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Special Care Dentistry

A compilation of essays

Forward by Professor Raman Bedi



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Forward

By Professor Raman Bedi



This book has been created primarily for dental undergraduates studying in South East Asia and India. It started as an attempt to provide all the Asian dental schools with a special care curriculum, which was available on an open access basis.

Initially a series of video lectures were produced and these are available on YouTube and provide the viewers the core subjects which should be included in the teaching of every dental student.

This collection of articles accompanies each of the videos which can be found at:

www.gcdfund.org/special-care-dentistry-lectures

Dedication

This e-book is dedicated to my parents Satya Pal and Raj Bedi

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Chapter 1

An overview to oral health care for people with special care needs

By Siti Zaleha Hamzah, Hana Samejima,
Gemma Bridge and Raman Bedi

Definition of Special care dentistry (SCD)

Difficulties in defining the scope of the discipline of SCD is one of the reasons why the field is underdeveloped and has been neglected in several countries [1]. The term 'disability' can mean different things depending on the people, context, cultural expectations, and environment. For example, 'mental retardation' is a term accepted and currently used in the US whereas in the UK it is considered stigmatizing and unacceptable [2]. The lack of agreement on nomenclature is a factor that affects the confusion around the population considered to require special care treatment and the different populations considered for SCD between countries and regions [1].

Some countries may include marginalized groups of the population with social or financial constraints. These differences in understanding mean that there are variations in what is taught to general dental practitioners and dental specialists [1]. In the case of Malaysia, SCD is defined as "the oral health management of patients adversely affected orally by intellectual or physical disability and medical or psychiatric issues or, more often, a combination of a number of these factors, where such conditions necessitate a modified delivery of oral health care for patients' total well-being [3]." The target patients includes those with learning or physical disabilities and the elderly.

Special Care dentistry: The global picture

SCD is becoming increasingly important due to the advances in care, longer life expectancy of people with special needs and changes in societal attitudes towards seeking treatment for those with special needs [2]. Globally, 15% of the population live with moderate to severe disability, which corresponds to 1 billion people [4]. Of this global population, 90 million people with special care needs live in Southeast Asia. The prevalence is highest in Indonesia with 8.6% followed by 7.8% in Vietnam [4]. Although recognized in international treaties such as the UN Article 25 of the Convention of Rights for Persons with Disabilities [5], a multitude of studies have shown that people requiring special care have poorer oral health despite similar patterns of oral disease as the general population [6].

Focus and scope of practice

Patients treated with SDC can be categorized into four groups, namely 1) Frail and dependent elderly patients, 2) patients with special needs, 3) patients requiring conscious sedation or general anaesthesia and 4) adult patients (in Malaysia these are aged 16 years old and above but varies by country).

Scope of the SCD service is almost identical to that of general dentistry however, it requires various additional consideration such as financial support, transportation methods, length of the treatment etc.

In addition, SCD also include monitoring of the daily oral routine care to see if the patient is capable to perform sufficient oral care at home or whether they require help from their caregiver. SCD is about having a comprehensive view on the patients. At Dr. Siti's clinic, the service also includes visit to local community health centers for consultations, domiciliary oral health care and behavioral modification strategy.

Who requires SCD care?

The disabilities experienced by patients needing SCD can be categorized into five groups:

1. Intellectual disability, defined as limited intellectual ability affecting social skills, behaviors, and ability to perform activities of daily life such as down syndrome, autism, and global developmental delay. [7]
2. Psychiatric and psychological disability, is defined as chronic loss or impairment of function due to a mental disorder, resulting in severe difficulties in meeting the demands of life. Patients with such disabilities may have abnormal thoughts, emotions or behaviors and may have difficulty in forming relationships with others.[8]
3. Multiple disabilities, defined as having a combination of more than one category of disabilities.[2]
4. Physical disability, defined as a physical condition that affects a person's mobility, physical capacity, stamina, or dexterity causing limitation to daily activities such as hemiplegia, paraplegia, stroke, cerebral palsy, or hearing/visual disability and these could be permanent or temporary. [9].

Activities of Daily Living (ADL) explains the skills required to perform basic physical needs independently such as personal hygiene or grooming, dressing, toileting, transferring and eating.[10]

5. Complex medical problems, defined as medical issues and long term illnesses that need treatment or medication that may or may not be directly related to the disability but may pose a risk to the oral treatment. For example, Alzheimer, Parkinson disease, cancer, hemophilia, and renal disease may create barriers to access of certain oral treatments.[11]

People with special care needs often require more dental care than other populations. In support, it was recently stated that "Many patients with disabilities have a higher risk of oral disease due to compromised oral hygiene as a consequence of their impairment, oral manifestations of their particular condition and/or the side effects of drug regimes, notably xerostomia and sugar in medicines". [12, p 119] However, people with special needs often have difficulty accessing oral care due to a range of barriers in accessing care.

Common issues in SCD – Barriers to access

In SCD, communication difficulties may become barriers to access to care for many people with special care needs. In some cases, the patient may not be able to express their need or, the caregiver may not be able to understand the patients need for medical attention. Another issue common in SCD, is that oral care for people with special care needs is not given high priority when the patient is suffering from other existing health problems. [13]

In support, it was stated that “For obvious reasons, the medical aspects of a disability often have to be given priority by the patient, who has a high number of contacts with different professionals, including physicians, physiotherapists, psychologists, people within the social insurance and educational systems.” [13, p 269] Other barriers to care include, a fear of losing control which can induce anxiety in patients, absence of continuity with the dental care team which makes it difficult to build trust, and a lack of support for preventative care when patients have difficulty complying with self-care. [13]

Patient consent

There are a number of acts and regulations regarding consent on SCD depending on the country context. In other words, the patients have the right to refuse or to accept or to delegate the decision to a third party for the treatment on a legal ground.

Examples of national acts and regulations:

- Philippines: Magna Carta for Disabled Persons (1992)[14]
- Malaysia: Person with Disabilities Act (2008), Mental Health Act (2001)[15, 16]
- Singapore: Mental Capacity Act (2008), 5 Years Enabling Master Plan [17, 18]
- Thailand: Persons with Disabilities Empowerment Act (2007)[19]
- Indonesia: Law No.4 on the Handicapped (1997), Law No.39 on Human Rights (1999)[20]
- Vietnam: National Disability Laws on Persons with Disabilities (2010), National Action Plan to Support Persons With Disabilities (2012)[21, 22]

Dougall and Fiske (2008) explored the meaning of informed consent and the implications of the Mental Capacity Act in obtaining consent from vulnerable adults such as those with SCN. The authors explained that the process of providing valid informed consent generally consists of effective communication and general decision-making materials. Effective communication entails the usage of language that can be understood by the patients/care giver and the patient/care giver. The party providing consent must have sufficient capacity to understand what they are being asked, and they should be given sufficient time to make decisions. The patient in question has the right to be given information on different treatment options, the procedure and the potential risks regarding the treatment as well as legal, professional, ethical, and other relevant standards. Dougall and Fiske (2008) emphasized that it is important that the decision is voluntarily and not forced by a third party.

The presumption in general is that those aged over 16-18 depending on the jurisdiction, are competent to make an informed choice and provide consent to medical treatment, unless proven otherwise. [16] In the Laws of Malaysia Act 615 Mental Health Act (2001), a person is considered incapable of giving consent if they are a.) unconscious, b.) age of under 18, c.) age of 18 and above but are unable to understand fully the nature and the effect of the treatment.

Factors such as basic intellectual or emotional immaturity, severe intellectual disability, severe mental illness, and Alzheimer's disease may impair the decision making ability of the patients and will therefore render that individual incapable of providing consent. In such cases, a caregiver or other designated party such as a doctor or dental professional, provides consent on behalf of the patient.

Conclusion

It is possible that most people with a mild or moderate disability or medical condition can and should be treated in line with general dental practice recommendations. It should be remembered that not everyone with a disability requires SCD care, as not all disability limits oral treatment. However, it is important to ask patients if they require any additional support to access appropriate dental care. SCD is about patient complexity rather than the complexity of the dentistry being provided.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 2

Oral care and hygiene care in people with disabilities

By Hani Ayup, Hana Samejima, Gemma Bridge and Raman Bedi

Definition of disability

The United Nation Convention on the Rights of People with Disabilities (UNCPRD) considers those with disabilities to include “those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.” [2] (p.4) The World Health Organization (WHO) has a slightly different definition and considers disability as “an outcome of interaction between health condition and contextual factors.” [3](p.10). The definition provided by the WHO describes impairment in relation to activity participation and limitation. It highlights the fact that not all people with impairment will have disability [3]. It is also worth considering that most people are likely to experience difficulties in functioning at some point in their lives. [4] In this vein, approximately 14% of the global population experience disability, with experience increasing to 39.4% for people aged 65 of over.[4]

People with disability and oral health

People with disabilities typically have poorer oral health than those without such disabilities. Reasons for this are varied, but often relate to difficulty in accessing oral care. [5] Hence, this population experienced higher levels of oral diseases due to poorer oral hygiene, increased plaque levels, severe periodontal disease, high rates of untreated caries, high edentulism and low rates of replacement of missing teeth.[5-7]

The risk of poor oral health is even higher for people with multiple disabilities and complex health issues.[5] As poor oral health can greatly impact an individual's quality of life and the dental care required for people with disabilities are not complex, it is important that all dental practitioners in a community setting or at a primary care setting have the skills and confidence needed to treat patients with disabilities.[8, 9]

Physical disability

Physical disability is a condition that affects a person's mobility, physical capacity, stamina, and dexterity and does not necessarily impact an individual's general or oral health status.[9] However, their physical disability may impact access to their mouth and also access to the dental surgery. [10] This includes physical barriers such as transport to the clinic, navigating through the building and sitting on the dental chair. In many cases installing rails and ramps can improve accessibility of the patients with physical disabilities.[11] In other cases, if the patient has oral or general muscle control and tone impairment, this may become barrier to access to the mouth as it becomes difficult to keep a posture or a mouth position for the duration of the treatment.[11] Cushions, beanbags, photographic cheek retractors are some of the things that are used to improve access to the mouth. [11]

Intellectual disability

Persons with Intellectual disabilities may experience problems with general mental abilities in two areas: intellectual functioning (learning, problem solving and judgement) and adaptive functioning (activities of daily life, communication, and independent living).[12] People with such disabilities may have the most difficulty in communicating. In terms of dental care, this could manifest as a challenge in describing the pain or the source of the pain experienced. This can delay intervention and result in worsened oral health. Some people with intellectual disabilities may display challenging behavior which can make oral health care difficult to administer. [12] In such situations, acclimatization and behavioral techniques can be used to develop rapport and trust to gain co-operation. [11] During treatment, use of a bite support, rubber spatula, safeguard is some of the ways to support patients with challenging behavior to deliver safe dental care. However in most cases empathy alongside practicality is the best way to approach the challenge of providing oral care for patients with special needs.[11]

Sensory disability

Sensory disabilities, or sensory impairments, affect one or more of a person's senses: touch, hearing, sight, taste, smell, or spatial awareness.[13] People with sensory disabilities may require special care. For instance, individuals with such disabilities may have difficulties in following verbal instructions or communicating their needs and may require other means of communication.

