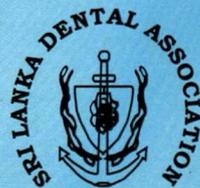


# Sri Lanka Dental Journal

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## EDITORIAL

### SOFT SKILLS IN DENTISTRY

There is no doubt that a dentist typically needs a repertoire of technical skills for a successful practice. However, like in many other professions, in the field of dentistry too, knowledge and technical skills are not the only prerequisites for a good practice.

In addition to technical skills, which dentist do people prefer to go to? The one who is pleasant and takes time to answer your questions; or the one who treats you like a number in a long line of numbered mouths? The answer is clear. This is where soft skills come into play. From the patients point of view, soft skills are the decisive factors which differentiate a good dentist from a 'bad' dentist and not the technical competency. The leading article in the present issue of the SLDJ gives a clear view about the significance of soft skills and their applicability in various aspects of dentistry in brief. I am sure that this is an eye opener for most of us who are not totally aware of the subject.

Soft skills or the ability to communicate effectively with patients-in particular, to use active listening skills, to gather and impart information effectively, to handle patient emotions sensitively, and to demonstrate empathy, rapport, ethical awareness, and professionalism-are crucial for a dentist to be a successful practitioner. Among the other benefits noted, when dentists demonstrate effective communication skills patient satisfaction and improved patient adherence to dental recommendations are increased and patient

anxiety, lower rates of formal complaints and malpractice claims are decreased.

Further, soft skills are needed to identify ethical issues, and to recognize significant psycho-social factors that lead to more accurate diagnosis and treatment processes, thereby increasing patient satisfaction and safety.

Both teaching and learning communication skills /soft skills can be very challenging, as communication skills are often viewed as an intrinsic part of the person's personality, cognitive functioning, and social experience. However, having correctly identified the challenge and the need of the day, soft skills training needs to be integrated into the dental curriculum, in order to train our dentists to be suitable for the modern day world.

**Upul B Dissanayake**  
**Editor**

## **Soft skills for success as a dentist**

**Nilmini Wanigasooriya**

In his best seller 'Emotional Intelligence' and other books that followed, Daniel Goleman an American psychologist argues that intelligence (IQ) is a poor predictor of success, in comparison with certain non-cognitive skills. Emotional Quotient (EQ) has since been shown to be a much better predictor of success than IQ. 'Soft skills' referring to a cluster of skills and abilities related to Emotional Intelligence is now accepted as being as important as 'hard skills' (technical skills and intellectual competence) for success, if not more.

Dentists should acquire a number of hard skills which are its occupational requirements, before he/she is admitted into the profession. Hard skills are job specific, easily specified and measured, and can become obsolete with advancements in the field. In dentistry they would be the skills in diagnosis, planning of treatment, and the technical skills required in carrying out clinical procedures. Soft skills on the other hand are more generic, and cannot be measured so readily. Unlike hard skills they do not become obsolete with time.

What are these soft skills? A search of the literature on the topic would yield an almost interminable list of such skills. They comprise basically of two categories: namely inter-personal and intra-personal. Inter-personal skills include everything that plays a role in relationships with other people, such as language, written and oral communication, friendliness, relationship-building, team and leadership skills, social graces, personal

habits, attire, grooming and others. Intra-personal skills on the other hand refer to mind skills which do not involve others, such as analytical skills, critical thinking, problem solving, creative thinking and innovation, self motivation, planning/organizing, time management, adaptability, stress tolerance, and personal development.

In dentistry, as in most other professions, while all these may be considered important, communication skills may be highlighted as the most important. All or most Interpersonal soft skills, hinge on communication skills. Dentistry.com, a web page that introduces dentistry to the would- be professional has this to say about communication skills. "For starters, communication skills are probably the most important skill you and your staff can develop. Those of you who have honed your interpersonal skills will ultimately be financially successful."

There are several different aspects of communication like public speaking, making presentations, and written communication. Among all these interpersonal communication skills on a one to one basis, may be cited as the key element that determines the ultimate success or failure of a dentist. It cannot be iterated too much, that the ability to interact successfully with a wide range of people, to work with and gain the cooperation of difficult people, is indispensable to the successful practice of dentistry. Some may even argue that communication skills should be considered among hard skills for doctors and dentists.

There are many ways in which good communication skills benefit the dentist, that have been substantiated by research. Good communication skills allow the dentist to relate well to the patients, elicit complaints better, manage anxiety, identify ethical issues, and recognize psycho-social issues, which would lead to more accurate diagnoses and treatment processes.<sup>1,2</sup> Good communication is closely linked with patient satisfaction. Patient satisfaction in turn influences several aspects related to dental treatment. A patient who is satisfied with the dentist, is more likely to cooperate better with the dentist during dental procedures, which in turn results in better quality of treatment.<sup>3</sup> Where cooperation in the long term is needed, for example in Orthodontic treatment and Periodontal Therapy this becomes even more important. Good communication also leads to better compliance with drug regimes and keeping follow-up appointments.

Patients are generally not competent to assess the technical competence of dentists, but they continually make such assessments, in making decisions about selection of dentists, etc. it has been shown that such decisions are most likely to be based on interpersonal factors such as 'communication' and 'caring'.<sup>4</sup>

Good communication has been shown to improve physical parameters such as blood pressure and pain control in medical patients. Anxiety resolution, better emotional health and other psychological benefits have also been reported.<sup>2</sup> Pain being the primary concern of many patients seeking dental care, better pain control leads to greater patient satisfaction.

Dissatisfaction with dentist is identified as the main reason for changing dentists.<sup>3</sup> Among patients who express dissatisfaction with the dentist, the most important reasons given are connected with communication skills. A good communicator is likely to retain his/her patients longer, perhaps for life. Satisfied patients are more

likely to recommend the dentist to others, which is the commonest way for people to find a new dentist. Legal action against the doctor is less likely from satisfied patients. A high proportion of litigation is in relation to communication problems.<sup>5</sup> It has been shown that the level of communication is more closely related to the intention to sue than the quality of treatment.

Communication and interpersonal relationships form an important component in working in teams be it as a leader or member. The importance of leadership and management skills in private practice, is now well recognized. This has prompted top end dental training institutions to include a substantial amount input in this area in their undergraduate training.<sup>6</sup> There is a trend among newly qualified dental graduates in Sri Lanka to opt for private practice early in their career, making this an important consideration in the training. Building of effective teams, gaining the cooperation of others, motivating and empowering others to act, are skills that become very important in developing a practice. Poor communication among the members of the dental team in a practice leads to dissatisfaction and a high turnover among them. Good communication skills and a participatory approach to management and decision making, leads to less job related stress and improved team member satisfaction.

Good communication with patients results in direct benefit to the doctor as well. Among physicians and dentists, those who practice better communication skills have been shown to experience higher levels of job satisfaction. It is well known that dentistry and even dental undergraduate programs give rise to high levels of stress. This seems to be true of the dental undergraduates in Sri Lanka, as well (unpublished data). With stress being identified as a killer, lowering of stress should surely be considered as a great benefit.

There is an ever increasing body of evidence of the benefits of good communication skills in dental

practice. The developed world has recognized the importance of communication skills in dentistry, and several registering bodies now insist on sufficient training in communication skills as a mandatory requirement of undergraduate training programs. The developing world seems to be either yet not fully aware of this or is slow in responding adequately to it. Although there is insufficient research on the extent to which communication skills affect patient and practice outcomes in the local setting, it may be safely assumed that it is rising. The explosion in information technology, making information more and more easily accessible, has seen the level of awareness of the public about dentistry increase. Litigation in the private as well as the public sector is on the rise. With more and more dentists opting for private practice competition among dentists is increasing.

Good communication in a dentist is beginning to play a much more important role than it used to, and sufficient attention in practice, as well as in the training of dental surgeons is timely to avert the possible negative impact on the profession.

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## Endodontics; evolution unveiled

E.M.S.A. Edirisooriya and K.A.Wettasinghe

Gone are the days where you extract a tooth, simply because a patient comes running to you with symptoms of irreversible pulpitis, or an abscess. Root canal treatment (*or nerve filling as a layman would call it*) has become the most prudent, legally-safe as well as the most 'lucrative' option in such a situation for us as dentists.

Nevertheless, in contrast to the popular belief, 'Endodontics' is not solely and merely 'root canal treatments (RCTs)'. In a nutshell, 'endodontics' comprises of all the procedures and techniques used in dentistry, to 'preserve the vitality' of a healthy or an injured pulp, or to 'preserve the tooth' by nonsurgical or surgical treatment of the root canal where the pulp is irreversibly damaged or dead.

Humans have evolved into the dominant species of the earth. The 'power of thought' has become the Aladdin's lamp granting them with unbelievable abilities which make almost anything possible. But the majority of us follow what is accepted and traditional, and only a few brave individuals can think beyond the usual norms, to make what they practice, changes for the better. Every time you think that a particular technique has made a certain task remarkably easier, compared to the techniques used in the past for

the very task, keep in the back of your mind that it didn't happen overnight, and some diehard soul would have committed years or even a lifetime, sacrificing many things and bearing tremendous criticism to introduce that new procedure.

Like all other health related sciences, endodontics too evolved in random bursts. If we look back a decade, a century or even a couple of centuries, we can see short periods of innovation and creativity and long periods of relative quiescence. There had been major breakthroughs, as well as major setbacks, but both had played their parts in sculpting this wonderful field of dentistry.

Specialist and the dental surgeon alike should be familiar with how contemporary endodontics we practiced today came about, and the people they should be thankful for the advancements that had taken place. *You should never forget your roots!!*

### *Before the Dawn of Time: Before 1800*

The very first evidence of endodontics seems to surface from Asia. Chinese and the Egyptians were the first to contemplate about dental caries and alveolar abscesses<sup>1-10</sup>. The Chinese brought forward '**The Worm Theory**'<sup>11</sup>. This described of a white worm with a black head, which lived

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within the tooth. The theory was not disproven until mid 1800s, and hence the worm had to be killed to treat the abscessed tooth. Arsenic was the material used despite the extensive tissue destruction it caused, if and when it leaked into soft tissues even in minute amounts.<sup>12</sup>

The Romans and the Greeks destroyed pulps by cauterization with a hot needle or boiling oil or with a mixture of opium and Hyoscyamus. Even as far back as the first century, people knew that there was no better way to relieve pain from an abscessed tooth than drainage; there still isn't.

