



After a Centuries of Dentistry. Prevention Remains Best

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Abstract

The vast majority of dental morbidity derives from tooth decay and/or gum disease. Most dentistry is reparative in nature and patients choose their treatments from restorative disciplines. This article reviews the principles which dictate the evolved pragmatic policies of dentistry, appraises techniques available in the 21st century, and stresses how preventive strategies that aspire to emulate optimal nature are better than elected interventional reparative treatments. Prevention remains the best cure of all.

Keywords: Artificial Intelligence; Dentistry; Electronic; Prevention; Prophylaxis

Introduction and Provenance

Dental caries and gum disease are the most prevalent afflictions that have affected mankind. The dentally sourced pain and associated morbidity is as old as mankind. Dentistry has been practiced for millennia, and because it demands specialized back-up apparatus and focused oral knowledge, dentistry has evolved into a disciplined science as a subspecialty of medicine. The major challenge for retaining natural teeth focuses on oral hygiene paraphernalia globally to tackle the challenge of decay and gum disease. Teeth are not necessary for survival and consequently over time exodontia became the ultimate treatment for an ailing tooth. Subsequent therapeutic efforts have developed to stop or correct the damage, and treatments have been to repair damaged teeth, and to replace lost dentition and function. Most of the intervention therapies applied are reactive in nature from the dental profession and are technically based on reparative skills. From the patients' point of view all dentistry is essentially elective as cost, access, choice and availability all moderate patients' choice and are executed by the treating dentist. Yet the ultimate optimal management of teeth is to retain a natural well-functioning dentition for life, and devolves into sustaining dental health, aspiring to realize the best form and function of a natural dentition. Often the best advice offered takes the form of orally transmitted aphorisms [1-3].

Aim of the Study

This commentary points out that most dentistry is an 'elective' decision in approach, and that prevention is better than traditional intervention practices for tooth decay and gum disease. Prevention

of caries and gum disease is achievable and will go a long way to realizing the mission of retaining teeth in optimal form and function for life.

Modes of treatment available

Therapeutic modalities are appraised here as to how the range of available dentistry determines that although the principles driving the pragmatic reparative intervention dental services provided by dentists are desirable, stress on prevention and emulating the pristine nature of teeth to procure optimal results over a lifetime, are by far more preferable.

The vast majority of the public tends to consult dentists only after they experience some sort of dental problems. This may be from a simple exfoliation of deciduous teeth, pain from tooth decay or from a serious spreading cellulitis infection from an infected tooth, and everything in between. The commonest complaint is some type of pain derived from the teeth. When visiting a certified well-trained dentist, a vast array of treatment modalities is readily made available for treatment. The following includes a brief summary of these with clarifying observations.

Conservative as conformative and restorative dentistry

Conservative dentistry strives to treat and retain teeth through treatment rather than extraction. This is procured using conformative and restorative approaches.

Conformative dentistry removes tooth-decay, and the eliminated decay is replaced with material to conform to the remaining shape of the prepared tooth. This form of conformative intervention therapy saves many dentitions but is derogatively labelled as "Patchwork Dentistry". Restorative dentistry restores the tooth to its original shape that existed before any loss due to decay or wear and tear. Typically crowns, onlays, inlays and overlays are used for the latter. Full mouth rehabilitation draws on restorative techniques, by mainly using crowns. Amalgams and silicate fillings were commonly used for conformative dentistry in the 20th century, but in the 21st century most restorations are done with composite resins, cast metal and/or fused porcelain. Full mouth dental rehabilitation relies extensively not only on the use of full-coverage crowns but also on osseointegrated implant prostheses, to restore lost teeth, mastication and appearance. Natural colored resins, hermetically sealed with 'acid-etch' techniques, have largely replaced 'amalgams' and metal restorations and fillings not only for their esthetic appeal, but also because the resins are less heat-conductive, and cause less pain from temperature changes.