A developmental disorder Autism Spectrum Disorder (ASD) is also considered as a sensory disability due to the difficulty they experience with processing everyday sensory information which can be anxiety inducing. ASD is often characterized by social communication impairment and repetitive or restricted behavior[14] and can manifest itself as non-compliance, hyperactivity, sensory hypersensitivity, and self-injurious behavior in dental care settings.[15] As every patient is different, patient-centered approach that involves a comprehensive understanding of the patient's concerns and preferences, with input from their carers as well as the unique medical management, behaviours, and needs of the individual patient is important.[15]

Psychological disability

People with long-term mental disorders or mental illness are considered as having psychological disability. Mental disabilities are characterized by a clinically significant disturbance in an individual's cognition, emotion regulation and behavior[16]. It is usually associated with significant distress or disability in social, occupational, or other important activities such as bipolar disorder, schizophrenia, and depression.[16] The evidence shows that people with psychological disability are at higher risk of having oral health problem due to layers of factors such as direct result from their illness, dietary habit, lack of motivation for self-care, regular intake of medication etc.[16] For people with psychological disabilities, cost and fear are the most commonly cited barriers to access to dental care. [16]

Oral health care for people with disabilities

BDA case mix model

The British Dental Association (BDA) developed the “BDA Case Mix Model” as a tool to measure and describe complexity in special care dentistry. This model is recognized and widely used in dental service in the UK.[1] The BDA model helps incentivize dental practitioners to take on complex cases by creating a system whereby they are rewarded according to the complexity of care that they provide. The model assesses the complexity of treatment according to six criteria: ability to communicate, ability to cooperate, medical status, oral risk factors (e.g. xerostomia, severe erosion etc.), access to oral care (transportation from home, dental chair, clinic setting etc.) and legal or ethical barriers to care.[1] The skills, competence and time to treat patient with special need must be recognized to overcome the reluctance of the treatment provider. [1]

Principles of oral hygiene care

For daily oral care, basic principles for oral care apply to those with special care needs. Brushing teeth at least twice per day, using toothpaste containing fluoride (1350-1500ppm), not rinsing with water after brushing teeth to avoid diluting the fluoride concentration, interdental brushing and minimizing the frequency of consumption of sugary food and drinks are all recommended.[17]

Studies have shown that caring for people with special needs can be complex and it is important to adapt to individual needs and to modify conventional treatment plans accordingly as well as practicing preventive dentistry. [12, 18]

Individualized treatment

Individualized treatment can be developed by identifying the problem or barrier to care that needs to be addressed, then setting a realistic goal and to decide on the approach that would be most suitable for the patient.[19] Approaches can be broken down into four elements:

1. Individual considerations

- Oral hygiene skills: Carrying out daily oral hygiene can be challenging but immensely important for an individuals' oral health. Some may be able to carry it out independently and some may be semi-dependent or dependent on the caregiver. Lack of manual dexterity, learning disability, lack of cognition, neurological condition etc. are some of the condition that may affect an individual hygiene skills. [18]
- Toothpaste: If the patient can tolerate toothpaste or not. If they can, what kind of toothpaste they can use (with/without foam, desensitizing etc.) Toothpaste containing fluoride is effective in reducing risks for dental caries. [18] Dry brushing or mouth wash dampened tooth brushing is also an option.

- Ability to rinse or floss: There are different tools such as 'no spill beakers' for rinsing and single use floss for flossing for those with manipulation difficulty.[18]
- Choice of toothbrush: Toothbrushes can come in different width, shapes, and sizes if commercially available, or can be modified using different tools to facilitate brushing. Electric toothbrushes are also effective tool for people with disabilities.[18]
- Method of brushing: Can vary from horizontal, circular, vertical, vibration etc
- Environment: Presence and absence of distracters
- Reinforcements: Promised activity after treatment, rewards and compliments can facilitate patient cooperation.
- Support plan for dependent: Plans to support daily oral care that can help patient build self-confidence.
- Oral touch or desensitization:
- Getting the patient accustomed to being touched in the mouth can facilitate the treatment. (toothbrush, gloved finger, wash cloth, etc.)[19]

2. Physical/positional considerations

- Physical/positional considerations concerns the safety of the patient and the provider.
- The patient can be either seated, standing, or lying down
- Most common provider position would either be on the side or towards the back of the patient.

3. Behavioral support

- Scheduled time: Choosing time of the day when patient is at their best condition or limiting duration of one visit etc.
- Place (room or location): Choosing a place with enough lighting and accessible positioning where patient and/or their caregiver feels most comfortable.
- instruction/explanation: Consideration to the method used to communicate to the patient. (Verbal, pictorial, video, sign language etc.)[20]
- Participation: Involving the patient in treatment can improve their cooperation [19].

4. Special adjuncts

- Prescribed oral treatment: Incorporating prescribed oral treatment such as high concentration fluoride toothpaste, fluoride rinses, etc. Consider the frequency and the length of use.[19]
- Edentulous or not: Removal of denture and denture hygiene care may need to be considered if the patient has one.[19]
- Dietary sugar intake: Assess intake and frequency of food and drinks that have sugar and limit it to mealtimes. See if sugar filled snacks or sodas are being used as behavioral reinforcers.[19]

Conclusion

Disability is varied, and everyone has different needs even if they have the same disability. It helps the patients to be engaged to their own oral care by treating them with individualized attention, based on their needs and preferences, promoting oral health improvements through behavioural change. [12]

Oral health has been at the back seat for a long time even though there has been effort to incorporate it into general health. One of the reasons is that it is challenging and secondly the impact of oral health and general health is not recognized enough. We need to put oral health back into general health in order to support patients.

Conflicts of interest

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Chapter 3

Oral health care in patients with hematological disorders

By Callum Durward, Rita Mbunwe Mbubo, Gemma Bridge and Raman Bedi

Introduction

Hemostasis is a biological process that involves the control of bleeding in the body and at the site of an injury [1]. The process of hemostasis involves primary hemostasis, which involves platelet aggregation and platelet plug formation to prevent excessive blood loss from an injury site, and secondary hemostasis which involves the deposition of insoluble fibrin, which forms a mesh around the platelet plug and leads to the formation of a blood clot. This process is regulated within the body so that it only occurs at the site of an injury. A balance between systems that promote and prevent coagulation is important for proper hemostasis and preventing pathological bleeding or thrombosis. In cases where the process is dis-regulated, pathological bleeding can occur.

In people with hematological disorders, of which there are several types, the normal process of hemostasis is dis-regulated resulting in a greater risk of excessive bleeding. The most common types of bleeding disorders are coagulation factor deficiencies, platelet disorders, vascular disorders and fibrinolytic defects. Bleeding disorders can be acquired, for example as a result of vitamin K deficiency or can be congenital, such as hemophilia A. Hematological conditions are more commonly seen in low income countries, where they account for significant levels of mortality and morbidity [2].

Maintaining good health is important for all as poor oral health can affect a person's ability to interact, speak, eat and grow.

Supporting people with hematological diseases to maintain good oral health relies on collaboration between healthcare professionals and appropriate treatment planning.

Hematological disorders

There are several types of bleeding disorders seen in the population. Whilst all conditions are rare, the most commonly seen hematological disorders include hemophilia A and B and von Willebrand disease, with data from 2019 indicating that globally, 195,263 people had been diagnosed with hemophilia and 80,302 had been diagnosed with von Willebrand disease [3].

Haemophilia A is an X-linked recessive disorder affecting males [1]. People with haemophilia A are at an increased risk of excessive bleeding as the disorder affects secondary hemostasis and the formation of a blood clots. Some people with haemophilia A will require supplementation with intravenous recombinant or plasma concentrate Factor VIII to support with clotting and to reduce the risk of excessive bleeding. People who have a mild form of haemophilia can be given medication that releases stored factor VIII from the walls of blood vessels, called desmopressin. Haemophilia B is a rare form of haemophilia that causes an abnormality in blood clotting due to a deficiency of factor IX. It is also an X-chromosome- linked bleeding disorder, affecting males, with female carriers. In the case of haemophilia B, the female carrier also has reduced factor IX activity [3].

Von Willebrand's disease is an inherited platelet condition that results in low levels of von Willebrand Factor in the blood, which results in an impaired platelet aggregation and blood clotting function [11]. In most cases of von Willebrand disease the individual can live a relatively normal life. However, in people with severe forms of the condition, internal bleeding can result in internal injury, as can be seen in people with hemophillia. Platelet disorders can also be caused by an auto-immune condition after viral illness, or can be drug induced, due to chemotherapy, radiotherapy or valproic acid [4].

Other hematological disorders include coagulation factor deficiencies and liver diseases [1]. Coagulation factor deficiencies occur when the proteins in the blood that are responsible for helping the blood to clot are missing or malfunctioning are another type of hematological disorder seen in the population. Such deficiencies affect the body's ability to produce blood clots and can lead to excessive blood loss in the case of an injury. Liver diseases include hepatitis C, Hepatitis C and alcoholism, non-alcoholic fatty liver disease, and hepatitis B, result in the impairment of the synthesis of clotting factors. In some patients with liver disease, bleeding can be controlled through the administration of frozen plasma and prescribed drugs.

Hematological disorders and dental care

Hematological disorders are rare, and most patients who have prolonged bleeding after extractions or surgery are unlikely to have a bleeding disorder,

However, it is likely that during the course of a dental career, that a dental professional will treat patients with pre-existing hematological disorders. As such conditions, if not managed appropriately, can be life threatening, it is important that dental professionals have the knowledge to know how to treat patients with hematological disorders and how to manage their care, especially after an extraction or surgery [1].

Prevention

As with the rest of the population, dental caries and periodontitis are commonly seen in patients with hematological disorders. There is some evidence to suggest that people with bleeding disorders are at a higher risk of poor oral health. For example, Azhar, Uazdanie and Muhammad (2006) found a higher prevalence of decayed, missing and filled teeth amongst people with hemophilia A and B [12]. Moreover, evidence suggests that gingival health is worse in children with hemophilia when compared to those without the condition. [10] To reduce the risk of developing dental caries and periodontitis, it is important that patients with bleeding disorders are advised on how best to look after their oral health.

Treatment

A dental care and treatment plan should be developed for all patients with hematological disorders. The plan required is dependent on the type and severity of the disorder that the patient has as this can affect the patients risk of excessive bleeding following dental treatment.

As a result, pre-assessment that involves communicating with patient's medical practitioner or haematologist to get a complete understanding of the patients medical history is necessary.

When patients with hematological disorders are required to undergo higher risk dental procedures such as the removal of heavy plaque, the patient may need to increase their medication to support blood coagulation and clotting and to reduce the risk of excessive bleeding. Such advice should be given following a conversation with or following the advice of the patient's hematologist. In situations where patients with hematological conditions require a higher risk procedure such as dental surgery, they may need to be referred to a hospital for their treatment. To reduce the risk of excessive bleeding from severe dental treatment, a strong emphasis should be placed on prevention and oral health education.

In patients that have been prescribed blood thinning drugs such as Warfarin to help them manage a pre-existing condition, impaired blood clotting can result. When dental treatments are required for such patients, the dosage of medication should be reduced. In addition to this, tranexamic acid mouthwash can be prescribed for 2 days prior to treatment to reduce the risk of excessing bleeding following dental care [6]. Any decisions about treatment and medication alternations should be discussed with the patients hematologist or medical professional.

Post treatment

Following a dental procedure such as a tooth extraction, a patient with a bleeding disorder is likely to experience prolonged bleeding. Spontaneous gingival bleeding, petechiae or ecchymosis may appear. The type of bleeding experienced depends on the type and the severity of the disorder. Chronic bleeding may cause staining of the teeth.

Conclusion

It is important for dental professionals to be aware when a patient has a hematological disorder as such disorders can increase the risk of poor oral health and the likelihood of excessive bleeding following dental treatment. Reducing the risk of excessive bleeding in patients can be achieved through alteration of blood clotting medication and through conducting dental care in hospital settings. Any advice given to patients with hematological conditions should be given in collaboration with hematologists.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 4

Oral health care in medically compromised individuals

By Srinivas Namineni, Nivedha Srinivasan, Gemma Bridge and Raman Bedi

Introduction

Maintaining good oral health is important in promoting good overall health and wellbeing. The maintenance of oral health is particularly important in patients who are medically compromised as a result of chronic conditions such as renal disease, gastrointestinal disease, endocrine disorders, diabetes and thyroid conditions. Oral health care may need to be adjusted for the patients to reduce the risk of morbidity and mortality. In addition, dental professional need to be aware of the oral effects of chronic conditions and of the medications taken by their patients.

The impact of chronic conditions on oral health

Renal diseases are “conditions that damage your kidneys and decrease their ability to keep you healthy by inadequately filtering waste from your blood” [3]. Renal diseases include chronic renal failure (where the Glomerular Filtration Rate (GFR) is between 10-25%), End stage renal disease (ESRD), and renal transplant. Renal diseases affect multiple systems within the body and as such, other conditions are often associated. Such conditions include diabetes and cardiovascular diseases. In some cases, patients can also suffer from a suppressed immune system, which can put them at risk of other complications and diseases.