In the 16<sup>th</sup> century pulpal anatomy was described. This opened up whole new spectra of avenues and possibilities in endodontics. Before long there were two types of dental operators; the type who extracted teeth and the type who preserved teeth. The 'preservers' tried to cauterize the pulp first by the use of a red-hot cautery or a strong acid. They also tried using leeches to treat an abscessed tooth. *The authors would like to acknowledge the sacrifices the operators and the patients would have made to perform and undergo these procedures, at a time when 'local anaesthesia' was unheard of!*

The preservers did not stop there, when all else failed they removed a tooth from one person and transplanted in to the mouth of another, with no regard of transmitting diseases between donor and recipient. *The concept of universal precautions had no place in this universe back then.*

In 1778, English dentists John Hunter and Joseph Fox advocated transplantation of teeth. Live and dead teeth were transplanted as a result, and this was further encouraged by the fact that dentures were ill-fitting and foul smelling, as a result of being made from ivory or bone. Hunter boiled teeth to remove soft tissues and inadvertently and unknowingly sterilized the tooth, which in turn protected the recipient from various venereal diseases. Transplanted teeth did not come cheap.

Live tooth transplantations and dead tooth transplantations cost 5 pounds 5 shillings and 2 pounds 2 shillings respectively.<sup>1-10</sup> *Considering the 300 years of inflation, the contemporary implant supported prostheses are quite cheap!*

#### *A long long time ago: From 1800-1900*

In this era endodontics became advanced due to the discovery of Local Anaesthesia, Gutta Percha and X-rays.<sup>1-10</sup>

#### **Local anaesthesia**

At the beginning of the century Sir Humphry Davy described the analgesic property of nitrous oxide (NO), in various surgeries.

A half a century later this so called 'laughing gas' was stumbled upon by Horace Wells. This brave soul practiced what he was about to preach, and got one of his own teeth extracted under NO, at the competent hands of Dr. John Riggs in 1844. However, in the public demonstration he had at the Massachusetts Central Hospital, he was unable to obtain analgesia. In spite of this, dentists started using NO, and it is still being used for relative analgesia, which is the main stay in conscious sedation in dentistry.

Cocaine was available in a syringe since 1884. This was a major step forward for dentists and the first block injection was performed by Dr. William Halsted in 1885.

#### **Gutta percha**

Gutta-Percha (GP) is the 'eternal' root canal obturation material. In 1843, Sir Jose d' Almeida introduced GP (*trans-polyisoprene*) simply as an isomer of natural rubber (*cis-polyisoprene*). GP is harder, brittle and less elastic than natural rubber.

GP was accepted as a root filling material in 1847, but was used simply to form a baseplate with calcium oxide or to keep arsenic from leaking

out of the canal. Arsenic was the pulp devitalizing agent at the time, and was extremely destructive to the periodontium and caused excruciating pain and gingival sloughing if it leaked out.

In 1867, G.A. Bowman envisaged GP to be the ultimate filling material for root canals, and came up with the cones that conform to the diameter and the shape of the prepared root canal. Since then, other than the incorporation of metal salts (eg. *Barium sulphate*) that makes it radiopaque, and other minor improvements, this fantastic material remains one of the most exclusive substances, that had lasted centuries serving the human race, without been superseded or obsolete.

### X-rays

In 1895, Wilhelm Konrad Roentgen discovered x-rays; the tissue penetrating wave length of the electro magnetic spectrum.

Merely two weeks after Roentgen's discovery, another free thinker and an eminent endodontist at the time, Professor Otto Walkhoff took a radiograph of his own teeth. He lied flat on the floor, facing the x-ray machine, biting the sensitized glass plate and exposed himself for 25 'minutes'. Thereby he produced the world's first dental radiograph which was actually a 'bitewing' radiograph.

### From 1900 to 2000:

#### The Science behind....

William Hunter virtually eradicated endodontics and annihilated the endodontists, when he put forward the '**Focal Infection Theory**' in 1911.<sup>1-10</sup> To date the field of endodontics has not received a severe blow than this. Hence, it is worth probing in to how he came up with this 'knockout uppercut'.

In 1904, Frank Billings discovered the apparent relationship between oral sepsis and bacterial endocarditis. One of his students E.C. Rosenow described a '**focus**' as a well circumscribed tissue

containing pathogenic organisms. He further described that an organism from an alveolar abscess could spread haematogenously and give rise to metastatic infections like endocarditis, appendicitis, gastritis and even pancreatitis. However, it's reasonable to state that after analyzing these findings William Hunter blew this concept way out of proportion.

People believed him, and the credulous public thought 'bad breath' as a symptom of whatever the disease they had. Consequently all the teeth with the slightest decay, were extracted in extensive numbers. This mass sacrifice of teeth is etched in history as the highest number of teeth extracted in any single era.

Thirty years went by when finally the defenses of the focal infection theory was brought down, and this was by extensive laboratory and clinical studies. However even in the 'dark times' that passed, some dental schools advocated root canal therapy for anteriors and premolar teeth, but the molar teeth were removed. (*Strangely this is still practiced today, by a few dental surgeons who have not updated themselves and continue to live in 'dark times!'*)

In 1931, Rickert and Dixon, formulated the '**Hollow tube theory**', and presented it at the 8<sup>th</sup> international dental congress which was in Paris, France. This stated that all the hollow tubes in the body must be obturated, as there is a chance of tissue fluid entering the tube and forming toxic products. However it was later proven that, hollow tubes are well tolerated, and what was important was the prevention of ingress of bacteria or fluid into that space, via the oral cavity or bloodstream (Anachoresis).<sup>1-10</sup>

In 1965, Kakehashi, Stanley and Fitzgerald, experimented with germ-free rats and conclusively proved that pulp and periapical problems are primarily due to microbial contamination of the root canal system. Thereby they proved beyond a doubt what was already speculated at the time.<sup>1-10</sup>

### **The Instruments Unleashed....**

Since 1838, when Edwin Maynard introduced the first ever root canal instrument, which he created by filing a watch spring, there were no significant equipment to instrument root canals until the 'Reamers' came in to the scene. Along with the Barbed-broaches these provided remarkable cleaning and shaping capabilities of the root canal. Stainless steel was the material of choice, because just like the name implies it did not stain, i.e. corrode, in the moist oral environment.

Yet again proving that 'nothing lasts forever', reamers were superseded by K- files for which the patent was obtained by the Kerr Company in 1931. There were only minor changes to this wonderful design subsequently, and as a result a whole plethora of endodontic instruments sprang up. There were H files, K flex files, flexofiles and S files etc...

The production of files by different manufacturers had dentists being divided among themselves, endorsing the type of the file that they found most convenient and efficient. Therefore, at the second international conference for endodontics in 1958, Ingle and Levine emphasized the need for standardization. As a result the International Organization for Standardization (ISO), and the American National Standards Institute (ANSI), collaborated in the standardization of the endodontic instruments. *The files used today are colour coded, have specific lengths, uniform handles and identifying symbols etc...*

The introduction of Nickel-Titanium alloys to the field, were what all the curved molar roots were praying for, when 'they' suffered terrible fates, at the hands of any operator, who carelessly instrumented without pre-curving their K-files. The super flexible Ni-Ti file negotiated and travelled the canals with ease and the incidence of procedural accidents was significantly reduced.

### **The Techniques Unraveled....**

Cleaning the root canal system and shaping it, was the cardinal requirement of any root canal

treatment. In the nineteenth century, Leeches were used to treat abscessed teeth and 'suck out' the infected blood. In the twentieth century this task was handed over to the Maggots.

Once the filing instruments came into use, dentists experimented with various ways to clean the root canal system completely without unduly removing sound dentine. The '**Standardized technique**' was introduced by Ingle in 1961 as a result. However, this technique gave rise to the 5 most common procedural accidents that happen during instrumentation. i.e. Apical blockage, Ledging, Zip formation, Perforation and Strip perforation. Clem (1969) and Mullaney (1979) stated that filing from apical to coronal with recapitulations reduced these problems. They called it the '**Stepback technique**'.<sup>13</sup>

In the search of a technique to eliminate procedural accidents completely, the researchers discovered the '**Stepdown technique**'. This was suggested by Schilder (1974) and was published by Goerig (1982).<sup>14</sup> The particular technique involved the coronal enlargement prior to the instrumentation of the apical part. The technique had been further modified in to two other variations. Some authorities believe even though used infrequently, the '**Double flared technique**' (Fava, 1983) and '**Crown-Down pressure less technique**' (Morgan & Montgomery, 1984) are derivatives of the stepdown technique.<sup>15,16</sup>

Movement of the files inside the canal also had its fair share of evolution. From the reaming action it changed to the filing action. To prevent strip perforation, Abou-Rass (1980) suggested '**Anti-curvature filing**' in curved root canals.<sup>17</sup> Nevertheless the breakthrough manipulative technique was the '**Balanced-force technique**'. Roane *et al.* introduced the technique in 1985, and the success it generated had the operators calling it the 'Roane technique'.<sup>18</sup> *It is strongly suggested that a standard textbook on endodontics must be referred to, by all the dental surgeons who are keen in improving their knowledge.*

### Medicaments Unconcealed....

Root canal medicaments are classified into several groups; namely irrigants, lubricants, sealers, intra-canal dressings and devitalizing agents. Obviously no single chemical fulfills all the requirements to be accepted as the universal medicament.

History reveals very little about how irrigants and lubricants came about in contrast to the documented 'archeological' evidence that is found regarding devitalizing agents etc... . It was mentioned earlier how arsenic was used as the principle medicament, to destroy inflamed pulps for over a hundred years, all the way up to the nineteenth century. Back then patients didn't know whether to opt for the excruciating pain of the sudden thrust of a wooden pin or the severe pain of arsenic induced gingival sloughing.

