

Sri Lanka Dental Journal

Volume : 35
Number : 02
December : 2005



**The Official Publication
of the Sri Lanka Dental Association**

ISSN 1391-07280



HI-TECH DENTAL LABORATORY

The Pioneer Commercial Porcelain Laboratory

For all your Dental Laboratory Work :

- ◆ Porcelain crown & bridge work
- ◆ Orthodontics/ lingual arch bar, trans palatal arch
- ◆ Removable Orthodontic appliances
- ◆ Post crowns & Jacket crowns
- ◆ Metal Crowns in precious metal, semi precious metal
- ◆ Bridge work
- ◆ Maryland Bridges
- ◆ Chrome cobalt full and partial dentures
- ◆ Overdenture abutments for Dental Implants

Sole Agent :

INNOVA CORP - CANADA

The endopore dental implant system endopore

T.P. ORTHODONTICS

IMTEC MINI DENTAL IMPLANTS

FOR DETAILS & PRICE LIST

DENTAL SERVICES CO. (PRIVATE) LTD.,

No. 141, Vauxhall Street,
Colombo - 2

Telephone : 2335175 , 2304185

Fax No : 2304186



Sri Lanka Dental Journal

Volume 35

Number 02

December 2005

The Sri Lanka Dental Journal is a refereed journal published biannually by the Sri Lanka Dental Association in collaboration with the College of Dentistry and Stomatology of Sri Lanka, College of General Dental Practitioners of Sri Lanka and the College of Community Dentistry of Sri Lanka.

Editorial Office

Office of the SLDA,
Professional Centre,
275/75, Bauddhaloka Mawatha,
Colombo - 7.

Correspondence regarding editorial matters, articles, reviews and news items should be addressed to the Editor, SLDJ, Dr. Ganananda Nanayakkara, Dept. of Anatomy, Faculty of Medicine, University of Ruhuna, Galle.

Tele: 091 - 2234801

Correspondence regarding advertisements and financial matters should be addressed to Dr. Malcolm Stanislaus, 50, Hekitta Cross Road, Handala, Wattala.

Tele: 011 - 2930368

ISSN 1391 - 07280

© SRI LANKA DENTAL ASSOCIATION

Typeset & Printed by:

AK 2 PRO - Ethul Kotte, Kotte.

Tele: 011-2871899

CONTENTS

42 Editorial

Leading Article

- 43 Aetiology of malformations with special reference to tobacco
N A de S Amaratunga

Review Article

- 46 Oral implants in young patients
B Ganananda Nanayakkara

Research Articles

- 49 A Study on The Emotional Effects of Tooth Loss
T. Anandamoorthy
- 54 Changes in the Arch Width due to Different Treatment Modalities in Orthodontic Patients
K.A.Kalyanaratne

Case Report

- 59 Calcifying epithelioma (Pilomatrixoma/ Pilomatricoma): a diagnostic pitfall for the Dental Surgeons!
H. Amarapala, P.R. Jayasooriya, D.K. Dias, E.A.P.D. Amaratunga

Presidential Address

- 63 Presidential Address - 2003
B Ganananda Nanayakkara
- 67 Presidential Address - 2005
E. A. Prasad D. Amaratunga

General

- 69 A Search for cosmic life
Prof. Chandra Wickramasinghe

News

- 74 *Professor N A de S Amarathunga*
- 75 The road less traveled
Prof. Lakshman Samaranyake

80 Instructions for Authors



Sri Lanka Dental Journal

Volume 35

Number 02

December 2005

Editor

Ganananda Nanayakkara

Assistant Editors

K. Krishnarasa

Harsha L de Silva

S.P.A.G. Ariyawardana

V.S. Weerasinghe

Finance Manager

Malcolm Stanislaus

Editorial Board

A.N.I. Ekanayaka

N.A.de S. Amaratunga

B.R.R.N.Mendis

M.T.M.Jiffry

M.S.Chandrasekara

Lilani Ekanayaka

Ajith W.Ranasinghe

Deepthi Nanayakkara

International Advisers

K.A.A.S.Warnakulasooriya (United Kingdom)

L.P.Samaranayaka (Hongkong)

D.Y.D. Samarawickkrama (United Kingdom)

Micheal Mars (United Kingdom)

David Davis (United Kingdom)

Brian Millar (United Kingdom)

Statistical adviser

R.O.Thatil

EDITORIAL

My vision during the three years as the editor was to make the Sri Lanka Dental Journal to achieve international standards. With that view in mind I invited internationally accepted colleagues of different fields of dentistry to contribute to enhance and introduce current trends in dentistry. Some of them accepted to be in the editorial board in all issues of the journals.

I wish to thank all my colleagues locally and foreign who contributed much to write the leading articles of the journals and for all other articles sent and published.

I offer my sincere thanks to the presidents members of the council of the Sri Lanka Dental Association and other colleagues and others who extended their whole hearted corporation during the last three years to achieved the standards setout to bring the last six issues of the journal of the Sri Lanka Dental Association to what it is today.

I extended greatfull thanks to Dr. Malcolm Stanislaus who was a pillar of strength during my tenure as editor.

Dr. Ganananda Nanayakkara

Editor - SLDJ

Aetiology of malformations with special reference to tobacco

N A de S Amaratunga

Department of Oral and Maxillofacial Surgery,
Faculty of Dental Sciences, University of Peradeniya, Sri Lanka.

Introduction

It is estimated that about 3% of newborns have a major malformation, which may have a cosmetic or functional significance. A large proportion of these children would have cranio-facial anomalies. Therefore the World Health Organization has drawn attention to the need for global strategies to reduce the health care burden of cranio-facial anomalies. In this regard tobacco control has assumed greater importance.

The adverse effect of tobacco on reproductive health as well as on health more generally is fairly well known. Smoking is practiced by about a third of the world's population aged fifteen or older, including some 12% of women.¹ The proportion of women who smoke in developed countries is currently estimated to be 21% while the proportion in the developing countries is about 7%, and these numbers may be increasing particularly in developing countries² where it is estimated that tobacco consumption is rising by about 3.4% per year.³

Tobacco use as a habit is very much related to the culture of a society. Globally each year approximately twelve million women smoke during pregnancy.⁴ In Sri Lanka however, the number of women who smoke would be negligible. Yet there is a large number of rural women who chew betel with tobacco. The effect of tobacco chewing on the oral mucous membrane is well known. Whether or not tobacco chewing could have an effect on reproductive health in general and on a developing fetus in particular has not been comprehensively studied. The addictive properties of tobacco seem to be effective even when it is used locally as in chewing. Sufficient quantities of nicotine have to be absorbed via the oral mucosa for addiction to take effect. Other harmful substances too could be similarly absorbed or ingested. Passive smoking by women too has to be taken into account when analyzing the relationship of developmental anomalies and tobacco.

The incidence of developmental anomalies in Sri Lanka has not been determined in a systematic manner. Frequency of oro-facial clefts is reported to be about 1.4 per thousand births.⁵ Epidemiological studies on other major cranio-facial malformations such as hemifacial microsomia, congenital heart disease, neural tube defects, and limb deformities have not been done in Sri Lanka. Yet doctors who deal with these conditions know by experience that they are not uncommon.

Of all air pollutants tobacco smoke is the one with the highest prevalence of disease. Tobacco smoke constituents include several carcinogens such as polycyclic aromatic hydrocarbons, benzopyrene and nitrosamines. It also has nicotine and phenol, which are believed to be capable of causing tumour promotion. Nicotine is the principle addictive agent without which tobacco cannot cause all the harm it does. Formaldehyde and oxides of nitrogen cause toxicity to cilia, which could result in respiratory illness and asthma. With regard to malformations the probable causative agent found in tobacco smoke is carbon monoxide, which causes impaired oxygen transport and utilization.

Pathogenesis

Congenital malformations can be defined as structural defects that are present at birth but some may manifest at later years. The term congenital however does not mean that the malformations always have a genetic basis. They may be caused by genetic or other factors or by a combination of several factors. In discussion of this subject there are several terms, which have to be clearly understood. Malformations are caused by primary errors of morphogenesis. Cleft lip and palate would be an example of a malformation. Disruption results from secondary destruction of an organ or body region that was previously normal in development. Formation of amniotic bands that cause such disruptions is a good example. Sequence refers to

multiple congenital anomalies that result form secondary effect of a single localized aberration in organogenesis, which could be a malformation, deformation or disruption. Malformation syndrome on the other hand refers to the presence of several defects that cannot be explained by a single localized error in morphogenesis. Syndromes are most often caused by a single causative factor that simultaneously affects several tissues, for example a viral infection or a chromosomal abnormality.

Known causes of malformations can be grouped into two major categories; genetic and environmental. In about half of the malformations the cause cannot be recognized. Malformations, which have a genetic basis, could be due to chromosomal disorders, single gene mutations or much more commonly multifactorial inheritance. In the later mechanism there is interaction of two or more genes of small effect with environmental factors. A majority of cleft lip and palate are believed to be caused by multifactorial inheritance.

Chromosomal disorders arise during gametogenesis and hence are not familial. Single gene mutations are characterized by Mendelian inheritance and are less common than chromosomal disorders. An example for a malformation caused by single gene mutation would be syndactyly. Down syndrome is an example of chromosomal disorder.

If tobacco has a role in the pathogenesis of malformations it would be as an environmental factor in multifactorial inheritance. Multifactorial (also called polygenic) inheritance is involved in many of the physiological characteristics of humans eg; height, weight, blood pressure. A multifactoril physiologic or pathologic trait may be defined as one governed by the additive effect of two or more genes of small effect but conditioned by environmental, non-genetic influences. It is believed that there is a threshold effect so that a disease becomes manifest only when a certain number of effector genes as well as conditioning environmental influences are involved. This form of inheritance is believed to underlie such common diseases as diabetes mellitus and hypertension and also quite commonly malformations such as cleft lip and palate and hemifacial microsomia.

Known environmental factors which may cause congenital malformations could be categorized as;

maternal/placental infections, maternal disease status, drugs and chemicals and irradiation. Maternal/placental infections which are implicated in the etiology of malformations are; rubella, toxoplasmosis, syphilis, cytomegalovirus and HIV. Maternal disease states, which may be associated with an increased frequency of malformations, are diabetes, phenylketoneuria and endocrinopathies.

A variety of drugs and chemicals have been suspected to be teratogenic; alcohol, folic acid antagonists, androgens, phenytoin, thalidomide, warfarin, retinoic acid etc.

Timing

The timing of the teratogenic insult will decide both the occurrence and the malformation produced. The intrauterine development of humans can be divided into two phases; the embryonic period (first nine weeks of pregnancy) and the foetal period (until birth). In the early embryonic period (first three weeks) the embryo is extremely susceptible to teratogenesis. The peek sensitivity during this period is between the fourth and the fifth weeks. It is during this period that the organs are being created from the germ cell layers. The foetal period that follows organogenesis is marked chiefly by further growth and maturation of the organs with greatly reduced susceptibility to teratogenic agents. Instead the foetus is susceptible to growth retardation or injury to already formed organs. It is possible for a given agent to produce different malformations if exposure occurs at different times of gestation.

Role of tobacco

Until recently the evidence to support the theory that tobacco increases the risk of malformations was inconclusive. Recently carried out meta-analysis of published research however have given more incriminating evidence against tobacco. Julian Little et. al.⁶ seem to have done a comprehensive meta analysis with excellent literature search which does not include animal experiments. They conclude that the study lends support to the hypothesis that maternal smoking increases the risk of oro-facial clefts. This meta-analysis has covered twenty-four studies on the relationship between maternal smoking and cleft lip and palate. The relationship seems to be of moderate strength but has been consistent in the

Aetiology of malformations with special reference to tobacco

studies analyzed. The effect of tobacco was stronger and more consistent for cleft lip with or without cleft palate than for isolated cleft palate.

No consistent association between smoking and other malformations such as neural tube defects, cardiovascular anomalies, Down syndrome ect has been reported. Some studies have found a relationship between smoking and limb deformities. Van den Eeden et. al.⁸ has conducted a population based case-control study to assess the association between maternal smoking and the risk of giving birth to a child with a congenital malformation. Increased risk was observed for a number of malformations; microcephalus, oro-facial clefts and clubfoot.

Interaction between tobacco and genes

The possibility of tobacco interacting with genes in women during pregnancy and as a result causing malformations has been investigated since mid 1990s'. However the findings are inconsistent. Yet this is a promising area of research for the future. Show et al (8) reported that smoking in combination with the presence of the uncommon TGFA gene variant increased the risk of occurrence of oro-facial clefts.

Animal experiments

Several studies on mice lend support to the theory that exposure to tobacco smoke during pregnancy increases the risk of giving birth to offspring with malformations. Seller and Bnait (9) have reported that exposure of genetically predisposed mice to tobacco smoke resulted in the occurrence of cleft lip and palate. This may have implications for humans too.

Conclusion

There seems to be sufficient evidence to convict tobacco as a causative factor of congenital malformations. There is consistent, moderate and statistically significant associations between both cleft lip with or without palate and isolated cleft palate and maternal smoking. This new information could be used effectively in tobacco counseling even in societies where women seldom smoke. The message delivered in the counseling process could be strengthened by demonstrating to men who smoke

the adverse effects of smoking, specially the malformations like oro-facial clefts and the implications of passive smoking.

