction.[4] An increased concentration of xylitol in the gum resulted in a lower number of *S mutans* in both saliva and plaque.[5]

It is documented that chewing gum increases salivary flow, which increases the buffering capacity of saliva. Even the use of sucrose chewing gum after meals and snacks (in the presence of fluoride from toothpaste) can enhance the remineralizing potential of the mouth, probably as a result of salivary stimulation.[6] The act of chewing causes the saliva to flow into the interproximal spaces. Salivary flow increases 2.7 times with chewing gum.[7] There is a rapid rise in plaque pH to safe levels above 5.5, after chewing gum, when plaque has been exposed to fermentable carbohydate. The xylitol chewing gum regimen resulted in significantly higher plaque pH than no gum, sucrose gum, or sorbitol gum.[8] The use of sucrose substitutes that provide the hedonistic appeal of sucrose, yet are not fermented by the plaque flora to the low pHs that are associated with caries, is a reasonable approach to caries control.[9] Chewing xylitol gum would have a much greater effect than the sucrose-laden chewing gum pellets currently present in MRE packages. Long-term habitual xylitol consumption decreased the prevalence of *S mutans* in the interproximal areas of the subjects and subsequently decreased the proximal and overall caries indices.[10] Two pellets of xylitol chewing gum should be included in each MRE package with the instructions to chew both pieces for at least 5 minutes after each meal. Chewing for 5 minutes is recommended, because that is when the concentration of xylitol in the saliva is greatest. If the service member is in a field environment where only MREs are served, then 3 MREs daily with 2 xylitol chewing gum pellets per MRE would represent the minimum recommended 3 times a day. This amount is equivalent to the recommended dosage of 5-10 grams of xylitol per day. (The maximum is 2 pieces 5 times a day.) Gastrointestinal intolerance at doses higher than those needed to achieve dental benefits is the only known side effect.

CONCLUSION

Military personnel in a field environment, where high carbohydrate foods are consumed and little or no regular oral hygiene is performed, would benefit greatly from chewing xylitol chewing gum, if it was included in the place of the current sucrose chewing gum in MRE packages. Chewing xylitol gum should be a supplement and not a substitute for good oral hygiene, which should include brushing and flossing at least twice daily. The Michigan Xylitol Programme (1986-95) results suggest that the use of xylitol chewing gum can be considered a valuable additional tool in caries prevention and stabilization of caries in all age groups.[11]

EDITOR'S NOTE: The 2004 Joint Services Operational Ration Forum approved the replacement of sugar gum in the MRE package with xylitol gum. The xylitol replacement gum went into production in 2005 and is currently being incorporated in MREs.

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A Policy Perspective for Army Dentists Performing Posterior Restorations

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ABSTRACT

This study reviews trends and behaviors in both the civilian and Army dental communities with regard to posterior restorations and choices of material for the restoration, and suggests policy perspectives for Army dentists based on this behavior. Items of research interest include provider experience, type of restorative material used, and the survival time of a posterior restoration. Data are obtained from the Washington Dental Service and the Army Dental Care System. The methodology used to review performance is Data Envelopment Analysis. The study shows that efficient dental providers produce longer lasting restorations regardless of material, and there is no difference in survival rate between amalgam and composite restorations when the restoration is performed by an efficient provider. The study has managerial implications for the improvement of military dental services through increased operational efficiency. The study has policy implications for better allocation of Army health resources and improved dental readiness within the military force structure.

INTRODUCTION

The longevity of dental restorations depends on many factors including dental materials, the dentist, and patient hygiene habits. Dentistry is often referred to as a cottage industry, yet the cost of dental services are substantial. In 2001, US national dental expenditures were $65.6 billion, an 8% increase from 2000.[1] Since dental restorations do not last forever, a cycle of restoration replacement is critical within DoD because dental readiness is a requirement for US military force deployment. A systematic review on the literature of the longevity of dental restorations concluded that 50% of all restorations will last 10 to 20 years, although significantly higher and lower survival times have been reported.[2]

Several types of commonly used restorative materials are used for posterior teeth. These include amalgam, composite resin, glass ionomers, gold, and porcelain. Dental amalgam is an alloy of mercury that incorporates silver, tin, copper, and zinc. Amalgam remains a popular dental restorative material because it is versatile, adapts well to use in the wet oral environment, and is relatively inexpensive. Previous studies have found amalgam to be the most cost effective and durable restorative material available.[3-8]

Composite material is a quartz and resin base material that can be matched to the patient's natural tooth color and is seen as more cosmetically pleasing to patients. However, it has been viewed as less reliable for posterior restorations because of increased mastication forces and the potential marginal leakage due to insufficient bonds on large sub-gingival restorations.