During the same era some dentists experimented with pouring hot oil or applying acids to the pulps as means of devitalization. In 1874, Adolf Witzel of Germany introduced 'mummification' of the pulp. A few years later A. Gysi came up with the 'Trio-paste' which contained formaldehyde, tricresol and creolin. This combination of chemicals satisfied the criteria of an ideal mummifying agent by being a potent antiseptic, penetrating and coagulating pulps and not irritating periapical tissue.

John P. Buckley formulated '**Formocresol**' in 1906, which soon became the medicament of choice for pulpotomy procedure, gaining the trust of endodontists for decades. Even though it is still being used today, more and more authorities discourage its use due to the carcinogenic potential of formaldehyde in it.

In 1856, ZnO was introduced as the first cement that came into dental use. The formulation was at its primitive stage and hence invariably hardened before it reached the apex of the root canal during treatment, thus complicating it. The evolution of cements and sealers has moved

forward rapidly in the past decades, resulting in resin sealers (eg. AH+) which more or less satisfy the requirements of an ideal sealer. (*Excellent working time, radiopaque, less irritant etc...*)

1930, was the year that bears most significance with respect to the root canal medicaments. It was the year, B.W. Hermann discovered the pulp preserving capabilities of Calcium Hydroxide (CaOH). A countless number of deciduous and permanent teeth were rescued and their vitality was saved by him as a result<sup>1-10</sup>.

Enlarging the root canal is still one of the prerequisites of obturation. For many years Suphuric acid served this purpose, despite the relatively high incidence of accidental soft tissue damage. This is now replaced by viscous preparations of EDTA (Ethylene Diamine Tetra-acetic Acid), which is a very safe alkaline agent.

Enlarging a root canal by dissolving the inorganic component of dentine is achievable, only if the canal was free of pulpal debris and microorganisms. Consequently, use of an irrigant became necessary in root canal treatment. Hydrogen peroxide was initially used as the irrigant, but despite its bactericidal ability, it gave rise to bubbling and emphysema in the periapical region. The current literature encourages the use of sodium hypochlorite (NaOCl) (5% or diluted), and as long as it's contained within the canal space by not injecting against pressure, it shows very little adverse effects.<sup>19</sup> NaOCl has excellent antibacterial and debris dissolving properties, which can be further enhanced by warming it up.<sup>20</sup> However, its irrigant properties are at its best when it's used with an ultrasonic device.<sup>21</sup> The use of ultrasound, through a suitable instrument inside the root canal achieves superior cleaning by acoustic micro-streaming.<sup>22</sup> Chlorhexidine and EDTA solutions have also been suggested as irrigants by some dentists, although they show either antibacterial property or dissolving property but not both.

When root canal treatment cannot be completed in a single visit either due to a weeping periapical lesion or due to time restraints, an intervisit intracanal dressing is placed to stabilize the condition. In the past such a canal had been left open to the oral cavity expecting it to drain, or sometimes packed with cotton or even formocresol. At present it is accepted worldwide that the ideal intracanal dressing is calcium hydroxide. The non setting variants either water or Iodine based has a high pH that would neutralize bacteria, suppress inflammation and stimulate odontoblasts and osteoblasts. It further creates an environment to repair perforations and prevent pathological resorption. Much like Gutta-Percha, calcium hydroxide has become a major contributor to the advancement of endodontics, since its introduction in 1930.

#### ***Not too distant past: From 2000 and beyond***

Contemporary endodontics is a specialty that transcends many aspects that dentists had only dreamed of a couple of decades ago. On a regular basis the dental surgeon is being equipped with new instruments, materials and techniques, enabling him to 'boldly go where no man has gone before'.

Preparation of the root canal is no longer stated as 'cleaning and shaping'. With the concept of the root canal as a system rather than a single canal, the use of irrigant following the shaping of the canal is mandatory, and hence it will be referred to as 'shaping and cleaning' in the future.<sup>23</sup>

The progressive dentists are gradually moving away from the standard files into proprietary file systems that have clinically proven to be more time-saving and efficient. (*Even though not used for all teeth*) When using the 'Greater taper system' (Buchanan) or the more widely used 'Protaper system' (Densply), instrumentation is relatively easy and it is even easier to obturate.<sup>24</sup> The rotary endodontics or use of these files on

engine driven hand pieces has significantly reduced chair side time. GP is no longer introduced as cones. There are systems that plasticizes GP by heat, which can then be syringed into the canal under pressure to obturate even the tiniest lateral canals. *Obtura* and *System-B* are two such systems that have gained popularity in the recent times.<sup>25,26,27</sup>

The use of magnification is still at its bud stage in the Sri Lankan endodontic practice. Whereas in many other countries everybody uses loupes and quite a few dental surgeons and virtually all the specialists use dental operating microscopes (DOM).

The use of apex locator was initially, merely an adjunct, to the radiograph with the file at estimated working length. However, now it is being said that due to the two dimensional nature of the radiographs and the frequency of apical curvatures of the root in the buccolingual plane, the radiograph is the adjunct to the apex locator and not vice versa.<sup>28</sup>

Rubber dam (Barnum, 1864) is gradually becoming the only method of isolation in endodontics, as the inhalation of an instrument would create a lawsuit, even the best lawyer or all the money in the world wouldn't be able to defend. It is worth mentioning that in many developed countries, use of rubber dam is mandatory in endodontics, at least from the moment an access cavity is made.<sup>29,30</sup> *The dental surgeons should educate themselves about the many advantages it provides and its very low cost per patient.*

#### **Conclusion**

In contrast to the popular belief that endodontics is a relatively young field, history reveals that it had been there for centuries. There had been an innumerable number of innovations in this vast and ever-expanding field in dentistry, and there is still room for more.

Forty years ago, in 1969 when man landed on the moon, many people including Sir. Arthur C. Clarke envisaged that by the year 2011 we will inhabit the moon and have man-driven spaceships exploring Jupiter ('Discovery' in '2011- A Space Odyssey<sup>31</sup>'). Instead just over year ago the entire world had been hit by the worst economic crisis in decades and people are struggling to survive let alone go to the moon.

Likewise, advancement of any field including endodontics might not always be at the speeds people expect or foresee it to be. Nevertheless, until the world runs out of the free thinkers, the experimenting souls and the radical researchers, mankind and dentists will see many wonderful inventions in the years to come. *Do look forward to it!!*

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## Effects of socio-demographic, maternal and childhood factors on the deciduous dentition of children in the Kalutara district

K.A.K. Dilum Perera and S.R.U. Wimalaratne

### Abstract

**Objectives:** The present study was aimed at assessing the effects of socio-demographic, maternal and childhood factors on the deciduous dentition of children in the Kalutara district.

**Materials and method:** A Child Welfare Clinic based descriptive study was carried out from June 2006 to December 2007. A cohort of 600 children aged 6-7 months was followed for a period of 18 months. Data was collected using a pre-tested validated self-administered questionnaire to the mothers of the selected group of children and through a clinical examination of children.

**Results:** The first tooth erupted at the mean age of 8.6 (SD±2.0) months with a range of 2.5 months to 14.0 months. Pre-term birth (adjusted OR=3.0, CI=1.5- 6.3), underweight in first year (adjusted OR=2.9, CI=1.9- 4.6) and failure to use supplements by mothers during first four months of the postnatal period (adjusted OR=2.1, CI=1.1- 4.1) were associated with late eruption of first deciduous tooth. The lower central incisor was the first to erupt.

The prevalence of developmental defects of enamel (DDE) was 12.5%. Failure to breast-feed within 1/2 hour-1 hour after the delivery (adjusted OR=5.4, CI=1.9-16.0), pre-term birth (adjusted OR=3.2, CI=1.5- 6.9), failure to use supplements by mothers during first four months of the

postnatal period (adjusted OR=2.6, CI=1.0- 6.7) and underweight (adjusted OR=1.9, CI=1.1- 3.5) were associated with DDE. The most commonly affected teeth were the incisors (50%). In the incisors, 75% of the DDE were present on the labial surfaces of maxillary incisors.

The prevalence of dental caries was 53.0%. Among the independently associated factors, intermittent consumption of sweets was highly associated (adjusted OR=4.7, CI=1.9- 11.9) with caries. Caries were commonly observed on the cervical areas of the labial surfaces of maxillary central incisors.

**Conclusions:** The results of the present study suggest that both prenatal and postnatal nutritional status during tooth development have an effect on the time of the eruption of the first deciduous tooth as well as the development of enamel defects. Moreover, the results confirmed the association between dental caries and dietary practices and behaviors.

**Key words:** deciduous dentition, mean age, developmental defects of enamel, dietary practices and behaviours

### Introduction

Primary teeth are useful for chewing food, pronunciation of words and growth of hard and soft tissues around the teeth. Most parents

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consider tooth eruption as an important milestone in the child's' development; hence, they often anxiously wait for the appearance of the first tooth in the mouth. It is well demonstrated that the maternal conditions and health status during antenatal, natal and postnatal periods affect the newborn child.<sup>1</sup> Child health status and growth, specially during the first five years may affect the later events of life in an irreversible way. Development of deciduous teeth starts during the intra uterine period and continues into the first year of life, even after the eruption of first few deciduous teeth in the mouth. Hence, maternal and childhood characteristics as well as social and environment factors may affect the development of deciduous teeth.

Enamel opacities and hypoplasia are the most frequently observed developmental defects of enamel. They are defined as defects of enamel matrix formation with reduced or altered amounts of enamel due to an insult to the ameloblast cells (enamel forming cells) and characterized by pitted and or grooved enamel. Clinical significance of enamel hypoplasia includes poor aesthetics, tooth sensitivity, malocclusion and predisposition to dental caries.

According to the statistics from the maternal and child health services in Sri Lanka, dental caries is still the most prevalent disease among early childhood and schoolchildren.<sup>2,3</sup>

In view of these observations, it was considered to carry out a study in Sri Lanka in order to determine the effects of socio-demographic, maternal and childhood factors on the deciduous dentition in terms of the eruption time of the first deciduous tooth, prevalence of DDE and caries experience of children.

### Methodology

A Child Welfare Clinic based descriptive study was carried out in the Kalutara district from June 2006 to December 2007. Newborn children registered in the Birth and Immunization Registers

at Medical Officer of Health (MOH) level in 2005 was considered as the sampling frame.

