# **Review Article**

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# Feasibility and outcomes of the removable prosthesis in medically compromised patients

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# **ABSTRACT**

Increasing awareness about providing the necessary care of oral health is essential for patients with a removable prosthesis. The awareness is less interested in dental disorders, being busier with the systemic ones. Planning prosthetic management should only be done after a thorough evaluation of the underlying systemic conditions because the treatment plan might vary accordingly. Previous studies have demonstrated that many systemic diseases are associated with removable prosthesis (RP) procedures. We aim to discuss the feasibility and outcomes of the removable prosthesis for medically compromised patients, including many conditions as diabetes mellitus, cardiovascular, renal, hematological, pulmonary, gastrointestinal disorders and immunocompromised patients. Taking adequate care of oral hygiene practices is recommended for these patients. In addition, it is necessary to have frequent care, but short follow-up visits to make sure that the modalities are still valid for additional use, and to investigate for potential complications and adverse events. Adequate prophylaxis against some diseases might also be the only convenient solution. Therefore, proper management of the medical condition might be associated with the enhanced success of the modality with favorable outcomes and better quality of life. Making unified protocols to deal with these patients is also suggested to enhance the practice among the different clinical settings.

Keywords: Removable prosthesis, Dentistry, Systemic disorders, Management

## **INTRODUCTION**

The systemic health among dental patients is hugely variable, and estimates show that the prevalence of some systemic disorders that might interfere with the dental management modalities is high across the different global populations. Research also shows that a high percentage of

these patients requires the integration of increased prosthetic care, as it has been shown that around 25% of the 35-74-year aged populations are edentulous. It is becoming more evident that systemic diseases are in a significant correlation with oral health. Screening and evaluation of the systemic conditions are becoming an essential part of the dental settings. Therefore, adequate

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efforts should be directed to the management of these diseases to achieve better dental outcomes. Increasing awareness about providing the necessary care of oral health is essential for these patients that are less interested in dental disorders, being busier with the systemic ones. Furthermore, planning prosthetic management should only be done after a thorough evaluation of the underlying systemic conditions because the treatment plan might vary accordingly.<sup>2,3</sup> Previous studies have demonstrated that many systemic diseases are associated with removable prosthesis (RP) procedures. 4,5 In the present study, We aim to discuss the feasibility and outcomes of the removable prosthesis for medically compromised patients, including many conditions as diabetes mellitus, cardiovascular, renal, hematological, pulmonary, gastrointestinal disorders and immunocompromised patients.

#### **METHODS**

This literature review is based on an extensive literature search in Medline, Cochrane, and EMBASE databases which was performed on 25<sup>th</sup> July 2021 using the medical subject headings (MeSH) or a combination of all possible related terms. This was followed by the manual search for papers in Google Scholar while the reference lists of the initially included papers.<sup>6,7</sup> Papers discussing the feasibility and outcomes of the removable prosthesis were screened for relevant information, with no limitation placed on date, language, age of participants, or publication type.

# DISCUSSION

In general, the global prevalence of systemic and dental diseases is variable across different countries and populations. Estimates show that the prevalence of chronic kidney disease is 10.6-13.4%, the prevalence of diabetes is 8.5%, the prevalence of leukemia is 2.5%, the prevalence of anemia is 24.8%, while the prevalence of hyperthyroidism is 0.2-1.3%.8-12 Other estimates also indicate that around 43.8 million patients suffer from dementia, while 422.7 million patients suffer from cardiovascular diseases globally. 13,14 Besides, it has been estimated that dental diseases are the most common globally, with an estimate that 5 billion people suffer from dental decays. 15 Furthermore, previous investigations have demonstrated variable rates for the prevalence of systemic diseases among patients suffering from dental disorders. A previous study demonstrated that around two-thirds of dental patients had a previous history of at least one medical condition, while half of the dental patients were also reported to suffer from multiple medical conditions.<sup>16</sup> Another investigation also reported that 35.2% of their included population with systemic diseases required dental consultation within a public setting, while only 28.1% were reported for private settings. <sup>17</sup> Accordingly, the following section will be divided into the commonest medical conditions that are associated with RP to discuss the feasibility and outcomes of these modalities in these patients.

