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RESEARCH ARTICLE

DENTAL MANAGEMENT OF INDIVIDUALS WITH NEUROLOGICAL CONDITIONS

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ABSTRACT

The sympathetic and parasympathetic nerve systems, as well as their connections to the human muscle, are sophisticated and complex from a physiological standpoint. Special management considerations are necessary for patients with neurological conditions. These include therapeutic techniques, pre and post treatment requirements. Dental patients with neurological problems may experience anomalies with the cranial nerves, sensory loss in the face, facial paralysis, and illnesses like epilepsy, Alzheimer's disease, Parkinson's disease, multiple sclerosis, stroke, and myasthenia gravis. Strategies for treating patients with some of these diseases are laid out in this article.

INTRODUCTION

In terms of difficulty and devastation, neurodegenerative diseases are among the worst conditions in medicine. These are a diverse collection of degenerative, chronic illnesses, such as Alzheimer's and Parkinson's. While treating individuals suffering with one of these diseases, dentists must deal with serious issues with behaviour, mobility, and cognition in addition to oral care. While treating individuals with progressive neurodegeneration remains challenging, new opportunities and a better understanding of their treatment requirements have been made possible by growing knowledge of the cause and progression of these conditions. The treatment considerations are briefly discussed in this article, along with two of the main neurodegenerative illnesses, Parkinson's and Alzheimer's. Dental issues linked to these illnesses include a decline in oral hygiene, trouble wearing and keeping dentures in place, and mindless chewing. Pharmaceutical side effects can cause xerostomia, which then leads to root caries and recurring decay. Patients with neurodegenerative diseases should always receive care from the same dentist, if at all possible (Kieser, 1999)

Oral health problems and their predisposing factors in individuals with neurological conditions (Madaan, 2022)

Poor oral hygiene

- Cognitive and motor deficits leading to dependence on others
- Oro-motor impairment causing reduced food clearance.

- Parental disregard

Dental plaque and caries

- Poor oral hygiene
- Long term intake of syrups
- GERD
- Kernicterus causing enamel hypoplasia.
- Xerostomia causing drugs

Chronic dental erosions

- Teeth grinding
- Malocclusion
- Periodontitis and gingivitis
- Poor oral hygiene and dental caries
- Chronic administration of phenytoin causes gingival hyperplasia more commonly than phenobarbitone, valproate or carbamazepine.
- Alveolar bone loss associated with carbamazepine or phenytoin
- Severe dental injuries
- Fall and seizure correlation
- Hyperactivity
- Behaviors involving self-mutilation

Intravenous General Anaesthesia: Patients who are challenging to treat while not sedated, such as those with Parkinson's or Alzheimer's, can benefit from intravenous general anaesthesia in dental treatment.

Monitoring: To gauge the intensity of intravenous general anaesthesia, a bispectral index sensor (BIS) is to be placed on the forehead of the patient and is then connected to a BIS monitor. BIS is optional yet useful. More specifically, surveillance of the sedation score is required during intravenous anaesthesia without BIS. The patient's digit was used as the pulse oximetry sensor. During intravenous anaesthesia, pulse oximetry is typically utilised to monitor respiratory function. It does, however, have some restrictions. Despite acute respiratory insufficiency, the decline in pulse oxygen saturation may be slowed while under anaesthesia with oxygen administration. (Keidan et al., 2008; Fu, 2004) An adhesive sensor with an acoustic transducer was used to monitor the patient's respiratory rate. It was placed above the thyroid cartilage, on the side of the larynx, and on the patient's throat. Sensor permits isolation of the breathing sounds by analysing the trace collected from several filters and enables real-time monitoring of the vibrations coming from the patient's larynx. The respiration rate value can then be continuously shown when the auditory signal is transformed into a numerical number. Measurement of respiratory rate is optional yet useful. Under intravenous anaesthesia without respiratory rate monitoring, closer attention must be paid to the movement of the chest caused by breathing and oxygen saturation (Ouchi, 2015)

Protocol for intravenous general anaesthesia: Oxygen delivered by nasal cannula. Moreover, nitrous oxide and oxygen can both be added together at a concentration of about 20%. Propofol was infused continuously to induce and maintain intravenous general anaesthesia. Utilizing a propofol TCI pump with a built-in TCI system and following the Marsh-reported settings, Continuous intravenous infusion of propofol was started utilising the TCI procedure. Propofol dosage was adjusted to obtain a BIS of 50 and an appropriate level of anaesthesia, which is defined as being asleep but unresponsive to stimulus. There was no need for endotracheal intubation, and spontaneous breathing was kept up. The target propofol level was changed using TCI to keep the anaesthetic level at BIS 30–50. (Figure 1).

