

AN INNOVATIVE DENTURE WITH TRACKER FOR THE REHABILITATION OF COMPLETELY EDENTULOUS PATIENTS DIAGNOSED WITH DEMENTIA : A CASE REPORT

Prosthodontics

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ABSTRACT

Dementia, also known as severe neurocognitive disorder, describes a group of disorders characterized by very poor cognitive function that often affects older people. Denture loss is a common problem amongst the elderly population who may suffer from cognitive impairments. The loss of dentures is both emotionally and financially draining as adapting to new dentures can be challenging for older individuals and it can also be time-consuming for the fabrication of new dentures. A novel technique is described to identify and locate lost dentures using a Bluetooth tracking device that is incorporated in the palatal vault of the maxillary complete denture. This technique to track the dentures is cost effective, simple, and its incorporation does not need any special laboratory techniques.

KEYWORDS

Dementia, Global Positioning system, Complete Denture, Tracker

INTRODUCTION

The number of elderly people with dementia has increased rapidly in recent years in India with the rapid increase in the aging population.

The common causes of dementia are vascular dementia and Alzheimer's disease [1,2]. Alzheimer's disease is the most prevalent type of dementia. Individuals suffering from severe dementia may face cognitive function issues such as aphasia, apraxia, agnosia, and disorientation, which can make it challenging to engage in everyday social activities [3]. Worldwide, more than 55 million people live with dementia in 2022 and there are nearly 10 million new cases every year. Dementia patients may not be able to clean their teeth as regularly, which increases the amount of dental plaque deposition and raises the risk of periodontal disease and dental caries [4,5].

Prostheses are deemed necessary for many elderly dementia patients who are associated with early tooth loss to restore their oral health and quality of life. [6].

A critical problem associated with these patients is the use of a new denture, as they often refuse dental management and are disturbed by minor changes in their oral environment [7]. For this reason, it is challenging for these individuals to obtain proper oral care in addition to routine dental checkups.

Patients and caregivers are considerably burdened when dentures are lost. In particular, Mann and Doshi stressed that residents may experience mental distress when they do not have their normal dentures.

Cognitive decline can make dental treatment difficult to fabricate new dentures. Another factor is the financial burden that accompanies which may be difficult on the patient or caretaker.

In current literature, there are, however, only few reports that aim at improving the quality of life of denture wearers with dementia through solutions to find lost dentures.

This article describes a technique that aims at helping the elderly denture wearing population who may suffer from dementia by using a GPS (Global Positioning System) with an audible alert to trace the location of the dentures. With the advancing technology, the implementation of this can be beneficial to the patients and their caregivers as it can be financially and psychologically draining for the fabrication of new complete dentures.

Case Presentation

A 75-year-old patient reported to the Department of Prosthodontics,

Government Dental College and Hospital, Kadapa with the chief complaint of missing teeth in the upper and lower jaw since 1 year with difficulty in chewing and speech. On intraoral examination, the patient was completely edentulous in maxillary and mandibular arches with well-formed ridges.

Maxillary and mandibular removable complete dentures were planned and fabricated using conventional procedures following which the incorporation of a compact Efficient Smart Tracker in the maxillary denture was planned.

This (Bluetooth Low Energy) BLE-based small tracking device (tag8 Dolphin Smart Tracker, Mumbai, Maharashtra) is mounted in the palatal vault area in the maxillary denture. The position of the tracker was located and marked on the maxillary denture.

The space was trimmed leaving a thickness of 1mm in the intaglio surface of the denture. (Figure 1)



Figure 1: Maxillary Complete Denture With Recess For The Tracker In The Palatal Vault

The tracker was stabilized in place using clear self-cure acrylic material (DPI-RR, Mumbai) around it. A soft 1mm thick thermoforming material (Ortho Spark Essix Thermoplastic Vacuum Forming Sheets 1 mm) was vacuum pressed over the placed tracker. The pressed thermoforming material sheet was shaped to cover and

protect the sensors.