Renal diseases and oral health

Renal diseases can impact oral health. Symptoms include pallor in the mucosa, stomatitis, xerostomia, delayed healing and periodontal diseases which subsequently leads to premature loss of teeth [4].

Patient medications prescribed to treat renal diseases such as antibiotics, antivirals, analgesia and NSAIDs can result in additional oral health issues. Renal osteodystrophy is a common side effect of drug therapy, which affects the density of the bone and causes periodontal problems. As a result of such side effects, medical professionals must be cautious when prescribing a medicine, should choose the drugs that are metabolised in liver rather than the kidney, and dental professionals should be aware of the medications that their patients are prescribed.

Dialysis

When the kidneys stop functioning completely, dialysis is prescribed. Dialysis is a procedure to remove waste products and excess fluid from the blood. There are two main types of dialysis namely, haemodialysis and peritoneal dialysis. Haemodialysis involves purification of the patient's blood through the dialysis device and back to circulation [5]. Haemodialysis is delivered 3-4 times a week for a period of 4-6 hours, depending on the person and the machine used. Peritoneal dialysis is typically prescribed for management of end-stage renal failure (ESRF) and it involves the exchange of solutes and fluid between the peritoneal capillary blood and the dialysis solution in the peritoneal cavity across the peritoneal membrane (vascular wall, interstitium and the mesothelium). [12]

Dialysis and dental procedures

Before dialysis, heparin is administered to the patient. Heparin is an anticoagulant that helps to prevent clots forming during dialysis.

Heparin has a half-life of 2-4 hours and circulates the body through blood. As blood thinning can result in excess bleeding, dental procedures should not be conducted soon after dialysis. It is recommended that elective treatments are not done less than 12 hours after dialysis. As part of the preparation for a renal transplant, the patient is referred to a dentist for a pre-renal transplant protocol. The dentist must examine the patient's oral cavity, looking for periodontal diseases and peri coronal sources of bacteraemia. It is important to ensure that bacteraemia is prevented as transplant patients are prescribed immune suppressant drugs for 6 months prior to treatment and as such, any source of bacteraemia can lead to life threatening disease. It is also important for the patient to maintain good oral health in the lead up to transplant as the drugs they are given can lead to gingival hyperplasia [6]. General practitioners, nephrologists, and dentists should coordinate with one another in these situations to provide a planned treatment for the patient.

Gastrointestinal diseases

Gastrointestinal (GI) diseases affect the gastrointestinal (GI) tract from the mouth to the anus. They can be structural or functional. GI diseases are highly prevalent, but often the cause of such conditions is unknown [7]. Some of the most common GI diseases include:

- Gastro oesophageal reflux disease (GERD). A defective oesophageal peristalsis which causes regurgitation of acid into the oesophagus and leads to frequent and prolonged transient lower oesophageal sphincter (LES) relaxation [8].
- Inflammatory bowel disease (IBD) is a structural disease of the gastrointestinal tract. Also known as Crohn's disease, this condition affects the mouth to the anus. It can affect a small part of the system or may be more generalised inflammatory condition.[9]
- Ulcerative Colitis (UC) affects the colon and large intestine and leads to inflammation. The severity of the symptoms depend on the level of inflammation. [13]
- Irritable bowel syndrome (IBS) is a functional disease that affects the function rather than structure of the gastrointestinal system. IBS can be diagnosed with biopsy or endoscopy but the cause is often unknown. [14]
- Coeliac Disease is an immune reaction to gluten that results in damage to the lining of the gut and make it harder for the body to absorb nutrients from food.[15]
- Gastric or colorectal cancer is a disease in which cells in the colon or rectum grow out of control. [16].
- Peptic Ulcer Disease results in symptoms such as epigastric pain, vomiting, haematemesis, melaena and anaemia.

Gastrointestinal diseases and oral health

Gastrointestinal diseases have several impacts on oral health, resulting in alterations in the hard and soft oral tissues. In some cases, oral manifestations can occur before the underlying GI disease is diagnosed, and as such, early identification of such oral conditions can facilitate an early diagnosis.

Oral health impacts of common GI diseases include:

- GERD leads to abnormal gastric emptying which results in increased gastric pressure and esophagitis and mucosal damage from gastric hydrochloric acid. This acid can damage tooth enamel [8].
- IBD leads to diffuse labial and buccal swelling, mucosal tags, deep liner ulcerations in the mouth, and muco-gingivitis, granulomatous cheilitis. [9]
- UC can lead to several oral health conditions including minor aphthous ulcer, halitosis, dysgeusia, dry mouth, tongue coating, gingivitis and periodontitis [13]
- IBS leads to fatigue, halitosis and unpleasant taste in the mouth were found to be common in IBS patients. [14]
- Coeliac Disease leads to dental enamel problems stemming from celiac disease involve permanent dentition and involve discoloration of the teeth surface (yellow or brown spots on the surface, pitting or banding of teeth, and mottled or translucent-looking teeth). [15]
- Gastric or Colorectal cancer can increase the risk of bacterial infections leading to periodontal diseases. Such infections can also increase the risk of cancer by the prolonged release of inflammatory mediators [16].
- PUD can lead to epigastric pain, vomiting, haematemesis, melaena and anaemia. In PUD, meticulous maintenance of oral disease is important as the H. pylori can control plaque as a reservoir.

Management of the impacts of gastrointestinal diseases on oral health

- GI diseases can impact on oral health in a variety of ways. Medical professionals and dental professionals should work together to identify the most appropriate treatment plan and to assess how best to manage oral health manifestations of GI diseases. Treatment options typically utilized include:
- NSAIDs and Aspirin are usually avoided for patients with renal disease because these medications can interfere with other medications such as metronidazole, ketoconazole and tetracycline and can also affect fluoride absorption. If taken, antacids can affect the oral mucosa and dentition leading to erosion, sensitivity and tooth loss. Dryness of mouth and halitosis can also occur and lead to aphthous ulcers.
- Histamine antagonists are prescribed to renal patients. These include cimetidine, ranitidine, nizatidine and Famotidine etc. Dry mouth, sore throat and fatigue are some of the common symptoms of histamine antagonists.

Endocrine disorders

The National Institute of Diabetes and Digestive Kidney Diseases state that "endocrine system includes 8 major glands throughout your body; such as the thyroid gland, pituitary gland, adrenal gland and pancreas.

This system affects growth and development, metabolism, sexual function and mood" [10]. There are several endocrine disorders that can affect people. These disorders can affect the pancreas (Diabetes mellitus), thyroid gland (hyperthyroidism & hypothyroidism), and adrenal gland (adrenal insufficiency, Cushing's syndrome). Diabetes Mellitus (DM) is the most common endocrine disorder in India. In fact, India is considered to have the most cases of DM globally [11]. Diabetes mellitus is a lifelong condition, but it can be controlled. Renal and cardiac conditions alongside DM, can be quite difficult to manage medically.

Dental conditions due to diabetes mellitus

DM can lead to several oral manifestations. One of the most common dental conditions is xerostomia which is caused due to infection setting in them. DM patients are more prone to periodontal disease, thus leading to early loss of teeth. This makes the patient being dependent on rice, which becomes a staple diet, which thus indirectly contributes to diabetes. It is important the patients are monitored regularly to ensure that they have a controlled fasting glucose level to prevent hypo or hyperglycemia. Patients with DM are more prone for infections during periodontal surgeries, oral maxillo-facial surgeons and implant procedures. Multiple extractions with more invasive surgical procedures are best handled when conducted in a hospital setup. Delayed healing - for maxilla-fascial procedures, as infection control is important.

Proactive preventions, where preventing the diseases in the beginning itself is considered essential.

Thyroid diseases

Thyroid disease is a medical condition that means that the thyroid does not produce the right amount of hormones. Normally, the thyroid is responsible for producing hormones that keep the body functioning properly, affecting the rate at which the body burns calories and heart rate. Thyroid dysfunction is the second most common glandular disorder of the endocrine system.

Hypothyroidism (TSH > 4-10Mu/L)

Hypothyroidism occurs when the thyroid gland produces insufficient amounts of thyroid hormone. Hypothyroidism can occur when there are problems within the hypothalamus, pituitary gland or thyroid gland. Hypothyroidism is more common in females than males. Symptoms include fatigue, feeling cold and muscle and joint aches.

Oral manifestations of hypothyroidism

There are several oral manifestations of hypothyroidism [17]. Salivary gland enlargement can present, with macroglossia (large protruding tongue). Macroglossia occurs as a result of increased accumulation of subcutaneous mucopolysaccharides as they are insufficiently degraded. Altered tooth morphology and delayed wound healing can be seen. Glossitis and mouth breathing is common in patients with hypothyroidism.

Periodontal health may be compromised if the dental hygiene is not proper. In children with hypothyroidism, they may present with thick lips, macroglossia, malocclusion and delayed eruption of teeth.

Hyperthyroidism (TSH < 0.4 Mu/L)

Hyperthyroidism occurs when too much thyroid hormone is produced. Patients with hyperthyroidism may experience emotional instability, intolerance of heat, increased cardiac output and increased appetite but with weight loss. Patients have enlarged extra glandular thyroid tissue which mainly occurs in the lateral posterior tongue with tremors occurring commonly.

Oral manifestations of hyperthyroidism

Patients with hyperthyroidism are more prone to caries, are at an increased risk of periodontal disease, will have accelerated dental eruption and may experience burning mouth syndrome. In patients with Graves disease, the thyroid gland may be enlarged, especially when the patient is laying down for a dental examination.

Dental healthcare professionals caring for patients with thyroid disorders should be aware of the potential oral manifestations of thyroid disease so complication can be identified, and treatment plans developed. The dental professional should communicate with the patients endocrinologist to ensure that the treatment provided is safe and optimal.

Adrenal Gland Disorders

Adrenal gland disorders occur when the adrenal glands which are located on the top of each kidney produce too much or too little adrenal hormones. Hormones produced by the adrenal gland include cortisol, aldosterone, adrenaline and noradrenaline. These hormones are important for maintaining metabolic processes, controlling the fight or flight response to stress and controlling sexual maturation. There are several types of disorders that affect the adrenal gland, and each has its own symptoms and treatments. Examples include adrenal gland tumors, cushing syndrome and adrenal insufficiency.

Oral manifestations of adrenal gland disorders

As with other systemic conditions, several oral manifestations can occur as a result of adrenal gland disorders. Adrenal insufficiency is an example of an adrenal gland disorder. It is characterized by inadequate production of glucocorticoid leading to the destruction of the adrenal cortex or reduced stimulation of adrenocorticotrophic hormone stimulation and is often caused by chronic glucocorticoid therapy. Patients with adrenal insufficiency can present with symptoms such as anorexia, nausea and confusion.

Chronic vomiting can erode tooth enamel and lead to oral health challenges. Cushing's syndrome can occur due to overproduction of glucocorticoids. In children, growth and development are slowed, leading to reduced dental age. Bone density is reduced, and this may lead to pathological fractures.

Conclusion

There are a range of disorders that can impact on oral health. It is important for dental health professionals and medical professionals to acknowledge the risk of oral health conditions in patients with endocrine, renal and GI disorders. Common diseases like gingivitis and periodontitis can be avoided by maintaining a good oral hygiene. Interdisciplinary skills and team work are major factors that contribute to providing better oral health care in special care patients.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 5

Oral health care in patients with neurodegenerative and respiratory disorders

By Linda Kusdhany, Gemma Bridge,
Shaminesswari Tamil Selvan and Raman Bedi

A growing older population

By 2050, it has been estimated that the proportion of people over 60 years of age will reach 22% (2.1 billion), whilst the number of people over 80, will reach 426 million, triple the number of people in this age group in 2020 [1]. With increasing age, there is the emergence of several complex health states commonly called geriatric syndromes. Such health states include common conditions of older age such as hearing loss, depression, diabetes and dementia. As people get older, it is more likely that they will experience several health conditions simultaneously. As such, with a growing older population, it is expected that there will be an increase in the prevalence of systemic diseases and degenerative disorders. In addition to such conditions, older populations can experience changes in their oral health. With age, the facial muscles soften, and the gums become weak. Gums may recede, resulting in an increased risk of periodontal disease and tooth loss. With increasing age, it can become harder to care for teeth due to health problems such as arthritis, or challenges with balance. This can result in further oral health challenges. It is important to monitor the oral health of older populations and to ensure that oral health is maintained as there is an association between oral health and systemic health and wellbeing.