References

1. World Health Organization. Trends in substance abuse and associated health problems. WHO 1996(fact sheet 127)
2. Ernster V, Kaufman N, Nichter M, Samet J, Yoon SY. Women and tobacco: moving from policy to action. Bulletin of the World Health Organization 2000;78:891-921.
3. World Health Organization. Combating the tobacco epidemic. The world health report 1999 — making a difference. Geneva: World Health Organization; 1999. p. 65-79.
4. Samet JM, Yoon SY. Women and the tobacco epidemic: challenges for the 21st century. Geneva: World Health Organization; 2001.
5. Amaratunga NAdS. Chandrasekera A. Incidence of cleft lip and palate in Sri Lanka. Am.J.Oral Maxfac.Surg 1989;47(6):559-61.
6. Little J. Cardy A. Munger R.G. Tobacco smoking and oral clefts: a meta analysis. Bulletin of the WHO.2004; 82:(3):
7. Van Den Eeden SK, Karagas MR, Daling JR, Vaughan TL. A case-control study of maternal smoking and congenital malformations. Paediatric and Perinatal Epidemiology 1990; 4:147-55.
8. Shaw GM, Wasserman CR, Lammer EJ, O'Malley CD, Murray JC, Basart AM, et al. Orofacial clefts, parental cigarette smoking, and transforming growth factor-alpha gene variants. American Journal of Human Genetics 1996; 58:(3): 551-61.
9. Seller G M.Bnait KS. Effects of tobacco smoke inhalation on the developing mouse embryo and fetus. Teratology 2004; 42:(3)

Yu and Company (Pte) Ltd.

We provide to dentist:

- ❖ *Quality products from reputed brands*
- ❖ *Reasonable pricing*
- ❖ *Dental equipment & supplies*
- ❖ *Orthodontic Material*
- ❖ *Unmatched caring and courteous after sales service*
- ❖ *6 days a week customer support by manufacture trained technicians*
- ❖ *Availability of original spare parts for all equipment supplied by us*
- ❖ *One stop shop all dental requirements*
- ❖ *We take responsibility, and provide reliability & assurance in all what we do*

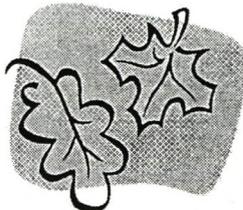
Contact: yu and Company (Pte) Limited

198 Cotta Road,

Colombo 8.

Tel: 2691740, 4618469

Fax: 94-11-2687463 Email: ty and co@wow.lk



**Opening Hours: Weekdays 9.00 a.m. - 5.00 p.m, Saturdays
9.00 a.m. - 1.00 p.m.**

Oral implants in young patients

B Ganananda Nanayakkara

Department of Anatomy, Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka.

Oesterle and Cronin have presented articles on the topic of oral implants and the growing patient. It was concluded since so few data existed in this field, that indirect information based on experience and the results from studies of ankylosed teeth, research implants, and implants in adults had to be used.^{4,19}

Thus, little is known about the outcome and prognosis of implant treatment in young patients. Up until now, only limited number of case studies have been reported.^{1,10,15,17,19,21,22} Some reports comprise more extensive materials.^{12,13,18} There seem to be no long-term follow-up studies of treatment with oral implants in children.

Scholz & d'Hoedt reported implant failure rates as high as 46% in the age group 8-11 years which was significantly higher than for the group 12-17 years (20%).²⁰ However, for some early clinical studies of oral implants in young patients,^{5,6,16} it may be suggested that the high failure rates were not only associated with the age of the patients but also with failures of the implant system itself. Thus a topic of special interest is when to treat young individuals with implant-supported prostheses. Many authors recommend that oral implants should not be introduced earlier than at the age of 15 for girls and a few years later for boys,^{5,16,20} it may be suggested that the high failure rates were not only associated with the age of the patients but also with failures of the implant system itself. Thus, a topic of special interest is when to treat young individuals with implant-supported prostheses, duced earlier than at the age of 15 for girls and a few years later for boys.^{11,15,20} Others have the opinion that the growth pattern should be carefully followed and the oral implants not installed until growth is completed.^{4,14,19}

Unwanted effects on surrounding tissues from oral implants installed in young patients have been reported. That behavior of oral implants is similar to that of ankylosed teeth has been shown in animal experiments as well as in clinical trials.^{10,18,20} Thus osseoirrounding bone in the growing process. This will result in the implant being embedded in bone and the prosthetic superstructure being infraoccluded.^{10,12,20} Submerged implants might also influence the occlusal relationship because of changed jaw growth patterns.⁴ In pubertal patients fixed implant supported prostheses crossing the midline of the jaw must be regarded as unsuitable because of the risk of jaw growth, especially in the maxillae.^{4,19,21}

Few reports concern young patients with ectodermal dysplasia.^{3,4,7,22} Implants have been installed in very young patients, 5 and 6 years of age, with promising long-term results. The prerequisite for treating such a young patient with implants is that the alveolar ridge in the front of the mandible is low or missing and only minor growth changes can be expected. A removable overdenture that permits growth and prosthetic corrections is recommended.³

Good results with extra-oral tissue-integrated implants for hearing-aids in children are reported.⁹ Despite the thin cortical bone of the skull, as compared to adults, the fixture survival rate was 96.6%. Technical drawbacks seem to be counterbalanced by the higher activity of bone healing in children.

One report deals with the rehabilitation of a young boy after hemisection of the mandible due to sarcoma.¹³

The necessity of a team approach for planning and treating young patients with implants is pointed out by many authors.^{1,2,3,8,17}

Ethical guidelines for treating patients with oral implants have been proposed by Tangerud & Orstavik.²³ Corresponding principles for children have not been presented in the literature.

References

1. Balshi J Osseointegration and Orthodontics; Modern Treatment for Congenitally Missing Teeth. *Int. J Peridont Rest Dent* 1993; 13:495-505.
2. Bergendal B, Bergendal T, Hallonsten A-L, Koch G, Kural J, Kvint S. A multidisciplinary approach to oral rehabilitation with osseointegrated implants in children and adolescents with multiple aplasia. *Eur J Orthod* 1996. In press.
3. Bergendal T; Eckerdal O, Hallonsten A-L, Koach G, Kuro J, Kvint S. Osseointegrated implants in the oral rehabilitation of a boy with ectodermal dysplasia: case report. *Int Dent J* 1991;41:149-156.
4. Cronin RJ, Oesterle LJ, Ranly DM. Mandibular Implants and the Growing Patient. *Int J Oral Maxillofac Implants* 1994;9:55-62.
5. Frisch E, Pehrsson K, Engelke W, Sennhenn S, Jacobs HG Beitrag zur Problematik der Implantaten im Oberkiefer-Frontzahnbereich, *Z Zahnarztl Implantol* 1990;6:108-110.
6. Fritzeneier CU, Lentrodt J, Joltje W, Osborn JF. Bisherige Erfahrungen mit dem Tubingen Sofortimplantat aus Aluminium Oxydkeramik. *Dtsch Zahnarztl Z* 1981;36:579-584.
7. Guckes AD, Brajo, JS, McCarthy GR, Rudy SF, Cooper LF. Using endosseous dental implants for patients with ectodermal dysplasia. *JADA* 1991; 122:59-62.
8. Higuchi K Hypodontia and Oligodontia. In: Worthington P, Branemark P-I(eds). *Advanced osseointegration surgery. Application in the maxillofacial region.* Quintessence Publishing Co. Berlin, p.248-252, 1992.
9. Jacobsson M, Albereksson T, Tjellstrom A. Tissue-integrated implants in children. *Int, J. Pediatr Otorhinolaryngol* 1992; 24:235-243.
10. Johansson G, Palmqvist S, Svenson B. Effects of early placement of a single tooth implant. A case report. *Clin Oral Impl Res* 1994;5:48-51.
11. Kupietzky A, Houpt M. Hypohidrotic ectodermal dysplasia: Characteristics and treatment. *Quintessence Int* 1995; 26:285-291.
12. Ledermann PD, Hassell TM, Hefti AF. Osseointegrated dental implants as alternative therapy to bridge construction or orthodontics in young patients: seven years of clinical experience. *Pediatr Dent* 1993; 15:327-333.
13. Ledermann PD, Schmoker R, Tschopp H. Ein universelles enossales Implantationskonzept: Das Ha-Ti –Schraubenimplantat. Ha-Ti-Implantate bei einem jugendlichen Sarkompatienten nach Untertakieferrekonstruktion. *Swiss Dent* 1990;11:27-32.
14. Lekholm U. The Use of Osseointegrated Implants in Growing Jaws. *Int J Oral Maxillofac Implants* 1993;3:243-244.
15. Mackie IC, Quayle AA Implants in children: a case report. *Endod Traumatol* 1993;9:124-126.
16. Mairgilnther R, Neutwig GH, Schneider M. Das Frialit-Implantat Typ Munchen. Ergebnisse nach Uber 5-jahrigen klinischer Anwendung. *Z Zahnarztl Implantol* 1990;6:115-119.
17. Mehrali M, Baraoidan M, Cranin AN. Use of Endosseous Implants in Treatment of Adolescent Trauma Patients. *N Y State Dent J* 1994; Febr: 25-29.
18. Odman J. Implants in Orthodontics. An experimental and clinical study. Thesis. University of Goteborg 1994.

Oral implants in young patients

19. Oesterle LJ, Cronin RJ, Ranly DM. Maxillary Implants and the Growing Patient. *Int J Oral Maxillofac Implants* 1993;8:377-387.
20. Scholz F, d'Joedt B. Der Frontzahnverlust im jugendlichen Gebiss-Therapiemöglichkeiten durch Implantate. *Dtsch Zahnarztl Z* 1984; 39:416-424.
21. Smiler DG, Treatment of the adolescent trauma patient with endosseous implants: a case study. *Pract Periodont Aesthet Dent* 1993;5:19-23.
22. Smith RA, Vargervik K, Kearns G, Bosch C, Koumjian J. Placement of an endosseous implant in a growing child with ectodermal dysplasia. *Oral Surg Oral Med Oral Pathol* 1993;75:669-673.
23. Tangerud T, Orstavik J, Retningslinjer for implantatprotetisk behandling. *Nordisk Klinisk Odontologi*, 21 B-VIII;1-10, 1990.
24. Vajdovich VI, Kostinek D. Die Versorgung von Lucken im Frontzahngebiet bei Kindern and Jugendlichen mit Hilfe von Implantaten aus DIAKOR®Biokeramik. *Stomatol DDR* 1988;38:806-811.

DRUGS FOR DENTAL PRACTITIONERS

ITEM	Unit	Supplier	W/S Price	Retail Price
			Rs:	Rs:
1 Absorbent Cotton Gauze B.P. 36" x 6YDS	6 YD	MEDTX	82.00	95.00
2 Absorbent Cotton wool 100G	100G	TAMED	30.00	35.00
3 Amoxicillin Tab 125mg	500T	SPMC	700.00	800.00
4 Cephalexin Cap 250mg	100C	RNBXY	300.00	345.00
5 cephalixin Tab 125mg	100T	RNBXY	450.00	520.00
6 Ciprofloxacin Tab 250mg	100T	ECURE	167.00	188.00
7 Ciprofloxacin Tab 500mg	100T	FOURT	300.00	350.00
8 Cloxacillin Cap 250mg	1000C	SPMC	1,575.00	1,900.00
9 Diclofenac Sodium Tab 100mg	1TAB	LUPIN	2.51	2.90
10 Diclofenac Sodium Tab 50mg	100T	MADRA	40.00	53.00
11 Diflunisal Tab 500mg	100T	M.S.D	3,500.00	3,546.00
12 Famotidine Tab 20mg	100T	BELCO	85.00	45.35
13 Famotidine Tab 40mg	336T	NCOLS	295.00	191.50
14 Hydrogen Peroxide Solution	400ML	ATLNT	140.00	140.90
15 Mefenamic Acid Tab 250mg	1000T	INTPH	650.00	834.00
16 Metronidazole Tab 200mg	1000T	UNIQUE	300.00	350.00
17 Nystatin Oral Suspension	30ml	BELTA	120.00	135.00
18 Nystatin Oral Tab	100T	LIFE	1,400.00	1,600.00
19 Paracetamol Tab 500mg	1000T	MEDOP	271.70	244.90
20 Paracetamol Tab 500mg	2000T	MEDOP	429.70	483.40
21 Paracetamol Tab 500mg	100T	BALPH	40.00	50.00
22 Povidone Iodine Gargle	50ML	WCKRD	75.00	90.00
23 Roxithromycing Tab 150mg	100T	CIPLA	832.10	936.10
24 Vit 'B' Co Tab C.H.F	2000T	SPMC	240.00	280.00

SPC provides safe, effective & high quality drugs at a reasonable price.



State Pharmaceuticals Corporation of Sri Lanka
 No.75, Sir Baron Jayathilake Mawatha, Colombo 1.
 Telephone: 2320356-9 Fax: 2447118
 Website:www.spc.lk Email:md.@spc.lk

A Study on The Emotional Effects of Tooth Loss

T. Anandamoorthy

Department of Prosthetic Dentistry, Faculty of Dental Sciences, University of Peradeniya

Abstract

Aim:- To study the emotional effects of tooth loss in a group of edentulous patients attending the Department of Prosthetic Dentistry at the Dental Hospital (Teaching) Peradeniya. **Method:-** An interviewer administered questionnaire was used to collect the data. A total of 150 edentulous patients were interviewed in private. Among them there were 92 females and 58 males. **Results:-** Among the 150 patients interviewed 67% of patients stated that they were not prepared for the consequences of tooth loss. Sixty percent of those who were prepared for the effects felt that tooth loss was an inevitable consequence of ageing. Sixty five of patients were of the opinion that tooth loss had adversely affected their self-image. Among them 85% of patients felt their faces were changed. Eighty seven percent did not feel anger towards themselves or their dentist. Eighty three of patients said that they never felt any form of rejection by their spouses or by society. **Conclusion:-** Tooth loss can have a serious impact on the lives of some individuals. The patients should be well informed about the effects of tooth loss prior to extraction of teeth. **Key words:-** Edentulousness, Emotional effects. Self image

Introduction

Teeth are extracted as a routine treatment by most dental practitioners. Edentulousness is a handicapping condition which is poorly compensated for by means of conventional complete dentures and causing psychological insecurity. (Blomberg and Lindquist 1983).