The sample size was calculated considering the two main outcome variables namely, mean eruption time of the first deciduous tooth and prevalence of developmental defects of enamel in deciduous dentition with an allowance of 20% for loss to follow up.<sup>4</sup>

$$N = \frac{4 \times Z_{\alpha}^2 \times S^2}{W^2}$$

N = Minimum sample size

Z $\alpha$  = Standard normal deviation at 95% confidence interval (1.96)

S = Standard deviation of the eruption time of first deciduous tooth (2 months; found by principal investigator following a pilot study)

W = Desired total width (0.5 months)

$$N = \frac{4 \times 1.96^2 \times 2^2}{0.5^2} = 246$$

An allowance of 20% out of the above minimum sample size was allocated for loss to follow up. Sample size with an allowance of loss to follow up = 246 + 246 x 20%  
= 246 + 49.2  
= 296

The anticipated number of children with developmental defects of enamel was low because the prevalence of the condition was low as 10-20%. Therefore, according to the expertise advice, the sample size was doubled (296x2=592) to get an adequate number of children with developmental defects. Finally, the sample size was rounded to six hundred.

A multistage sampling method was adopted to recruit the children. Initially, the sample (n=600)

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was divided among the 10 MOH divisions according to the proportion of live births per month reported in year 2005. The required number of children allocated per MOH clinic was selected from the CWC in the MOH area. Accordingly, a cohort of 600 children aged 6 to 7 months attending 21 CWCs for immunization in 10 MOH areas in the Kalutara district was selected and followed up monthly until they reached the age of 24 months.

Pre- testing of the questionnaire for validity, reliability and acceptability was done in an area not included in the study sample.

A self-administered questionnaire to mothers was used to obtain the information about socio-demographic, maternal and childhood factors. Maternal data such as mother's age at the delivery, weight gain during pregnancy, use of supplementation, medical condition/ illnesses etc were extracted from pregnancy record. Childhood data such as birth weight, gestational age, growth assessment in CHDR, childhood illnesses were extracted from Child Health Development Record (CHDR). A clinical examination was conducted to determine the eruption time of first deciduous tooth, developmental defects of enamel and dental caries status of children.

In phase I of data collection, (beginning of the study) information pertaining to socio-demographic characteristics was obtained from the mothers of 600 selected children. In phase II of data collection (after 18 months of follow up period), information on eruption time of the first deciduous tooth (main outcome of the study) was obtained from 517 children. In phase III, (at the end of study period) the number of teeth present in the mouth, developmental defects of enamel and dental caries status in children were recorded.

The eruption time of the first tooth was noted by the mother of the child and recorded in a specially designed pictorial record sheet given to the

mothers. Criteria introduced by Drury *et al*, (1999) were adopted for the assessment of the caries status of the child.<sup>5</sup> DDE was assessed according to standard WHO criteria.<sup>6</sup>

The Principal Investigator was trained and calibrated with a Consultant in Community Dentistry and a Consultant Paedodontist. The intra-examiner variability was assessed by the Kappa statistics for categorical variables and intra class correlation coefficient for continuous variables. Ethical approval for the study was obtained from the Ethical Review Committee of the Faculty of Medicine, University of Colombo.

Data analysis was carried out using SPSS statistical package- version 13.0. Differences between two mean ranks and more than two were using Mann Whitney U test and Krushkal Wallis test respectively. Associations between categorical variables were determined by chi-squared test. Multiple binary logistic regression analyses were performed separately to determine factors associated with the eruption time, development defects of enamel and caries status of the children. The independent variables selected for the multiple binary logistic regression were those variables which were significant in bivariate analysis at a  $p \leq 0.05$  level.

## Results

The information on eruption time of first deciduous tooth (the main outcome of the study) was obtained from 517 children. Hence the response rate from children was 86% (517/600). Intra examiner variability was determined by calculating the intra-class correlation coefficient (ICC) for numerical data and Kappa value for categorical data. ICC values ranged from 0.95 to 1.0 and Kappa values from 0.97 to 1.0 denoting good agreements.

## Discussion

According to the results of multiple logistic regression analysis, three characteristics namely,

gestational age, growth during the first year assessed by CHDR (in turn a nutritional indicator) and use of supplementation ( Calcium lactate, folic acid, Iron and Vitamin C) during the first four months following the delivery had independent effects on the time of the eruption of the first deciduous. (Table 2) These findings are consistent with the findings of many studies reported in the literature. In their study, Viscardi *et al*, (1994) had reported that five neonatal factors namely, duration of oral intubation, birth weight, gestational age, age when full enteric feeding were attained and apnoea of prematurity explained 44 % (R=0.67, p<0.05) of the variability in age at which the first tooth erupted. <sup>7</sup> Furthermore, Delgado *et al*, (1975) found that the time of eruption of deciduous tooth is more closely associated with postnatal weight gain than with birth weight.<sup>8</sup> Thus, it is possible that children with short gestational ages and delayed growth in early childhood may have delayed tooth eruption.

Pregnant mothers are prescribed four types of Vitamin and mineral supplements namely, calcium lactate, folic acid, ferrous sulfate and vitamin C. Although, it is not prescribed as a routine, nowadays many mothers use these supplements during the period of exclusive breast-feeding (first 4-6 months) as well. In the present study, nearly 20% of mothers had Vitamin and mineral supplements during the first four months after delivery. Use of vitamin and mineral supplements emerged as a significant predictor of the eruption of the first deciduous tooth. Calcium is a major constituent of tooth hard tissues enamel and dentine. Vitamin C is a substance that needs for conversion of certain proteins to more stable and strengthened forms. According to recent theories of tooth eruption, dental follicle, a connective tissue that consists of protein, plays a major role in tooth eruption.<sup>9</sup> Studies have shown that the age at which the first tooth erupted correlated significantly with the age when oral vitamin supplementation commenced.<sup>7</sup> In Sri Lanka, Vitamin or mineral supplementation is not prescribed for infants unless on medical

recommendation. However, they can be indirectly introduced to some infants during the period of exclusive breast-feeding.

DDE were significantly associated with many maternal and childhood characteristics in the bivariate analysis. Subsequently, a multivariate analysis was performed to identify the independent effects of these variables on DDE (Table 3). Breast-feeding within 1/2 - 1hour after delivery had the greatest effect on DDE in deciduous teeth (p=0.002)

Enamel proteins are secreted by a group of cells called "ameloblasts". They are known to be very sensitive cells and lack of nutrition even for a few minutes may affect their function.<sup>10</sup> "Colostrum" which is secreted soon after delivery is highly nutritious and rich in anti microbial constituents. When there is a delay in breast-feeding soon after delivery, it is possible that it can affect the highly sensitive ameloblasts and lead to the development of enamel defects. Another reasonable explanation may be that children who were not breast-fed soon after the delivery may had other neonatal problems such as pre maturity, birth asphyxia or apnoea that may need immediate intensive care attention. These medical conditions in turn could have an effect on the ameloblasts causing enamel defects.

Calcium is the main constituent of tooth hard tissues; enamel and dentine. Nearly, 96% of enamel is made up of inorganic material, mainly hydroxyl apatite crystals in which the main constituents are Calcium and Phosphate with traces of organic materials enveloping in each crystal.<sup>11</sup> There is evidence that hypocalcaemia may cause DDE.<sup>10</sup> During the period of exclusive breast-feeding, there might be a hypocalcaemic status in mother's circulation that could lead to DDE. According to the findings of this study, Vitamin and mineral supplementation during the first four months in the postnatal period may have a positive effect on lowering DDE in early childhood. (Table 3)

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Pre term children were significantly at a higher risk of developing enamel defects compared to normal children ( $p < 0.002$ ) (Table 3).

Low birth weight is considered as a nutritional status indicator in the community. Similarly, gestational age is considered as an indicator of maturity of an infant at birth. Both nutritional status and gestational age may affect the child's general health, growth and development in early childhood period. Results of other studies also indicate that low birth weight and pre-term birth are accompanied with DDE.<sup>12,13</sup>

According to the CHDR, growth can be categorized into three groups namely, normal, underweight and overweight. Similarly, to other maternal and childhood characteristics, any growth faltering during early childhood period may affect growth and development of the child. DDE were significantly higher in underweight children than in normal or overweight children ( $p = 0.024$ ) (Table 3).

In the present study, many factors were found to be significantly associated with caries status of the child in bivariate analysis. Multivariate analysis was performed to identify the independent effects of these on children's caries status. It was found that mother's educational status, mother's age at the delivery and childhood behaviours like breast-feeding at night, feeding formula milk at night and frequent sweet consumption were independently associated with early childhood caries (Table 4). Of them, consuming sweets in an irregular way (no exact frequency) had the greatest effect on the occurrence of early childhood caries among the children of this age group ( $p < 0.001$ ). Supporting to this result, Seow (1998) found that breast and bottle-feeding predispose to early childhood caries.<sup>14</sup>

### Conclusions

Results of this study suggest that some nutritional related pre-natal and postnatal conditions might

play a role in the eruption time of first deciduous tooth and development defects of enamel in deciduous teeth.

Furthermore, multifactorial aetiology for dental caries and its' close association with dietary practices and behaviour was also emphasized.

### Recommendations

It is recommended that the eruption time of first tooth be recorded in the CHDR as it is an important developmental milestone.

**Acknowledgement:** The authors gratefully acknowledge the National Science Foundation on behalf of providing a research grant for this study.

**Table 1.** Distribution of study population by socio-demographic characteristics

<b>Characteristic</b>	<b>n</b>	<b>%</b>
<b>MOH division</b>		
Panadura	117	22.6
Bandaragama	57	11.0
Horana	56	10.8
Madurawala	37	7.2
Mathugama	49	9.5
Bulathsinhala	23	4.4
Kalutara	46	8.9
Beruwala	77	14.9
Agalawatte	36	7.0
Walallawita	19	3.7
<b>Sex</b>		
Boys	271	52.4
Girls	246	47.6
<b>Age at the recruitment (months)</b>		
6.0 - 6.5	151	29.2
6.5 - 7.0	366	70.8
<b>Age at the end of study period (months)</b>		
24.0 - 25.0	166	32.1
25.0 - 26.0	351	67.9
<b>Place of residence</b>		
Urban	84	16.2
Semi urban	185	35.8
Rural	236	45.6
Estate	12	2.3
<b>Ethnicity</b>		
Sinhala	461	89.2
Tamil	6	1.2
Muslim	48	9.3
Burgher	2	0.4
<b>Religion</b>		
Buddhist	439	84.9
Hindu	6	1.2
Islam	48	9.3
Catholic	24	4.6
<b>Total</b>	<b>517</b>	<b>100.0</b>

According to Table 1, the majority of the sample was boys, (52%). Also the majority of the children were Sinhalese (89.2%) and Buddhists (84.9%).