Neurodegenerative disorders

With increasing age, there is an increased risk of developing chronic diseases such as neurodegenerative disorders [2].

Neurodegenerative disorders are a heterogeneous group of chronic and progressive conditions which primarily affect the neurons in the human brain, examples include Parkinson's and Alzheimer's disease [3]. As described by Walker et al. (2019) such conditions are associated with increasing age with progressive degeneration, death of nerve cells, problems with movement (ataxia) and problems with mental functioning (dementia) [4]. Cognitive impairment is common among older adults. Mild cognitive impairment (MCI) is considered a pre-dementia syndrome and it is important to identify the risk factors of MCI to delay the onset and decline of cognitive impairment.

Importance of oral care for patients with neurodegenerative disorders

There are several oral conditions associated with neurodegenerative disorders. Some of these conditions, such as xerostomia and recurrent decay, result from medication side effects, whilst other oral conditions such as tooth wear occur because of physical effects from the neurodegenerative disorder such as purposeless chewing [5]. In patients with neurodegenerative disorders, poor oral health can lead to difficulties in chewing and in turn in consuming adequate nutrition. This can lead to malnutrition and in some cases, where chewing is poor, aspiration pneumonia can occur. Aspiration pneumonia is the misdirection of oropharyngeal or gastric contents into the pulmonary parenchyma which may cause death among the elderly.

Dementia

Dementia is a syndrome that results in the progressive deterioration of cortical functioning beyond that which may be expected from the impacts of normal biological ageing [6]. The deterioration of cognitive functioning affects an individual's language, judgment, comprehension, memory, thinking and learning. Dementia occurs because of several diseases and injuries that damage the brain. Alzheimer's disease is the most common type of dementia estimated to contribute to up to 70% of dementia cases [6]. Approximately 55 million people globally have dementia, with over 60% of those living in low- and middle-income countries [6]. The most consistent risk factors for dementia are age, family history, stroke, diabetes, obesity, high cholesterol, hypertension, low physical activity and low education. Dementia and cognitive impairment are the leading chronic disease contributors to disability and dependence among older people worldwide, which includes increasing difficulty to meet their personal care need.

Oral manifestation of Dementia

A recent study found that elderly people with dementia are at an increased risk of poor oral health, with a higher incident of caries, periodontal problems, xerostomia, oral lesions and uncomfortable denture fit [7]. A study in Indonesia found that the number of missing teeth to be a risk factor for low cognitive function and dementia, which may be the result of reduce nutritional intake.

This relationship could be bi-directional in nature i.e. dementia causing tooth loss [8]. Another study showed that improved masticatory ability improved cognitive function [9], and also reported a positive correlation between periodontitis and cognitive impairment, which could be explained by improved nutritional intake and in turn, improved memory functionality [10].

Dental care for patients with dementia

Elderly people with dementia should establish daily oral care routine during early stages of the disease and have regular dental examinations and early minimal interventions. Caretakers and community health workers need to ensure patients optimal oral hygiene as they tend to forget about it. Dentists should provide guidance on the maintenance of oral health [11]. Preventive programs, simple treatment and emergency care should be provided to those with neurodegenerative disorders to control dental disease, re-establish and preserve function thereby enhancing their quality of life. Oral hygiene care in cognitively impaired individuals are complicated by impaired dexterity, impaired sensory functions, and impaired communication. Besides, medication taken by elderly people may also cause some adverse oral effects such as xerostomia and tardive dyskinesia which should be monitored and treatment options should be discussed between oral and general health practitioners.

Parkinson's disease

Parkinson's disease is a complex and heterogenous brain disorder that primarily affects the dopamine producing neurons in the substantia nigra area of the brain. [12] Parkinson's results in several motor and non-motor symptoms including difficulties in walking, memory and sleep, which generally develop slowly over a number of years. The cause of Parkinson's disease is unknown, but there are several environmental factors such as head injuries and exposure to pesticides [13], behavioural factors such as smoking or limited physical activity, and genetic factors such as gene mutations [14], that may increase the risk of developing Parkinson's. There are also several treatments that may be prescribed to help the patient manage their symptoms or to slow the progression of the disease.

Oral manifestation of Parkinson's disease

Patients with Parkinson's are at a higher risk of developing oral health problems [15]. Oral health issues can occur as a result of non-motor symptoms such as dysphagia but may also lead to an exacerbation of such conditions. Oral health concerns in these patients include higher rates of caries and periodontal disease, sialorrhea, cracked tooth (bruxism), orofacial pain, burning mouth syndrome, xerostomia, difficulty in retaining dentures, taste impairment and dysphagia [16].

Examples of oral health conditions that occur in patients with Parkinson's disease include:

- Xerostomia is a subjective complaint of dry mouth which can cause rapid tooth decay, severe oral infections and dehydration of gingiva. Thus, sufficient daily intake of water is important for these patients
- Excessive drooling may cause perioral dermatitis, impede oral hygiene, impairs eating and speaking, bad breath and more. It may be contributed by dysphagia, poor facial muscle control and complex stooped posture.
- Dysphagia is difficulty in swallowing. Associated symptoms are weight loss, malnutrition, dehydration, etc. Dysphagia increases the chance for aspiration pneumonia and mortality. Thus, patients should eat in small bites and avoid eating and drinking simultaneously. EAT-10 score of 3 or higher indicates deterioration of swallowing function.

Dental care for patients with dementia

The recommended advice for patients with dementia is to ensure that they follow a low-sugar and soft food diet, seek regular dental visits, utilize an electric toothbrush/ large hand-held toothbrush/ or water irrigation. It is important for dentists to regularly survey patients for symptoms of Parkinson's and their effect on oral hygiene maintenance. The presence of family member when treatment plan is presented is crucial as patients may not be able to communicate effectively.

Interdisciplinary cooperation between general and oral health professionals is essential to help manage oral health problems in patients with Parkinson's disease. Such cooperation should start an early stage in the disease course to help ensure that the patients' overall comfort and condition is managed as best as can be [17].

Respiratory disorders

As people age, there are several normal physiological and structural changes that occur in the respiratory system. Such changes can result in reductions in respiratory muscle strength and ventilation control which can lead to decreased vital capacity, increased chances of infection and reduced responsible to hypoxia. Older people are also at a higher risk of respiratory diseases that affect the lungs and airways and may lead to changes in respiration. Respiratory system disorders include airway disease, lung tissue disease and lung circulation disease [18].

Examples of commonly seen respiratory diseases in older people include:

- Chronic obstructive pulmonary disease (COPD) is an irreversible and slowly progressing disorder characterized by a limitation of airway flow (e.g. chronic bronchitis, lung emphysema)
- Asthma is a syndrome of episodic and reversible acute/subacute narrowing of airways or bronchospasms. Precipitating factors are stress, cold air, pollutant, respiratory infection, etc
- Tuberculosis is a chronic infectious granulomatous disease cause mainly by Mycobacterium tuberculosis.

Oral manifestation of respiratory disorders

There is a bidirectional relationship between oral health and respiratory disorders. Salivary enzymes associated with periodontal disease can modify the mucosal surfaces along the respiratory tract, thus facilitating colonization by pathogens and leading to diseases and infection [19]. Hydrolytic enzymes from periodontal disease can also destroy salivary films and inhibit bacterial elimination, which promotes the possibility of aspiration of these pathogens into the lungs [20]. However, respiratory diseases can also increase the risk of poor oral health, with evidence to indicate that pathogens from the lungs can inhabit the oral cavity [21]. Oral hygiene and frequent professional oral health care will help in reducing the occurrence of respiratory disorders among high risk elderly people [22].

Oral health care for older patients with neurodegenerative and respiratory disorders

There is a growing elderly population globally. This population is at a higher risk of developing a range of chronic diseases such as neurodegenerative and respiratory disorders. Evidence suggests that poor oral health may contribute to the etiology of such disorders and as many oral conditions are preventable, it is important to prevent and treat oral conditions as early as possible in the elderly population.

To promote oral and general health, the following oral health practices are recommended [23]:

- Mechanical plaque removal using soft toothbrush with light pressure. The use of electric toothbrush or modified toothbrush/adaptive aids will be helpful for those with reduced manual dexterity. Denture care is also important. Patients should brush and rinse their dentures thoroughly, and also clean and massage oral mucosal tissues to enhance oral health and improve circulation.
- Chlorhexidine rinses can be used, it is indicated mainly for gingivitis
- Fluoride gel, varnish, dentrifices to enhance remineralization of enamel, remineralizing rinses or topical fluoride should be used for root caries
- Counseling and education. Giving patients education and motivation and the use of tell-show-do method for better understanding. The oral health services should be organized and developed to secure adequate early detection, prevention, and treatment of oral health problems. It requires the involvement of other health professionals, health care workers or caregivers and the patients.

Conclusion

Globally, the population is aging and with increasing age, there is an increased risk of chronic diseases such as neurodegenerative disorders. There is also a higher risk of poor oral health as a result of chronic disease states and due to difficulties with maintaining regular oral hygiene.

Dental professionals must work with medical professionals to support older people with neurodegenerative and respiratory disorders to look after their oral health. As the prevention of oral health problems can help to reduce the risk of developing systematic disease in older people, the benefits of such work will be numerous.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 6

Oral healthcare in individuals with immunodeficiency disorders

By Gemma Bridge, Cynthia Yiu, Nibras Elhag Arabi, Maanasa Koripalli and Raman Bedi

Introduction

The cellular immune response is an essential component of immune defence, acting to recognize and control intracellular pathogens (Moss, 2022). An impaired immune system can contribute to a variety of systemic and oral manifestations, including inflammation of the periodontium, periodontal disease, and decay (Szczańska-Poplonyk et al., 2009). Immunodeficiency relates to malfunctions in the body's immune system, resulting in infections that develop and recur more frequently, are more severe, and last longer than usual (Justiz Vaillant and Qurie, 2022). Primary immunodeficiencies are hereditary, and can result from defects in hematopoietic stem cells, phagocytic cells, T cells, B cells, or complement (Mayo Clinic, 2022). Secondary immunodeficiencies are acquired later in life and much more common, as they relate to infectious agents, drugs, metabolic diseases, environmental condition, and immunosuppressive treatments (Chinen and Shearer, 2010).

As medical technology advances and medications can modulate immune function, more patients are living with immunodeficiencies (Peacock et al., 2017). Patients with immune deficiencies benefit greatly from oral care, which reduces morbidity and complications associated with living with a weakened immune system (Epstein and Chow, 1999). However, as immunocompromised patients are at an increased risk of medical complications such as infection, bleeding, and side effects from medications or drug therapy.

it is recommended that the dentist consult coordinates treatment with the patient's physician to maximize the benefits of oral health care and decrease the potential for treatment-related complications (Parisi and Glick, 2003).

There is currently a dearth of literature on the oral health and oral health care management of immunocompromised patients, as a result there is a lack of awareness, specific knowledge and information available for dental professionals to treat patients with immunodeficiency disorders effectively (Coulthard et al., 2020; Nasir et al., 2008). The aim of this paper is to summarise common immunodeficiency disorders, their potential impact on oral health and the key considerations that dental professionals need to be aware of.

Di George Syndrome, an example of a T-cell defect

T-cells lymphocytes are necessary for cell mediated immunity, responsible for killing cancerous cells and cells that have become infected by pathogens (Balley, 2019). When T-cells are defective the immune response is reduced, increasing the risk of infection and disease. DiGeorge syndrome (DG), linked to the deletion of chromosome 22q11.2, is the most prevalent chromosomal deletion defect affecting the T-cells (Gennery, 2012). DG can result in a range of clinical manifestations including congenital cardiac problems, endocrine dysfunction like aplasia/hypoplasia of thymus and parathyroid glands, and craniofacial anomalies (Botto et al., 2003; Marom et al., 2012).