Less common restorative materials for posterior teeth include glass ionomers, gold, and porcelain. Glass ionomers are also used in a limited fashion, primarily serving as an interim or temporary restoration. Gold and porcelain based restorations are also options for restoring posterior teeth, but are significantly more expensive.[3-4] Cast gold restorations function well due to similar wear properties to enamel, but laboratory fees significantly increase costs and the restorations generally do not meet the aesthetic concerns of the 21st century. Porcelain restorations meet aesthetic concerns but are expensive and can wear opposing enamel surfaces. The cost of porcelain and gold restorations make them impractical for use within the Army and DoD.

With respect to the two common restorative materials, amalgam has historically been considered the restorative material of choice for most dental providers due to the perception of superior performance and lower cost. However, due to increasing aesthetic concerns of the military population and public

concerns over the safety of amalgam restorations due to the perceived effects of mercury, amalgam restorations may no longer be the consumer or provider restorative material of choice.

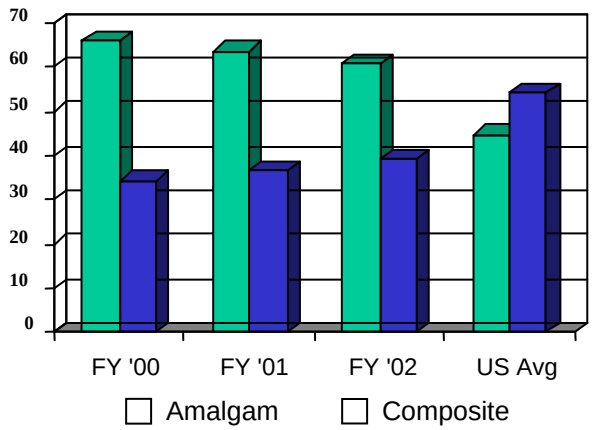
Supporting these public concerns, the 1999 American Dental Association (ADA) Services Rendered Survey reported that 54.1% of all restorations placed in the US in 1999 were composite resin based.[5] This significant shift toward composite use has not taken place in the military, where more effective and less expensive amalgam is still popular. This investigation evaluates the longevity of amalgam and composite posterior restorations, including the impact of efficiency with respect to Army dental providers.

BACKGROUND

In the civilian community, amalgams are more frequently placed on posterior teeth. This is because dental insurance companies are more likely to reimburse a patient for an amalgam restoration on a molar, but decline to reimburse for composite restorations because the amalgam restoration is cheaper and fits the standard of care.[6,7] The ADA conducted a nationwide survey of dental fees in 1999 which found that the average cost (based on the 75th percentile) of an amalgam posterior two-surface restoration is approximately $93, while a similar composite restoration costs approximately $139.[8]

Amalgam restorations in permanent teeth have been the most common operative dentistry procedure in the United States.[9-14] Dentists have avoided placing more aesthetic posterior composite restorations because of their perceived inferiority and higher costs to patients, as well as the likelihood of their being refused reimbursement by the dental insurance companies.[11,15-17] Some researchers suggest that amalgam's acceptable record of accomplishment has established a practice guideline that establishes it as the posterior material of choice in restorative dental practice.[18] Recent research suggests that, in fact, improved materials and techniques are resulting in superior composite restorations, with failure rates virtually indistinguishable from those of amalgam.[19] The results of this study are significant as DoD strives to increase the dental readiness of the force structure while minimizing dental costs.

Though composite restorations are gaining popularity in private practice settings, public settings such as the military and public health clinics may be slower to adopt these practices. The perceived durability combined with being less expensive and technique sensitive makes amalgam the chosen restoration material. The Army Dental Care System (ADCS) provides dental services for the 485,000 active duty Soldiers worldwide and their family members overseas. The system can be viewed as providing dental care in a public health arena. The 1999 ADA data on restorative material use is a reflection of private practitioner trends as the data comes from insurance claims. In that study, 54% of all restorations were composite restorations, while only 46% were amalgam. The figure compares composite and amalgam restorations placed by the ADCS versus the US national average.



Comparison of amalgam and composite restorations placed by the Army Dental Care System from FY 2000 through FY 2002 with the US average.