Dental instruments, apparatus and armamentarium

In historical times hand-instruments were used for dentistry. Tooth scalers and scrapers were common, as were devices like forceps, screws and levers to extract teeth. Many hand-instruments are prevalent and still in common use like mouth mirrors, sharp explorers, measuring probes, tweezers, excavators, scalers and hand-instruments to manipulate dental materials. Forceps and levers are now shaped for optimal grip on teeth for extractions. Tooth-decay removal from teeth started with manual-excavators and were supplanted by foot- and/or hand-driven small drills. The early electric revolution from about 1900 to 1920, introduced hand-drills electric belt-driven (at 6000-to-8000 revs per minute RPM) driven by electric motors. These were standard until the late 1950's during which time conservative dentistry was physically challenging and slow. Powerful hand and grip-strength was demanding, and rarely more than one tooth at a time could be repaired. When high speed air-rotary drills (at over 150,000 RPM) were introduced, decay removal and cavity preparation was revolutionized. Access to the teeth, and the remaining healthy tooth-material, by speed-cutting under a continuous spray of cooling water facilitated rapid, accurate and reliable tooth preparation for sound restoration. Both conformative and restorative dentistry was vastly accelerated and made relatively (to old-style electric drill preparation) easy, as more than one tooth cavity could be prepared at one sitting was feasible. Hand-strength remains important but skill and knowledgeable accurate judgement of cavity preparation has become prime. Crown preparation, notoriously

difficult with both old and new techniques, is now more prevalent in treatment plans, especially for full mouth rehabilitation of oral cripples. Oral cripples (OC's) are deemed to exist when more than 50 percent of natural dentition's form and/or function is lost.

Endodontics

Should the pulp of a tooth become non-vital, usually from progressive infective caries, but occasionally from trauma, a 'root-filling' or endodontics is used to save the tooth. The pulp is extirpated, sterilized and filled with an inert material before the tooth is restored. The teeth are referred to as 'non-vital', or a 'dead tooth', and should no periapical reaction occur, they are deemed stable and inert. Some sources claim that 'dead teeth' have an anachoretic effect and can act as an auto-antigen that generates autoimmune reactions. Anecdotal reports that extraction of 'dead teeth' improves eyesight, or moderates allergic induced pathologies are not unknown. This notion remains controversial for lack of 'water-tight' cause-and-effect evidence.

Fixed and removable prostheses

A fixed prosthesis replaces lost teeth and remains in the oral cavity, retained by remaining healthy teeth, or by strategically placed osseointegrated implants. The prosthesis may need maintenance and monitoring for possible defects but should be durable and serve for decades if well cared for. Fixed prostheses demand regular cleaning as oral hygiene at home and professionally. The latter includes monitoring for physical fracturing or leaking of restorations or prostheses, recurrent decay and periodontal breakdown, but also for other pathologies, like cancer, or premalignant conditions, like leukoplakia in the mouth.

A removable prosthesis replaces lost teeth and may be stabilized by remaining existing teeth or by implants but is usually removed from the mouth at night before going to sleep. A removable prosthesis needs regular cleaning and this is done outside the mouth.

Full and partial prosthesis

Full prostheses replace all the teeth. It may be fixed or removable. A full, fixed prosthesis remains in the mouth permanently (unless removed for maintenance and repair). A full removable prosthesis may be supported and stabilized as an overdenture on implants, or just on alveolar-bone covered gingival mucosa, sealed and stabilized, but both are removable prostheses from the mouth. These full-mouth-prostheses are usually removed from the mouth at night before going to sleep. Stabilizing implants for full dentures need to be cleaned and maintained like natural teeth.

Osseointegrated implants and prostheses

Osseointegrated implants are essentially metal screws, posts or other shapes embedded into jawbone, purposed specifically to support replacing dental structures. The implant forms a type of ankylosed union with the alveolar medullary and cortical bone and acts as a solid immovable foundation. This may be used for an individual tooth, or act as a foundation to sustain a placed prosthesis. Osseo-integrated implants also may be used as an ankylosed foundation base, to be used in orthodontic movement. They may be single units or multiple placements, the number space and size being determined by anatomical constraints, and each individual oro-dental presenting case. They have a high confidence success rate (over 90 percent) when receiving sites have no disadvantageous features. Failures are rare and often can be successfully repeated. Super-structures as prostheses are successfully placed and are easily maintained with regular home oral-hygiene and professional visits for cleaning. The cost in financial terms and the subjective suffering and discomfort of placing and maintaining OI implanted teeth, are valid barriers to avoid them as a voluntary choice for ideal treatment [4].