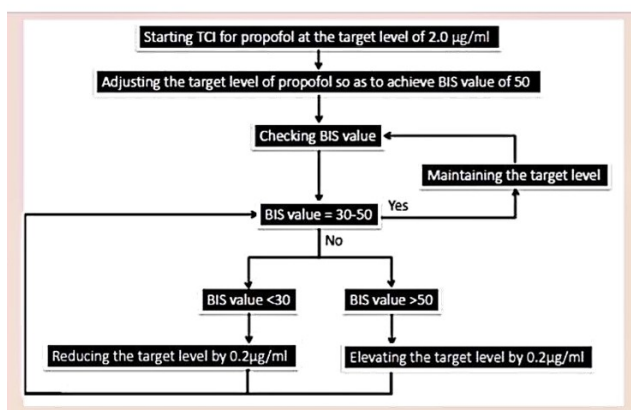
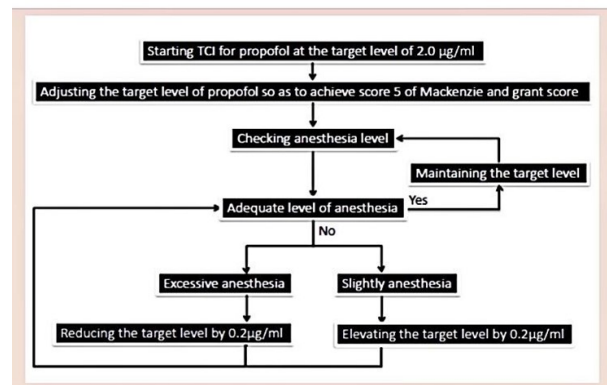


Figure 1. Intravenous general anaesthesia protocol with BIS. TCI: target-controlled infusion. BIS: Bispectral index⁵

Propofol dosage was adjusted without BIS to get a Mackenzie Grant score of 5, which indicates that the patient is sleeping but not responsive to stimulation. By changing the target propofol level using the propofol TCI, the level of anaesthesia was kept at a Mackenzie and Grant score of 5 (Figure 2). The target blood concentration of propofol was lowered by 0.2 g/ml if respiratory depression was noticed or the BIS value was less than 30. The target blood level of propofol was raised by 0.2 g/ml if the BIS value was more than 50 and the anaesthetic level was deemed insufficient. After the anaesthetic level stabilised without respiratory depression, the dental procedure was begun.



Mackenzie grant score; 1, Fully awake; 2, Drowsy; 3, Eyes closed but rousable to command; 4, Eyes closed but rousable to mild physical stimulation; 5, Eyes closed and unrousable to mild physical stimulation.⁵

Figure 2. Intravenous general anaesthesia protocol without BIS. TCI: target-controlled infusion

The dentist doing the procedure made the proper use of a local anesthetic. After the dental treatment, the administration of propofol was stopped. Patients were watched until they were completely awake and breathing steadily after coming out of anaesthesia (Ouchi, 2015).