The trend shown by private practitioners is not consistent with restorations by Army dental providers. In fiscal year 2002, 60.7% of all restorations placed in the ADCS were amalgam, and 38.1% of posterior restorations were composite. The data clearly documents a practical variance between increased use of posterior composite restorations by private dentists versus the amount used by Army dental providers.

Why has the shift to composite resin experienced in the US civilian sector not been mirrored by military providers? One reason may be that military dental providers still view amalgam as the material of choice. Another reason may be lack of training of providers in posterior composite restorations, a situation which could be addressed in continuing education and residency training.

The results of this study have managerial implications at the clinic level and policy implications at the Army level. Currently, Army practitioners make their own decisions of which material to use based on training and their judgment as to the best material for the particular patient. If composite restoration longevity were to surpass amalgams in repeated studies, the Army may want to review existing policies and initiate a continuing education program on the use of posterior resin restorations.

DATA AND STATISTICAL INSTRUMENT

For the statistical part of the study, data were obtained from the Washington Dental Service, Seattle, WA. This dental insurance claims database contains over 1.5 million patient encounters and over 23,000 contributing dentists. Providers and patients are followed from January 1993 through December 1999. A total of 1,240 dentists in the database met researcher selected screening criteria of performing at least one-hundred posterior restorations over 7 years. The final patient sample size included 279,999 restorations, of which 194,484 were amalgams and 85,515 were composites. DEA-Solver Professional Version 2.0 (SAITECH Decision Support Systems, May 2001) was used as the statistical measuring instrument in the analysis. Data were obtained from the ACDS for the policy part of the study.

METHODS

In order to analyze the differing effectiveness of amalgam and composite survival times, this study employs a relatively new technique, data envelopment analysis (DEA). In the DEA methodology, efficiency is defined as a Pareto-optimal allocation of resources. An allocation is Pareto-optimal or Pareto-efficient if production and distribution cannot be reorganized to increase the utility of one or more units without decreasing the utility of other units. Stated another way, efficiency is a simple ratio whose quotient is derived as a function of outputs over inputs where *E = fx (O/I)*. DEA has been successfully applied in numerous examples from many industries, and specifically to the study of health care organizations and professionals.[20-27]

DEA introduces the concept of decision-making units (DMU), in this case the individual dentist, by considering multiple inputs and outputs while identifying the most efficient providers. A DMU is regarded as the entity responsible for converting inputs into outputs and whose performance is to be evaluated. In DEA, *Inputs* are defined as any factor used as a resource by the DMU for producing something of value. It may also be any environmental factor that bears a strong effect on how the resources are consumed. *Outputs* are the amount of goods, services, or other outcomes obtained as a result of the processing of resources or any factor that describes the qualitative nature of the resulting outcome.[26-30] The DEA program algorithm is briefly presented by the following equation[28-30]:

$$\text{Minimize } E = \frac{\sum_{r=1}^{s} ur\, yro + co}{\sum_{i=1}^{s} v_i\, x_{io}}$$

Subject to:

$$\frac{\sum_{r=1}^{s} u_r y_{ro} + c_o}{\sum_{i=1}^{s} v_i\, x_{io}} \leq 1$$

$$u_r \geq 0; \;\; v_i \geq 0$$

Where

E denotes the efficiency score for each dentist in the set of $o = 1 \ldots n$ dentists

y_{ro} is the selected output "r" produced by each dentist in the set "o"

x_{io} is the selected input "I" used by each dentist in the set "o"

y_{rj} is the selected output "r" produced by dentist "j"

x_{ij} is the selected input "I" used by dentist "j"

In this formulation, u_r and v_i are the weights assigned respectively to output "r" (survival time) and input "i", both obtained from DEA. The constant is represented by c_o.

The output variable includes the survival time of the restoration, while inputs represent provider experience, amalgam, and composite materials. When the aforementioned equation is linearized for conceptual purposes, the efficiency formulation of a dentist can be expressed as:

$$\text{Efficiency} = f\,[(\text{survival time})/(\text{amalgam} + \text{composite} + \text{provider experience})]$$

Efficient dental providers receive an efficiency score of 1.0.