#### Diabetes mellitus

Reports show that edentulism is significantly associated with diabetes mellitus, and both types of the disease have been reported to increase the risk of periodontal diseases and denture stomatitis. 18,19 The complications and adverse events of diabetes mellitus are various, and many of these have been reported within the oral cavity. Moreover, some of these complications might include loss of the alveolar bones, aggressive periodontal diseases, increased risk of formation of periodontal abscesses, candidiasis. xerostomia, and denture stomatitis. Furthermore, it has been reported that the disease is also associated with an increased risk of resorption of the residual ridge.<sup>20</sup> Accordingly, using minimal pressure techniques is recommended for these patients to potentially record the impression for further implications. Besides, in cases suffering from severe xerostomia, it is recommended to care for a salivary denture reservoir. Hyperglycemia has been associated with many oral adverse events, including candidiasis and the development of many oral pathogens that can induce serious problems. Besides, previous studies indicate the efficacy of oral hypoglycemic drugs administration on eradicating oral candidiasis in patients with dental wear.<sup>21</sup> Adequate control of the blood glucose levels using oral hypoglycemic modalities. Therefore, enhance the quality of oral care and health and be associated with better outcomes in diabetic patients with dental wear.<sup>21</sup> Accordingly, advising diabetic patients to adequately administer their oral anti-hyperglycemic modalities and continuously brushing their teeth is mandatory to achieve better prevention and enhance the outcomes.

Moreover, adequate education for the patients about their oral health is also recommended to urge these patients to maintain adequate oral health and hygiene, with the frequent use of denture cleaning modalities. Caring for the structure of the intended RP modality is also important, and it has been recommended that such modalities should be with wide interdental, self-cleansing spaces, not covered by marginal gingiva, with embrasures regions, with maximum retention and free gliding occlusions, and with a specific contact point between the natural abutment teeth and the denture. It is now widely accepted to say that the masticatory functions are poorer with RP modalities than the fixed and implant prosthesis.<sup>22</sup> Accordingly, previous studies have recommended that implant treatment should be done using the least traumatic approaches within a stress-free environment to enhance the outcomes and make these modalities feasible when diabetes is adequately controlled.<sup>22,23</sup> Increased risk of inflammation and infection might also affect the prognosis in these patients. Therefore, frequent follow-up observations recommended.

#### Cardiovascular, renal, and hematological diseases

There is no strong evidence about an existing association between cardiovascular diseases and removable dentures.

However, it has been previously demonstrated that the quantity (number), and quality (maintainance) of the remaining teeth, in addition to removing any potentially observed inflammatory foci are good predictors for survival among patients with cardiovascular diseases.<sup>24</sup> A previous investigation by Ercalik-Yalcinkaya et al reported that among their 400 included subjects with dental wear, hypertension was the most commonly diagnosed disorder among them.<sup>25</sup> For denture wear patients, there is also an increased risk of periodontitis and denture stomatitis, which can furtherly disseminate into the patient's blood, leading to the potential development of many chronic systemic diseases, including stroke, atherosclerosis, and hypertension. <sup>26-28</sup> The increased risk of dissemination from the dental infections might be mainly attributable to dental wounds and manipulation. Therefore, adequately taking care of these events might significantly enhance the prognosis. Besides, prophylactic drugs might also be indicated in such cases to prevent any potential risk of dissemination and the development of systemic diseases. Dentists should, therefore, advise their patients to maintain adequate oral health and hygiene measures to achieve better outcomes.<sup>24,29</sup>

In general, patients suffering from cardiovascular diseases should be given short appointments and the surgical procedures should be conducted according to properly planned stress reduction protocols. These patients usually suffer from reduced blood to the peripheral tissues and reduced oxygenation. Therefore. using vasoconstrictors is not recommended. Furthermore, gingival hyperplasia might also be associated as a result of the administration of calcium-channel blockers, as antihypertensive drugs. Consequently, replacing these modalities might be needed in some cases. Although anemic patients might be subjected to an increase the risk of impaired bone development and maturation, and implants can still be used. However, this requires the administration of certain prophylactic protocols such as RP. On the other hand, this might be a suitable option for these patients with minimal risk of adverse events and enhanced outcomes. Among patients with leukemia, removal prostheses can be used. However, these should not irritate the underlying soft tissues, and patients are advised to maintain good oral health to enhance the prognosis and outcomes. Nevertheless, it should be noted that fixed partial dentures are the most commonly recommended modalities for these patients that have been associated with reduced risk of injury and complications to the gingival tissues. Among patients suffering from renal diseases, caring for dental problems should be conducted before initiating renal transplantation because the process requires the administration of immunosuppressive modalities that might flare up systemic infections that are usually associated with invasive dental procedures. The management of the dental disorders in these patients should be conducted by non-surgical procedures, including medications or laser therapy. Accordingly, dental implants might be contraindicated for some patients. On the other hand, RP can be indicated in such cases with minimally invasive modalities.