Patients with a T-cell deficiency such as DG may be susceptible to secondary infections. However, the likelihood of this improves with age, especially if other organ defects are restored (Peacock et al., 2017). To improve the condition, T-cell function grows with age and is usually normal by the age of five, therefore, earlier identification and therapy focused on compromised organ systems results in better outcomes (Peacock et al., 2017).

Di George Syndrome and oral health

Regarding oral symptoms, DG patients indicated a range of oral health issues, such as; dental anatomical abnormalities, hypoplasia of the enamel, hypomineralization, loss of teeth, and tooth decay (Fukui et al., 2000; Klingberg et al., 2002, 2005; Toka et al., 2010). As a result of the multifaceted clinical manifestations and the interaction between oral and general health in patients with DG, it is essential that a multidisciplinary care strategy is devised (E et al., 2021).

BTK deficiency, an example of a B-cell defect

B- lymphocytes are responsible for eliminating external pathogens by producing antibodies via humoral immunity (Carter, 2021). As Carter (2021) summarizes, B-cells are activated when they recognize an antigen or foreign marker on a cell, they then produce antibodies to neutralize the foreign cell. When B-cells are malfunctioning, their response is weakened or absent, resulting in a weakened immune response.

BTK Deficiency (X-linked agammaglobulinemia or Bruton's agammaglobulinemia) is a primary immunodeficiency condition that was first recognized in 1952 (Buckley, 1998). The condition is X-linked or autosomal recessive and is the result of a defect in the Bruton tyrosine kinase (BTK gene), which is essential for B-cell development. The condition results in immature B-cells (pre-B-cells) that are unable to make antibodies (Brunner et al., 2005). T-cells are unaffected. Patients with BTK Deficiency are at a higher risk of developing respiratory and sinus infections and enteroviral infections. Numerous reports of conjunctivitis, diarrhoea and dermatological diseases have also been reported (Ozturk et al., 2013). The indicated medication is ongoing gamma globulin administration (for the duration of the patient's life), along with preventative antibiotic use. Stem cell gene therapy may be possible for future treatment (Peacock et al., 2017).

BTK deficiency and oral health

As a result of a reduced immune response, patients with BTK deficiency are also at a higher risk of developing oral health problems. Commonly seen oral health issues include recurrent bacterial infections, recurrent aphthous ulcers, and odontogenic infections. BTK deficiency can also appear as ulcerations, candidiasis, and gingivitis in the mouth (Porter and Scully, 1994), with recurrent aphthae being the most common oral condition (Meighani et al., 2011).

Combined T and B cell defects

There are also conditions in which both the T and B cells are affected, and thus both the humoral and cell mediated immune response are dampened.

Dyskeratosis Congenita (DKC), an example of a combined T and B-cell defect

Dyskeratosis Congenita (DKC) is a rare congenital condition, otherwise called bone marrow failure condition (Atkinson et al., 2008; Peacock et al., 2017) that affects both the T and B cells. DKC results from a telomerase deficiency as a function of mutations in one of the nine telomeric protein genes (Ballew and Savage, 2013). The condition results in a variety of clinical manifestations, many of which do not appear until early adulthood. DKC is clinically characterized by skin hyperpigmentation, pancytopenia, premalignant oral leukokeratosis, dystrophic nails, and recurring infections (Ballew and Savage, 2013; Picard et al., 2015). Other symptoms include Aplastic anaemia (86% of cases), liver disease, lung fibrosis, and reduced or fluctuating levels of circulating T-cells, B-cells, and serum Ig (Mialou et al., 2013). Hematopoietic stem cell transplantation (SCT) is the foremost long-term, curative option for treating bone marrow failure in individuals with DKC (Peacock et al., 2017).

DKC and oral health

In patients with DKC, there are several oral conditions that are commonly seen.

These include leucoplakia, a smooth atrophic tongue and early-onset severe periodontal disease (Atkinson et al., 2008; Yavuzylmaz et al., 1992), as well as hypodontia, small maxillary lateral incisors, and short, blunted roots (Ogden et al., 1988). Other oral health challenges that have been reported include tooth crowding, significant alveolar bone loss, tooth movement, dental decay, tooth loss and delayed eruption (Arca et al., 2003).

Severe Combined Immunodeficiency (SCID), an example of a combined T and B-cell defect

Severe Combined Immunodeficiency (SCID) is a group of several genetic variants of the most severe kinds of congenital immunodeficiency conditions. SCID's are the most severe primary immunodeficiencies and are characterized by a lack of T- and B-cells and abnormal antibody responses (Peacock et al., 2017). Patients with SCID often have less than 500 circulating CD3 T-cells (Roifman et al., 2012). Patients born with SCID are often asymptomatic at birth, but soon after develop severe and recurrent infections, in addition to failure to thrive, and autoimmune disorders over time (Rivers and Gaspar, 2015). Without successful bone marrow transplantation or gene therapy (experimental), SCID has a poor long term prognosis with long-term therapy with antibiotics required (Scott et al., 2015).

SCID and oral health

In patients with SCID, in the first year of life, oral symptoms such as candidiasis, viral infections, and ulcerative stomatitis can occur (Porter and Scully, 1994; Stocks et al., 1999). To reduce the risk of oral infection in patients with SCID antibacterial, antifungal, and antiviral prophylaxis should be considered (BMJ, 2022).

Human immunodeficiency virus (HIV) infection, an example of a condition resulting in acquired immunodeficiency

Human immunodeficiency virus (HIV) is a global public health challenge that has resulted in approximately 40.1 million deaths over the last 40 years (WHO, 2022). There is no cure for HIV, but there are medications that can enable people to live with the condition. As of 2021, there were 38.4 million people living with HIV, many of whom (25.6 million) live in the WHO African region (WHO, 2022). HIV can result in immunosuppression as a result of CD4 lymphocyte depletion, as such people living with HIV can be at a higher risk of oral health problems including fungal, viral, and bacterial infections, periodontal disease and salivary gland disease (NIH, 2021). Other oral health problems include increased risk of enamel hypoplasia, oral bleeding due to thrombocytopenia and salivary gland enlargement with parotitis. Such oral health problems can impact on quality of life because of pain, difficulty eating and speaking.

A recent cross sectional survey exploring oral health status of 222 patients with HIV found that 50% (n=111) had missing teeth and over a third (35.6%, n=79) were edentulous (Shaghaghian et al., 2021). The researchers noted that oral health status significantly associated with patient age, disease duration and smoking status, highlighting the importance of early intervention when patients are diagnosed with HIV, and the need for collaboration with other health care members to support patients to reduce smoking or taking other harmful substances.

Oral health and HIV

Prevention of oral health problems should be prioritized in people living with HIV. Regular check ups and daily oral hygiene practices should be promoted. When patients with HIV first visit the dentist, they should undergo a medical history review which includes a complete medication history, level of immunosuppression, hematological status, coagulation status, the requirement of antibiotic prophylaxis and a dental history review. Supporting patients to maintain a balanced diet, that is low in sugar and alcohol, and that includes regular consumption of water or other sugarless drinks can also help to prevent oral health problems (NIH, 2021). When oral health problems do arise, most can be treated by a dental professional. Depending on the severity of the condition, medications can be prescribed to prevent infection from worsening.

However, the prescription of medications should be done in collaboration with other healthcare professionals. HIV can be transmitted to children via bodily fluids, as a result dental professional may be presented with HIV+ children who are experiencing oral health challenges because of their condition. To ensure treatment is appropriate, dental professionals should consult with the child's physician to establish current level of immunosuppression and acceptable procedures specific to the child's current treatment plan.

Dental management of patients with immunodeficiencies

When patients with immunodeficiency disorders present at a dental practice with an oral health problem, after reviewing the patients' medical history, the first step in dental management is addressing any pain the patient may be feeling. Infections should then be assessed and treated before dental care is delivered. Oral candidiasis is one of the most seen infections in patients with immunodeficiency conditions, which, depending on the severity of the infection can be treated with topical or systemic antifungals, clotrimazole troches, nystatin suspension or fluconazole. Herpes simplex infection is also often experienced by patients with immunodeficiency conditions. The infection can be managed with pain relief via hydration antivirals and systemic acyclovir. Once infection is controlled, any diseased teeth or periodontal issues can then be restored or treated.

Preventative dental care should be promoted to reduce the risk of oral health problems in patients with immunodeficiency conditions. Such preventative care should include dental education and counseling of the patient and their caretakers, regular oral hygiene practices including the use of fluoridated toothpaste, the promotion of a balanced and low sugar diet, and frequent periodic review. To reduce the risk of infection because of dental procedures, patient hematological status should be considered. In terms of absolute neutrophil counts, if the count is between 1000 and 2000 cells / mm^3 then antibiotic coverage may be needed. This should be discussed with the patients' medical team before proceeding with treatment. If absolute neutrophil count drops below 1000 cells / mm^3 then elective dental care should be deferred.

For patient safety, the patient may need to be referred to hospital for dental management. In terms of platelet count, if platelet count is between 40,000 and 75,000 cells / mm^3 then platelet transfusions may be needed pre and 24 hours post-dental procedure. The dental professional should contact the patient's physician to discuss supportive measures before proceeding. If the patient's platelet count drops below 40,000 cells / mm^3 , care should be deferred.

Across all patients who are immunosuppressed, dental professionals should consider a minimally invasive intervention strategy.

To avoid excessive bleeding and risk of infection, deep block injections should be avoided, and local measures to control bleeding should be prepared. In terms of tooth extraction, to avoid septicemia and excessive bleeding, extraction of pulpally involved primary teeth is preferred to endodontic treatment. Any extraction should be followed by antibiotic therapy for one week. A 3-6 monthly recall schedule should be put in place to monitor potential oral health changes in patients.

Conclusion

Patients with immunodeficiency disorders are at a higher risk of infection. As such, ensuring that their oral health is well maintained is of paramount importance. It is important to practice preventative care, to reduce the risk of developing dental caries and periodontal disease. Regularly reviewing patient oral health status, including patient dentition, gingivae and mucosa can help to reduce the risk of oral health problems. Moreover, due to the high risk of infection, more care must be taken during dental treatment. A risk reduction approach should be factored in when planning dental care. Oral health care and dental treatment plans should be developed in collaboration with the patient and their wider healthcare team.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 7

Oral health and hygiene care in elderly patients

By Noel Vallesteros, Zoha Anjum, Gemma Bridge and Raman Bedi

Geriatric Dentistry: The global picture

Globally, there were 703 million older persons aged 65 or above in 2019 [1]. The highest numbers were found in Eastern and South-Eastern Asia (260 million), followed by Europe and North America (over 200 million) [1]. These numbers are expected to double by 2050, reaching 1.5 billion persons [1]. As mentioned in the FDI World Dental Federation 2017 report, oral health among the older population is a neglected field with limited data on their health status. Older persons are a vulnerable and marginalized group globally – due to the presence of disabilities, HIV/AIDS status and/or residence in rural areas [2]. However, this should not prevent this group from accessing appropriate oral health care as oral health is a human right for everyone at every age. Dr Noel highlighted the gap in access to oral health care among seniors by describing the Philippines as a case study and explaining that the country has the Expanded Senior Citizens Act which provides special services to seniors; however, the Pilipino National Insurance Coverage does not incorporate dental care [3]. Therefore, there is an urgent need to promote equity through policies, laws, and regulations to improve the oral health of the seniors.

What is ageing?

Ageing is universal, inevitable and normal dynamic process [4]–[6]. Deteriorating physical and mental capabilities over time lead to a decline of self-care capabilities.

A lack of access to quality healthcare can manifest in oral health conditions and malnutrition, which may accelerate the rapid debilitation of an individual [7]. Ageing negatively impacts the physical, mental and social wellbeing of individuals. There are different ways to categorize the elderly population into smaller groups. The elderly may be grouped by age - into new/young (65-74 years), old/mid-old (75-84 years) and the oldest old (85 and above) categories [8]. There are also three descriptive classifications for the elderly population based on their level of physical activity and capabilities: 1) Robust are the active and capable; 2) Frail adults with limited activity and capability and have difficulties with instrumental activities of daily living; and 3) Dependent adults are the ones with very limited activity and capability and may face difficulties with basic activities of daily living such as eating, toothbrushing, and getting up from the bed [9]–[11]. Typically, problems arise when an older person becomes frail as it increases their vulnerability to stressors due to a decline in their physiological abilities [12].