RESULTS

Table 1 displays frequencies for efficient and inefficient providers. Table 2 shows that 122 providers, which constituted approximately 10% of the study population, were found to be efficient. Table 2 suggests a disparity between efficient and inefficient providers. The average material survival time for efficient dentists is 46.47 months, for inefficient dentists it is 41.79 months. Efficient dentists have an average restoration longevity of 4.7 months longer than that of the inefficient providers. An interesting finding is that the average experience for efficient dental providers is approximately 25 years, whereas inefficient providers have approximately 5 years less experience. The difference is significant (ρ <.001, χ^2 = 18.98). The results suggest that efficient providers are, on average, 17% more experienced than inefficient providers. Efficient providers also performed 44% of their total replacements with composite material, while inefficient providers used composite material only 29% of the time. This suggested that in order to become efficient, inefficient providers should perform more composite restorations.

Table 1. Frequencies of provider services for amalgam and composite restorations between inefficient and efficient providers.

	Inefficient Providers		Efficient Providers	
	Encounters	**Percentage**	**Encounters**	**Percentage**
Total	216,376		15,607	
Amalgam	152,693	71%	8,695	56%
Composite	63,683	29%	6,912	44%
Amalgam Severity 2 Surface	61,891	40.59%	3,787	43.55%
Amalgam Severity 3 Surface	61,237	40.10%	3,096	35.61%
Amalgam Severity 4 Surface	29,475	19.30%	1,812	20.84%
Composite Severity 2 Surface	35,639	55.96%	3,814	55.18%
Composite Severity 3+ Surface	28,044	44.03%	3,098	44.82%

Table 2. Comparison of age, experience, and survival times of restorations between efficient and inefficient dentists.

	Inefficient Providers	Efficient Providers
Total Number	1,118	122
*Provider years of experience	20.25	24.5
Average survival time of restoration (months)	41.79	46.47
Mean age of dental provider	46.7	50.9

*Chi-square (χ^2) = 18.98 ρ < 0.0001

Post hoc analysis was performed, and iDEAs-W was used to identify theoretical possibilities for improvement of the inefficient population of dental providers. A virtual output/virtual input quotient was calculated to achieve an Iota (ι) value by balancing projections of inefficient provider properties along the efficiency frontier. Projections provide information on the relative changes required by each dentist that must be made in order to reach the efficiency frontier.

Iota is obtained by standardizing the total weighted distance by the virtual input. Iota values are a measure of total inefficiency in terms of proportional input reduction. An Iota value less than one ($\iota < 1$), indicates inefficiency. A $\iota = .5$ indicates that the DMU should be able to decrease input by 50% to be efficient. The theoretical model in this case returned an $\iota = .807$, suggesting that only 20% of dentists in this population are capable of achieving efficiency with 5 years additional experience without changing their amalgam based practice pattern.

DISCUSSION

This study suggests that the longevity rate of a restoration is related to the experience of the provider. This is particularly important within the Army because dental health status is critical for individual and unit deployment. The results also suggest that providers who work with amalgam, regardless of severity, are less likely to be efficient than are providers who work with composite restorations. This is significant because amalgam is the compound of choice within the Army. The finding may suggest that less experienced providers may need additional continuing education focused on the placement of posterior resin restorations, since 71% did not use composite material. This is an appropriate area for further study within the Army.

The research suggests a positive correlation between experience and success for procedures. The growing options for dental restoration within private industry will also become a growing trend for Army consumers in the years to come. From a managerial perspective, military dental clinics have not traditionally given patients options. As a result, managers in military dental clinics may encourage dental providers to practice both amalgam and composite material restorations in order to increase efficiency and quality.

Military dentists who wish to improve efficiency are challenged to implement meaningful programs and services that can positively affect military readiness. This study clearly demonstrates that Army dental clinics may be missing an opportunity to improve efficiency by expanding the use of composite restorations. Additionally, it is clear that as the level of efficiency of dental providers increases, the quality and longevity of the dental restoration also increases. Improvements in the training of Army dental providers will provide better patient care and ultimately increase the life of a posterior restoration. This will result in increased military readiness. Therefore, Army dental clinic managers are encouraged to integrate the use of composite restorations and improved provider training in their strategic planning process to ensure operational efficiency and improve military readiness.

POLICY IMPLICATIONS

This study suggests that provider experience and practice patterns are key indicators for the success of a posterior restoration. This finding is particularly important within the Army where recent dental graduates compose a large percentage of the general dentistry provider force. These results would suggest the Army should invest additional training funds early in a dentist's career to improve their practice efficiency. Also, it may be appropriate to consider the range of clinical practice, quality of practice, and efficiency of practice. The results also support the use of retention bonuses later in a dentist's career to retain efficient providers.