Tooth loss can have a profound impact on the lives of people. In a study conducted by Berg et-al, it was found that almost half of the edentulous patients interviewed felt bitter and sad about the loss of their teeth. This feeling was found to be more common in women than men. (Berg et al 1984). Even patients who stated that they were apparently happy with their dentures, felt bad about the loss of their teeth (Fiske et al 1998).

In a study on patients attending a General Dental Practice in Sri Lanka Nanayakkara reported that overall patients accepted their tooth loss without difficulty

even though it caused limitations in their functions. (Nanayakkara et al 2003).

Loss of teeth may have personal and social implications for many patients. It has been shown that people with total loss of teeth perceived it as a serious event in life and considered it to be more important, in terms of adjustment, than events such as marriage and retirement. (Bergendal 1988). There were no significant differences in these feelings in relation to age and gender.

Edentulousness in one or both jaws is a common condition. Edentulousness is neither a fatal nor a condition for which one is shown sympathy for. Many people with this handicapping condition felt unhappy about their predicament. (Fiske, et al 1998)

The aim of this study was to assess the feelings associated with tooth loss among edentulous people who demanded prosthetic rehabilitation at the

T. Anandamoorthy

Department of Prosthetic Dentistry, Faculty of Dental Sciences.

Materials and methods

One hundred and fifty patients were randomly selected from those who had been given an appointment for prosthodontic treatment for complete dentures. The purpose of the study was explained in detail to each patient and none refused to take part. Data was collected by means of an interviewer administered questionnaire. The interview was carried out by the author in private on the clinic.

The questionnaire was pretested among fifteen individuals and the necessary modifications made.

The interview was conducted like a normal conversation in a friendly manner in the dental clinic. The questionnaire contained five questions with multiple responses related to the feelings of people following complete loss of teeth, changes in their behaviors and how they coped with tooth loss.

Results

The mean age of the participants was 59.7 years and the age range was 38 – 88 years.

There were 58 males and 92 females (see Table 1)

Table 1 Distribution of patients according to the age group and gender.

Age range of people	No. of people	No. of Males	No. of Females
31-40	04	01	03
41-50	29	09	20
51-60	50	13	37
61-70	43	17	26
71-80	20	15	05
81-90	04	03	01
Total	150	58	92

A Study on The Emotional Effects of Tooth Loss

Table 2 Distribution of patients according to their feelings about tooth loss

Patients' feelings	Yes		No	
	Number	%	Number	%
1. Feeling of anger	20	13	130	87
(a) towards the self	13	65		
(b) with his/her dentist	7	35		
(c) with every one	0			
2. Feeling of depression	115	77	35	23
(a) due to affected appearance	76	66		
(b) due to affected speech	71	61		
(c) due to difficulty in eating and selection of food	97	84		
3. Effect on self- image	98	65	52	35
(a) changed facial appearance	83	85		
(b) inability to smile and laugh	83	85		
(c) reluctance to look in the mirror	72	73		
4. Preparedness to face the consequences	50	33	100	67
(a) as tooth loss is due to ageing	30	60		
(b) because dentures could replace	09	18		
(c) as the teeth were in bad condition	11	22		
5. Feeling of rejection	26	17	124	83
(a) by the spouse	16	62		
(b) by the society	10	38		
(c) by the family members	10	38		

Eighty seven percent of patients did not have any feeling of anger due to tooth loss. Among those who did feel anger 65% felt anger towards themselves for not caring about their teeth in order to avoid the need for extractions whilst 35% expressed feelings of anger with their dentist for their failing to save their teeth without extracting them. (Table 2)

Seventy seven percent of patients stated that they were depressed as they felt that their appearance was affected due to the loss of teeth. Among those patients who felt depressed 84% were unhappy because of

their inability to chew their food and the limitation in the selection of their food.

Tooth loss had a profound effect on the self image of 65% of patients of whom 85% felt that their facial appearance had changed for the worse as a result of tooth loss and they could not smile or laugh as before.

Among the patients interviewed 67% of patients stated that they were not prepared to face the consequences of tooth loss. Sixty percent of those, who were prepared for the loss of their teeth, expressed the feeling that they had to lose their teeth due to the age changes and therefore they were prepared to

accept their condition. In addition 22% of them were prepared to lose their teeth as they felt the loss was inevitable as their teeth were in a bad condition.

Eighty three percent of patients expressed their opinion that they had not felt any rejection by others. Among those who felt rejected 62% admitted that they had been rejected by their spouses and 38 % of the patients felt that the society did not accept them as before.

Discussion

Among the 150 patients interviewed 49% of patients were wearers of complete dentures and 51% were getting their dentures for the first time. There were 92 females and 58 males among those who reported for prosthetic treatment.

It is interesting to note that in the study conducted in London out of 94 patients there were 48 males and 46 females. (Reference for this). This suggests that more females in Sri Lankan culture are concerned about their appearance compared to males.

It is clear from the findings of this study that loss of teeth has a dramatic effect on the lives of people. Sixty seven percent of the patients interviewed were not prepared to face the consequences of tooth loss. Among those who were prepared for the loss of their teeth 60% of people considered tooth loss to be a consequence of ageing, whilst 22 % were prepared to get rid of their teeth as they were in a bad condition.

In his study Nanayakkara (2003) showed that 84% of patients were not prepared to lose their teeth. This difference may be attributed to the contrast in the life styles of the affluent people who seek treatment in a General Dental Practice compared to the less affluent people who attend the Dental Hospital clinic.

Where the impact of tooth loss on self image was concerned 35% of the patients did not feel any effect. Sixty five percent of patients were of the opinion that the impact of tooth loss was tremendous. Tooth loss caused adverse effects in their facial appearance and limitations in their ability to smile and laugh. Similar finding were reported from Norway. (Berg et al 1984). In their study almost half of the patients expressed the opinion it was a traumatic experience to become edentulous. It is an accepted fact that some people usually feel angry when they lose their

teeth. In this study 87% of patients did not feel any anger towards anybody following tooth loss.

The difficulty in selection of food and eating were reported by 84% of patients. This is similar to results obtained by Davis et al in their study. They showed that 76% of the patients they investigated had restricted their choice of food. (Davis et al, 2000)

Many patients were unprepared to face the effects of tooth loss. This may be due to the fact that the explanation by the dentist prior to extraction may be inadequate regarding the effects of tooth loss on appearance and chewing ability as well as on speech.

Conclusions

Sixty seven percent of patients stated that they were not prepared to face the consequences of tooth loss. Sixty percent of edentulous people who were prepared the effects of tooth loss were of the opinion that teeth were lost due to ageing.

Eighty seven percent of patients who were interviewed did not feel anger towards themselves or their dentist. Among those who felt anger only 35% expressed a feeling of anger towards their dentist for the failure to save their teeth without extracting them.

Sixty five percent of participants felt that tooth loss had an adverse effect on their self image. Eighty five percent of patients among those who felt affected were of the opinion that their facial appearance had changed and they were unable to smile and laugh as they did before. This study emphasizes that the impact of tooth loss on the emotional aspect of people should be given more consideration. The effects of tooth loss need to be explained clearly to patients before extraction of their teeth.

References;

1. Bergendal, B The relative importance of tooth loss and denture wearing in Swedish adults. *Community Dent Health* 1989; 6; 103-111
2. Davis, D.M, Fiske, J. Scott, B. and Radford D.R The emotional effects of tooth loss. A preliminary quantitative study. *Br Dent J* 2000; 188; 503-506

A Study on The Emotional Effects of Tooth Loss

3. Fiske, J. Davis, D.M. Frances, C and Gelbier, S. The emotional effects of tooth loss in edentulous people. *Br Dent J* 1998; 184: 90-93
4. Berg, E, Ingerbertsen R, and Johnsen T.B Some attitudes towards edentulousness Complete dentures, and co-operation with the Dentist, *Acta Odontol Scand* 1984; 42:333-338
5. Nannayakkara, G, Davis DM, Fiske J, The emotional effects of tooth loss in edentulous and partially dentate people in Sri Lanka. *Sri Lanka Dental Journal* 2003;32(2): 60.64
6. Reeve PE, Watson, C.S, Stafford G.D The role of personality in the management of complete denture patients. *Br Dent J* 1984; 156:356-362
7. Smith, P.W, McCord, J.F What do patients expect from complete dentures. *Journal of Dentistry* 2004; 32:3-7
8. Bolmberg, S, Lindquist, L.W, Psychological reactions to edentulousness and treatment with jaw bone anchored bridges. *Acta Psychiatr, Scand* 1983; 68:251-262
9. Marinus A.J., Van Wass, The influence of psychologic factors on patient satisfaction with complete dentures. *J. Prosthet Dent* 1990; 63: 545-548
10. Carlsson G.E, Otterland, A, Wennstrom Patient factors in appreciation of complete dentures. *J. Prosthet Dent* 1967;7:322-328

Acknowledgements:

The Author is grateful to Prof. S.L. Ekanayaka for making valuable suggestions during the preparation of the manuscript and Ms. Sumangani Bandara for typing the manuscript.

Changes in the Arch Width due to Different Treatment Modalities in Orthodontic Patients

K.A.Kalyanaratne

Senior Lecturer and Consultant Orthodontist, Division of Orthodontics, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka

Abstract

Introduction: Some advocates believe that extraction treatment, especially the extraction of bicuspid for orthodontic treatment causes a narrowing of dental arches which subsequently leads to inadequate facial fullness. The public opinion therefore is unfavourable for extraction treatment. Hence, the purpose of the present study was to analyze a randomized sample of study models treated with two different treatment modalities, extraction and non extraction, to find out whether extraction may cause a narrowing of dental arches. **Materials and Method:** A total of 50 sets of study models belonging to 25 patients treated by 4 first premolar extraction and 25 patients treated without extractions were randomly selected. The intercanine, intermolar and basal arch lengths of the maxilla and mandible were measured and compared using Welch two sample t test. **Results:** Though the maxillary intercanine and intermolar widths increased after the treatment in the non extraction group, the increase in the intercanine width was not statistically significant. Both maxillary and mandibular intermolar widths decreased after the treatment in the extraction group, but were not statistically significant. The intercanine widths in the extraction group increased but were not significant. **Conclusion:** The result of this study supports the extraction treatment because the extraction treatment does not result in narrower dental arches than non extraction treatment.

Introduction

Extraction of teeth for orthodontic purposes has been in practice through out the world since early days of orthodontic treatment. Some advocates believe that extraction of teeth especially the extraction of bicuspid for orthodontic treatment may lead to narrowing of dental arches and subsequently may lead to inadequate facial fullness. Moreover, during smiling it further causes the appearance of dark triangles at the corners of the mouth, the so called buccal corridor of the mouth, a recently introduced landmark that represents the space between the the buccal surface of the dentition and the corresponding soft tissues with particular emphasis on the corners of the mouth. Some researchers who evaluated the smile aesthetics in extraction and non extraction

orthodontic patients¹ revealed no negative findings. Numerous studies have been carried out to evaluate the effects of extraction of teeth for orthodontic purposes on the dimensions of the dental arches,^{2,3,4} also have reported no adverse effects. In spite of these recent findings, the debate on, to extract or not to extract teeth for orthodontic treatment, is still intense and on going. Moreover, this has resulted in a swinging of treatment pattern more towards a non-extraction method.

Hence, the purpose of this study was to analyze a randomized sample of study models of orthodontic patients treated with two treatment strategies to find out whether extraction of teeth may cause a narrowing of the dental arch.

Materials and method

The total sample comprised of 50 sets of study models selected from the Department of Orthodontics, University Dental School, Saitama, Japan. This included randomly selected post treatment study models of 25 patients who had all first bicuspid extractions and another 25 sets of post treatment study models who had undergone non extraction treatment. The type of malocclusion in all patients had been Angle Class I malocclusion with varying degrees of crowding from mild to severe. In all the cases the treatment had been completed and had been carried out by various doctors under the supervision of the permanent academic staff. All the cases had been treated with either standard edgewise or pre adjusted edgewise techniques. No specific arch expansion devices had been used except expansion introduced to the arch wires

The intercanine width and intermolar widths between first molars in the maxillary and mandibular arches were measured using a fine grade caliper. The

measurements were taken from both pre and post treatment study models. Tip of the canines and the tip of the mesio-buccal cusp were considered as landmarks for measurements in canines and molars respectively.

The basal arch length of the mandibular arch in pre and post treatment models were measured using Bealey guage. All measurements were taken twice and average values were considered. The data were statistically analyzed using Welch two sample t-test.

Results

The means and standard deviations of intercanine and intermolar widths of pre treatment, non- extraction models were calculated and are presented in Table 1. The corresponding values of the Post treatment models of the same patients were calculated and are also presented in Table 1. The means and standard deviations of intermolar and intercanine widths of pre treatment and post treatment models of who underwent extraction treatment were also calculated and are presented Table 2.