Parkinson's Disease: Parkinson's disease frequently hides specific difficulties with developing and sustaining a dental treatment strategy that is effective and efficient. Parkinson's disorder affects people of almost all ages, however older patients may have more difficult problems than younger ones. Parkinson's disease's harmful symptoms make it challenging to perform daily at-home oral hygiene and perform routine recall visits' intraoral exams. Tongue-cheek-lip control, muscle-eye coordination and digital adeptness are some of the main requirements for household oral healthcare programmes (Rotaru, 1992). Many PD patients, particularly female patients, expressed difficulty with their dentures. This outcome was in line with a publication by Kieser et al. (1999) that claimed a third of PD patients had loose dentures or had trouble controlling their dentures. The following explanations may help to explain this. First, anticholinergic medication use may have led to oral dyskinesia (Watanabe, 1999; Kakinoki, 2000) or xerostomia (Fiske, 2000) in PD patients. Second, lack of muscular coordination and inflexible facial muscles in PD patients may compromise denture retention and control (Fiske, 2000). Denture discomfort was reported by numerous female PD patients but fewer male ones. Because oral dyskinesia is more frequently observed in senior women than in elderly men, it is conceivable that female PD patients may have denture discomfort compared to male PD patients. This is because some face muscles, the tongue, and the lips may move involuntarily (Watanabe, 1999; Fukuizumi, 2000). Regardless of gender, a large number of PD patients lacked their own teeth. Patients with Parkinson's may be at a greater risk of losing their teeth because they frequently experience heartburn and nausea, which can lead to poor oral hygiene (1,12), as well as xerostomia, which can increase the risk of caries owing to the use of anticholinergics or monoamine oxidase inhibitors, (1,13).

Additionally, the presence of tremor mitigates the effects of effective plaque-control and oral hygiene practises. The danger of aspiration (choking) from advanced dental devices can be increased by impaired swallowing. Also, people affected with Parkinson's disease and have been on medications like levodopa for a long period of time tend to develop dyskinesias, which affects the jaw (orobuccal dyskinesias) and bruxism. Parkinson's disease patients may also have xerostomia, or dry mouth, which may be one of the most significant factors affecting dental health and the oral mucosa and frequently causing the exacerbation of pre-existing masticatory issues or denture anxiety. Reduced salivary flow severely impairs the remineralization process of oral hard tissues, which serves to maintain the integrity of the oral mucosa. As a result, new dental caries, including root surface caries, may arise more readily (Wood, 1997).

The oral mucous membrane's resistance to invasion by foreign bodies is similarly decreased by dry mouth. This is particularly true in cases of prosthetic injuries brought on by dentures that become loose owing to a lack of saliva, as salivary biofilm is ideal for the best adhesion. (Dev, 2014)

Oral rehabilitation: These patients' oral rehabilitation calls for a multidisciplinary approach (Fiske, 2000) and special attention because prosthodontic procedures become challenging to complete and denture retention is compromised (Rahn, 1993) due to increased saliva, increased tremors, decline in adaptive skills, and poor patient muscle control. The patient also finds it challenging to maintain and care for the denture. Thus, prosthodontic operations become difficult to execute and demand great care and attention. Also, the patient's medical condition prevents him from making many dental appointments (Persson, 1992).

Complete Denture Fabrication for Patient's with Parkinson's Disease: There may be a propensity to fall forward or backward when the centre of gravity is misaligned. The mandibular denture may become loose due to the tongue, and a maxillary denture may get loose due to tight or uncontrolled facial muscles. The patient also finds it challenging to maintain and care for the denture. The patient is unable to make multiple visits for the surgery. Hence, using a bespoke tray with removable handles and occlusal rims with the aid of tich buttons, border moulding, final imprint, and jaw relation operations can be merged into one session. Because of the patient's health, facebow transfer and Gothic arch tracings are not possible in these situations. This does away with the need for an articulator that could be adjusted partially or totally. To account for the erratic centric relation, monoplane teeth can be employed. This method is a significant deviation from the norm and is rather straightforward. Complete dentures can be provided using this method in three visits, which is also very cost-effective for the patient. This method lengthens the time spent in the lab, but it cuts down on the number of clinical visits without sacrificing the fundamentals of complete denture manufacture (Singh).

Alzheimer's disease: The "model" for the discussion of dementias has been chosen to be Alzheimer's disease. In regard to patient dysfunction, carer stress, and societal costs, it is the most prevalent type of dementia (Little, 2005). Alzheimer's disease is characterised by a slow, persistent deterioration in mental capacities, including memory loss, aphasia, and declines in organising, planning, sequencing, and abstracting. Significant impairment in social and occupational functioning might result from these cognitive flaws (Daniel, 2004; Little, 2002).