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**Table 2.** Independent effects of selected characteristics on the eruption time of first deciduous tooth – Multiple logistic regression analysis

Variable	OR	95% CI	p-value
<b>Gestational age</b>			
Term	1.0		
Pre-term	3.0	(1.5-6.3)	0.002
<b>Growth assessment in CHDR (in first year)</b>			
Normal or overweight	1.0		
Underweight	2.9	(1.9-4.6)	<0.001
<b>Use of supplementation (Calcium, Folic acid, Iron, Vitamin C)</b>			
Yes	1.0		
No	2.1	(1.1-4.1)	0.025

Dependent variable (eruption time of first deciduous tooth) was dichotomized as

0 = Appearance of first deciduous tooth <9 months

1 = Appearance of first deciduous tooth ≥ 9 months

Pseudo R<sup>2</sup>=0.107

$\chi^2=53.25$

df=6

p<0.001

The mean eruption time of the first deciduous tooth was 8.6 (SD±2.0) months. According to Table 2, three variables, namely gestational age, growth assessment according to Child Health Development Record (CHDR) and use of supplementation during first four months after delivery had independent effects on the eruption of the first deciduous tooth.

**Table 3.** Independent effect of selected characteristics on developmental defects of enamel – Multiple logistic regression analysis

Variable	OR	95% CI	p-value
<b>Use of Supplementation (Calcium, Folic acid, Iron, Vitamin C)</b>			
Yes	1.0		
No	2.6	(1.03-6.7)	0.043
<b>Gestational age</b>			
Term	1.0		
Pre-term	3.2	(1.5-6.9)	0.002
<b>Breast-feeding 1/2 – 1 hour after delivery</b>			
Yes	1.0		
No	5.4	(1.9-16.0)	0.002
<b>Growth assessment by CHDR</b>			
Normal or overweight	1.0		
Underweight	1.9	(1.1-3.5)	0.024

Dependent variable (developmental defects of enamel) was dichotomised as

0= no developmental defects of enamel

1 = presence of developmental defects of enamel

Pseudo R<sup>2</sup>= 0.066

$\chi^2 = 32.43$

df=5

p<0.001

According to Table 3, use of supplementation during the first four months of the postnatal period, breast feeding within 1/2 hour - 1 hour after the delivery, gestational age (pre-term) and growth during the first year of life according to CHDR were found to have independent effects on DDE.

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**Table 4.** Independent effect of selected factors on prevalence of dental caries among the children – Multiple logistic regression analysis

Variable	OR	95% CI	p-value
<b>Educational status of mother</b>			
Above AL	1.0		
Up to GCE/AL	2.3	(1.4-3.8)	0.002
<b>Mothers' age at the delivery (years)</b>			
≥ 35	1.0		
< 35	3.7	(1.6-8.4)	0.002
<b>Breast-feeding during night</b>			
No	1.0		
Yes	2.2	(1.3-4.0)	0.006
<b>Feeding formula milk during night</b>			
No	1.0		
Yes	1.9	(1.2-3.1)	0.006
<b>Frequency of sweets consumption / day</b>			
Rarely/once	1.0		
Several times	1.6	(0.9-2.5)	0.061
No exact frequency	4.7	(1.9-11.9)	<0.001

Dependent variable (dental caries status) was dichotomised as

0= no dental caries; 1= presence of dental caries

Pseudo R<sup>2</sup>=0.126                       $\chi^2=49.57$                       df=8                      p<0.001

According to Table 4, caries was 4.7 times more likely to occur among children who consumed sweets in an irregular (no exact frequency / day) pattern compared to the children who consumed sweets rarely/ once per day. The total variance explained by the logistic regression model was 12.6%. (Pseudo R<sup>2</sup>=0.126)

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## **Emotional effects of wearing complete dentures**

**T. Anandamoorthy**

### **Abstract**

**Objective:** Objectives of the present study were to assess the emotional effects of patients wearing complete dentures, who requested replacement dentures and study the state of their existing dentures which were regarded unsatisfactory by these patients

**Method:** The sample consisted of 77 patients out of those who attended the department of Prosthetic Dentistry at the Dental Hospital (Teaching), Peradeniya requesting replacement dentures in the period between January to December 2006. An interviewer administered questionnaire was used to collect the data. A total of 77 patients were interviewed by the author in private. Among them there were 49 females and 28 males.

**Results:** Among the 77 patients interviewed 55% sought construction of replacement dentures due to fracture of their existing dentures. Almost more than half number of patients had worn their existing dentures for less than 10 years only. Almost half the number of patients (49.3%) interviewed expressed that they felt bitter and sad when they got all their teeth extracted. Seventy five percent of interviewed patients informed that they were able to talk freely to their relatives and friends about the fact that they wear dentures. In this study 41.5% of patients stated that they do not mind if they were seen without dentures.

Among the 77 patients 78% said they felt that the dentures were as part of themselves.

### **Conclusion**

Denture wearing is regarded by many patients as a serious event in their life which causes emotional reactions. As the dental appearance is the integral part of the face, majority of patients felt bitter and sad when they become edentulous. Duration of usage of dentures among Sri lankan patients is satisfactory. however, they need advice on careful use of them to avoid fractures.

### **Introduction**

Loss of teeth is regarded as a physical disability which could lead to psycho-social and emotional problems for many patients.<sup>1</sup> It has been shown that totally edentulous people who wear dentures perceived it as a serious event in their life as marriage or retirement. It is also reported that there is no significant difference in the way that the denture wearers perceive edentulousness between sexes and different age groups.<sup>2</sup> Reported study has shown that eighty five percent of patients who wear dentures felt that their facial appearance has been changed and they are unable to smile and laugh as they did before.<sup>3</sup>

Total edentulousness is poorly compensated by the provision of conventional removable dentures for many patients. The majority of patients stated that there had been a significant improvement in their quality of lives with fixed prosthesis supported by implants.<sup>1,4</sup>

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Many individuals with conventional dentures are willing to talk about wearing dentures but quite unwilling to appear without them in front of others.<sup>5</sup> No relationship has been found between dissatisfaction and patients personality. On the other hand moderate relationship has been reported between dissatisfaction and attitudes of the patients towards dentures.<sup>6,7</sup>

Level of education, self perception, economic status and quality of life are all contributory factors to patient satisfaction. The quality of dentures is an important factor which showed strongest correlation with patient satisfaction.<sup>8</sup>

Many denture wearers have unrealistic expectations about the functional and aesthetic values of dentures.<sup>9,8</sup> However, expectations may differ between individuals.<sup>10</sup> Well fitting and well functioning dentures with socially acceptable appearance contribute much to patients' satisfaction.<sup>11</sup> It has been shown that the psychological reaction of those who wear dentures is also an another important factor with reference to satisfaction and the quality of life of these patients. However, literature reveals that no such studies have been reported in Sri Lanka to date.

The aims of the present study were to assess the emotional effects of patients wearing complete dentures, who attended to the Department of Prosthetic Dentistry, requesting replacement of dentures and study the state of their existing dentures which were regarded unsatisfactory by these patients.

### **Material and methods**

A convenient sample of seventy seven patients were selected from the patients who attended the department of Prosthetic Dentistry, at the Dental Hospital, Peradeniya, requesting replacement dentures in the period between January to December 2006. The purpose of the study was explained to the patients and consent was obtained before the interview. Patients were

willingly volunteered to take part in the study. Data were collected by means of an interviewer administered questionnaire. This questionnaire was pretested earlier among 10 patients and the necessary modifications were made accordingly. The questionnaire consisted of 6 closed questions with 3 predetermined responses, each pertaining to the patients' feelings associated with edentulousness and wearing complete dentures. The interview was conducted by the author in private at the first visit of the treatment in a friendly environment at the prosthetic clinic.

### **Results**

The sample consisted of 28 males and 49 females. The mean age of the patients participated was  $63.39 \pm SD 9.876$  and the age range was from 44 – 78 (Table 1). In this study 55% of patients wanted replacement dentures due to problems associated with fractures of their existing dentures. Looseness of dentures was the second common reason given by 34% patients (Table 2). Acrylic dentures had been worn by patients for variable number of years. In this study the reported duration of denture wearing ranged from 1-30 years. Fifty four (54%) percent of patients requested replacement dentures within the period of 10 years (Table 3). Seventy three percent (73%) of the patients needed the second set of their dentures. Among the 56 patients who demanded the second sets, 30 patients (54%) had worn their dentures for less than 10 years. About 25% of patients were wearing the dentures from 11- 15 years. Only one patient had managed to wear dentures for nearly 30 years (Table 2 and 3).

Table 4 gives the details of the distribution of patients according to their feelings associated with wearing of their dentures. Almost half the number of patients (49.3%) interviewed expressed that they felt bitter and sad when they got all their teeth extracted. Of the females 57% and among males 36% felt bitter and sad (Table 4 question 1). Although 80% of patients said that they were happy when the dentures were inserted and 20%

felt that their dentures were uncomfortable (Table 4 question 2). Seventy five percent of interviewed patients informed that they were able to talk freely to their relatives and friends about the fact that they wear dentures. However, 21% of them preferred to avoid talking about their dentures (Table 4 question 3). In this study 41.5% of patients stated that they do not mind if they were seen without dentures (Table 4 question 4). Of the females 60.7% and among males 30.6% expressed the same feeling. Great majority (90%) of the patients preferred to be alone when they clean their dentures. Among women 94% and men 82% preferred to be alone when cleaning their dentures (Table 4, question 5). Seventy eight percent (78%) of the sample studied informed that they regard their dentures as part of themselves and 20% of them said they consider them as foreign bodies in their mouth (Table 4 question 6). (No significant differences in relation to gender were found with responses for all six questions in this study).