Table 01 – Pre treatment and post treatment maxillary and mandibular intercanine and intermolar widths in non-extraction cases: means and SD (mm)

	Maxillary			Mandibular		
	Pre treatment	Post treatment	Significance	Pre treatment	Post treatment	Significance
IM	53.42±3.01	55.56±2.98	0.01	44.95±2.81	47.48±2.87	0.002
IC	35.94±2.50	36.35±1.82	NS	29.03±3.56	27.54±1.61	NS

IM=Inter molar width, IC=Inter canine width, NS=Not Significant

Table 02 – Pre treatment and post treatment maxillary and mandibular inter molar and inter canine width of extraction cases: means and SD (mm)

	Maxillary			Mandibular		
	Pre treatment	Post treatment	Significance	Pre treatment	Post treatment	Significance
IM	52.51±2.85	51.19±2.10	NS	44.58±2.78	43.58±2.78	NS
IC	35.11±2.12	36.51±1.33	0.007	27.16±2.68	27.16±2.68	NS

IM=Inter molar width, IC=Inter canine width, NS=Not Significant

Table 03 – Basal arch lengths of mandible after treatment in extraction and non-extraction cases: means and SD (mm)

	Pre treatment	Post treatment	Significance
Extraction	30.02±2.54	26.11±1.92	0.05
Non-extraction	32.27±2.24	32.44±5.11	NS

Changes in the Arch Width due to Different Treatment Modalities in Orthodontic Patients

At the commencement of treatment, the intermolar and intercanine widths of both treatment groups were similar and did not differ significantly except the lower inter canine widths of both groups ($P < 0.05$).

At completion of treatment, in the non extraction group, both maxillary intercanine and intermolar widths have increased during treatment. However, a statistically significant difference was observed only in relation to the inter molar width ($P < 0.05$). With reference to the mandibular dimensions in the non extraction group, an increase was observed for the mandibular intermolar width but the inter canine width has reduced. The increase in the mandibular inter molar width was statistically significant. The reduction in relation to intercanine width in the mandibular arch was however not significant (Table I).

The results reveal that intercanine and intermolar dimensions in relation to the extraction treatment have behaved differently. The inter molar width of the maxillary arch has reduced but the difference is not statistically significant. The intercanine width of the maxillary arch has increased during the period of treatment in the extraction group and this increase was statistically significant ($P < 0.05$). The mandibular intermolar width has decreased though it was not statistically significant. The intercanine width has increased during the treatment of the extraction group. This increase too was not statistically significant (Table 2).

Although the basal length of the mandibular arch in non extraction cases has increased the difference was not statistically significant ($P = 0.87$). But in the case of the extraction group the basal arch length of the mandible has reduced significantly during treatment ($P < 0.05$).

Discussion

The orthodontic treatment is carried out basically to improve the aesthetics and the function of the dento-facial structure. As there is a growing concern about the aesthetics, various post treatment impacts on the dentition by carrying out orthodontic treatment have been investigated and debated. The impact of extraction of teeth on the facial harmony is one of the mostly argued aspect from Calvin Case era.⁵

The appearance of dark triangles at the corners of the mouth during smiling in cases where teeth have been removed for orthodontic treatment, has been attributed to extraction of teeth by some authors. Their main conclusion is that dental arches become narrower due to extractions. The impact of the extraction not only causes narrowing of the dental arch, but it also affects the stability,⁶ facial profile,^{7,8,9} the positioning of condylar head leading to temporomandibular joint disorders,^{10,11} The arch expansion has been practiced frequently as an alternative method to extraction treatment. The maxillary arch expansion by means of rapid palatal expansion has been extensively discussed.¹² Rapid palatal expander would become an increasingly recognized appliance in patients with narrow dental arches to broaden the smile.

In the present study the possible changes of arch widths were analyzed by measuring the arch dimensions before and after the treatment in the two groups of patients who were underwent the two treatment strategies.

According to the data presented in Table 1, it is evident that the inter molar and inter canine widths of both treatment groups were similar and did not differ significantly except the lower intercanine widths of both groups.

In the extraction group, the maxillary intermolar width has decreased during the treatment. This is probably due to the mesial migration of the molar teeth and acquiring a position in relatively a narrower arch anteriorly. Concurrent distal movement, the maxillary canines have acquired a relatively distal position in the arch. Obviously, therefore the canine have moved into a wider arc. Numerous researchers have supported the idea that the intercanine width can be increased if the canines are moved distally into extraction site,^{13,14} It can be argued but it is difficult to be proven whether the actual buccal arch width has not been changed during the treatment as the second maxillary molar now occupies the position which the first maxillary molar had occupied previously. The buccal arch width at the second molar region now would be as wide as it was at the first molar region initially. It seems that the maxillary arch width has not really been changed during treatment in the extraction group. This idea is also supported by the fact that the reduction in the inter molar width is not statistically significant.

The mandibular intermolar width has reduced and the teeth have moved into a narrower arc whereas the mandibular canines have moved into relatively a wider arc. Therefore, the intercanine width has increased. It is clearly shown that the basal arch length is now reduced as the arch perimeter has become shorter. The reduction in the basal arch length is statically significant. It is difficult to determine whether the mandibular labio-lingual position of the incisors has absolutely changed as its inclination was not estimated in the present study.

In the non extraction cases the maxillary intermolar width has increased during the treatment by nearly 2mm. The maxillary intercanine width also has increased by 1mm. Similarly, the mandibular inter molar width has increased but surprisingly, the intercanine width has decreased. The latter is not completely understood and does not compare with the findings of other studies¹¹ where the intercanine has shown an increase. The possible explanation for this reduction would be the contribution of the following factors: the mandibular incisors have proclined and the canines have mesially migrated acquiring a more anterior position in relatively a narrow arch. The proclination of the mandibular incisors may be attributed to the increase in the basal arch length. It is noted here that the mandibular basal arch length has slightly increased during the treatment (Table 3). But as it has been mentioned earlier, the labio-lingual position of the mandibular incisors was not estimated in the present study.

In comparing the end treatment figures of both treatment groups, the maxillary intermolar width increased significantly in the non extraction group. Although the maxillary intermolar width is slightly reduced in the extraction group, this difference was not statistically significant. In the mandibular arch a similar situation can be seen with an increase in the intermolar width in the non extraction group and a decrease in the intermolar width in the extraction group. But this difference too was not statistically significant.

In concluding the findings in the extraction and non extraction treatment out come, it is seen that the position of the maxillary molar has acquired a more

buccal position with minimum change in the antero-posterior plane in the non extraction treatment group. This has a great impact on the original arch form and may change, possibly leading to a reappearance of the original arch form.¹⁵ In the extraction group although the maxillary molars have acquired a more palatal position, it can be assumed that their antero-posterior positions have changed. Therefore, it is unlikely that the I arch form may change during the treatment, which is more favorable for retention.

References

1. Johnson DK, Smith RG. Smile aesthetics after orthodontic treatment with and without extraction of four first premolars. *Am J Orthod Dentofacial Orthop* 1995; 108: 162-7.
2. Little RM, Wallen TR, Riedel RA. Stability and relapse of mandibular anterior alignment; first premolar extraction cases treated by traditional edgewise orthodontics. *Am J Orthod* 1981; 80: 349-65.
3. Davis LM, Begole EA. Evaluation of orthodontic relapse using the cubic spline function. *Am J Orthod Dentofacial Orthop* 1998; 113: 300-6.
4. Luppapornlarp S, Johnston LE. The effects of premolar extraction: a long term comparison of out comes in clear cut extraction and non extraction class II patients. *Angle Orthodontist* 1993; 63: 257-72.
5. Case C. The question of extraction in orthodontia(reprint). *Am J Orthod* 1964; 50: 660-91.
6. Shapiro PA. Mandibular dental arch form and dimensions. *Am J Orthod* 1974; 66: 58-70.
7. Drobocky OB, Smith RJ. Changes in facial profile during orthodontic treatment with extraction of four first premolars. *Am J Orthod Dentofacial Orthop* 1989; 95: 220-30.
8. Rains MD, Nanda R. Soft tissue changes associated with maxillary incisor retraction. *Am.J.Orthod* 1982; 81: 481-8.
9. Huggins DG, McBride LJ. The influence of the upper incisor position on soft tissue facial profile. *British J Orthod* 1975; 2: 141-146.
10. Sadowskey C, Begole EA. Long term stability of temporomandibular joint function and functional occlusion after orthodontic treatment. *Am J Orthod* 1981; 78: 201-12.

Changes in the Arch Width due to Different Treatment Modalities in Orthodontic Patients

11. Gianelly AA, Wohlgenmth P. Condylar position and extraction treatment. *Am J Orthod Dentofacial Orthop* 1988; 93: 201-5.
12. McNamara JA, Jr. Maxillary transverse deficiency. *Am J Orthod Dentofacial Orthop* 2000; 117: 567-70.
13. Bishara SE, Chadha JM, Potter RB. Stability of intercanine width, overbite and overjet correction. *Am J Orthod* 1973;63: 588-594.
14. Hernandez JL. Mandibular bicanine width relative to overbite. *Am J Orthod* 1969; 56: 455-467.
15. De La Cruz AR, Sampson P, Little RM, Artun J, Shapiro PA. Long term changes in arch form after orthodontic treatment and retention. *Am J Orthod Dentofacial Orthop* 1995; 107: 518-30.

Table 2 Inter canine and inter molar widths changes after the treatment in extraction cases.

	IM		Upper IC		Lower IM		IC	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre Treatment	52.51	2.85	35.11	2.12	44.68	2.78	27.16	2.68
Post Treatment	51.19	2.1	36.51	1.33	43.51	2.34	28.05	1.09
P value	0.0712		0.007		0.114		0.132	
Significance	No		Yes		No		No	

Table 3 Basal arch changes in mandibular arch after the treatment in extraction and non extraction cases.

	Extraction		Non Extraction	
	Mean	SD	Mean	SD
Pre Treatment	30.02	2.54	32.27	2.24
Post Treatment	26.11	1.92	32.44	5.11
P value	<0.05		0.87	
Significance	Yes		No	

Calcifying epithelioma (Pilomatrixoma/ Pilomatricoma): a diagnostic pitfall for the Dental Surgeons!

H. Amarapala¹, P.R. Jayasooriya¹, D.K. Dias², E.A.P.D. Amaratunga¹

Department of Oral pathology, Faculty of Dentistry, University of Peradeniya¹
Teaching Hospital, Karapitiya²

Abstract

Although familiar to dermatologists and general pathologists Pilomatricoma (PMC) is a perplexing entity to the Head and Neck surgeon confronted with these lesion. Thus PMC are usually not considered in the differential diagnosis often leading to misdiagnosis, resulting in aggressive treatment to an essentially benign innocuous lesion. PMC is a common benign childhood tumour, expressing differentiation towards hair matrix formation. The clinical presentation is typically is that of an asymptomatic superficial mass that slowly increases in size located in the head and neck region.

PMC in children are simple to treat successfully. Early accurate diagnosis is important so that unnecessary aggressive surgery can be avoided. This can be achieved by a simple excisional biopsy or by a simple fine needle aspiration (FNA) biopsy.

This article highlights the necessity of the clinician's knowledge in this lesion and the importance of considering PMC in the clinical differential diagnosis of head and neck solitary nodules especially in children.

Introduction

Pilomatricoma (PMC) originally described in 1880¹ is a hamatoma composed mainly of dead calcified epithelial cells resulting from epithelial cells trying to differentiate in to hair structures, possibly due to disturbance in hair follicle cycle. This benign skin appendage tumour expressing differentiation towards hair matrix formation is a common skin neoplasm in the paediatric population².

Case

A 17year old female presented to the Teaching Hospital Karapitiya with a firm lump 7x7x4 mm in size, on the left side of the face. The covering epithelium was normal. Patient had no previous occurrence or familial occurrence of a similar lesion and she was healthy otherwise. Clinical impression mimicked a sebaceous cyst.

A complete excisional biopsy was performed and sections stained with haematoxylin and eosin. Microscopic examination revealed a multilobular tumour composed of basaloid and ghost cells along with calcification within the lesion.

The histopatological features were consistent with those of a calcifying epithelioma (Pilomatricoma). As such a definitive diagnosis of a Pilomatrixoma was arrived at.

Discussion

The main presenting symptoms of PMC are a hard, subcutaneous slowly growing mass of several centimetres. Generally the tumour varies in diameter from 4-35mm³ in size, but tumours as large as 50mm have also been reported¹. Most commonly it manifests as a firm

deep-seated nodule covered by normal skin, lying deeply subcutaneous or superficial and is often misdiagnosed as other skin conditions¹. Frequently it is confused clinically with sebaceous cyst³. Chalky deposits may be present, revealing calcification as radio-opaque mass on radiographs⁴. More superficial lesions may present with possible erosion through the skin surface thus leading to false diagnosis of malignancy^{5,8}.

The most common site of presentation is the head and neck region. Where neck, cheek, scalp and peri-orbital were the most common sites in the decreasing order of frequency⁶.

PMC may appear at any age, but young people are mainly affected. Some 60% of cases being excised before 20 years of age and most before 10 years of age⁴. However more recent studies revealed a peak presentation bimodally in first and 6th decade⁸. There is a slight female predominance of 3:2.

Diagnosis can be arrived at by an excisional biopsy. Although one study suggests the use of FNA aspirates⁷.

Histopathology

Histologically PMC are characterised by the presence of the two distinct cell populations basaloid cells and anucleate ghost cells, fairly specific to PMCs. PMC is a tumour expressing differentiation towards hair matrix formation; therefore hair shaft formation is not evident. A multilobulated tumour may be situated within the dermis and sometimes extending into the sub cutaneous fat. Occasionally surrounded by a fibrous pseudocapsule composed of compressed adjacent connective tissue elements. Individual tumour lobes are a composition of a variable mixture of basaloid and ghost cells, the former predominance in evolving lesions and the latter in more mature lesions⁴.

Basaloid cells are small uniform with round vesicular nuclei and prominent nucleoli. Early lesions may show brisk mitotic activity indicating a rapid growth rather than malignancy⁴.