Oral Complications and Manifestations: Agranulocytosis, leukopenia, and thrombocytopenia can be side effects of antipsychotic medications, which are sometimes used to treat psychotic symptoms in Alzheimer's patients (Little, 2022). This response could result in oral lesions. Patients on antipsychotic medications who have oral lesions, fever, or sore throat need to be examined for agranulocytosis (Little, 2022). Antipsychotic medication users may experience muscle issues in the mouth and face like dyskinesia, tardive dyskinesia or dystonia. The patient should be sent to the patient's doctor for evaluation and care if the dentist initially notices symptoms of dysfunction (Judd, 1991). Individuals with psychological conditions that could be linked to Alzheimer's disease might commit torturous acts of self-harm. Orofacial mutilation acts have been documented, including eye gouging, inserting sharp items into the ear canal, biting the lips, cheeks, or tongue, burning oral tissues with a cigarette's tip, and injuring the mucosa with a sharp or blunt object (Mitchell, 1991; Brightman, 1977; Michels, 1978). Alzheimer's disease patients who have the condition severely lack the motivation and capacity to take care of themselves. As a result, dental issues become more prevalent and oral hygiene is poor. Due to the fact that xerostomia is one of their most common side effects, the majority of drugs used to treat the accompanying psychiatric disorders contribute to an increase in dental issues in these people (Little, 2002). This could result in a rise in the prevalence of candidiasis and smooth surface caries.

In community settings, Stiefel et al (1990) reported on the dental health of people with and without chronic mental illness. Xerostomia, oral lesions, coronal smooth surface caries, and the degree of plaque and calculus buildup were all shown to be much more common in patients with chronic mental illness. Individuals with dementia frequently get oral injuries from falls and alveolar mucosa ulcerations from mishaps involving cutlery or chewing and biting (Little, 2002; Friedlander, 1987) They also may have poor dental hygiene with a higher prevalence of missing teeth, root and crown cavities, periodontal disease, wasting diseases of teeth, and migration of teeth. Patients with edentulous mouths frequently lose or misplace their dentures, and occasionally they even get confused trying to wear the lower denture on the upper arch and vice versa (Little, 2002; Kocaelli, 2002; Steinberg, 1986)

Dental Management: The main problems associated with the dental therapy of individuals with irreversible forms of dementia will be illustrated using an example from Alzheimer's disease. The greatest way to treat Alzheimer's sufferers is with compassion and empathy. The dentist should keep the patient's interest and explain what will happen before conducting it. The dentist should repeat instructions and explanations while using few words and sentences. It can be quite beneficial to communicate nonverbally. The dentist's body language and facial expressions should convey support, understanding, and concern for the patient. Direct eye contact, a smile, a hand on the arm, and other positive nonverbal cues are examples of positive nonverbal communication. (Little, 2002) Alzheimer's patients should start a rigorous preventive dental regimen that includes a 3-month recall, oral examination, prophylaxis, application of fluoride gel, oral hygiene instruction, and prosthesis adjustment (Little, 2002; Kocaelli, 2002; Bridgman, 2002; Ocasio, 2000; Lapeer, 1998) Sedation and brief sessions may be necessary for patients with advanced dementia. (Little, 2002; Kocaelli, 2002) The patient's doctor should be consulted when selecting the sedative drug. With some success, chloral hydrate and benzodiazepines have been utilised (Mitchell, 1991; Magarian, 1983) In patients with Alzheimer's disease, localization of the cause of tooth and oral discomfort may be quite difficult (Lapeer, 1998; Moody, 1990).

Treatment Planning Considerations for Alzheimer's Disease: Maintaining oral health, comfort, and function as well as preventing and controlling oral disorders are the aims of treatment planning for people with Alzheimer's disease. Most patients would be vulnerable to dental caries and periodontal disease without an intensive preventative strategy. The xerostomia side effect of drugs used to treat anxiety and depression that may be linked to Alzheimer's disease, makes people more susceptible to these disorders (Little, 2002; Kocaelli, 2002). Moreover, the illness lowers the patient's interest in and capacity for oral hygiene practises. Also, a lot of these individuals consume a lot of foods and beverages that raise their risk of developing oral disease (Judd; Niessen, 1987). The following components should be included in the dental treatment strategy. It is necessary to determine the regular oral hygiene practises. The patient's physical condition and psychiatric problem must be taken into account in the treatment strategy. The strategy must be flexible enough to adapt to shifts in the disease's trajectory and the patient's physical condition. For instance, a person with advanced Alzheimer's disease has cognitive and physical impairments, making dental care more challenging as the condition progresses. In the dentist office, the patient with advanced dementia frequently acts apprehensive, aggressive, and uncooperative. If at all possible, complex dental procedures should be performed on such a patient before the disease has progressed too far. There might be Misplacement, loss, or incorrect wear of prosthetic appliances. Because of the risk of self-injury, removable prosthetic devices may need to be removed from a patient in more severe situations. The course of treatment should reduce any anxiety associated with the appointment. The best way to do this is through careful patient management and the use of nonverbal cues (Niessen, 1987). The dentist should convey to the patient and family members an upbeat, optimistic outlook on maintaining the patient's oral health. (Chalmers, 2000) The dentist should ascertain the patient's capacity to make informed decisions