The extension of thermoplastic was sealed with clear self-cure acrylic resin. (Figure 2)



Figure 2: The Extension Sealed With Clear Self Cure Acrylic Resin

The thickness of the denture was assessed after securing the tracker. (Figure 3)



Figure 3: Thickness of the denture measured using a Vernier Calliper

The denture was placed in a bowl of water and observed to confirm adequate seal around the tracker. The tracker is connected to the patients' phone through the Dolphin Tracker application which is installed from the Google Play Store. A notification with an audible alert is produced when the tracker is out of range from the connected phone. The last seen GPS location of the tracker can be traced through the app. (Figure 4)



Figure 4: The Tracker Connected To The Patients Phone

The thermoplastic sheet over the tracker made it easy for the patient to access the button which is present on the tracker. On clicking the button, the connected phone produces an audible ringtone. Hence, this feature can be used to locate the phone through the denture tracker. (Figure 5)

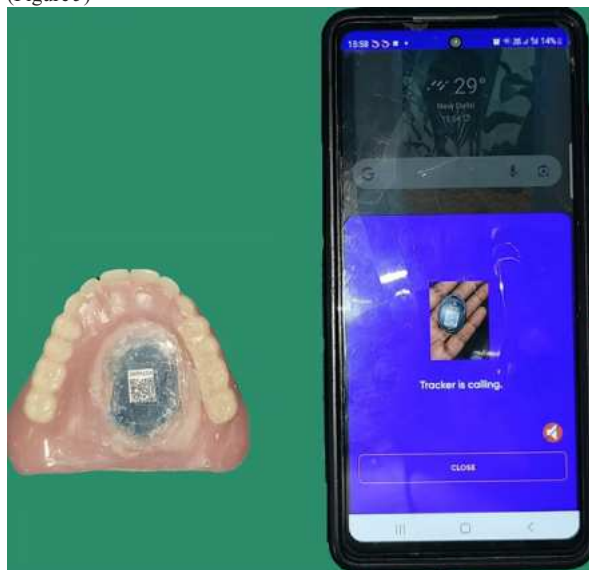


Figure 5: Audible Alert Produced In The Connected Phone.

The patient information such as name, age, sex, address, and mobile number is linked through the barcode on the tracker and is connected through the application on the phone. Once scanned, the patients' information can be obtained.

The upper and lower complete denture insertion was done and the patient was satisfied with retention, esthetics, and phonetics. (Figure 6).



Figure 6: Insertion Of Maxillary Complete Denture With Tracker

The patient was able to adapt to the increased thickness at the palatal vault of the denture. The patient was instructed on the process of connecting to the application through the phone.

The patient was recalled for a follow up at 1 month, 3 months and every 6 months. At the 1 year post insertion recall, the patient was satisfied with denture tracker. The tracker had helped the patient identify the location of the dentures with ease.

DISCUSSION

Those with cognitive impairments, such as dementia, frequently lose their dentures while they are in unfamiliar environments. Replacing lost dentures may cause a number of issues. A person may lose their ability to wear their dentures correctly or adjust to a new pair if they are without them for an extended period of time. Dentures that have been used by an individual for a long time are familiar, and Michaeli et al. [8] noted that getting new dentures to replace old ones that had been in use for years might be challenging. Additionally, it's possible that the patient fails to cooperate with the dentist throughout the several appointments necessary to fabricate the new dentures.

The tracker used in the study is introduced into the oral cavity of a denture wearer without causing irritation to the mouth while at the

same time it is isolated it from the oral cavity and any fluids that might damage the tracker when subjected to prolonged exposure. The tracker is confined within the conforms of the denture in a recess. The tracker in the mandibular denture can be positioned on the lingual flange. It can also be located in a cavity in the molar area of the upper or lower denture.

It also gives GPS live location of the denture when the mobile is within the tracker's range. The range is with 60 feet, which works well within the circumference of a house. A separation alert is produced when the denture goes out of range. The application shows the last seen position when out of range.

Once lost, it can be marked as "Lost" in the application to have every phone running on the Tracker application to join the search.

The visible external QR code can be used to feed the patient details to identify the denture owner. Such a unique mark can be stored on a computer with an accessible database which could include information in addition to the identity of the owner. The patient's location can be found using the GPS-attached denture, which can be tracked using the application downloaded in the mobile.

The device is powered by 1 CR2 battery lasting 6-9 months depending on usage. Standby time lasts 18 months. The thermoplastic resin can then be trimmed out and the battery can be replaced.

CONCLUSIONS

This technique to track the dentures is cost-effective, very simple, and the incorporation of the tracker does not need any special laboratory techniques. It is easy to use and install, compatible with Android, IOS systems, and provides accurate real-time GPS tracking. It is useful for older denture-wearing patients who suffer from dementia and tend to misplace their dentures or their phones. The patients' phone can be used to find the location of the denture and vice versa. However, the tracker is bulky in dimensions, making its incorporation in the contours of the denture difficult. The tracker system with the barcode can be universally adapted with further use of technology. Overall, the advantages of this system outweigh the limitations and can thus be implemented for the benefit of patients with dementia.

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