With maturation basaloid cells transform to ghost cells acquiring abundant eosinophilic cytoplasm and developing small hypochromatic nuclei. Eventually the nuclei disappear leaving sheets of eosinophilic keratinous debris of ghost cells. Giant cells and keratinisation are often reported to be present⁴. Presence of melanin is evident in some tumours with differentiation toward hair bulb¹. Approximately 80% of lesions show the presence of calcification a feature common to those that have reached maturity⁴. Ossification is seen in another 20% of cases, which is believed to be through metaplasia of fibroblasts into osteoblasts⁽¹⁾. In Addition to these features such as myxoid change, oedema fluid, necrosis with karyorrhectic debris may be seen in a few of these tumours⁹.

Typically cytological findings of PMC include a variety of cellular components like basaloid cells, ghost cells, foreign body type giant cells, nucleated squamous cells and calcium deposits. Presence of basaloid and ghost cells appear to be the key components in order to make a confident cytological diagnosis¹³.

PMC usually present as a solitary lesion, however multiple tumours are evident as a part of an autosomal dominant inherited disorder¹². Patients with a family history of multiple PMC pose a higher probability of developing other autosomal dominant disorders such as Myotonic dystrophy, Garner syndrome and Rubinstein-Taybi syndrome⁴.

PMC has been reported not only as a benign lesion, but also as a low grade malignant lesion with a tendency to recur locally. Highly malignant variants have also been reported¹³. Some believe of the possibility of a malignant transformation of the calcifying epithelioma¹⁴.

Prognosis of calcifying epithelioma (PMC) is good, with a low recurrence rate². However making an accurate clinical diagnosis of PMC can be difficult and is frequently missed. Owing to incorrect interpretation of the abnormality patients have had the misfortune of undergoing more radical treatment than necessary.

The preoperative diagnosis was consistent with the pathological diagnosis only in 28.9% of cases in one study and 20% in another study. While in many as

Calcifying epithelioma (Pilomatrixoma/ Pilomatricoma): a diagnostic pitfall for the Dental Surgeons!

69% of cases in another study the lesion was mistaken as other conditions. Referring diagnosis and preoperative diagnosis was incorrect in most of the cases and this benign tumour is often misinterpreted as a carcinoma resulting in unnecessary aggressive therapy.

Fortunately for our patient the preoperative diagnosis did not advocate uncompromising treatment.

It is therefore of grave importance that the clinicians note the clinical and pathological characteristics of this innocuous lesion though rare and consider it along with the other benign and malignant conditions in the clinical differential diagnosis of solitary firm skin nodules, especially those that occur in the head and neck region of children.

Acknowledgements:

The authors wish to express their thanks to the technical officers at the Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka for their assistance.

References:

- (1) Lever WF, Lever GS : Histopathology of the Skin; 7th edition; 587-589.
- (2) Pirouzmanesh A, Reinisch JF, Gonzalez-Gomez I, Smith EM, Meara JG. Pilomatrixoma: a review of 346 cases. *Plast Reconstr Surg.* 2003 Dec;112(7):1784-9.
- (3) Darwish AH, Al-Jalahema EK, Dhiman AK, Al-Khalifa KA. Clinicopathological study of pilomatricoma. *Saudi Med J.* 2001 Mar;22(3):268-71.
- (4) Philip HM. *Pathology of the Skin*, 2nd edition: 15.22.
- (5) Chuang CC, Lin HC. Pilomatrixoma of the head and neck. *J Chin Med Assoc.* 2004 Dec;67(12):633-6.
- (6) Lan MY, Lan MC, Ho CY, Li WY, Lin CZ. Pilomatricoma of the head and neck: a retrospective review of 179 cases. *Arch Otolaryngol Head Neck Surg.* 2003 Dec;129(12):1327-30.
- (7) Domanski HA, Domanski AM. Cytology of pilomatrixoma (calcifying epithelioma of Malherbe) in fine needle aspirates. *Acta Cytol.* 1997 May-Jun;41(3):771-7.
- (8) Julian CG, Bowers PW. A clinical review of 209 pilomatricomas. *J Am Acad Dermatol.* 1998 Aug;39(2 Pt 1):191-5.
- (9) Punia RP, Palta A, Kanwar AJ, Thami GP, Nada R, Mohan H. Pilomatricoma—a retrospective analysis of 18 cases. *Indian J Pathol Microbiol.* 2001 Jul;44(3):321-4.
- (10) Demircan M, Balik E. Pilomatricoma in children: a prospective study. *Pediatr Dermatol.* 1997 Nov-Dec;14(6):430-2.
- (11) Martino G, Braccioni A, Cariati S, Calvitti M, Veneroso S, Tombesi T, Vergine M. Pilomatrixoma or Malherbe's calcifying epithelioma. A case report and review of the literature. *G Chir.* 2000Mar;21(3):104-9.
- (12) Vico P, Rahier I, Ghanem G, Nagypal P, Deraemaeker R. Pilomatrix carcinoma. *Eur J Surg Oncol.* 1997 Aug;23(4):370-1.
- (13) Saussez S, Mahillon V, Blaivie C, Haller A, Chantrain G, Thill M. Aggressive Pilomatrixoma of the infer-auricular: A case report. *Auris Nasus Larynx* 32(2005)407-410.

FIGURE LEGENDS :

Figure 1 : Photomicrograph of Pilomatricoma showing early calcification and basophilic cells.



Figure 2 : Photomicrograph of Pilomatricoma showing basophilic granular calcification.

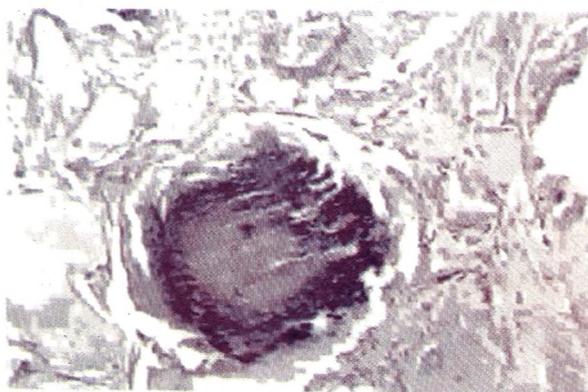


Figure 3 : Photomicrograph to show the Pilomatricoma composed of ghost cells with keratin debris within the ghost cell island.]



➤ Note eosinophilic keratinous debris

Presidential Address - Sri Lanka Dental Association 2003

B Ganananda Nanayakkara

Department of Anatomy Faculty of Medicine, University of Ruhuna,
Galle, Sri Lanka.



I would like to begin with a quote by Dr C Everett Koop, former US Surgeon General, who said "You're not healthy without good oral health." This evening I would like to share with you some of the fascinating milestones in the evaluation of dental care.

It is evident from human remains, as far back as 500,000 years, that oral diseases existed. In a reference dating back to the Sumerian period, 25,000 years ago, tooth decay was attributed to "tooth worms".

Tooth decay and associated pain – toothache – have afflicted man from very early times. Indeed it is one of man's commonest ailments even today –

As frequent as the common cold!

Numerous remedies for toothache have been tried through the ages, and range from the use of medicaments, fumigation to drive out the tooth worms, charms, chants, mantras and prayers.

The Egyptians used numerous oral applications to relieve tooth pain – (Ebers papyrus dating back to 3700 BC).

The Chinese used acupuncture (around 2700 BC).

In Medieval Europe urgent pleas were made to Saint Apollonia, the patron saint of toothache sufferers. Fossilized human remains and Egyptian mummies around 3000 BC, show evidence of tooth decay and other forms of oral ill health. They also provide an insight into some of the remedial practices adopted in ancient Egypt, such as removing diseased teeth and drilling holes in the jaw bones to release pressure caused by abscessed teeth.

The Egyptians are also credited with being the first to designate a doctor specializing in dental care, in fact

the earliest known dentist is said to be Hesi-Re an Egyptian "doctor of the tooth" who lived during the reign of Zoser, the pharaoh who ordered the building of the great Step Pyramid at Saqqara in 2600 B.C.

Around 1300 BC – the well known Greek physician, Aesclepias, is believed to have introduced the concept of extracting diseased teeth.

Hippocrates and Aristotle, around 500 BC, had written extensively on remedial ointments and use of sterilization procedures, using red hot wire to treat diseases of the teeth and oral tissue; and the use of wire to stabilize fractures of the jaw and bind loose teeth.

The Romans were rather concerned with their oral health and guests were treated to gold tooth-picks to clean their teeth after a meal.

The use of tooth-picks was also prevalent in China and in several far eastern countries including the Indian sub-continent.

It was not uncommon for the wealthy to wear tooth picks of gold or silver as utility ornaments.

From around 450 BC, the Romans were treating toothache, filling cavities and fashioning bridges to replace extracted teeth.

Diocles, the Greek Physician, in 300 BC recommended rubbing the teeth and gums with pulverized mint to remove food particles.

Celsus the Roman medical writer around 100 BC wrote extensively on oral disease, the use of astringents and narcotics, as well as dental care.

Galen, another Greek Physician, who lived in Rome, in 100 AD advocated the use of a file to remove decayed portions of a tooth.

B Ganananda Nanayakkara

By 659 AD, the Chinese, were filling cavities with a mixture of mercury, silver and tin, long before amalgam came into use in the Western World.

The Mayan Indians of Mexico, at the peak of their civilization around AD 300 to 900, inlaid their teeth with beautifully carved minerals for cosmetic and ritualistic purposes.

In the Asian subcontinent cleaning the teeth featured as a social need. Twigs of various trees were used to clean the teeth, a custom that is still prevalent, while Western societies are known to have used linen or sponge for the same purpose.

Tooth powders of varying composition have been marketed from early times. They usually contain abrasive substances, such as finely powdered brick dust, china, earthenware, cattle fish bone, pumice stone, soot, charcoal and salt.

Toothbrushes date from the mid 17th century – with time they were adorned with fashionable handles and carrier cases. The humble toothbrush has not escaped the effects of modernization, and the buzz of a battery – operated toothbrush, is becoming commonplace!

In earlier times, emphasis was on the removal of diseased teeth and extraction rather than restoration was the norm. Several instruments and techniques were employed for extraction.

Both historically and to the present day, diet has played a prominent role in the pathogenesis of dental disease. In prehistoric times, man relied on coarse foods for sustenance. This resulted in greater wearing down of the teeth, as found in some prehistoric skulls. The bone around the teeth also showed substantial loss of bone substance possibly due to exposure of the gum in gum disease. Sugar did not form part of their diet so caries was comparatively rare.

With progress the diet of the rich and the poor began to differ and this was reflected in the status of their oral health. The rich began to consume sugar and suffered from caries and dental abscesses. The more the consumption of sugar the greater was the incidence of caries.

Looking back – one would note that the seeds of modern dental and oral care had been shown in the Pre-Christian era. However progress in most fields of dental care lay dormant or were slow in development around the Middle Ages – (5th to 15th Century AD). Refinement had to await technological development and advancement – with leadership by the Western and the New World.

In the late 14th and 15th centuries there was a greater understanding of the anatomy of teeth. This brought a number of developments that contributed to the quality of dental care, such as the introduction of gold fillings, the use of wood to replace extracted teeth – just to mention a few. This trend continued into the years that followed.

From the middle ages to the early 17 hundreds, most dental therapy in the Western world was provided by “barber surgeons” who, in addition to cutting hair, would extract teeth, perform minor surgery and even undertake embalming!

In 1728 AD – the French dentist, Pierre Fauchard, published his well known treatise “The Surgeon Dentist”. He was the first person to provide a comprehensive account of the dental sciences. He is regarded as the father of modern dentistry. His work gave greater visibility to dentistry and helped the establishment of dental science as a separate scientifically based profession.

Several noteworthy advances were made in the 19th and 20th centuries.

A few pertinent milestones include –

The discovery and use of amalgam as a dental filling material in USA in 1832.

The establishment of the world’s first dental school in Baltimore in 1840 A.D.

The discovery of ether as an anesthetic agent in 1846 with its potential for use in dental procedures.

The invention of the foot powered dental drill in 1858, by G.V.Black, an American dentist. This enabled dentists to use both hands for drilling procedures.

Presidential Address - Sri Lanka Dental Association 2003

The development of the first hydraulic dental chair in 1877.

The use of nitrous oxide, better known as laughing gas, in 1884, by Horace Wells, a Connecticut dentist.

For centuries caries was thought to be due to worms – through the years, several theories as to its etiology were suggested. It was W.D. Miller, an American biochemist who in 1890, propounded the chemo-parasitic theory of caries i.e.

“Initial action of acids resulting from fermentation of food followed by the action of bacteria on the softened tissues” !!!!

The use of X-rays by the German physicist, Roentgen gave dentists the ability to observe hidden cavities in teeth.

One of the greatest milestones in the evolution of dental care was the discovery in 1990 that fluorides in the water supply reduced tooth decay. The introduction of fluoridation of the water has brought about a substantial reduction in the incidence of caries. Fluorides are now being incorporated in many brands of tooth paste in current use.

This brings us to the present when dental care around the world is at varying stages of development. The affluent countries are able to provide state of the art care to the patient, though this comes at a price. Developing countries lack the resources and manpower to provide, at times, even the basic needs of the community, so there are profound and consequential disparities in oral health.

At present there are eight sub-specialties in the art and practice of general dentistry. They are:

Periodontics - associated with gums and the bone that supports the gums. It is one of the most common oral diseases.

Endodontics – related to defective dental pulp and its management.

Prosthodontic – concerned with replacement of lost tooth substance or teeth with dentures, implants, bridges and crowns.

Orthodontics – which is the management of misaligned teeth.

Paediatric dentistry – concerned with the care of childhood dental problems.