under the law. The patient and a close friend or family member should talk about this. In order to make decisions, treatment planning frequently involves a loved one's input and consent. The final component of the treatment plan deals with the choice of drugs to be used for the patient's dental care. Some medications may need to be avoided, while others may need to have their typical dosage reduced. It is advised to seek medical advice in order to determine the patient's current health status, confirm the medications they are taking, pinpoint any potential difficulties, and confirm dental medication and dosages that will reduce potential drug interaction. In conclusion, because mild dementia is a progressing condition, good dental health should be immediately restored in patients who have it. If the dementia worsens, subsequent care should focus on preventing oral problems. A patient with mild dementia might not be as responsive to dental care as one with the condition at an earlier stage. For these people, treatment focuses on preserving dental health and reducing any degeneration. Advanced dementia patients are frequently exceedingly challenging to treat and almost always need sedation, brief consultations, and simple treatments.

General Dental Management consideration for individuals with neurological conditions: Dentists should be conversant with the disorders that are common between neurology and dentistry because orofacial symptoms of neurological diseases have a direct connection to dentistry. As it's crucial to recognise these symptoms and being unfamiliar with them could be upsetting, it's necessary to properly investigate any potential connection between neurological symptoms and dental problems. A thorough salivary study, including the quality and amount of saliva, the salivary pH, bacteriological salivary tests, and mycological salivary testing, is required since dry mouth is a serious pharmacological side effect that has been linked to over a thousand different drugs. These individuals are counselled to use antimycotic medications in addition to routine antibiotic therapy. In cases of low salivary pH, topical fluoride applications to teeth are insufficient since the fluoride's effectiveness declines to a 5.5 pH (the critical pH). As a result, regular contact between the tooth surface and acidic meals does not prevent demineralization from being suppressed by active fluoride ions. This paved the way for the crucial function of patient desire to avoid very acidic substances. It is advised to occasionally moisten the mouth mucosa with still water rather than artificial saliva to balance the effects of the acidic pH. (when it is possible). Also, the use of chlorhexidine mouthwash, gels, and toothpaste with baking soda is encouraged since they may improve the saliva's general resistive ability (12,13) Electric or sonic toothbrushes are typically recommended as a great alternative to the typical manual toothbrush for patients who are physically, psychologically, or paediatric. A plausible and cogent connection between neurological illnesses and dentistry can be seen in their oral manifestations. For each patient with neurological illnesses, we support individualised dental treatment. Pit and fissure sealants, a type of dental medication used by professionals, may slow the growth of dental cavities. In order to maximise the comfort of patients who are in distress from neurological illnesses, a tight communication between the neurosurgeon and the dentist is also necessary in order to come up with the best treatment for the patient. Dental surgeons should therefore become familiar with these manifestations in order for them to recognise, diagnose, and treat these manifestations in such patients with greater accuracy.

CONCLUSION

In conclusion, managing the oral health of people with neurological problems is difficult and requires special attention. Many people frequently overlook the need of dental health care due of continuous medical conditions. As was previously said, because of their increased risk for oral health issues, medical professionals must be aware of these factors and ensure that patients receive routine dental examinations both inside and outside of the hospital. It is crucial to promptly send patients to oral healthcare professionals. Healthcare professionals in the medical and dental fields should collaborate, and difficult situations would benefit greatly from proper planning ahead

of time. Dentists, neurologists, and psychologists, should work together to manage and treat individuals with neurological conditions.

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