Military dentistry continues to seek best practices as a method to improve quality and reduce costs. If posterior composite restorations were found to last longer than amalgam, long-term cost savings could be realized by extending the replacement cycle of restorations. Future research in restoration compounds that address the replacement cycle could reduce costs and enhance the deployability of individuals in military units. Since this study shows employment of experienced providers results in 4.7 months of longevity in the restoration and improved dental fitness of the population, the findings stress the importance to the military of hiring experienced dentists. This can be achieved by selective hiring from dental schools or the use of hiring bonuses for dentists in private practice. Additionally, a retention bonus

may be a sound economic investment to encourage experienced dentists to remain on active duty.

The data also suggest that dental providers with a more restricted scope of practice (i.e., higher percentage of amalgams regardless of severity) are less likely to be efficient than those dental providers with a broader scope of practice (i.e., higher percentage of composite restorations). While this finding may have different implications within the Army due to unique practice settings, it does suggest that inefficient dental providers should broaden their scope of clinical practice to include both amalgam and composite restorations to become efficient. By providing additional training to dental providers, it is possible to improve the overall rate of efficiency leading to an improved state of dental readiness and lower overall costs.

This study has implications within the Army because military readiness is affected by the choice of dental materials. During the recent mobilization of forces for Operation Iraqi Freedom, approximately 25% of the reserve component Soldiers had emergent dental conditions effecting their deployment. Over half of those emergent conditions were corrected with dental restorations. The prevailing thought is that posterior amalgam restorations should be utilized on this high-risk group. However, the research suggests that composite restorations can last as long or longer than amalgams when performed by an experienced provider.

The results of this study suggest that dental experience is key to restoration survivability. However other factors bear mentioning. The first factor addresses patient preference and the policy implications of preference. As already mentioned, the use of composites has recently exceeded amalgam for the first time in the civilian practice setting. Clearly, patients are interested in composite restorations. Reasoning behind this trend may be explained through Rogers' diffusion of innovation theory.[31] In brief, tenets of the theory suggest that the relative advantage, compatibility, and observability of an innovation (composite resin) will positively increase its adoption by (in this context) dental patients. Many patients and some dental professionals remain concerned about the effects of mercury in amalgam, despite clinical studies dismissing the risk. Thus composite has a perceived advantage of being a safer alternative to amalgam. In addition, the aesthetics, or cosmetic value, of composites versus amalgam is immediately observable to patients and quite compatible with the current societal pressure to maximize one's appearance. In summary, the perceived advantage and concerns over one's appearance have served to create a strong public demand for the use of composite resin and have given patients a viable choice. By offering composite restorations to military beneficiaries, the Army may gain a strategic advantage in recruitment and retention leading to a significant increase in patient satisfaction.

Surprisingly, only 70% of all North American dental schools teach their students how to repair a resin-based composite dental filling.[32] The gaining popularity of this material combined with the similar longevity identified from this study necessitates composite repair practices at all schools. From a policy perspective, the Army may want to ensure similar coverage is offered to all military beneficiaries.

SUMMARY

There have been few long-term studies of the longevity rate of amalgam or composite material and none that have considered the experience of the provider in the longevity rate.[33,34] This study has important implications for the Army because it suggests that experience is a key factor in the longevity rates of composite restorations.

Since experience is such a significant factor in restoration longevity rates, this study has implications for provider selection, training, retention, and specialty pay. Additionally, the study may improve the level of efficiency of practice within military dental clinics as well as improve the deployability of active duty and reserve military members. A 10% increase in efficiency would result in significant cost savings and an improved readiness posture for the military. The impact of a 10% increase in efficiency created by the 4 -month increased longevity of restoration is even more important because it represents a long-term system-wide saving that is compounded as newer materials and procedures are used throughout military dental care. More importantly, the financial savings are enhanced by the improved deployability of the active duty and reserve forces.

Portions of this article were included in the presentation "Performance of Dental Providers on Restorations — A DEA Evaluation" at The 16th Triennial Conference of the International Federation of Operational Research Societies, 8 – 12 July, 2002, hosted by the UK Operational Research Society, University of Edinburgh, Scotland.

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2005 Spurgeon Neel Writing Competition Winners

COL Thomas Munley, Executive Vice-President of the Army Medical Department Foundation, has announced that CPT Kevin Goke, William Beaumont Army Medical Center, Fort Bliss, TX, and 1LT Rene De La Rosa, Brooke Army Medical Center, Fort Sam Houston, TX, has been selected as winners of the 2005 Spurgeon Neel Writing Competition. CPT Goke is a psychiatric nurse and 1LT De La Rosa is a medical-surgical nurse.