Oral Health Care for the Frail and the Dependent

The model of the geriatric treatment planning process involves mouth level, patient level and community/family level. At the patient level, there are four steps to treatment planning [13]:

- **Assess:** The patient must be assessed for their capabilities and for risk factors of oral disease. The World Health Organization (WHO) describes health as a state of complete physical, mental and social wellbeing and not merely the absence of disease [14]. Therefore, during the assessment, all three components of wellbeing must be assessed. For physical aspect, the professional must ascertain patient's activity levels as well as whether they are medically compromised. For the mental aspect, the patient needs to be evaluated for any cognitive impairment (loss of short-term or long-term memory, confusion, impaired judgement, poor motor coordination or dysphagia). In presence of cognitive impairment, the patient's ability to complete home/ self care may be decreased, further leading to an increased risk of oral disease. For the social aspect, it is important to assess if the patient is independent or dependent. Social isolation and loneliness are common among the elderly and may be associated with depression [15]. Older people may also undergo life changing health events such as accidents that can cause disability and/or suffer from stroke, heart attack, cancer, Alzheimer's, Parkinson's, dementia or diabetes which may further impact their wellbeing [16], [17]. Once the patient's overall health has been assessed, the risk factors for oral disease can also be identified.
- **Prevent and Control:** The second step is to prevent and control disease.

Restorations do not resolve the disease – for rehabilitation, the disease must first be controlled, risk factors must be reduced/ eliminated and then the function and aesthetics can be restored. The risk factors are described in the section below.

- **Treat:** Once the prevention and control has been completed, treatment can be pursued. Many elderly individuals may be prone to recurrent caries and/or failed restorations. Approximately 50% of persons aged older than 75 years of age have root caries affecting at least one tooth [18]. Older adults are at higher risk of root caries as a result of gingival recession that exposes root surfaces and increased use of medications that produces xerostomia [18]. Exposed root surfaces will get decay due to exposed dentine tubules (and higher cervical sensitivity), lower acid resistance (and increased demineralization) and the ability of root surface to trap plaque at the cemento-enamel junction. In presence of root decay at the site of root exposure, glass ionomer restoration material can be applied. The patient should be advised to brush gently and regularly as well as follow an overall healthier lifestyle by limiting sugar intake and consuming more fruits, vegetables and whole grains [8] [19].
- **Maintain:** The final step in this process is maintenance. The patient should be brought back for a recall exam every 3-4 months to monitor and control caries with radiographs taken every 18 months.

Calcium phosphate paste adjunct and saliva substitute can also be prescribed. Fluoride varnish should be applied at the recall exam, and 5000 ppm toothpaste must be used at home [8], [20].

Risk factors for poor oral health among the elderly

Some of the risk factors that elderly persons face includes the following:

- Chronic diseases (diabetes, respiratory diseases), polypharmacy, frailty and dependency [21]. Additionally, impaired vision, lower tactile thresholds, reduced dexterity, cognitive impairment and dementia may also jeopardize daily oral hygiene routine [21]. When the patient sees a dental practitioner, their medical history must be updated, and the physician must be consulted when appropriate.
- Patient should also be screened for xerostomia (dry mouth or hyposalivation), which is a common side effect of many drugs – and is more likely to occur in patients with more than 4 daily prescription medications. Dry mouth can lead to mucositis, caries, cracked lips and fissured tongue. Recommendations to manage xerostomia include drinking regular water throughout the day and limiting alcoholic, sugary and caffeinated beverages. Calcium and phosphate creams can also be used as an adjunct if needed.
- Lifestyle factors such as smoking, drinking, and eating habits as well as oral hygiene habits can also act as risk factors [22].
- Diet rich in sugar will lead to more caries, obesity, cancer, diabetes, and cardiovascular diseases. Patients should be encouraged to consume more fresh produce than processed foods [22].
- Oral hygiene is an important risk factor. At times, the patient may benefit from modification of manual toothbrush handles (with Velcro straps or attaching a bicycle handlebar grip) or use of an electric toothbrush with a wide, greppable handle that accommodates for the lost mobility and manual dexterity [19].
- Fluoride toothpaste (ideally 5000ppm) is recommended for patients as they are at risk of root caries [19].
- Lack of social support in isolation can lead to depression and loneliness, thus impacting their oral hygiene habits [15].
- Dental home is an ongoing relationship between the dentist and the patient inclusive of all aspects of oral health care. Dental home must be essential, continuous, accessible, coordinated and family centred. Every community centre must be equipped to provide oral health care for the elderly [23].

Rational treatment planning

There are various indications for when an ideal treatment plan is not possible – for example, in presence of behaviour problems, medical problems, budget constraints, technological constraints, time constraints, patient preference and patient's readiness.

The main goal of rational treatment planning is to prevent and control the disease and to improve the quality of life. For frail and dependent individuals, rational treatment planning is needed and asks:

- What does the patient want?
- What can the patient tolerate?
- What is achievable?
- What can the patient afford?

The International Caries Classification and Management System (ICCMSTM) involves management of caries using primary prevention (of new caries), non-operative care of lesions (control), and tooth preserving operative care of lesions [24]. Non-operative care control involves mechanical biofilm removal, fluoride varnish, oral hygiene with 5000 ppm fluoride toothpaste, glass ionomer root surface protection and silver diamine fluoride. Tooth preserving operative care involved stepwise excavation with indirect pulp capping as well as atraumatic restorative therapy. Both non-operative care control and operative care are non-invasive (physically safe), atraumatic (elderly friendly), nontechnology dependent (home-based care friendly) and inexpensive (pocket friendly).

In addition to regular 5000 ppm fluoride toothpaste, 2.26% fluoride varnish can be used for coronal caries and 38% silver diamine fluoride can be used for dentin caries [25], [26]. Glass ionomers can act as a reservoir of fluoride, which can be absorbed by surrounding dentin and enamel, making the teeth less susceptible to acid challenge, for up to a year [27]–[29].

Furthermore, fluoride uptake into the glass ionomer filling can occur from toothpastes, mouth rinses and topical fluoride application as well [30], [31]. Typically, flowable glass ionomer works conveniently for patients with dementia [32]. Overall, starting the conversation with patients when they are healthy and receptive and preparing the recently old for their advancing age is critical as it will impact their future care needs.

Criteria for Good Oral Health for Older Adults & The Healthy Aging Diary Checklist

There are a set of basic clinical criteria for good oral health for the older adults. This includes a functional occlusion with at least 20 remaining teeth (with 10 contiguous teeth in each arch), a dentition that is free of active caries, no evidence of more than 4mm of attachment loss, no probing depths more than 4mm, only physiologic tooth mobility, functional restorations and comfort with mastication of a range of foods. Specific Healthy Aging Diary includes a clinical checklist for patients aged 50 or above [33]:

- Oral screening ((ICCMSTM)
- Caries risk assessment
- Oral prophylaxis
- Fluoride varnish application
- Root surface protection
- Lifestyle counseling
- Oral hygiene care
- Regular professional care every 3-6 months

Core pillars to improve oral health of older adults

FDI World Dental Federation introduced the eight core pillars to improve oral health of older adults globally [34]:

- Integrate oral care into general care – support an “oral health in all policies” approach in regard to nutrition, tobacco and sugar policies.
- Promote oral health throughout the life course
- Shape evidence-based oral health policies
- Remove financial barriers
- Remove physical barriers – implement mobile oral health care services and develop teledentistry care models
- Provide appropriate oral healthcare – foster the implementation of new treatment approaches such as minimally invasive interventions
- Mobilize all stakeholders along the care pathway (policymaker and governments, FDI World Dental Federation, national dental associations, dentists and dental teams, health professionals, public health professionals, research and academia, media and patients and their families).
- Foster community-based programs – implement community based oral health promotion and disease prevention programs in nursing homes and collect and share best practice examples from local communities

Conclusion

The elderly population is a vulnerable population that may require additional support with their oral health. It is important to recognize the risk factors for poor oral health among the elderly earlier to prevent the onset of oral disease. The Universal Health Care Coverage advocates for comprehensive primary care that reaches everyone and “leaves no one behind” but currently excludes oral health [2]. In further support, one of the guiding principles in the recently published WHO draft global strategy on oral health was to promote tailored oral health interventions across the life course [35]. Therefore, there is a need for advocacy to promote oral health on the global level – especially for the growing numbers of the elderly population.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 8

Principles of management – treatment planning, preventative care, restraint and referral

By Sun Kuo Ting, Giorgia Soldà, Gemma Bridge
and Raman Bedi

Background

The estimated number of people with special health care needs (SHCN) in Taiwan according to the ministry of health and welfare of Taiwan¹ is 1.19 million people as of 2021. This accounts for 5.1% of the total population, with people over 65 years old being the major group, accounting for about 45% of all SHCN patients. According to Mac Donald and Avery², the definition of SHCN is medical, physical, developmental, mental, sensory, behavioural, cognitive, emotional impairment, social problem. The SHCN can be divided into three groups according to the occurrence: congenital, acquired, adult and aging. Amongst the most common congenital SHCN are: systemic disease, intellectual disability, cerebral palsy, epilepsy, Down syndrome, autism, rare diseases. Amongst the acquired ones we find trauma (brain or extremities), tumour (cancer), stroke, infection (bacteria, virus), complications of chronic diseases, psychiatric disorders, Spinocerebellar atrophy (SCA), Huntington's disease, amyotrophic lateral sclerosis (ALS), dementia, Parkinson's disease, Alzheimer's diseases, and others.

Children with SHCN

Children with SHCN may suffer from dental problems³. Brushing their teeth can be difficult. It is also hard for caregivers to ensure that the child collaborates with dental hygiene practices.

The common dental problems experienced in SHCN children are dental caries, gingivitis, and periodontitis.

Other frequently occurring conditions include pulpitis, pulp necrosis, residual roots and missing teeth.

The impact of such dental health problems can be severe with tooth decays and missing teeth, which can lead to chewing difficulties, upper respiratory infections due to accumulation of bacteria because of poor hygiene, and disturbance of the digestion, because of the chewing difficulties. The issues associated with poor oral hygiene can lead to disturbed digestion, nutrition imbalance, and as a result of the above, overweight and underweight, and eventually an overall poor life quality.

Treatment plan

Making a treatment plan for children with SHCN can be difficult. The plan depends on the following factors: the types of SHCN, the degree of cooperation, the systemic disease conditions, and the severity of tooth decay. Besides, it is hard to collect complete and detailed information for SHCN, including history, careful inspection, periodical X-rays films panoramic films, and models due to lack of cooperation⁴. Eventually, it is important to include consultation of a multidisciplinary team including physicians and dental specialists before making a treatment plan. There are many types of SHCN, and the levels and severity are varied. Before making a treatment plan it is important to identify the characteristics and precautions that need to be taken..

The degree of cooperation determines the location and specifics of the treatment:

- If the patient can cooperate with dental treatment, the treatment can happen in the outpatient clinics, following the outpatient procedure;
- If the patient cannot cooperate with dental treatment, consider using sedation or general anesthesia.

It is also important to consider the conditions of the systemic disease:

- Consider and evaluate the physical condition and health status;
- Treatments in patients undergoing chemotherapy, radiotherapy, or immunotherapy should be considered very carefully;
- Bleeding disorders need coagulation factor before and after dental treatment;
- Consider inpatient observation after dental treatment for patients with cancer, immune diseases, heart diseases, bleeding disorders, epilepsy, and other severe diseases.

It is important to consider the severity of the specific dental condition, such as tooth decay. If the tooth decay is severe and needs multiple dental procedures, the process may stimulate or trigger psychological stress, vital signs, seizure, or other unpredictable conditions. Moreover, the treatment could be multiple and therefore too complicated to tolerate for the patient. Consider suggesting that the patient receive the treatment under sedation or general anaesthesia.