Orthodontics

Frequently teeth are not well aligned into arches that look and function optimally. Often the teeth sizes cannot be accommodated in the dental-arch space available, and this leads to malocclusions, bony-impactions, difficulty in maintaining oral hygiene and consequent increases in gum disease and decay. Tooth movement can be started in pre-pubescent years to take advantage of the cranial and jaw growth spurts at puberty and in the hebephrenic years that follow. Fixed or removable appliances are constructed so as to re-align all the teeth into optimal form and function. After the new teeth position is completed, post-op splints are frequently needed to sustain the best long-term results. Cleft palates are treated early in life (before age 2 years) and can assist surgery by relocating the existing bones into optimal positions for subsequent surgical correction.

Orthognathic surgery

Sometimes, dental repositioning is so mal aligned because of jaw disfigurements that orthodontic treatment relies on orthognathic maxilla-facial surgery to realign the jaws and teeth to improved positions. Invasive surgical augmentation, resection and/or repositioning of the maxilla and/or the mandible may correct many of these deformities. Often combined with orthodontic realignment, optimal results are realized.

Exodontics

The ultimate resolution of tooth derived morbidity is to extract the offending teeth. Exodontics for centuries was regarded as ideal therapy, and immediate treatment of dental problems. Total voluntary exodontics and replacement with removable prostheses became popular. "Blood and vulcanite" dentistry was prevalent: Vulcanite was a hard rubber that preceded the use of acrylic-plastic as denture-bases. However, from the early twentieth century, people who understood the chronic nature and cause of both tooth decay and gum disease, a slow realization that prevention of disease was feasible, and that retaining the natural dentition into old age was far more beneficial than being edentulous. Replacement of dentitions with prostheses made enormous strides, culminating with replacement with full arch dental prostheses, supported by OI implants.

Prevention and prophylaxis

Nearly all oral and dental diseases are cause-related to microbes in oral biomes. All oral biofilms are not the same and different ecosystems evolve with time, stagnation of the biofilm, substrates provided in the diet, and the health status of the host. The complexity of the physiology and oral biochemistry of the mouth obscured and confused prevention strategies against oral diseases for centuries. Enamel reinforcement against caries, plaque control and oral hygiene practices now constrain the action of biofilm and development of disease. The theory of decay starts with decalcification of calcified dental material (at acid pH 5.5), and its' subsequent attack and cavitation by microbes. Climax oral biofilms evolve with time into invasive ecosystems which will produce gingivitis, and in vulnerable hosts sometimes progress to periodontitis. These complex processes are constrained to a minimum with oral hygiene practices sustained subjectively and regularly at home and are supported with annual visits to dentists for professional care. Public-, mass-media-, and school-education at all levels are essential to make people aware of the necessity for oral hygiene practices. Access, affordability and use of oral hygiene paraphernalia should become globally available to tackle the challenge of decay and gum disease [5]. Understanding the pathology of biofilm and also the wide horizons of medicine, from prions, viruses, bacteria, fungi and unicellular microbes facilitates management and prevention of aggravated morbidity of ora-dental pathologies [5,6].

Fluoride as a prophylaxis strategy

The use of eufluoridated water (St concentrations between 0.7 mg and 1 mg Fluoride per liter of potable municipal water) is a proven community health strategy that reduces tooth decay by as much as eighty percent (80%), as compared to communities

without fluoridated water supplies. When fluoride ion is ingested systemically during growth and development with the diet, the fluoride-ion is included in the calcification and formation of the teeth. The calcified dental structures of enamel, dentine and cementum, all form calcium-hydroxy apatite crystal, which is resistant to ionization at pH 6.5 to pH 5.5 with fluoride. With a fluoride ion included, fluor-hydroxy-apatite forms, and the calcified structures will only dissociate at a lower pH at about pH-three-point-five (~pH 3.5). Consequent to fluoridation, decalcification and cavitation is reduced and there is a marked reduction in the development of tooth-decay. Also, fluoride inhibits plaque maturation by reducing the rate of bacterial growth. Accordingly, both caries and gum disease will be significantly prevented. The use of fluoride in tooth pastes and mouth-rinses is effective, but not as successful as imbibing eufluoridated water during growth and development [7,8].