Public Health or Community Dentistry – which is promotion of dental health in the community.

Oral Pathology – the aetiology and pathogenesis of oral diseases.

Oro-maxillo-facial surgery – related to correction of diseases and abnormalities by surgery.

The commonest global ailments include dental caries and periodontal disease. The current trend in their management is towards restorative dentistry rather than extraction. This is seen in Sri Lanka as well, possibly due to increasing public awareness of the value of retaining the teeth where possible, and the availability of trained dental surgeons and facilities.

THE FUTURE

One can look forward to the future of dental and oral health care with optimism- the trend seems a healthy one.

The factors that would influence oral health in the future, globally and in Sri Lanka, would include:

Integrating dental and oral health care into comprehensive health care.

Recognition of the link between oral health and overall health.

Gene mediated therapeutics – altering the genetic structure of teeth to make them resistant to disease.

Possibility of growing new tooth structures around weakened enamel.

Computer assisted technology for diagnosis and treatment of oral disease.

Reducing the possible ill effects of sweet, fast and preserved foods.

B Ganananda Nanayakkara

Curbing the commercial promotion of the sweet tooth syndrome in the young.

Meeting the demands of emerging oral diseases as a consequence of ageing and the escalating cost of care.

Possibility of a greater insurance coverage at cheaper rates – this would be welcome.

Increasing the visibility and understanding of the benefits of oral health care in the community.

Develop, implement and facilitate educational, informational and service programmes designed to

educate the public; improve public awareness of preventive and self care; raise awareness of the rights of the patient and demand for the state of the art treatment; access to litigation for dental misadventures – in short an informed and demanding public.

These measures could influence oral health problems and their management in the future.

It is foreseen that the dental profession should keep space with professional developments through a sustainable program of continuing learning to be able to face the future with adequate knowledge, skill, practice and competence.

Presidential Address - Sri Lanka Dental Association 2005

Dr. E. A. Prasad D. Amaratunga



The standard of Dentistry in Sri Lanka has gone up tremendously over the years. Today Sri Lankan dental surgeon is able to practice all aspects dentistry and provide the patients with latest treatment options. Dental Implants have been in the market in the west for nearly 2 decades although it has not yet caught the Sri Lankan market in a great way. Demand for permanently fixed prosthesis is on the rise in Sri Lanka too. As such we should be prepared to offer Dental Implants to our patients whenever they demand for it. As such, I decided to deliver my Presidential Address on Dental Implants.

Losing teeth, either through old age or accident, has been always a cause of untold agony and depression for most of the human beings. The question they always ask the dentist is "Can I have my tooth back?". Dental implant is the answer which would restore near normal function and aesthetics to the natural tooth compared to traditional methods such as removable dentures and bridges.

What is a Dental implant ? A dental implant can be considered a connector that connects an externally held artificial tooth to the jawbone. History of dental implants go as far back as 2000BC. Various materials such as wood (2000BC), stone (1000AD), human and animal teeth (1809) and subperiosteal metal structures had been used as implants with varying degree of success. Real breakthrough in dental implants was the accidental discovery of the ability of titanium to intergrade with bone (Branemark 1950). This process is known as osseointegration. Titanium implants were first used on human patients in 1965 on experimental basis and were then available for commercial use in the 1980s.

Implants can be classified according to the site of its final location in relation to the bone. These include endosteal, transosteal and sub-periosteal implants. Implants can also be classified according to their shapes. These are the root form, cylindrical, conical and pin implants. Root form implants have the shape of natural tooth root and are the most popular at present.

Dental implants can be used to for the replacement of a single missing tooth, multiple missing teeth or for full mouth replacement of all teeth. They can also be used to support a bridge or for stabilization of removable dentures. In addition, more recently, implants have earned a place in providing orthodontic anchorage.

Implantation can be considered under 4 Phases:

1. Examination and planning phase
2. Surgical placement of implant
3. Healing phase
4. Construction and attachment of Prosthetic superstructure

Each phase is essential and has a direct effect on the clinical outcome. Examination and planning phase is necessary to assess the patient's physical and mental fitness and to assess the quality of the implant site. Detailed examination of the proposed operative site, alveolar bone and the position of other related teeth should be carried out clinically and also with the aid of study models and radiographs. In developed countries CT scanning of the jawbones would provide a much accurate picture of the dimensions of the jawbones. In addition, it is necessary to have a good idea about the bone density. Density of the bone has been graded from D-1 to D-4. D-1 bone is more dense and contain

higher proportion of the mineral component whereas the D-4 is spongy and the least dense.

During surgical placement of the implant (figure 1-4), it is essential to follow aseptic techniques. Having raised a mucoperiosteal flap to expose the bone, an osteotomy bur hole is made using a series of titanium burs to, finally, achieve the size of the implant to be placed. This drilling procedure is done at a slow speed (800-900rpm) with plenty of saline irrigation, both

internally and externally with the aid of a physiodispensor to prevent bone necrosis as a result of heat generation. Implant can then be screwed into position using titanium tools. Having completely submerging the implant, the mucoperiosteal flap is placed over it and suture into the position. It is generally recommended to leave the implant without loading for 3 to 6 months to allow complete osseointegration to take place.



Figure - 1



Figure - 2



Figure - 3



Figure - 4



Figure - 5



Figure - 6



Figure - 7



Figure - 8

After leaving the implant for a suitable length of time, it can be surgically exposed by removing the lid of mucosa immediately above it. A healing cap is then fitted (figure 5) to the implant and leave for about 1 week to allow the gingival growth and crevix formation (figure 6).

Healing cap is then replaced the final abutment which will hold the crown in position.

Position of the implant and the abutment can be transferred to a plaster model using a technique call implant transfer (figure 7 and 8). A crown or a bridge can then be constructed in the laboratory.

A SEARCH FOR COSMIC LIFE

Chandra Wickramasinghe

Department of Applied Mathematics and Cardiff Centre for
Astrobiology, Cardiff University, United Kingdom.

My early interest in astronomy that led to the theory I shall discuss in this article owes much to the trivial accident of my birth in the tropical island of Sri Lanka. In my youth the skies over my family home in the suburbs of Colombo were pristine - street lights were dim and there was hardly any pollution from traffic. They were the days of the rickshaw and the bullock cart, primitive in Western terms but eco-friendly in every sense of the word. In the evenings I would often stroll along the beaches near my home in Colombo to witness spectacular sunsets, sunsets that soon gave way to an even more spectacular sight of Milky Way comprised of billions of stars arching gracefully across the sky.

For me such a nightly pageant was like walking through the corridors of prehistory. To our ancestors of thousands of years ago this glistening spectacle of the night sky would have been pregnant with meaning, undoubtedly re-affirming Man's unalienable links with the cosmos. Here we are standing upon a mere speck of dust that is the Earth against the backdrop of an almost immeasurable cosmos. As the centuries rolled by, that once self-evident link became ever more tenuous. Reconnection with the cosmos was slow to occur in the West particularly in the wake of the Industrial revolution of the 19th century. Our skies and our perceptions of the universe remained polluted and blurred.

It is perhaps no coincidence that an instinctive cosmic link still survives in countries of the Orient, in the form of religions such as Buddhism and Hinduism, which are manifestly cosmic in their world views. For instance in the Buddhist text *Anguttara Nikaya*, a dialogue of the Buddha, set into written form probably around the first century BC, it is said:

"As far as these suns and moons revolve, shedding their light in space, so far extends the thousandfold

world system. In it there are a thousand suns, a thousand moons, a thousand Earths and a thousand heavenly worlds. This is called the thousandfold minor world system...."

Life according to both Hindu and Buddhist tradition is an integral attribute of the Universe, which is itself eternal and endless. If one interprets the texts appropriately, ideas about the Universe that prevailed here in ancient times were distinctly modern.

The acceptance of a cosmic perspective of life in the Western world was a slow and tedious process. The scientific quest for life outside the Earth had tentative start with the Viking Missions of 1976 when NASA sent two probes to Mars to search for microbial life. Viking 1 arrived at Mars on 20 July 1976 and Viking 2 on 3 September 1976. In one experiment a nutrient broth of the sort that is normally used to culture a wide range of terrestrial bacteria was contained in a sterilised flask, and the Martian soil was robotically added to it. It was found that the nutrient was taken up by the soil and gases frothed out from the flask as would be expected if bacteria were present. Yet another experiment in the Viking package proved more difficult to reconcile with biology. This experiment sought to analyse the organic content of Martian soil, to look for the dead bodies of bacteria. Here the results were disappointingly negative for organic matter, indicating that if such matter existed it was present only in the minutest quantities.

The fact that one experiment was decisively positive and the other experiment was negative posed a difficulty for NASA. The outcome was indefinite, and this is the way it should have been presented to the public. Yet NASA elected in 1976/77 to announce that the Viking experiments did not support the presence of life, and their statement that Mars was a lifeless planet was given a great deal of publicity in

1976. It was their view that some other non-biological explanation had to be sought and would eventually be found. This has not happened to date and it has to be conceded that the balance of evidence is still positive for Viking landers to have detected life. But even retrospectively, there still remains an enormous resistance to admit this, and modern pronouncements by NASA relate mostly to the presence of past life in an epoch when rivers flowed over the surface of the planet.

The Mars probe *Odyssey* was launched in April 2001 to orbit the red planet and map its surface for hydrogen, water and minerals. Named *Odyssey* after Arthur C. Clarke's famous novel, the probe obtained data that, according to Levin, when combined with earlier images from Viking, showed clear evidence of heavy frost or snow in many locations including the Viking landing sites. Snow or frost deposits were found to be seasonal, pointing to some kind of water cycle. But still NASA was claiming that contemporary life was highly improbable, despite the fact that on many sites on Earth where life has been discovered - in antarctic ice and at depths of 8km below the Earth's surface - there are unquestionable parallels with Mars. Even as recently as 2004, the spacecraft "Mars Express" has obtained traces of methane and oxygen in the atmosphere that together would normally be interpreted as indicating biological activity.

Beyond the question of whether there is life on Mars or not there is a much more important issue to be addressed. How did life itself begin? Turning to space for the origins of life was considered an outrageous heresy scarcely twenty years ago. The conventional viewpoint was that life on Earth *must* have started on Earth, in some form of "primordial soup" a few billion years ago. Nearly half a millennium after Copernicus had dethroned the Earth from its privileged place at the centre of the world, our planet still continued to be regarded as the supreme centre of life. Even in the year 2004 every book in biology still begins with the story of genesis in a primordial soup, and there is scarcely a reference to any alternative possibilities.

One of the earliest theories of the origin of Earthly life, one that dominated Western thought for centuries, is contained in the ancient doctrine of spontaneous generation. According to this life was supposed to

arise from inorganic matter spontaneously under suitable conditions. For instance the Greek philosopher Aristotle (384 322BC) stated that fireflies emerge from a mixture of warm earth and morning dew. And there were many variations on this general theme.

From the middle ages onwards this ancient doctrine suffered a succession of setbacks. It might have been discarded even in the mid sixteenth century with what evidence was then to hand. But it was really the work of Louis Pasteur in 1857 that dealt a death blow to spontaneous generation. He studied such processes as the souring of milk and the fermentation of wine, and from simple experiments was able to show that microorganisms are always derived from pre existing parent microbes, just as in the case of larger creatures, plants and animals alike. So the clear logical deduction is that life is always derived from life that existed before. That is the hardest fact upon which any scientific theory of life should be based, the rest is only speculation and guesswork.

The logic of Pasteur's discoveries was given a cosmic interpretation by several contemporary scientists in England and Europe, including John Tyndall, Lord Kelvin, but most succinctly by Helmholtz. Thus Herman von Helmholtz wrote as early as 1874:

"It appears to me to be fully correct scientific procedure, if all our attempts fail to cause the production of organisms from non living matter, to raise the question whether life has ever arisen, whether it is not just as old as matter itself, and whether seeds have not been carried from one planet to another and have developed everywhere where they have fallen on fertile soil...."

One of the issues that held scientists back from accepting a cosmic theory of life was related to survival of bacteria under space conditions. During the past 25 years the survival attributes of bacteria have continued to surprise microbiologists. Thermophillic, heat-loving bacteria can replicate in superheated water at temperatures above 100C in deep sea thermal vents. Entire ecologies of psychrophillic or cold-loving microorganisms are found to thrive in Antarctic permafrost. Bacteria can survive freeze drying cycles, desiccation and have been found to withstand pressures such as exist at the bottom of the ocean

A search for cosmic life

and seven kilometers below the Earth's crust. And bacteria are found to resistant to huge doses of ionizing radiation.

The overwhelming logic of panspermia stems, in my view, from the life from life relationship that connects life on earth today to life in earlier epochs through the sequence of fossils and microfossils in the geological record. Although the oldest surviving microfossils are dated at 3.5 billion years, the very oldest evidence of terrestrial life has recently been pushed back even further, to a time about 3830-4000 million years ago. A surprising discovery is that at this epoch 4 billion years ago the Earth and Moon were under extremely heavy bombardment by comets and asteroids, thus putting the first-born life on Earth in the harshest of nurseries. In view of the fact that we have no empirical knowledge of any process by which non-living organic matter can be converted to life in a vanishingly small timescale, the data now points to comets bringing primitive life to Earth along with water that went to form the Earth's oceans some 4 billion years ago.

It seems sensible therefore to suppose that the totality of material available in all the star systems in the early Universe, acting somehow co-operatively, might present the best bet for overcoming the seemingly insuperable difficulty of starting the first living system. This could legitimately be seen as a unique, one-off and near miraculous cosmic event from which all other manifestations of life are derived. Once it has originated the dispersal of life on a galactic or extragalactic scale would be assured by virtue of the survival properties of microorganisms to which we have earlier referred. Any improbability factors associated with surviving the hazards of space would pale into utter insignificance when compared with the improbability of starting life in the first place.