Case study

- 30-year-old male, moderate intellectual disability
- No systemic diseases
- The diagnosis includes 1) caries over posterior molars upper and lower bilateral sides, 2) residual root first molar lower right side, 3) full mouth gingivitis with plaque
- Tooth decay is not severe, the treatment plan is not complicated, and could be considered and arranged under sedation
- The patient cannot cooperate with the dental treatment outpatient clinic
- The treatment plan is complicated and included endodontic treatment, prosthesis, extraction, and operative dentistry.
- The treatment should be arranged under general anesthesia to complete full mouth dental treatment



General Anaesthesia

There are advantages of conducting treatment under general anaesthesia:

- Most of the procedure and treatment could be completed and executed according to the treatment plan
- The treatment plan will not be interrupted due to some factors
- Do not need the cooperation of the patient
- Reduce the risk of infection
- Reduce the treatment times.

The comprehensive treatment plan needs to be developed after the consultation with the multispecialty teams, including physicians, paediatrics dentists, endodontists, oral surgeons, and prosthodontists. It also needs to be discussed with the patient's family, and reach a consensus with them before the treatment. Social workers are also needed and provided to the patient family.

Before the general anaesthesia is important to go through the following steps:

- Check chest X-ray;
- Check blood routine;
- Perform a clinical evaluation before general anaesthesia;
- Check EKG if the patient had a heart disease history.

Preventative care

Prevention is better than cure and therefore of the utmost importance.

Preventive care includes:

- Fluoride
- Regular check-up
- Diet habit
- Oral hygiene

The fluoride application can be done by a professional (fluoride varnish; concentration: 22,600 ppm) or at home (fluoride mouth rinses, fluoride supplement, fluoride gel, and tray)

Fluoride varnish

It is important to repeat the application of fluoride varnish every 3-6 months. The application method consists of several steps: 1) clean the tooth surface, 2) mix the varnish, 3) brush down the tooth surface from gingiva to the incisor edge, 4) wait for seconds and close mouth, 5) give the instruction for fluoride varnish, 6) wait for 15 minutes.

Fluoride mouth rinses

Fluoride mouth rinses consist of neutral water solutions containing sodium fluoride between 0.05% (230 ppm, daily used) and 0.2% (900 ppm, weekly used). They are traditionally applied in the school-based program but are currently also recommended by dental professionals for home use. Recommended dietary fluoride supplements vary according to the age and environment fluoride concentration in drinking water.⁷

Fluoride gel and tray (home use)

This home procedure consists of putting the fluoride gel (0.4% stannous fluoride) into the tray on the upper and lower sides and biting it for 3-5 minutes every day before sleep.

Regular check ups and good hygiene routine

Check-ups should be scheduled preferably every 3 months to prevent tooth decay, gum diseases, and maintain good oral health. To improve oral hygiene among SHCN patients first determine the patient's ability to self-care by asking them to show you how they brush and then provide hands-on demonstrations to patient's/caregivers on how to effectively brush their teeth. To help them brush their teeth by themselves adapt the toothbrush handles to simplify the use and suggest other aids to use, such as flood holders and electric toothbrushes. Also, the position of the professional or the caregiver is key when helping SHCN patients to brush their teeth; it is preferable to let them sit, if possible, to stand behind them or in front of them. When standing behind them, is more comfortable for them and it allows the caregiver to hold the head more steadily and hold the jaw. Besides, this position can provide a sense of security. If positioned in front of a mirror, they can look at it and understand how we help them brush their teeth.

Restraints

According to the AAPD guidelines 2020, the following categories of patients are those requiring restraint while performing a procedure.

- Patients who require immediate diagnosis and or urgent limited treatment and cannot cooperate due to developmental levels (emotional or cognitive), lack of maturity, or medical/physical conditions.
- Patients who require urgent care and uncontrolled movements risk the safety of the patient, staff, dentist, or parent without the use of protective stabilization
- Previously cooperative patients who quickly become uncooperative and cooperation cannot be regained by basic behaviour guidance techniques in order to protect the patient's safety and help complete a procedure and/or stabilize the patient
- Uncooperative patients who require limited treatment and sedation or general anaesthesia may not be an option because the patient does not meet sedation criteria or because of a long operating room wait time, financial considerations, and/or parental preferences after other options have been discussed
- Sedated patients who require limited stabilization to help reduce movements during treatment and a patient with SHCN who exhibits uncontrolled movements that would be harmful or significantly interfere with the quality of care

There are some situations where restraints may be required:

- Cooperative non-sedated patients
- Uncooperative patient when there is not a clear need to provide treatment at that particular visit
- Patients who cannot be immobilized safely due to associated medical, psychological, or physical conditions

- Patients with a history of physical or psychological trauma may be at greater psychological risk during restraint
- A dental team without requisite knowledge and skills in patient selection and restraining techniques to prevent or minimize the psychological stress and/or decrease the risk of physical injury to the patient, the parent, and the staff

There are several risks to be considered when using restraints. First, the provider should consider the patient's emotional and cognitive developmental levels and be aware of potential physical and psychological effects. Restraint-related injuries such as bruises and scratches can occur. Restraints can lead to release of adrenal catecholamines, leading to agitation and heart rhythm disturbances.

Conclusion

When treating patients with special health care needs, a comprehensive treatment plan can help to ensure good treatment quality. Treatment should be adapted to the needs of the patient. In some cases general anaesthesia and/or restraint may be needed. Quality care and preventative supports quality of life.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 9

Pharmacological and non-pharmacological strategies for anxiety and cooperation management in dentistry

By Guang Xu David Lim, Gemma Bridge, Rita Mbubo Mbunwe and Raman Bedi

Introduction

Dental anxiety, i.e. the fear of visiting the dentist or receiving treatment, is an oral-health problem as it is associated with a lower frequency of dental visits and a higher prevalence of dental caries (Seligman et al. 2017). Dental anxiety commonly causes poor oral health and may lead to worsening of oral health-related quality of life. It is estimated that about 3–16% of adults suffer from dental anxiety (Dou et al. 2018). There are other forms of anxiety that can also affect an individual's ability to visit the dentist. Anxiety results in a range of mental and physiological phenomena, and can affect a person's conscious state and their worry over a future unwanted event, or fear of an actual situation (Evans et al. 2022). In 2015, it was estimated that the proportion of the global population with anxiety disorders was 3.6%, whilst the estimated number of people living with anxiety disorders was 264 million (WHO, 2017).

Anxiety and cooperation management

The management of anxiety and fear of patients experiencing medical or dental treatment can be challenging (De Stefano et al. 2019). Behavioural management and patient cooperation are important in dentistry to ensure that treatment can be conducted safely (Mokhtari et al. 2021). Anxiety can be managed and patient cooperation can be enhanced.

- There is general consensus that behaviour management forms the primary foundation in the care for patients in dentistry.

This includes simple communication techniques like tell-show-do, positive reinforcements, and stop signals. If a patient's cooperation cannot be managed by behavioural management strategies, more extensive interventions below would be required (Roberts et al. 2010).

- Behavioural therapy differs from behavioural management in that there is dedicated intent to change, modify, and improve the patient's reaction to a fearful stimuli. For example, a patient can react to seeing a dental chair by having palpitations and then running out of the clinic. The range of therapy can help desensitise the experienced palpitation, or break down the mental process when approaching a dental chair etc. This change for desired behaviours can occur through learning, and involve muscle relaxation and relaxation breathing (Appukuttan 2016). Cognitive behavioural therapy is widely accepted due to vast literature on its success.
- Within pharmacological strategies, mild sedation and moderate (or conscious) sedation are often employed by dentists for various indications (Lim & Boyle, 2020).
- General anaesthesia (GA) is at the furthest end of the sedation spectrum, where the patient is fully sedated or anaesthetised that respiratory assistance becomes necessary. GA offers the highest level of anxiety and cooperation control. In most cases, GA is administered by a anaesthetist (Lim & Boyle, 2020).

- Other supportive techniques that do not constitute pharmacological methods or behavioural management and therapy may also help improve anxiety and cooperation. This includes a wide array of techniques like acupuncture, transcutaneous electric nerve stimulation and aromatherapy.

Other tests can be done to gauge the patient's threshold, or if the patient is uncertain of what he or she is exactly fearful about in the dental setting. Toothbrushing is a useful way to gauge if the patient can accept foreign instrument in the mouth, and could be a way to engage persons with intellectual disability or children.

Underlying principles of anxiety and cooperation management

To best support an anxious patient, it is essential that the clinician engages the patient in an accepting, open, and sincere manner. This also means using an individualised approach, rather than a generalised strategy. Every patient and every anxiety presented are different. Using the three step framework: "assess", "plan" and "execute.."

- **Assess:** Assessing typology and severity of anxiety or challenging behaviours are key to planning for effective approaches to addressing individual needs. A detailed dental history, including anxiety history is needed particularly in the first visit. Clinicians must not be impatient as it can be a harrowing experience for patients to recount their fears.
- **Observe:** Observing the patient's behaviours, inside and outside the dental operatory, or interaction with parents and caregivers, can sometimes provide useful practical information.
- **Test:** Dental anxiety questionnaires are widely available and can be a useful way to elicit details even before the date of the appointment. This allows allocation of suitable appointment time.

- **Plan:** Consult: While formulating a treatment plan, it is necessary to find out if the patient prefers or shun certain procedures, such as sedation. This is also a chance to allay misconceptions or miscommunication. On the other end, the clinician may wish to consult another dentist (for second opinion), the patient's family and representatives, the doctor, or even the psychologist. The dentist will often require support when planning to manage difficult cooperation or severe anxiety. This could be asking for a translator, more dental assistants, anaesthetic support, psychotherapy and allied health services. Other than people and expertise for support, the dentist needs to prepare the necessary armamentarium. This also includes emergency equipment for sedation or GA procedures.
- **Execute:** At this stage, nonpharmacological techniques, pharmacological techniques, or even a combination can be used. This depends on patient factors, the anxiety and cooperation difficulties, and extensiveness of dental treatment. In the case of failure, the clinician should repeat the previous steps of assess and plan before reattempting to execute.

Basic techniques

There are many pharmacological and non-pharmacological techniques that are available. As a beginner, it is of greater value to under a couple techniques in depth and adapt them practically to different clinical needs. (Appukuttan 2016).

Spectrum of sedation

Conscious sedation for dentistry often requires training beyond the undergraduate curriculum. Other than dental anxiety, conscious sedation is used to manage hyperactive gag reflex, reduce uncontrolled movement (e.g. tremors or dyskinesia), or simply to allow extensive dental procedures (e.g. oral surgery) more acceptable. The common types of sedation administered by dentists include nitrous oxides inhalation sedation, midazolam oral sedation, or intravenous sedation (Lim & Boyle, 2020).

The spectrum of sedation starts from a normally aroused state of mind, and progresses towards one in which consciousness, and even protective reflexes like respiration, are fully depressed. This involves four stages (Appukuttan 2016). The first is minimal sedation or anxiolysis. The patients respond normally to verbal commands. Second is conscious (or moderate) sedation with a state of depression of the central nervous system but maintains verbal contact (IACSD, 2015). Deep sedation is depression of consciousness, patients cannot be easily aroused but respond to stimulation. Finally, general anaesthesia is a loss of consciousness during which patients are not arousable.

Graded exposure

Graded exposure is based on the principle that anxiety can be managed by a progressive and systematic exposure to the fearful stimulus. The intended stimulus is firstly broken down into a hierarchy of steps, each with increasing anxiety for the patient. Once this is established, a coping mechanism, such as relaxation methods, is mastered by the patient. The therapy progresses through each step of increasing anxiety, with the patient learning to “cope” or “relax” successfully before progressing to the next. This is known as habituation (Porritt et al., 2012). One way which graded exposure has been adapted to our dental setting is through the “tell-show-do” technique. While a simple technique, this versatile technique can be further modified as long as the principles of graded exposure are well understood.