The article by CPT Goke and 1LT De La Rosa, titled "Mental Health Services at FOB Abu Ghraib: Nafsea (Psychology) Through the Wire" appeared in the July-September 2005 issue of the *AMEDD Journal*. The article provides a look at the history and current medical and mental health care provided to both US troops and Iraqi detainees. The judges determined that this article best exemplified the history, legacy, and traditions of the Army Medical Department.

As Neel Writing Award winners, CPT Goke and 1LT De La Rosa will divide a $500 monetary prize and receive specially-designed medallions that will be presented at an AMEDD Museum Foundation special event in March.

CORRECTION

In the October – December 2005 issue of the *AMEDD Journal*, the table "Brooke Army Hospital Residents 1947 – 1962" in the article "Development of Army Residency Programs: Pathology at Fort Sam Houston" contained incomplete information for several entries. Correct information for those entries is provided herein. The *Journal* regrets the error.

NAME	BIRTH	SCHOOL	RESIDENT	DEATH	LOCATION
Grahm, Harvey P.	1917	Duke '52	57-61	12/17/99	Suwanee, GA
Keller, Edward S.	1924	McGill '55	57-58	11/26/90	Everett, WA
Lardinois, Clifford C.	1919	Wisconsin '51	52-55	10/13/94	Huron, SD
Snyder, Dale R.	1927	Pennsylvania '54	56-59	10/27/02	McLean, VA
Van Auken, Howard A.	1904	Michigan '31	48-51	10/18/83	San Antonio, TX

The US Army Medical Department Regiment

The US Army Medical Department was formed on 27 July, 1775, when the Continental Congress authorized a Medical Service for an army of 20,000 men. It created the Hospital Department and named Dr. Benjamin Church of Boston as Director General and Chief Physician. On 14 April, 1818 the Congress passed an Act which reorganized the staff departments of the Army. The Act provided for a Medical Department to be headed by a Surgeon General. Dr. Joseph Lovell, appointed Surgeon General of the United States Army in April 1818, was the first to hold this position in the new organization. The passage of this law marks the beginning of the modern Medical Department of the United States Army.

Throughout its early history, the size and mission of the US Army Medical Department would wax and wane in response to military events around the world. There was, however, no formal regimental organization until World War I. Then, in the late 1950s, the brigade replaced the regiment as a tactical unit. In the reorganization that followed, some Army units lost their identity--their lineage--their history. This loss did not go unnoticed and the US Army Regimental System was created in 1981 to provide soldiers with continuous identification with a single regiment. Department of the Army Regulation 600-82, The US Army Regimental System, states the mission of the regiment is to enhance combat effectiveness through a framework that provides the opportunity for affiliation, develops loyalty and commitment, fosters a sense of belonging, improves unit esprit, and institutionalizes the war-fighting ethos.

The US Army Medical Department Regiment was activated on 28 July, 1986, during ceremonies at Fort Sam Houston, in San Antonio, Texas, the "Home of Army Medicine." Lieutenant General Quinn H. Becker, the US Army Surgeon General and AMEDD Regimental Commander, was the reviewing officer. He was joined by general officers of the US Army Reserves and the Army National Guard, representing the significant contributions and manpower of the reserve forces in the Total Army concept.

This Regimental web site (http://ameddregiment.amedd.army.mil/default.asp) is designed to provide you with useful information about the US Army Medical Department (AMEDD) Regiment. Through the web site, you can learn the history of the AMEDD Regiment, the symbolism behind our heraldic items, how to wear the Regimental Distinctive insignia, and various programs available to you and your unit.

The Office of the AMEDD Regiment is located in Aabel Hall, Building 2840, on Fort Sam Houston, Texas. The Regimental staff can provide further information pertaining to the history of the Army Medical Department, the AMEDD Regiment and assist with any of the services described in this web page.

For additional information please contact the Army Medical Department Regimental Office at the following address:

Commander
US Army Medical Department Regiment
ATTN: MCCS-GAR
2250 Stanley Road
Fort Sam Houston, Texas 78234-6100

The telephone number is Commercial (210) 221-8455 or DSN 471-8455. The fax number is 8697.

The email address is amedd.regiment@amedd.army.mil

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