The Sun and its system of planets, including the Earth, had its beginnings some four thousand six hundred million years ago in a cloud of cosmic gas and dust. We know that new stars are born within such interstellar dust clouds. The precise details of the processes involved in the spawning of new stars are not yet understood, but we know that myriads of tiny solid particles of radii about 1/3 of a micrometre, the average size of a bacterium, play a crucial role. They go into regions where stars form and they re emerge from the neighbourhood of newly formed stars in

vastly amplified numbers. The millions of clouds of diffuse material that populate the Milky Way are filled with such particles, which show up as a cosmic fog, dense enough in many instances to blot out the light from distant stars

Clouds such as this are found to be rich in a variety of gaseous molecules. Water, an essential ingredient of life was found to be associated with the denser clouds where stars and planets were forming, whereas formaldehyde H_2CO was present more ubiquitously in dense as well as tenuous clouds. Over the past decade the list of interstellar molecules has expanded considerably to include a biologically relevant amino acid glycine as well as the molecule vinegar, and most recently of all is the discovery of the sugar glycolaldehyde, all of these present in the cloud complex known as Sagittarius B2.

A key to the origin of life has turned out to be the nature of cosmic dust, the interstellar fog to which I have referred. The work I started in the mid 1960's with the late Sir Fred Hoyle led over the years to the stark conclusion that cosmic dust matched the properties of freeze-dried bacteria. Evidence from astronomy pointed unerringly to particles resembling bacteria in every possible way being present in vast quantity, accounting for a third of all the carbon in interstellar space. If the bacteria-like dust grains really were bacteria, planetary systems forming from interstellar dust clouds would always have the legacy of cosmic life. There would be no need or no logic to demand an origin of life on any particular planet such as the Earth.

But where in the cosmos would microbial replication occur in order to produce such an astronomically large quantity? Within interstellar clouds cosmic microbes would be freeze dried at an average temperature of some -250C. They would simply lie there in a state of freeze-dried dormancy until such time as they became incorporated into comets that envelope every new planetary system similar to our own solar system. Even if only a minute fraction (say one in a trillion) of the cells retained viability, their replication and regeneration would be inevitable.

One normally thinks of comets as frozen lump of ice, but the interiors of newly formed comets become melted due to radioactive heat sources, and it is within

the lukewarm interiors of such comets, where liquid water and the right nutrients are present, that anaerobic microbes can replicate. Given the right nutrients a single microbe in a culture medium divides into two in 2-3 hours, these then divide again in a further 2 hours, and so on.... Some 40 or so doublings and continued access to nutrients lead to a culture the size of a sugar cube in 4 days. Eighty doublings and after 8 days the culture would be large enough to swamp a village pond. After a total of 120 doublings in a mere 12 days an entire cometary inner core of dimension 10 kilometres could be completely converted into bacterial matter. No inorganic process is remotely able to match the efficiency of biology in the production of organic matter.

So in our theory comets are the sources from which new biological material is generated from a residue of survivors. Recent studies of comets have yielded data that are at the very least consistent with this point of view. The infrared spectrum of Comet Halley obtained in 1986 was found to be indistinguishable from heated bacterial particles, and spacecraft studies of the same comet showed the dust to be comprised of organic material that would be consistent with biology. Similar results were found for other comets, notably comets Hyakutake and Hale Bopp.

A further indication of cometary biology was the observation that comets show explosive activity when they are at great distances from the Sun, far beyond the orbit of Jupiter for comet Hale Bopp in August 1995. Inorganic comets would not be expected to explode in this way in the cold depths of space. But biological activity simmering beneath a frozen crust could lead to the build-up pockets of high pressure gas that periodically explode, releasing dust particles.

In February 1999 NASA's Stardust Mission was sent hurtling through space to comet Wildt 2 to bring back samples to search for the building blocks of life. Although the Stardust Mission to a comet Wildt2 was not designed to search for life, an unexpected discovery was made last year. Five interstellar dust particles hitting the detectors on board Stardust were analysed using mass spectroscopy. The impact speeds were of the order of 30km/s, so high that only the sturdiest of chemical structures would have survived. What stardust found were described as cross linked heteroaromatic organic polymers with

molecular masses upwards of 2000. In other words the surviving structures were comprised of organic structures that bear an uncanny resemblance to components of cell walls of bacteria.

On July 4th 2005 a historic experiment was conducted on a comet called Tempel 1. A space craft the size of a washing machine was sent hurtling through space at a speed of 25000 miles per hour to crash onto the surface of the comet. We have been able to analyse the stuff that splashed out from the impact site, and again all the signs of living material were discovered – huge amounts of organic matter and clay particles that had been in contact with liquid water inside the comet. The comet showed evidence of liquid pools laden with life.

Life from space theories suddenly came into fashion in August 1996 following the announcement of a possible detection of microbial fossils in a Martian meteorite. The meteorite ALH84001 - a piece of Martian rock ejected by a cometary impact - was studied by David S. McKay and his team and found to contain complex organic molecules. The NASA team made the startling claim that the organics were likely to be generated biologically, and moreover structures such as are shown in the bottom frame are most likely to represent bacterial fossils. The headline news prompted by this work that "we are all descended from Martians" - provoked a veritable storm of controversy that continues to the present day. Although the 1996 microbial fossil claim is still being argued, the idea of microbial life being moved from one planetary body to another through impact ejection of lifebearing rocks is rapidly coming into fashion.

The Mars meteorite ALH84001 has shown beyond any doubt that complex organic structures, and by inference even microbial cells, could be transferred in a viable form from one planetary body to another. Planetary panspermia as this concept has recently come to be known is not by any means a new theory. It was discussed by Helmholtz and Kelvin over a century ago. Such interplanetary transfers of life remain a possibility of course, but one that represents a relatively unimportant route for transference of life on a cosmic scale. Moreover it fails to address the all-important question of how life began in the solar system in the first place. According to the theory I have developed, a far better option is to have Mars,

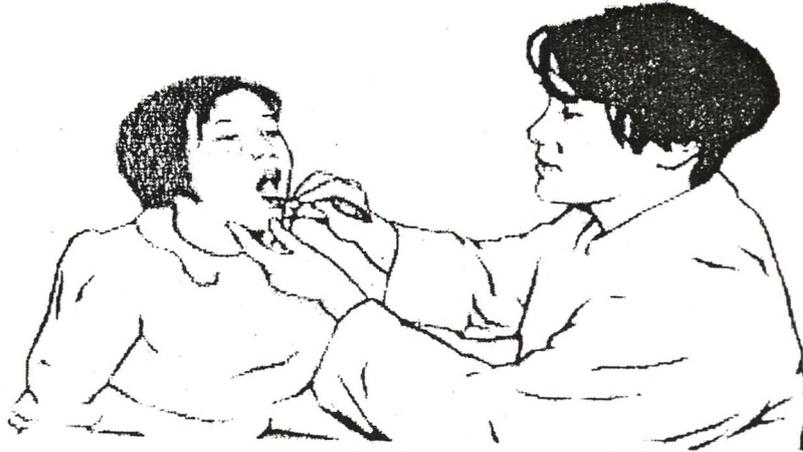
A search for cosmic life

Earth and every other habitable planetary body infected with the same cometary source of life - a source of life that is derived from an even bigger system.

According to the point of view that I have developed over several decades nothing of great innovative significance in biology ever happened on the Earth. The Earth was simply a receiving station, a building site for the incomparably magnificent edifice of cosmic life. It came in units - clumps of bacteria. Natural selection, according to the criterion of the survival of the fittest, selected those forms from the

cosmically available master plan that were best suited to the local environment at all times. It is against this backdrop that the normal evolutionary processes discussed in conventional biology would operate, more in the manner of fine tuning than innovation.

On other planets around other stars the same processes of assembly of cosmic genes would also operate. Life would inevitably develop on every habitable planet, descended from the same all pervasive cosmic genes.



Contributing to Advancement of Dentistry
with latest Equipment and products of International repute



UNICEL

(PRIVATE LIMITED)

25 Hedges Court, Colombo 10, Sri Lanka.
Phone : 94 11 2699765/ 2686848 Fax : 94 11 2697097/ 2686848
e-mail: unicel@eureka.lk

Branch Office and Showroom:
436/1, Peradeniya Road, Kandy. Phone: 08 235681

Sole Agents in Sri Lanka for:

**DENTAURUM IVOCLAR-VIVADENT VOCO
ZHERMACK MANI DIADENT YOSHIDA
MEADWAY GOOF PENG LIM**



*The gum protection
formula*

FOR TOTAL GUM CARE

Qualident

TOOTHPASTE

Sure Relief from Sensitivity of Teeth

Manufactured by; Roomi Enterprises (pvt)Ltd
Consumer Healthcare Co. Karachi, Pakistan
(Manufactured under R&D guidance of Diane Lauret, England)

Sri Lanka distributor: PETTAH PHARMACY LTD, Colombo 01



Professor N A de S Amarathunga BDS, FDSRCS, PhD, DSc

Senior Professor of Department of Oral and Maxillofacial Surgery
Faculty of Dental Sciences, University of Peradeniya, Sri Lanka.

Prof. Amarathunga current senior professor of department of oral and maxillofacial surgery and former dean of the faculty of dental sciences, University of Peradeniya. He has contributed immensely to academic education of the dental undergraduate and postgraduate students in the field of oral surgery in Sri Lanka. His original work in research on cleft lip and palate, and also development of a cleft lip and palate unit at the Faculty of Dental Sciences which is internationally recognized.

Also the development of the department of Oral and Maxillofacial Surgery which is recognized as a training center by the International Association of Oral and Maxillofacial Surgeons.

Acceptance speech: Lakshman Samaranayake

The road less traveled.....

I am deeply honored and privileged indeed that the University of Peradeniya has thought fit to confer on me the Degree of Doctor of Science (honoris causa). I am truly humbled by this honor for three reasons. First, because I am in the company of illustrious predecessors who have received honorary degrees from my alma mater such as Pandit Amaradeva, Lester James Peiris and Martin Wickramasinghe. Second, because I am the first from the dental profession in Sri Lanka to receive this degree and, last but not the least, I consider recognition by ones own *alma mater* and peers as the most precious indeed.

When I received the news that I have been so honored, the initial joy, elation and fulfillment of such an accomplishment naturally turned into introspection and contemplation. Contemplation, of the reasons why I have been singled out from the profession of dentistry to receive this accolade. Then it dawned upon me a poem by the American poet Robert Frost who wrote:

‘Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the under growth:

Then took the other, just as fair,
Because it was grassy and want of wear
In leaves no step had trodden back
I doubted if I should ever come back

Two roads diverged in a wood ,and I-
Took the one less traveled by,
and that has made all the difference.

- Robert Frost (1874 -1963)

So, let me tell you about the road that I took, the road that was less traveled. Dentistry in most nations including Sri Lanka is equated with routine cleaning, filling and extraction of teeth and in some countries a profession that is rather feared because of the visual imagery of pain associated with the term dentistry. But nothing could be further from the truth. Dental professionals are now recognized as oral physicians who take care of ailments ranging from oral cancers to orofacial deformities and deliver totally painless dental care in modern surgeries with technological advances that were undreamed of a few decades ago. Indeed dentists in the very near future will be able to collect a few drops of saliva from your mouth and perform laboratory analysis to let you know whether you have breast cancer or various types of hidden ailments. The

discipline of dentistry is now subdivided into many different specialties and facets, but one of the most fascinating aspects of dentistry is to look at the more than one billion different viruses, bacteria and fungi in our mouth and how they cause disease. It is the latter aspect of infectious diseases that I have spent studying more than a quarter century working on a fungus called *Candida* that lives in our mouth.

In fact, one half of the population has *Candida* in the mouth and our studies in Sri Lanka also indicate this to be the case. Now, the most intriguing aspect of this ‘bug’ is that it does not usually cause harm in healthy individuals but when you get infections such as AIDS it strikes back with a vengeance leading to chronic ailments that are difficult to eradicate. And this is how I

serendipitously began my work on patients with HIV disease and AIDS when I first arrived in Hong Kong more than a decade ago. When we began research in Hong Kong the stigma attached to this disease was such that the hospital attendants were reluctant to sweep the surgery where we provided oral care for these unfortunate individuals. Sadly, such stigmatization is still highly prevalent throughout the world as a consequence of which the patients do not divulge their disease status, leading to further spread of the disease. As you are aware HIV and AIDS is a disease that is spreading throughout the world in a staggering manner and last year alone it caused 3.1 million deaths. Indeed, the shocking overall global burden of infectious diseases is much more than the Tsunami and all the earthquakes put together; Let me give you three examples:

- As regards HIV, one person is infected with this virus every 6.4 seconds
- some one in the world dies of tuberculosis every 18 seconds and ,
- one child dies of malaria in Africa every 29 seconds

Indeed, specializing as an infectious disease consultant with a background in dentistry has been a fascinating and a mesmerizing journey for me. Let me now return to the less traveled path that I took. The next turn in my journey occurred in Canada when I met Dr Howard Barrows the guru of a new educational paradigm called *Problem Based Learning*. As an educationist and a Dean of Dentistry this pedagogic approach caught my imagination as an ideal method to impart knowledge and life long learning skills in students. For those who are unfamiliar with this philosophy, problem based learning is defined as “a learning method based on principles of using problems as a starting point for the acquisition and integration of new knowledge”.