# Pulmonary diseases and Helicobacter pylori infections

Respiratory infections with Candida pneumonia are rare. However, many studies have demonstrated that oral bacteria are responsible for many respiratory infections.<sup>30,31</sup> Moreover, it was previously demonstrated that these oral pathogens might colonize dental plaque that might develop following the administration of the RP modalities.<sup>32</sup> It has been demonstrated that the continuous use of RP during sleep might be associated with an increased risk of inflammation, infections, and pneumonia.<sup>33</sup> Accordingly, routine and continuous caring of oral health might be associated with a significant reduction in these burdens to enhancing the related outcomes in the elderly population. In this context, a previous investigation in Japan reported that reduced frequencies of febrile illness, pneumonia, and pneumoniainduced mortality over a 2-year follow-up duration were significantly associated with the continuous care of oral health and oral hygiene for the 400 study participants that were wearing dentures.34 Accordingly, it has been suggested that performing oral hygiene measures and protocols should be adequately conducted by the healthcare givers to prevent pneumonia and other associated complications.<sup>35</sup> The risk of pneumonia is in direct association with the status of bacterial colonization among patients that wear dentures. 32,36 Besides, it has been demonstrated that vulnerable patients might significantly benefit from the continuous care of their oral health.<sup>36</sup> Besides, patients suffering from chronic obstructive pulmonary diseases have been shown to have significant amounts of bacterial colonizations within their lower respiratory tracts during all the stages of the disease, which was attributable to wearing RP. Furthermore, the incidence of mucosal infections and prosthetic stomatitis is higher in these patients as compared to the healthy controls.<sup>37</sup> In cases of apparent inflammation that is induced by denture wear. Furthermore, there is an increased risk of developing superficial candidiasis.<sup>38</sup> Swarming pulmonary circulation, which might result from bacterial colonization from the continuous use of RP, can also impact the esophageal air channels, leading to further complications and adverse events.39

Gastric inflammation might be associated with inflammation and infection to the oral mucosa that is usually caused by fungal or bacterial pathogens. In 100% of patients suffering from *Helicobacter pylori*-induced gastritis, oral infections were associated, indicating a strong correlation between the pathogen and oral health. Nonetheless, the mechanism is not still fully comprehended. Adequate management of *Helicobacter pylori* infection that resides in the oral cavity is a difficult process, as it has been noticed that even after eradicating the pathogen from the oral cavity by antibiotics. It can still infect the stomach within few weeks after applying the management modalities. Besides, it has been reported

that even with adequate oral hygiene practices, adequate management of the pathogen is still difficult to achieve. <sup>42</sup> On the other hand, other researchers have demonstrated that adequately managing dental plaques might effectively facilitate the process of eradication of *Helicobacter pylori* bacteria. <sup>43</sup> Moreover, re-infection, relapse, and gastric ulcers might also be significantly correlated with the previous infection, even after adequately eradicating the bacteria. <sup>44</sup> Therefore, these patients should be admitted to suitable prophylactic programs that can effectively intervene against such issues and enhance the associated outcomes.

#### Others

The entrapment of microorganisms has become easier as a result of the surface irregularities of the dentures, which increases the risk of bacterial colonization and infections. Accordingly, immunosuppressed patients, by iatrogenic causes, following human immunodeficiency virusinfections, or due to other causes, are not recommended to use RP because of the increased potential complications from the increased frequency of infections.<sup>45</sup> Evidence from the literature shows that these patients have higher frequencies of bacterial isolates from their oral mucosa, which is mainly attributable to wearing RPs. It has been demonstrated that wearing RPs is significantly associated with the increased incidence of candidiasis among patients suffering from HIV infections, and the levels of CD4 were also reported to be in a significant correlation with the development of oral candidiasis. 46 Daniluk et al previously reported that the rate of candidiasis was higher among patients with dentures than other patients without it.<sup>47</sup> The incidence of this infection increases with multiple factors as chemotherapy or radiotherapy, and with patients that frequently administer immunosuppressant drugs or antibiotics.<sup>48</sup> Cancer patients might also suffer from an immunocompromised state. As a result, the rates of infections might also be high in these patients. Moreover, evidence shows that Gram-negative Enteric bacilli and Staphylococcus spp. were effectively isolated from the palate, tongue, and dental plaques in a more frequent pattern in cancer patients than other patients without cancers.47 The presence of history with inflammatory conditions might precede the presence of a neoplasm, while in other cases, inflammation comes secondary to the presence of a neoplasm, and therefore, adequate oral hygiene practices are recommended to enhance the associated outcomes. 30,49,50.

# **CONCLUSION**

Taking adequate care of oral hygiene practices is recommended for these patients. In addition, it is necessary to have frequent care, but short follow-up visits to make sure that the modalities are still valid for additional use, and to investigate for potential complications and adverse events. Adequate prophylaxis against some diseases might also be the only convenient solution. Therefore, proper management of the medical condition might be associated

with the enhanced success of the modality with favorable outcomes and better quality of life. Making unified protocols to deal with these patients is also suggested to enhance the practice among the different clinical settings.

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