### Discussion

The contribution of the dentition to the pleasing appearance of the face is relatively greater. Almost half the patients expressed their feeling of bitterness and sadness when they got all their teeth extracted. Other studies also have reported similar results.<sup>5</sup>

Seventy-five percent of the patients expressed that they are not unhappy to talk freely to their relatives and friends about wearing dentures. One fifth of the patients (21%) preferred to avoid talking about their dentures. Self image of the most of the patients are not so badly affected when they see many of their friends are also edentulous. This finding is in agreement with the reports from Norway.<sup>5</sup>

However, in the present study 42% of patients informed that they don't mind appearing in front of others without their dentures. However, study conducted in Norway reported, only 4% of the patients were not hesitant to appear in public without dentures.<sup>8</sup> This attitude may reflect the

difference in the psychological perception in relation to the social and cultural environment in which they live. The importance given for facial and dental appearance of individuals in a society is also influenced by the socio economic status of them.

The great majority of denture wearers in this study insisted that they prefer to be alone when they routinely remove and clean their dentures. This finding is in agreement with the study of Berg *et al*, (1984). Seventy eight percent (78%) of patients interviewed in this study revealed that they regard their dentures as part of themselves. Only 20% of them felt their dentures as foreign bodies in their mouth. This finding is also in agreement with the results of Berg *et.al*, (1984). No relationship was found between sexes and their emotions regarding denture wearing. The denture wearers requested replacement of complete dentures due to various problems with the existing unsatisfactory dentures. In this study 42 patients (55%) demanded replacement dentures as the result of fractures of their existing dentures. Fracture of acrylic dentures is very common problem among denture wearers. Many patients return their fractured dentures to our clinic for repair. Thirty four percent of patients sought replacement of their dentures which were loose in their mouth. Even though looseness of dentures is very common complaint most of the denture wearers become well adapted to them in due course.

Further, duration of denture usage among our patients is satisfactory (generally 10 years would be considered as the life of a complete denture). However, substantial number of patients requested replacements due to fractures. Therefore, it is prudent to emphasize to the patients the importance of careful handling of their dentures in order to avoid fractures. The need to use the acrylic with high impact strength should be recommended even though it is expensive.

**Conclusion**

As the dental appearance is the integral part of the face, majority of patients felt bitter and sad when they become edentulous. Majority of patients regard their dentures as part of themselves. This emphasizes the importance of the dentures in improving the quality of life of individuals edentulous. Duration of usage of dentures among Sri lankan patients is satisfactory. however, they need advice on careful use of them to avoid fractures.

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Emotional effects of wearing complete dentures

**Table 1.** The distribution of patients according to age and gender

Age range of patients	Number of patients	Number of Males	Number of Females
41-50	7	2	5
51-60	29	6	23
61-70	20	6	14
71-80	16	10	6
81-90	5	4	1
<b>Total</b>	<b>77</b>	<b>28</b>	<b>49</b>

**Table 2.** The distribution of patients according to the reasons for requesting replacement dentures

Reasons for replacement	Number of patients	Percentage
Fractured dentures	42	54.6
Ill-fitting dentures	26	33.8
Functional defects(Inability to eat)	7	9
Aesthetically unsatisfactory dentures	1	1.3
Due to misplacement of dentures	1	1.3
<b>Total</b>	<b>77</b>	<b>100</b>

**Table 3.** Duration of 1<sup>st</sup> set of dentures worn by patients when they requested replacement

Duration of denture wearing (in years)	Number of patients	Percentage
1-5	13	23.2
6-10	17	30.4
11-15	14	25
16-20	7	12.5
21-25	4	7.1
26-30	1	1.7

**Table 4.** Distribution of patients based on sentiments about wearing dentures

Response of the patients	Number and percentage					
	Total (n)	Percentage	Male (n)	Percentage	Female (n)	Percentage
1. Reaction when the teeth were lost						
(a) sense of relief	15	19.5	6	21.4	9	18.4
(b) felt indifferent	24	31.2	12	42.9	12	24.5
(c) felt bitter and sad	38	49.3	10	35.7	28	57.1
2. Feeling when the dentures were worn						
(a) happy	62	80.5	23	82.1	39	79.6
(b) indifferent	0	0	0	0	0	0
(c) not comfortable	15	19.5	5	17.9	10	20.4
3. Talking to their friends about the fact that they wear dentures						
(a) can talk freely	58	75.3	23	82.1	35	71.4
(b) can talk to a close friend	3	3.9	1	3.6	2	4.1
(c) prefer to avoid talking about	16	20.8	4	14.3	12	24.5
4. Feelings patients when they were seen without dentures						
(a) did not mind if seen by anyone	32	41.5	17	60.7	15	30.6
(b) avoided, seen without dentures	38	49.3	9	32.1	29	59.1
(c) never seen without dentures	7	9.0	2	7.1	5	10.2
5. Cleaning their dentures in the presence of others						
(a) didn't mind the presence of others	7	9.0	4	14.3	3	6.1
(b) preferred to clean alone	69	89.6	23	82.1	46	93.9
(c) always cleaned when alone	1	1.3	1	3.6	00	
6. Feeling their dentures as part of themselves						
(a) as part of them	60	78	20	71.4	40	81.6
(b) can not comment	2	2.4	00	00	2	4.1
(c) as a foreign body	15	19.5	8	28.6	7	14.3
<b>Total</b>	<b>77</b>		<b>28</b>		<b>49</b>	

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## Retained microbial flora of tooth brushes used by a group of Sri Lankans

J.A.M.S. Jayatilake and H.N. Fernando

### Abstract

**Objective:** To examine the retained microbial flora (RMF) of tooth brushes used by a group of healthy Sri Lankans.

**Materials and methods:** Fifteen periodontally healthy subjects (8 males and 7 females of 22-23 years) were randomly selected. Their tooth brushes were collected within 1h of last tooth brushing. The microbes from the brush-head and bristles were dislodged into 10ml of sterile PBS by vortexing, for 3min. Resultant suspension was centrifuged and the pellet was resuspended in 1ml of PBS. 75 $\mu$ l of 10<sup>-3</sup> dilution in PBS was inoculated in triplicate into blood agar (BA), MacConkey agar (MA) and Sabouraud dextrose agar (SDA) plates. Plates were incubated aerobically and anaerobically at 37°C, 100% humidity for 48h, and CFU/ml were counted. Colony morphology, Gram stain, hemolysis, lactose fermentation, catalase, coagulase and oxidase tests were used for microbial identification.

**Results:** All tooth brushes were of similar type and they had been used at least a month prior to the day of collection. All participants brushed their teeth using fluoridated tooth paste twice a day. Four (27%) did not wash tooth brush prior to use. Everyday after tooth brushing, six (40%) stored their brushes in the bath room whereas others (60%) kept their brushes in outside locations.

Except one, all tooth brushes showed microbial growth of 10<sup>4</sup> – 10<sup>6</sup> CFU/ml on aerobic BA, anaerobic BA and MA resulting about 5-10 colony types per brush. Only one brush showed colony growth on SDA. Gram +ve clusters of cocci that gave +ve catalase and coagulase tests were isolated from 4 brushes. 14 brushes produced several lactose fermenting, Gram -ve bacilli on MA. Gram -ve, nonlactose fermenting bacilli with +ve oxidase reaction were isolated from 2 brushes. Filamentous Gram +ve rods that gave characteristic yellow granular colonies on BA and Gram -ve spindle shaped rods were detected separately from 2 brushes. One tooth brush carried gram +ve budding yeasts.

**Conclusions:** Current data shows that 10<sup>4</sup>–10<sup>6</sup> CFU/ml microorganisms (aerobic, anaerobic, Gram +ve and -ve) have survived on tooth brushes used by the above group. These may include *Staphylococcus aureus*, *Pseudomonas* species, *Actinomyces* species, *Fusobacterium* species and *Candida* species.

**Keywords:** oral hygiene, oral health, microorganisms, tooth brush

### Introduction

Tooth brush is the commonest oral hygiene device used by the public. It helps mechanical debridement of the oral biofilm better known as

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dental plaque in the oral structures including, tooth surfaces, gingiva, tongue and the palate. Strikingly, it has been revealed that many oral bacteria as well as saprophytes survive on tooth brushes posing a threat of cross-infection and self-inoculation.<sup>1,2</sup> In a pioneering study, Svanberg has shown that *Streptococcus mutans* could be isolated from tooth brushes as well as the orifices of the tooth paste tubes.<sup>3</sup>

According to Taji and Rogers, the retained microbial load on the toothbrushes used by healthy population accounted up to  $10^4 - 10^5$  colony forming units (CFU).<sup>1</sup> Further, these investigators have reported that staphylococci and streptococci were commonly isolated on toothbrushes in addition to other microbes namely *Candida*, corynebacteria, pseudomonads and coli-forms. Strikingly, anaerobic periodontal pathogens such as *Aggregatibacter actinomycetemcomitans* (*Actinobacillus actinomycetemcomitans*) and *Porphyromonas gingivalis* have also been found to survive on tooth brushes.<sup>2</sup>

Most interestingly, scanning electron microscopic observations have demonstrated that bio-films are formed on the bristles of tooth brushes by oral microorganisms.<sup>3</sup> Alarmingly, some of these bacteria thriving on the tooth brushes have shown resistance to routine antibiotics such as ampicillin, kanamycin, sulphonamides and polymyxin-B.<sup>5</sup> These data demonstrates clearly that tooth brushes do harbor a microbial flora that can be potentially pathogenic. Therefore, this study was designed to obtain preliminary data on the retained microbial flora (RMF) of tooth brushes used by a group of healthy Sri Lankans as no previous studies have reported on the RMF of tooth brushes used by Sri Lankans.