Oral hygiene and diet

For many centuries a 'fibrous chew' was deemed 'Nature's tooth brush'. Eating raw apples, carrots and celery were encouraged for dental health. This was a fallacious notion, as although the fiber in diet does help to reduce biofilm, it does so only on bulging cusps and surfaces, but does not thoroughly remove stagnated biofilm from the major vulnerable area where decay starts. Occlusal pits, interdental-proximal, and cervical areas are the loci where biofilm is left to stagnate as sessile bacterial colonies will decalcify the underlying tooth, and once cavitation forms, ongoing progressive tooth decay takes over. Diets rich in easily fermentable carbohydrates like sucrose (and glucose fructose, galactose, maltose or lactose) facilitate the formation of extracellular polysaccharides in sessile microbial colonies, and are metabolized to reduce the biofilm acidity to the critical pH of pH 5.5. At pH 5.5 or less, decalcification starts. This low acidity frequently drops well below to pH 3 or pH 4, and these sugary-diets substantially contribute to a huge increase in developing tooth decay. In vulnerable communities, without fluoridation and high intakes of easily fermentable carbohydrates sweetened diets, tooth decay and gum disease always have high prevalences. Acidulated drinks that cause decalcification cause erosion and promote attrition and abrasion [9].

Computerized adjuncts

In the 21st century most radiography has been digitized and included into computerized diagnostic recall systems. Diagnostic Imagery, like those used in pan-oral radiography, computer assisted tomography (CAT scans), magnetic resonance imaging (MRI) and artificial intelligence.... all assist with interpretation of radiographic images. Digital computerized recording of clinical findings accelerate and facilitate manual measures and recordings of

observations for decay and periodontal morbidity (pocket depths with or without bleeding or pus). Electronic computer programs assist with treatment planning for osseo-integrated implants, and allows for discretionary implant choice (length, width and type), visualization, and placement of Implants on patients radiographs. Recording and retention of records with computers has markedly facilitated recall, application for clinical progress, is permanent and saves storage space.

Discussion

Prevention of complications from impactions

Dental impactions indicate that fully formed teeth are "stuck in bone" and will not erupt into function in the mouth. This may be due to the size of the teeth not being able to fit into the intra-oral dental arches. To create more mesio-distal arch-space, often removal of teeth in the erupted arches is done; for example, extraction of four premolars will allow for impacted third molars to erupt and be fully functional. Impacted teeth may be exposed surgically and then moved orthodontically into the desired position; like impacted canines being exposed and orthodontically moved into a space. Many impacted third molars are malaligned, erupt partially, and are often a source of intra-oral pathology like pericoronitis, ANUG (Acute Ulceromembranous Gingivitis), cyst formation, or bone infection. Consequently, impacted teeth often have to be removed surgically with accompanying uncomfortable pain and post-operative morbidity. Most third molars start developing after birth and those tooth follicles are visible from about 8 to 9 years on radiographs. To avoid this suffering arresting the growth of third molars by FUS (Focal Ultrasound) or Cryo-ablation has been suggested [10,11].

Disadvantages

The major disadvantage of interventional therapy are difficulties and challenges arising from executing procedures. Most dental procedures are painful and demand some form of local analgesia or general anesthesia. This applies to all conservative dentistry, surgical, periodontal, maxilla-facial and/or osseo-integrated implantology. Besides the necessity for proper tooling, apparatus and materials, dentistry requires highly trained operator-skills, qualified expertise and access to clinical locations. Add to that that excellent dentistry commands proportional payment. These are all disadvantages and major challenges to be overcome to cope with disadvantages of interventional dental care.

A natural healthy dentition by comparison provides endless benefits. Monitoring for oral diseases and maintenance of durable and oral health status is assured by annual visits to a dentist. Pris-

tine natural teeth in stable gums, demand minimal payment and assure optimal survival and function. Sanitary oral hygiene routines ensure prevention of developing caries or gum disease. Daily tooth-brushing, interdental flossing with professional application of topical application of fluorides, are the proven foundation pillars of successful prevention against tooth decay and gum disease. Accordingly, preventing oro-dental pathologies, consequent to stagnating plaque biofilm in vulnerable loci through prophylaxis, is achieved.