Let me tell you briefly why I believe that problem based learning should be critical for the new e-generation of students living in a global community that is exploding with information both in their own professional domains and others. It is now known that information in fields such as dentistry and medicine doubles every 20 months with eight new articles published every day and, by the time a career span of an individual is

over there will be million times more information in his/her own field. Hence to provide a curriculum that is all embracing, over four to five years of university education appears not to be a viable proposition. I believe that all university curricula should embrace at least major components of problem based education in order to foster skills of self directed and life long learning amongst our youth. Indeed, many secondary schools in the world including Hong Kong have now introduced this pedagogy into their curricula.

It has been said that as a teacher you touch the future of your students. As a dental clinician and an expert in infectious disease consultant and lastly, as an educationist and an administrator my guiding axiom has been to touch the minds of my students and make a difference to the way they think and make shifts in their thought processes.

I am sure all of you will agree that the University of Peradeniya is one of the most beautiful campuses in the world and I believe, second to none. In my travels in five continents I have yet to come across such an enchanting and beautiful university setting. Although some 35 years apart, both you who are graduating today and I, have had the privilege of getting a free education in such beautiful surroundings. If you are like me, then I am sure you will cherish all the moments you have spent here and I urge you to frequently to return to your alma mater. If each and every one of us do so we can make a big difference to those who are coming after us. Even in rich countries such as USA and Hong Kong the universities look to their alumni for further support of institutions and I believe we in Sri Lanka are sadly lagging behind in such ventures and philanthropy. We ought to seriously think of harnessing the talent of our extremely large pool of alumni for this purpose.

Let me finally wish the young men and women graduating today the fulfillments of your life's dreams and ambitions. You, your parents, family and loved ones have been dreaming of the dawn of this day. This is the morning of your dreams. Do embrace the future with open arms because you are equipped with an excellent education, supportive friends and family, and the ambition and determination in good measure to realize your dreams. Henry Ford is credited with saying: “Anyone who stops learning is old, whether at 20 or 80. Anyone who keeps learning stays young. The greatest thing in life is to stay young”. So do just

The road less traveled

that - allow your mind to roam free, challenge the boundaries of knowledge and build on what you have learned here.

In conclusion, let me once again express my deepest gratitude to the University of Peradeniya and the

Faculty of Dental Sciences for bestowing your highest academic honor on me. I shall strive to live and dedicate my academic life in consonance with the honor that you have bestowed.

Professor Lakshman Samaranayake receives the highest honor from the

Peradeniya University – a historic event for the dental profession in Sri Lanka

The Senate of the University of Peradeniya at its 302nd meeting held on 26 October 2005 has approved the recommendation made by the Faculty Board of Dental Science to confer the degree of Doctor of Science (*Honoris Causa*) to Professor Laskhman Samaranayake who is currently the Dean of the Faculty of Dentistry at the University of Hong Kong and the Director of the Prince Philip Dental Hospital, Hong Kong.

Professor Samaranayake received his early education at the Royal College, Colombo and his university education at the Faculty of Dental Science, University of Peradeniya. After a brief stint as a government dental surgeon at the Dental Institute, Colombo and the General Hospital, Kurunegala he joined the Department of Biochemistry, Faculty of Medicine, University of Peradeniya as an Assistant Lecturer where he began his research career under the mentorship of Professor Tommy Wikramanayake. Subsequently, he proceeded to the University of Glasgow, UK where he undertook research on candidiasis, an oral fungal infection commonly seen in AIDS patients. For his seminal work on the subject he received a Doctor of Dental Surgery degree - the only Asian to have received the honor thus far. After publication of a critically acclaimed monograph and more than 300 research articles on the subject he is now a recognized international authority on human candidal infections.

During the period he worked as a Senior Lecturer in Oral Medicine and Pathology at the University of Glasgow he also undertook training in medical

microbiology at the Glasgow Royal Infirmary (where Lord Lister discovered the principle of antiseptics) under a doyen of the subject, Professor Morag Timbury. This led to successful entry into the Royal College of Pathologists and receiving the membership of the college (MRCPATH) followed by the Fellowship (FRCPath). He is thus far the only Asian to have received this qualification by examination in both medical and oral microbiology and, one of less than a handful globally. During this period he also served as an honorary consultant in infectious diseases to the Greater Glasgow Health Board.

In 1990, Professor Samaranayake was appointed as an Associate Professor in Oral Biology at the University of Alberta, Edmonton and after a short period there he arrived in Hong Kong to take up a readership in Oral Biology at the Faculty of Dentistry. He is currently serving as the Chair Professor of Oral Microbiology and the Dean of Dentistry at the HKU with a concurrent appointment as the Director of the only dental teaching facility in Hong Kong, The Prince Philip Dental Hospital with more than 350 dental and ancillary staff from more than ten countries.

In Hong Kong too his research, mainly focused on infectious diseases, has been much acclaimed and he has been the recipient of both the 'Outstanding Researcher Award' and the 'Outstanding Research Student Supervisor Award' of the University of Hong Kong. In total he has received more than HK\$ 11 million (Rs 143 million) in research grants and recently as a co-investigator he was awarded a European

Community Multi-Country project grant of 3 million Euros (Rs 357 million) to work on human Candida infections associated with autoimmune polyendocrine syndrome - a rare childhood genetic disorder. The author or co-author of over 400 research/review articles, Professor Samaranayake has also written 28 book chapters and eight books/monographs translated into French, Spanish, Italian, Portuguese, Polish, Korean, German and Chinese.

Internationally he holds many Honorary/Visiting Professorships from Universities of London, UK, University of West Indies, West Indies, Thammasat University, Thailand and Universidad Sao Paulo, Brazil. He is also serving as the Chairman of the Science Commission and a Director of the International Dental Federation (FDI) the largest NGO in dentistry with a membership of 900,000

dentists from more than 155 countries. For his academic and related achievements the Royal College of Surgeons of Edinburgh Faculty of Dentistry recently awarded him a honorary diploma, FDSRCSE (*ad hominem*) – a unique honor for a Sri Lankan.

Professor Samaranayake is also a recognized expert in dental/medical education and has been a technical consultant to the World Bank in *Problem Based Learning* and conducted workshops on the subject at Indonesia, Taiwan and Thailand. He has been a mentor for more than 20 PhD graduates including seven from the Universities of Peradeniya and Colombo. Professor Samaranayake is the first from the dental profession in Sri Lanka to receive an honorary DSc which will be conferred upon him on 21st December 2005 at the General Convocation of the University of Peradeniya.

Instructions for Authors

The Sri Lanka Dental Journal publishes the following categories of articles which have relevance to Dentistry and allied sciences.

1. Leading articles - One article per issue. It may be solicited by the Editor. Authors are welcome to submit leading articles on current topics of interest. One's expertise or commentaries on general practice etc. They should be approximately 1500 words in length. References should be 20 or less.

2. Reviews - Reviews are detailed surveys of published research pertinent to dentistry and associated sciences. They should be critical in nature and should not normally exceed 3000 words and 30 references.

3. Research articles - Articles resulting from research work belong to this group. Results from routine clinical examinations or laboratory investigations will not be considered under this category. Subjects may vary from clinical trials to basic science research, historical analysis to dental economics. They should not exceed 3000 words and 30 references. A reasonable number of tables and illustrations will be accepted.

4. Short reports - These include reports on current topics, modified techniques, new materials, practice management etc. Interesting results from routine, clinical work or laboratory investigations also may be accepted.

5. Case reports - Reports such as of rare diseases or conditions. Modifications to accepted treatment procedures, new management methods etc. may be included in this category.

6. Letters to Editors - Subjects unlimited, but may include short critique of published papers in the SLDJ.

7. Miscellaneous topics - Subjects unlimited and the format are free. These may also include details of scientific meetings, conferences, annual sessions, examinations, news and views, visits and obituaries.

8. Proceedings of annual sessions - Abstracts from annual sessions of the SLDA and other colleges will be published under this category.

Submission of manuscripts

Authors submitting a paper do so on the understanding that no part has been published before, that it is not being considered for publication elsewhere and that it has been read and approved by all the authors.

Manuscripts including Tables and Figures should be sent in triplicate as the work will be reviewed by two or more referees. While papers are subject to editing, the journal does not hold it responsible for statements made by the contributor. The author alone is responsible for the statements made in his paper.

Submission of a manuscript means that authors automatically agree to assign exclusive copyright to the Sri Lanka Dental Association if and when the manuscript is accepted for publication.

Manuscript on disk

Once an article has been accepted for publication, the author will be asked to supply a copy of the final manuscript on disk together with two copies of the complete manuscript. Every disk must be clearly labelled with the name of the author, title, software and program version number.

Manuscript style

The manuscripts should be typed, double-spaced: on A4 (210x297 mm) paper and submitted in correct English: both English and American spelling are acceptable, provided this is consistent throughout the manuscript. Manuscripts not submitted in proper format or in poor English may be returned without review. The format of a manuscript should be as

follows: Title page. Abstract. Introduction, Material and methods. Results. Discussion. Acknowledgements. References. Figure legends. and Tables, arranged in that order.

Title page - The title page should contain the following information in the order given: 1) a concise but informative title; 2) author's full names' (without degrees and titles); 3) author's institutional affiliations; 4) a running title. not exceeding 40 letters and spaces; 5) name, address, telephone, telefax and electronic mail address of the author responsible for correspondence.

Abstract page - Original and review articles must contain an abstract of approximately 250 words with four specified subtitles:

- 1) **Objective:** An introductory sentence indicating the objective and purpose of the study.
- 2) **Material and methods:** A description of experimental procedure including applicable statistical evaluation.
- 3) **Results:** A summary of the new. Previous unpublished data and results.
- 4) **Conclusion:** A statement of the study's conclusion 3-5 key words according to Index Medicus should be provided.

Introduction - The introduction should carry sufficient background information on the subject of study.

Material and methods - Procedures should be described in such detail as to make it possible to repeat the work. Subheadings may be used to improve clearness. Correct unit abbreviations should be used (e.g.; "h", "min", "s" and "Fm" rather than "hr", "minutes", "sec" and "Fl". respectively).

The authors should consider the ethical aspects of their research and ensure that the work has been approved by an appropriate Ethical Committee. Where applicable, a copy of the ethical clearance certificate should be attached. In human experimentation. informed consent from individuals should be Obtained and this should preferably be stated.

Statistical analysis - Since many scientific investigations rely on statistical treatment, authors are strongly urged to consult a person with in-depth statistical knowledge. Manuscripts with a clear element of statistics are regularly refereed by the Journal's statistics consultant.

Results - The Results section should clearly and concisely present the findings of the research, as a rule in the past tense without subjective comments and reference to previous literature. The results should be supported by statistical or illustrative validation. For the sake of clarity this section may have subheadings. **Discussion** - This section should present the interpretations of the findings and is the only proper section for subjective comments. Authors are strongly urged to avoid undue repetition of what has been reported in Results.

Tables - The tables should be numbered in the order" of appearance in Arabic numerals, Each table should have a brief explanatory title. Each table; should be typed on a separate sheet, with due regard to the proportion of the printed column/page.

Figures - All graphs, drawings, and photographs are considered figures and should be numbered in the order of appearance in Arabic numerals. Each figure should have a brief and specific legend, and all legends should be typed together on a separate sheet of paper. Photographs should be glossy prints and the reverse should give the figure number, title of paper principal author's name and have a mark indicating the top. Colour illustrations may be submitted in instances where their use may contribute significantly to the scientific value of the article. Colour illustrations may be printed free of charge at the Editor's discretion, whereas others may be printed at the author's expense.

References - References are listed double-spaced in a separate reference section immediately following the text. References are numbered consecutively in the order in which they appear in the text; do not, alphabetise. Identify references in texts, tables and legends by Arabic numerals (within parenthesis).

Congress abstracts should not be used as references nor may "unpublished observations" and "personal communications" be placed in the reference list. References cited as "in press" must have been accepted for publication and not merely in preparation or submitted for publication

Examples of correct forms of references are given below. These are based on the format used in the *Index Medicus*. Abbreviate journal names according to the *List of Journals Indexed*, printed annually in the January issue of *Index Medicus*. List all authors; do not use *et al.* in the reference list.

Journals

Standard journal article

Bartlett IG, O'Keefe P. The bacteriology of the perimandibular space infections. *J Oral Surg* 1979; 37: 407-409.

Corporate (collective) author

WHO COLLABORATING CENTRE FOR ORAL PRECANCEROUS LESIONS. Definition of leukoplakia and related lesions: an aid to studies on oral precancer. *Oral Surg Oral Med Oral Pathol* 1978; 46: 518-539.

Unpublished article

Barker DS, Lucas RB. Localised fibrous growth of the oral mucosa. *J Dent Res* 1965: in press.

Books and other monographs

Pindborg JJ Atlas of diseases of the oral mucosa. 5th edition.. Copenhagen: Munksgaard, 1992: 50-66.

Chapter in book

Boyde A. Amelogenesis and the structure of enamel. In: Cohen B, Kramer KH (eds). *Scientific Foundations of Dentistry*. William Heinemann Medical Books Ltd. London. 1976: 335-352.

No author given

International statistical classification of diseases and related health problems, 10th revision, vol 1. Geneva: World Health Organisation, 1992; 550--564

*With Best Compliments
From*

M/s. Darley Butler & Co., Ltd,
98, Sri Sangaraja Mawatha,
Colombo 10.

Marketers of

Ultra β [®]
WITH DUPONT TYNEX HEXAGONAL BRISTLES

O-GUARD[®]
Double Action
TOOTHBRUSH

DENTA WITH SOFTER DUPONT TYNEX BRISTLES **Kid**[®]

DENTA[®] WITH DUPONT TYNEX BRISTLES

Super Quality Tooth Brushes

Maximum germ protection!



FDI recognizes that twice daily brushing with a fluoride toothpaste such as Signal is beneficial to oral health.