#### Materials and methods

Tooth brushes collected from a randomly selected group of fifteen healthy Sri Lankans (eight males and seven females) in the age of 22-23 years were used in the study. All participants had healthy periodontium and minimum of twenty

eight teeth in their mouths. Those who had undergone any antibiotic treatment or dental scaling within three months prior to the experiment were excluded. Individuals having dental appliances were also excluded. After obtaining the informed consent, their tooth brushes were collected within one hour of last tooth brushing and they were replaced with new brushes. Information regarding the type of tooth brush, duration of use, tooth paste, tooth brush cleaning and storage practices and also brushing habits were recorded. Microbial cultures of collected tooth brushes were done within two hours of collection following a modified method of Brunetel *et al.*<sup>6</sup> In summary, the microbes from the brush-head and bristles were dislodged into 10ml of sterile phosphate buffered saline (PBS) by vortexing, for 3min. Resultant suspension was centrifuged at 1500g and the pellet was resuspended in 1ml of sterile PBS. Afterwards, ten fold dilutions were made using PBS. 75 $\mu$ l of  $10^{-3}$  dilution was inoculated in triplicate into blood agar (BA), MacConkey agar (MA) and Sabouraud dextrose agar (SDA) plates. Plates were incubated aerobically and anaerobically at 37°C and saturated humidity for 48h, and colony forming units per ml (CFU/ml) were counted. Colony morphology, hemolysis on blood agar, Gram stain, catalase test, coagulase test, oxidase test and lactose fermentation test were used to identify different types of microorganisms.

#### Results

All tooth brushes were of similar type and they had been used at least for one month duration prior to the day of collection. All participants (15) used fluoridated tooth paste and brushing frequency was twice a day. Four participants (27%) did not wash tooth brushes prior to use while others washed their brushes prior to use. Six participants (40%) stated that they store their brushes after tooth brushing everyday in the bath room. Others (60%) kept their brushes in outside locations. All used tap water to wash their tooth brushes before or after brushing teeth.

Except one, all tooth brushes produced microbial growth on culture plates (Table 1). RMF levels accounted up to  $10^4 - 10^6$  CFU/ml on aerobic BA anaerobic BA and MA. Interestingly, many tooth brushes produced  $10^5$  CFU/ml in each of the culture media used. These colonies gave about five to ten morphotypes per one tooth brush. Only one tooth brush showed colony growth on SDA. Gram staining showed that RMF is full of Gram positive and negative organisms of different morphologies arranged in numerous patterns. Gram positive cocci in clusters that gave positive catalase and coagulase tests were isolated from four tooth brushes. Several lactose fermenting Gram negative bacilli in all of the fourteen brushes were detected on MA cultures. Gram negative, nonlactose fermenting bacilli with positive oxidase reaction were isolated from two tooth brushes. Filamentous Gram positive rods that gave characteristic yellow granular colonies on BA and Gram negative spindle shaped rods were detected separately from two brushes. One tooth brush carried gram positive budding yeasts.

### Discussion

Interestingly, foregoing data is comparable with that of Taji and Rogers<sup>1</sup> who have investigated on RMF of tooth brushes in a group of ten healthy Australians. These investigators postulated that RMF of tooth brushes used by healthy people lies with in  $10^4 - 10^5$  CFU/ml. Similarly, current findings showed that  $10^4 - 10^6$  CFU/ml microorganisms with different characteristics (aerobic, anaerobic, Gram positive and negative) thrive on tooth brushes used by this periodontally healthy study group. Gram positive cocci with catalase and coagulase positive reaction were determined as *Staphylococcus aureus* while Gram negative nonlactose fermenting bacilli with positive oxidase reaction were identified as *Pseudomonas* species based on the SLCM Laboratory Manual, 2001.<sup>7</sup> Filamentous Gram positive rods that gave yellow granular colonies on BA and Gram negative spindle shaped rods were morphologically similar to *Actinomyces*

species and *Fusobacterium* species respectively. Gram positive budding yeast resembled *Candida* species. However, further confirmatory tests are needed to identify these organisms up to the species level. On the other hand, selective media have to be used in order to identify specific oral microbes such as *Streptococcus mutans*, *Lactobacillus* species, *Porphyromonas gingivalis* etc.

Microorganisms are everywhere in our environment and they prefer cool dark places. Thus, a pair of moist toothbrushes left side by side in the bathroom provides an ideal breeding ground for germs and viruses. In the current study, some of the participants (40%) mentioned that they keep their tooth brushes in the bathroom after use. The bathroom is by far the most infectious environment within the household carrying a multitude of airborne microorganisms, with each flush of the toilet. People are at serious risk of introducing these pathogenic microorganisms into their biological systems via the toothbrushes neglected in such an environment. Moreover, more than 25% of this study group did not clean their tooth brush prior to use. This can increase the risk of microbial self-inoculation. Finally, these data demonstrates that tooth brushes used by this group of Sri Lankans do harbor RMF belonging to various types and growth characteristics. This may facilitate evolution of virulent strains of microbes that are resistant to antibiotics, dentifrices and environmental stimuli. Self-inoculation of such organisms may be hazardous with regard to oral and systemic infections particularly in patients whose immunity is compromised.

Covering the brush head with a cap may help growth of opportunistic microorganisms like *Pseudomonas aeruginosa*. However, overnight immersion of a toothbrush in chlorhexidine gluconate (0.2%) was found to be highly effective in preventing microbial contamination.<sup>8</sup> Similarly, chlorhexidine spray has also proved to be an effective and practical means for toothbrush

disinfection.<sup>9</sup> On the other hand, some other studies have reported that immersion in 0.12% chlorhexidine gluconate and 1% sodium hypochlorite significantly reduced the retention of microbes in the toothbrush.<sup>4,10</sup> Apart from external disinfectants, the composition of the dentifrice also interferes with the RMF of the tooth brushes.<sup>11</sup> For instance, dentifrices containing triclosan have significantly reduced bacterial contamination of the toothbrushes.<sup>12,13</sup>

Leading oral pathogens including *Streptococcus mutans*, *Porphyromonas gingivalis* and *Candida albicans* have been found to adhere to the brush head and the bristles.<sup>6</sup> Spolidorio et al. have found that transparent toothbrushes inhibit the viability of the *Streptococcus mutans* in the RMF.<sup>14</sup> Moreover, the arrangement of the bristles on the head of the toothbrush is also of great importance with regard to oral hygiene. For instance, Wetzel et al. have explained that the individual attachment of bristles to the head is better than bundle attachment to avoid microbial retention.<sup>15</sup> Eventually; it is advisable to be vigilant on the oral hygiene as well as the hygiene of the toothbrush to avoid many oral health problems. In this context, disinfection or frequent replacement of brushes should be considered as important steps in the maintenance of proper oral hygiene.<sup>2</sup> Changing the toothbrush on a regular basis at least once in three months, proper cleaning and storing of the brush in a dry place after use are some helpful tips in the maintenance of the hygiene of the toothbrush that improves the oral health.

**Acknowledgement:** Authors thank all participants for donating their tooth brushes for the study.

**Table 1.** Distribution of microorganisms on the tooth brushes used for the study.

<b>Characteristics of the microorganism</b>	<b>Identification of the microorganism</b>	<b>Number of brushes detected</b>
Gram positive budding yeast grown on SDA	<i>Candida</i> species	01
Gram positive cocci in clusters that gave positive catalase and coagulase reaction grown on BA	<i>Staphylococcus aureus</i>	04
Lactose fermenting Gram negative bacilli grown on MA	coliforms	14
Gram negative, nonlactose fermenting bacilli with positive oxidase reaction grown on MA	<i>Pseudomonas</i> species	02
Gram positive rods that gave characteristic yellow granular colonies grown on BA	<i>Actinomyces</i> species	01
Gram negative spindle shaped rods grown on BA	<i>Fusobacterium</i> species	01

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### Management of a patient with failed surgical endodontics

U.U.K.P.C. Perera and K.A. Wettasinghe

#### Introduction

Over the past decade, nickel titanium rotary instrumentation, microscopic endodontics, digital radiography, a variety of obturation systems, and biocompatible sealing materials have helped practitioners perform endodontic procedures more effectively and efficiently than ever before. The evolutions of better tools and technology have made it more predictable in a wider variety of complex cases.<sup>1</sup>

But if orthograde restorations fail there is a need for surgical access and retrograde restorations known as root end fillings. Endodontic surgery has now evolved into endodontic microsurgery. The use of state-of-the-art equipment, instruments and materials that match biological concepts with clinical practice and these microsurgical approaches produce predictable outcomes in the healing of lesions of endodontic origin.<sup>2</sup>

Improvements in root canal treatment techniques have lessened the need for apical surgery. Cases which at first seem obvious candidates for endodontic surgery may respond to conventional treatment provided careful thought is given to the aetiology. Once the decision has been made to carry out surgery, consideration must be given to the chances of success.<sup>3</sup>

Success rate for conventional root canal treatment range from 40% to 97% depending on

differences in study design, clinical procedures, criteria for evaluation and length of postoperative observation period.<sup>4</sup> These results are promising for the long-term function of root canal treated teeth. The apical seal as well as the coronal restoration is equally important in endodontic therapy.<sup>5</sup>

Most periapical lesions (> 90%) can be classified as periapical granulomas, radicular cysts or abscesses.<sup>6</sup> They cannot be diagnosed only on clinical and radiological means but also histopathological examination is needed.

Although endodontic surgery is carried out primarily in cases of failed orthograde treatment, there are other indications. Surgery may be necessary to establish drainage, to biopsy a lesion; to repair any defects or perforations in the tooth root; to resect a multi-rooted tooth where, for technical reasons, one of the roots cannot be successfully treated.

The one specific indication for endodontic surgery is uncertainty about the nature of the apical lesion. The lesion should be excised in its entirety and sent for evaluation.<sup>3</sup>

Periradicular curettage used to be a routine operation carried out by many practitioners after completion of a root canal filling. The rationale for this is no longer accepted, because if the root

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filling has been carried out successfully and the canal system has been sealed, then healing of the lesion will take place without surgical intervention.<sup>7</sup>

There are a number of reasons why a root filling might fail, but generally this is due to inadequate cleansing and filling of the root canal. Some root fillings can prove very difficult to remove, for example hard setting pastes.