1. Tell: The clinician describes the process and reason for a procedure.
2. Show: The clinician demonstrates the equipment's use on the clinician's finger, The “show” step provides tactile and visual stimulus.
3. Do: This is when the clinician carries out the procedure. The clinician should always try to achieve habituation in each step. The “Do” step can also be broken down even further. For example, counting from 1 to 3 for the use of a high speed handpiece before a short break, and then repeating.

Conclusion

Anxiety and cooperation management in dentistry can be as complex as dentistry itself - it adds an extra permutation to every single dental treatment fathomable. This summary provides an overview and a simple framework that would benefit both the junior and senior dentists, and help us serve our patients better.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chapter 10

Managing a patient with complex and special needs

By Matana Kettratad-Pruksapong, Phuong Ly, Gemma Bridge and Raman Bedi

Access to dental services

There are four features in the design of a dental clinic that ensures access for special care patients:

1. Universal design: how to make the clinic accessible to everyone
2. Healing environment: creating a warm and anxiety-reducing space, providing spiritual support
3. Dementia-friendly environment: catering to cognitive-impaired patients
4. Infection control in the COVID-19 era

'Universal design of healthcare facilities' refers to a set of principles that offer designers guidance to integrate inclusive and useful features that meet the needs of as many users as possible (1). For the dental clinic settings, it is critical that patients with special needs are fully considered when building the clinic. The specification of universal design starts in the parking lot, with requirements about the angle of the ramp, the shape of the handrail to the size of the door and how it opens. Dental care for patients must start even before the patient comes to the clinic. This means having a readily available mode of transportation that can ensure patients' access to the clinic and the hospital, especially when public transportation is limited. In other cases, having extra equipment to help ease the access to and the experience of the patients at the clinic should be one of the top priorities. This is going beyond the minimal requirements by the universal design guideline which details specifications within the clinic's facility only.

Inside the clinic, at least one unit should be both wheelchairs and stretchers accessible. Waiting chairs must not be too high or too low. They must have armrests and their cushion must not be so soft that it becomes difficult for patients with limited mobility to lift themselves out of the chair. Additionally, the dental unit should be that of a cart type with wheels for convenient relocation. Waiting areas should have space for wheelchairs storage and their design should incorporate a high contrast colour scheme, which would make it easier for older adults with low vision and individuals living with cognitive impairment to navigate to. The similar design should be applied in the washroom, when necessary, with the addition of a blind for mirrors. This is intended for patients with cognitive conditions who have troubles recognising their own reflection as looking into the mirror may scare them.

Another increasingly popular aspect of dental care is mobile dental service/domiciliary dental care. Dental care in this case applies to three settings: hospital inpatients/ICU, long term care facilities and community dwelling/home visiting. The importance of universal design in these settings remains high but they represent certain challenges for dentists. A study from Taiwan points to two reasons for why dentists are reluctant to see patients outside of the clinic; these include complex medical history of the population and unfavourable working conditions, i.e. outside of their comfort zone (2).

To overcome these two barriers, Srivaraman et al (3) recommended to consider five areas, emphasising the need for preparation before delivering care outside of the clinic:

1. Medical, dental and drug history
2. Compliance forms
3. Evaluation for specific clinical manifestations of Sars-Cov2 infection
4. Treatment plan based on chief complaint and urgency
5. Equipment preparation

Relevant information should be obtained before seeing the patients. This is especially beneficial when treating special needs patients. Thanks to the advancement of technology, these documents have become easier to obtain via the internet. In Thailand, because of the Covid-19 pandemic, dentists can get part of the consultation done over phone, or phone applications. This step ensures the dentists that the patients will come onsite and that they have adequate information to prepare the necessary equipment. Furthermore, with this information, dentists can also assess risk level when coming to sites of infectious outbreak (3). An example of systemized preparation is the UK NHS Red Bag project (4). This red bag includes a list of medication, past medical history as well as two other documents on the identity of the patients, such as their preferences, a brief history of their life, what they want to be called. With this red bag, when patients go to the hospital or emergency room, the red bag that they bring helps the nurses and physicians obtain information fast. Similarly, the application of the red bag can also be utilised in the dental settings.

Apart from ensuring access to patient dental information, to cater to special needs patients better, dental clinics have also been restructured to be more movable. As a result, portable/mobile dental units serve a critical function in delivering dental treatment. Additionally, medical tools that are seemingly not related in the dental clinic, such as an oximeter, can be useful in treating patients with high risk of aspiration.

Safe transfer from a wheelchair

The gold standard for safe transfer from wheelchairs is the ceiling lift/ceiling hoist, which helps both the patients and the care providers (5). The standard model dental chair that will facilitate the transfer process more easily is a break - leg chair (4 hinge or 5 hinge), with a ceiling or portable lift/hoist. However, in case the clinic does not have access to this expensive equipment, a manual lift using a cloth, ideally with handles that can slide below the patient would suffice. The other option of transfer is a gait belt. If the patient can still bear some weight or can still somewhat stand and walk, a gait belt or any kind of belt or a big piece of cloth can be wrapped around the waist to aid the transfer. While using the gait belt, however, the care providers should not let patients hold on to their necks, as it will hurt their cervical spine. If the weight comes too abruptly, the patients can try to hold on to the shoulder or scapula. In other circumstances, with the banana board, patients can still slide or transfer themselves from the wheelchair into the dental chair.

In many cases, the patients do not have to transfer into the dental chair at all. This applies to oral examination, when no drilling, no scaling procedures are involved, and there is enough space behind the dental chair. The head rest of the dental chair can be tilted backward to provide head support for patients so that they can avoid the labour of transferring to a dental chair, while still being in close proximity to the dental suction. If the patient comes with a reclining chair or a stretcher, they do not need to be transferred. Dental treatment can still be carried out within the reclining chair but a head support must be available as well as extension of suction catheter and Yankauer tip if the dental suction is not within reach.

Positioning of patients

Positioning of patients with special needs in dental care is crucial as the risk of aspiration and spasticity are significant.

1. Aspiration

Aspiration is the inhalation of foreign objects into the airway which can cause complications in various degrees of severity, from coughing to pneumonia. To reduce the risk of aspiration, the guideline is to recline the chair 30 degree to 60 degree (supine position is not recommended), in presence of cervical neck support. During the procedure, the dentists should also provide enough time for the patients to rest and make sure the patient is well awake. If the patient is semi-conscious or sedated, highest precaution must be in place.

2. Spasticity

Spasticity is abnormal muscle tightness due to prolonged muscle contraction. It is known to be length-dependent, particularly when bi-articular muscles are involved (6). To avoid spasticity, a particular type of dental chair - 4 hinge or 5 hinge is recommended with the ideal position of having patients' arms closer to the body and to the side of the body, supported with a pillow cushion. Other spasticity trigger factors such as bowel or bladder problems, pain, stress, fatigue, infections, tight-fitting clothes, and temperature should also be kept in mind. Medications can reduce the risk of spasticity. Anti-spasticity medications take 10 to 20 minutes to exert effects. However, for patients with Parkinson disease, tremor and fragility, it may take up to two hours. For patients with psychological conditions, laying a breathing life-like pet toy on the tummy of the patient may also reduce anxiety and in turn, spasticity.

Managing medically complex patients

Examples of when it is necessary to manage patients with complex needs include: 1) when patients do not open their mouth, 2) when they are undergoing dialysis, 3) when they have deep brain stimulator and cardiac implantable electronic devices, and 4) during medical emergencies.

Conclusion

It is possible that people with disability or medical conditions are treated in line with general dental practice recommendations, with additional support and proper training from dentists. This can be shown through appropriate and accessible facility design and full awareness of the most frequent barriers to care those special needs patients have. The solutions for these barriers are also relatively simple and do not require much financial investment, meaning that adequate dental care for patients in low-resources areas can also be ensured. More importantly, training dentists on how to care for patients with disability should also address the interdisciplinary aspect which spans across design architecture, physical therapy and critical care.

Conflict of Interest

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Chapter 11

Considerations when providing dental treatment for medically compromised patients

By Mas Suryalis Ahmad, Sante Leandro Baldi, Gemma Bridge and Raman Bedi

Introduction

Oral health is important for an individual's quality of life as it impacts on an individual's ability to eat, speak and socialize [1]. Oral health is also associated with general health, with research to indicate that there is a bidirectional relationship between chronic conditions such as diabetes and oral diseases such as periodontitis [2-4]. Maintaining good oral health is important for all, but particularly so for people with pre-existing health conditions as an oral condition could worsen the impact of their systemic disease and may result in the need for extensive medical and/or dental intervention [2]. Ensuring good oral health for people who are medically compromised requires communication and coordination between medical professionals and dental providers.

Medical conditions and oral health challenges

Research supports the relationship between psychological conditions such as depression and anxiety [5], and behavioral conditions such as intellectual disabilities, and a greater risk of poor oral health [6]. Extensive research also suggests that there is a relationship between poor oral health and systemic conditions, such as HIV, diabetes, kidney conditions and respiratory conditions [2-4]. A dental practitioner should be aware of any diseases or conditions that a patient is living with to best support them, to be prepared for behavioral, physical, and cognitive challenges that may arise and to be able to adapt dental practice accordingly.

Being aware of such conditions will help a dental practitioner to ensure that they can provide good dental care and promote overall wellbeing. People with pre-existing conditions are at risk of poor oral health conditions. Such conditions vary between disease states. People with psychological conditions may be prescribed antidepressant drugs, some of which, such as xerostomia can lead to oral health challenges, such as dry mouth condition, dry/red fissured tongue, oral ulcers, candidiasis, halitosis, and increased development of caries [7-8]. Patients with intellectual disabilities can suffer from several oral health conditions that include gingival hypertrophy, bleeding caused by low platelet count, and oral infections caused by low white blood cells, associated with the use of antiepileptic drugs [9]. Other problems encountered include caries and periodontal disease caused by poor oral hygiene, xerostomia, sugars contained in medications [10]. In patients that are HIV+, oral health problems include candidiasis, oral hairy leucopenia, linear gingival erythema, acute ulceration, gingivitis and periodontitis, Kaposi's sarcoma and non-Hodgkin's lymphoma [10-11]. Dental practitioners should be aware of such conditions occurring in patients with pre-existing health conditions and should help the patient to reduce their risk through good oral hygiene practices and liaison with the patients doctor.

Oral health care considerations

People with pre-existing systematic conditions, psychological disorders or behavioural conditions, are at an increased risk of developing poor oral health. This occurs for multiple reasons including inflammatory processes from the systematic condition, secondary effects of medications, challenges in accessing quality dental care, and difficulties in maintaining good oral hygiene behaviors due to memory challenges or a lack of dexterity.

For patients with intellectual disabilities or behavioral difficulties, there are additional challenges that dental professionals need to be aware of since they can affect cooperation in the dental practice. Communicating with and discussing care with the patient, their family and their doctor can enable an appropriate dental care plan to be developed. Also, discussing oral health challenges with the patient's doctor can help to identify the most appropriate drug regimen which could result in less gingival sacrifice, and dental damage and therefore reduce the need for extensive dental work.

In addition to supporting patients with pre-existing medical conditions to access care, dental professionals will need to be aware of the most common oral health challenges that patients with such conditions may present with. It is important to consider however, that all patients are individuals and will therefore likely experience different dental health challenges even if experiencing the same pre-existing health condition.

Across all patients, dental professionals should work with patients and other healthcare providers when developing plans and should also work with all parties involved to promote healthy habits such as encouraging low sugar consumption, at home oral hygiene behaviors and regular dental checkups. It is also helpful for a dental professional to obtain an accurate medical history alongside any medications taken and to ensure that there is an effective liaison between nurses, occupational therapist, and patient caregivers, who can help in planning daily oral hygiene.

Conclusion

Patients with pre-existing medical conditions such as diabetes, dementia and behavioral difficulties are at an increased risk of developing poor oral health. It is important that dental professionals are aware of the most commonly seen oral manifestations of systemic conditions and are able to consider how to support patients with such conditions. Working on collaboration with other healthcare providers, and with the patient and their caregivers, is an important part of being able to develop an appropriate treatment plan that can best support the patient to maintain good oral health and in turn maintain a good quality of life.

Conflict of Interest

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