Advantages and benefits of prevention

The positive benefits from preventing tooth-decay and gum disease throughout life are numerous. Infections are avoided. Toothache, pain and suffering are avoided. A full dentition allows for a varied omnivorous diet. Additional use of teeth as an accessory for gripping, holding, incising or cracking is universally apparent. Phonation and speech becomes crisp clearer and more comprehensible. The Appearance of a healthy dentition adds to the attractiveness of people during speech, communication with grins (showing teeth with lips apart but when in occlusion) and smiles (showing teeth when lips apart and mouth open). During a lifetime, regular visits to the dentist, combined with regular home-care-oral-hygiene, not only will it realize comfort and increased quality of life, but will also save a lot of money that is required to repair decayed or missing teeth, and curing gum diseases. It is said that "If you want spectacular dentistry, be prepared to pay spectacular prices". That remains true, but if you invest an ounce of prevention, the benefit is that it will save you a ton of intervention dentistry.

Concluding Remarks

Should periodontal treatment be seen as inefficient or that it was started too late, many patients opt for exodontia and implant replacement. Preventing gum disease with sound oral-hygiene is far more desirable than requisite complex gum therapy.

As implantology has advanced with over 90 per cent success rate, cases that should be referred, or teeth that should be retained, too many teeth are readily extracted, and are summarily replaced with osseointegrated implants. Challenging or tedious periodontal treatments should not compromise or create restrictions with contra-indications for implants. Yet strategic extractions of teeth with advanced gum disease should not be eschewed from optimizing treatment plans. The decision for exodontia should be based on a prognosis influenced by the clinical condition (including, pocketing, bone loss, vitality, mobility, and restorability), relevant facts from literature, professional skill, training and experience of the operator, and the patients informed desire. The final decision rests

with the patient. Often because of fear, cost or misinformation more teeth are extracted for convenience than the number unnecessarily retained. A tooth may be extracted and replaced with an implant at any time, but exodontia is irreversible and a final definitive action.

All dentistry is ultimately elective. Dentistry is a sub-specialty of medicine, and general medical practitioners need not only to be familiar with dentistry options available, but also with fluoride physiology in pre-teens and hebephrenic years. Most dentistry is done with physical intervention therapies. Yet most preventative therapy derives from choosing principles of management that manifest in prophylactic strategies. Prevention remains the best principle to attain and sustain dental health for life. Prevention remains the best cure of all.

Author's Statement

The author has no conflict of interest to declare.

Bibliography

1. Touyz LZG. Orally transferred aphorisms of dentistry. *Dentistry and Oral Health Care, BioRes Scientia Publishers*. 2023;2(2):1-5.
2. Touyz LZG. More orally transmitted aphorisms (OTA's-2) in dentistry. *Dentistry and Oral Health Care, Biores Scientia Publishers*. 2023;2(2):1-4.
3. Touyz LZG. Additional orally transmitted aphorisms (OTA's-3) in dentistry. *Dentistry and Oral Health Care, BioRes Scientia Publishers*. 2024;3(2):1-6.
4. Anibal-Goiris F, Smolareck P, Larocca de Geus J. Periodontics versus Implantology: a short review. *Academia Letters*. 2021:2099.
5. Touyz LZG. The pathophysiology of oral biofilms and it's relation to initial gum disease and caries. *J Dent Oral Disord Ther*. 2017;5(4):1-6.
6. Touyz LZG. Periodontitis: A dual infection. *Current Opinion*. 2023;3(1):238-248.
7. Touyz LZG and Nassani LM. Does fluoridated municipal water reduce prevalence of tooth caries? Fluoridated water DMFT compared with Non-fluoridated DMFT in the greater Montreal area. A clinical epidemiological study. *World Journal of Pharmacy and Pharmaceutical Sciences*. 2019;8(6):15-25.

8. Touyz LZG and Nassani LM. Affirmation: Fluoridated water reduces caries in children. *Jnl Pediatric Dentistry and Hygiene*. 2019;1:1003.
9. Touyz LZG. Is quaffing colas and fruit juices innocent?. *EC Dental Science*. 2022;21(6): 21-28.
10. Touyz LZG. Prophylaxis of impacted teeth using MRI and Focal Ultra-Sound ablation? A feasible hypothesis. *Medical Hypothesis*. 2012;79(3): 342-343.
11. Touyz LZG. Cryotherapy for prophylaxis of wisdom teeth impactions?. *OA Medical Hypothesis*. 2013;1(1):10.