During conventional orthograde root canal treatment, procedural difficulties may arise as a result of one of the following:

- Unusual root canal configurations
- Extensive secondary dentine deposition
- Fractured instruments within the root canal
- Open apex
- Existing post in the root canal unfavorable for dismantling
- Lateral or accessory canals

Instrumentation of canals in roots which exhibit bizarre morphology or severe dilacerations may prove impossible. Similarly, where there is an apical delta, thorough cleansing, shaping and obturation of the canal may prove impossible and surgery will be required to complement the orthograde approach.<sup>3</sup>

Teeth that have been injured before completion of the root development should be treated conventionally in the first instance. If the pulp is vital, then the coronal pulp is removed and the remaining vital radicular pulp is covered with calcium hydroxide to allow continued root development; this is termed 'apexogenesis'. If the pulp is irreversibly inflamed, then the radicular pulp is removed and the canal filled with calcium hydroxide to encourage root formation and closure of the apex; this is termed "apexification"<sup>3</sup>

Many restorative treatments modalities have been suggested after the completion of the root canal

therapy. Most of them involve either crowns or direct restorations such as resin composites or amalgam. Discolored anterior teeth can be managed with bleaching techniques, direct restorations with composite resin veneering and indirect restorations such as crowns and veneers.<sup>8</sup>

### Case Report

A 19 year old female from Kadugannawa, Kandy, presented to the Dept of Restorative Dentistry, Faculty of Dental Sciences complaining pain and discharge from discolored 11 and 21 (Figure 1) with a previous history of trauma 10 years back. The history revealed surgical endodontics with apicectomy and a retrograde amalgam restoration had been done at that time at the General Hospital, Kandy.

On examination patient was otherwise healthy and no other abnormality was observed. But there was a discharging sinus in relation to 21 labial surfaces with pus discharge.

22 gave a non vital response with the electric pulp tester. Composite restorations on 11 and 21 were with marginal breakdown and discoloration. Access cavities were not restored and no coronal seal was observed (Figure 2).

On examination the following teeth were present.

17,16,15,14,13,12,11	21,22,23,24,25,26,27
47,46,45,44,43,42,41	31,32,33,34,35,36,37

All third molars were not erupted. Her oral hygiene was satisfactory and no caries were detected.

Radiographic investigations were done and they revealed that apicectomy and the retrograde amalgam restorations with inadequate obturation of 11 and 21 with a fractured file on 11 (Figure 3).

Treatment plan;

1. Oral hygiene instructions, education and motivation.
2. Full mouth prophylaxis.
3. Non setting Calcium hydroxide dressings for 11 and 21
4. Endodontic treatment of 22
5. Review after 6 week intervals up to 3 months to change the dressing.
6. Endodontic treatment for 11 and 21 – Obturation with Gutta percha
7. Review
8. Frenectomy and crown lengthening
9. Management of discoloration of 11 and 21 with provisional restorations.
10. Indirect porcelain fused to metal crowns for 11 and 21.

Initially canals were opened cleaned and existing gutta percha from 21 was removed. The fractured endodontic file was removed from 11. Working length estimation was done Shaping of the canals was done with 5% Sodium hypochlorite irrigation and a nonsetting calcium hydroxide dressing (Metapex) was placed. Access cavities were sealed with Zinc oxide eugenol cement.

Then 22 was opened and a non setting calcium hydroxide dressing was done.

In review after 6 weeks healing of the sinus was observed. Calcium hydroxide dressing was changed again. After 3 months the canals were dry and final obturation was done (Figure 4).

Initial management of the discolored 11 and 12 which were endodontically stable was done afterwards. Silicone putty index was taken and crown preparations were done for porcelain fused to metal crowns. Preliminary impressions were taken with silicone impression material for provisional restorations. Provisional restorations were fixed with temporary luting cement.

As the frenal attachment was very high frenectomy with gingival recontouring was

performed with an electrosurgical unit. Provisional restorations were adjusted to the new gingival margins. After another 6 weeks crown margins were refined and another impression was taken for the PFM crowns of 11 and 21.

Patient was happy of the aesthetic outcome after fixing the PFM crowns (Figures 5 and 6).

### Discussion

Modern endodontic techniques should enable the root canal to be shaped adequately to permit flushing of sodium hypochlorite irrigation throughout the entire root canal system.

Unfortunately, infected debris may occasionally persist in lateral or accessory canals. Whilst orthograde retreatment may be attempted, a surgical approach may be the only solution, particularly if these canals form part of the apical delta which may be eliminated by adequate surgical resection.

A root filling may have to be removed and the tooth retreated for a variety of reasons. The patient may be experiencing symptoms, periapical radiolucency may be increasing in size, or the coronal restoration may require replacing in a tooth where the root filling is inadequate. The incidence of radicular cysts is reported to be highest among patients in their third and fourth decade of life and greater in males than females. They have high incidence in the maxillary anterior region. There are two types of radicular cysts namely those containing cavities completely enclosed by epithelial lining which are known as "True cysts" and those containing epithelial lining cavities that are opened to the root canals known as "Bay cysts" or "Periapical pocket cysts". Management of large cystic lesions which are bay cysts can be done nonsurgically with non setting calcium hydroxide dressings and retrograde endodontics. But true cysts need surgical management.<sup>6</sup>

It was the practice in early days to do apicectomy for each and every large cystic lesion. But that concept has changed during the past decade. The exact mechanism of how periapical cysts heal is not clearly understood. The lumen of a bay or pocket cyst is opened to the root canal and it will heal when the intra canal irritants are removed by conventional endodontic treatment.<sup>9</sup>

Packing the canal system with calcium hydroxide will cause direct contact with the periapical tissues and it is osseoinductive and the inflammation will cause breaking of the cyst lining which can cause healing of a cyst.<sup>6</sup>

Calcium hydroxide has a four fold action beyond the apex

- Anti inflammatory activity
- Neutralization of acid products
- Activation of alkaline phosphatase
- Anti bacterial action

Root canal treatments with prior Calcium hydroxide dressing results in complete healing of 74% large periapical lesions.<sup>6</sup>

According to the literature findings this particular failed apicectomized teeth healed with Calcium hydroxide dressings followed by conventional orthograde endodontic treatment.

Where possible, an orthograde approach should first be used to seal the perforation, ideally using mineral trioxide aggregate (MTA).<sup>10</sup> If this is not practical, the canal must be thoroughly cleaned and filled with calcium hydroxide paste to dry it out and to allow the tissues time to heal. The prepared canal space should then be obturated using conventional root canal filling techniques. Perforations caused by instrumentation errors can usually be treated by an orthograde approach as the access is generally good. However, if clinical symptoms persist or there is bone resorption, or in the case of a large perforation, a surgical approach will be necessary. If failure occurs, the cause must be established before further

intervention. Surgical intervention should not be the first line of treatment.<sup>11</sup>

Fractured endodontic instruments are a common endodontic problem which can cause endodontic obturation problems and can result in failure. The simplest situation is when a fractured endodontic instrument is in the coronal end far enough into the pulp chamber and that it can be grasped by Steiglitz forceps, narrow-beaked artery forceps or fine pliers. If the point lies in the root canal below the pulp chamber but in a straight part of the canal, attempts should be made to bypass and either remove the point or incorporate it into the root filling. A size 08 or 10 file is used, and the tip is coated with EDTA paste. If the point can be bypassed, it can frequently be removed with Hedstroem (H) files or by using an ultrasonic technique. CPR® Ultrasonic tips are ideal for accessing and dislodging points and broken instruments.<sup>5</sup> But in this patient a size 15 H file was used and the fractured piece was gently removed.

The management of discoloration with direct restorations was not much effective in this patient because the existing composite restorations were extensive and discoloration was difficult to mask. Therefore PFM crowns were the treatment of choice. Bleaching techniques were also possible with inside outside bleaching with Carbamide peroxide and with in office power bleach. But the existing composite restorations were a limiting factor.

This patient had a minimal incisal show with short central incisors which needed lengthening with crowns. But the patient did not wanted more length than the lateral incisors which did not coincide with golden proportions and aesthetic principals. The preservation of the existing teeth must be the ultimate goal in restorative dentistry.

Successful treatment of tooth discoloration depends on the correct diagnosis by the practitioner of the type, intensity, and location of

Management of a patient with failed surgical endodontics

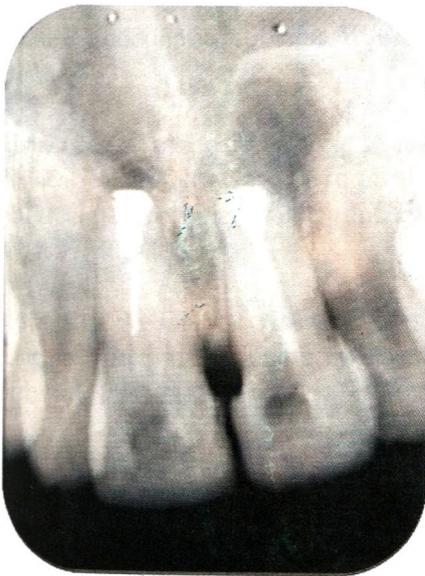
the discoloration. Other treatment options include full porcelain crowns or porcelain veneers which were not considered due to the cost and availability of the facilities.



**Figure 1.** Intra oral view



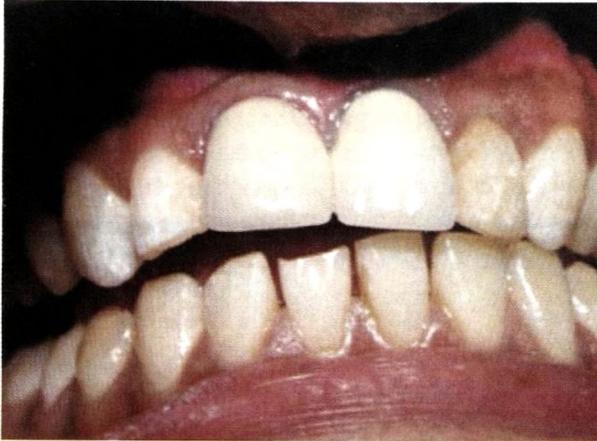
**Figure 2.** Palatal view - periapical lesion



**Figure 3.** Periapical Radiograph at the time of presentation



**Figure 4.** Periapical Radiograph after obturation of 11, 21, & 22



**Figure 5.** After fixing PFM crowns & healing of the discharging sinus



**Figure 6.** Post operative smile

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