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**COMPREHENSIVE MANAGEMENT OF ORAL FRAILITY IN MULTIPLE SYSTEMIC DISEASES GERIATRIC PATIENT
(CASE REPORT)**

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ABSTRACT

Background Oral frailty is an important geriatric syndrome characterized by decreases in oral function that coincides with declines in cognitive and physical function. **Objective:** The aim of this case report is to describe the comprehensive management of oral frailty in a medically compromised geriatric patient prior to cardiovascular surgery. **Case:** A 64-year-old male patient complained of pain in swallowing and sore mouth since two days before. He had multiple systemic diseases, including infective endocarditis, acute kidney injury, type II diabetes mellitus, thrombocytopenia, and electrolyte-fluid imbalance. Extra-oral examination showed lymphadenitis, icteric sclera, and dry-exfoliative lips. Intra-oral examination revealed tongue depapillation, frothy saliva, and dry mucosa with poor oral hygiene. The scraped-off white plaque leaving erythematous area was found on the dorsal and ventral tongue, buccal mucosa, and hard palate. Irregular multiple major ulcers, surrounded by erythema, well-demarcated with yellowish concave base, and covered by thick yellowish-green sputum at the soft palate to the uvula. The diagnosis was exfoliative cheilitis, aphthous-like ulcer, acute pseudomembranous candidiasis, and moderate xerostomia. A D-E-N-T-A-L questionnaire was used to evaluate oral frailty, and the cumulative result was seven. **Case Management:** The patient was treated with 100% petroleum jelly, 0.12% chlorhexidine digluconate mouthwash, and chlorine dioxide-zinc mouthwash three times a day. The oral lesions showed significant improvement after one week of treatment. **Conclusion:** Appropriate therapy for oral lesions and eliminating the infection could be considered to minimize the long-term effect of oral frailty. The comprehensive management of oral frailty could be beneficial for improving the quality of life.

Keywords: Geriatric, Oral frailty, Oral lesion, Systemic disease

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INTRODUCTION

The World Health Organization (WHO) classified the elderly as individuals who have entered over 60 years old. A serious public health problem worldwide is the condition of the aging population. All tissues in the body, including the oral cavity, undergo significant changes in line with age. The elderly usually have coexisting systemic diseases and are more susceptible to exposure to microorganisms. This comprehensive condition causes the elderly to be very susceptible to many oral mucosal lesions, such as infections, neoplasms, oral manifestations due to systemic diseases, xerostomia due to long-term usage of drugs, and hematological disorders. These various pathological conditions are due to systemic disease, metabolic changes due to age, nutritional deficiency, long-term drug use, use of dentures, and bad habits such as smoking and alcohol consumption.¹ The

oral vulnerability in the elderly is also referred to as oral frailty. The aim of this case report is to describe the comprehensive management of oral frailty in a geriatric patient with the involvement of multiple systemic diseases.

CASE

A 64-year-old male was referred to the Oral Medicine Department from the Cardiovascular Department Dr. Hasan Sadikin General Hospital Bandung with chief complaints of pain in swallowing, dry, and sore mouth since two days ago. There was no history of recurrent sore mouth. He had not brushed his teeth for three days because of these complaints and did not regularly check up with the dentist. He had lost 12 kg in the past month because of inadequate intake due to loss of appetite. He was a heavy smoker since 57 years ago

(more than 40 cigarettes/day). The history of alcohol consumption and drug abuse was denied. The patient was currently on fluid restriction from Cardiology Department.

He was hospitalized due to shortness of breath and currently diagnosed with infective endocarditis (IE). He was also diagnosed with other systemic diseases including acute kidney injury (AKI), thrombocytopenia related to IE aggravated by drugs (furosemide), hyponatremia et causa hemodilution, hypocalcemia et hypokalemia (hypomagnesia) et causa renal loss (furosemide), respiratory failure and electrolyte-fluid imbalance. His contributory past medical history was uncontrolled type II diabetes mellitus (DM) for five years. During hospitalization, he received furosemide, digoxin, captopril, calcium gluconate, gentamycin, ampicillin-sulbactam, potassium chloride, calcium carbonate, lansoprazole, paracetamol, magnesium sulfate, bisoprolol, ramipril and lactulose.

Extra-oral examination revealed lymphadenitis on the right submandibular lymph node, icteric sclera, dry-exfoliative lips and dry saliva at both corners of the lips. Intra-oral examination (Figure 1) showed poor oral hygiene. There were plaque, stains, calculus, caries, retained root tips and missing teeth. The gingiva showed multiple, diffuse, blackish-brown macules along the anterior upper and lower attached gingiva. Dorsum of the tongue was depapillated with debris accumulation on it. Frothy saliva and absent of saliva at the floor of mouth. The overall oral mucosa looked dry, mouth mirror sticking to the tongue and buccal mucosa. The scraped-off white plaque leaving erythematous area was found on the dorsal and ventral tongue, buccal mucosa, and hard palate. Irregular multiple major ulcers, surrounded by erythema, well-demarcated with yellowish concave base and covered by thick yellowish-green sputum at the soft palate to the uvula.

The subjective examination of xerostomia was carried out using a dry mouth questionnaire introduced by Thomson et al.² The result was xerostomia with 31 cumulative points. The objective examination of xerostomia was carried out using the Challacombe scale³ (Table 1) and showed moderate xerostomia with six points. The laboratory investigations showed in Table 3. The patient was also tested with anti-CMV IgM and IgG to rule out the possibility of cytomegalovirus infection. The diagnosis for this patient were exfoliative cheilitis, acute pseudomembranous candidiasis, aphthous-like ulcer, moderate xerostomia and smoker's melanosis.

CASE MANAGEMENT

The acute pseudomembranous candidiasis and aphthous-like ulcer were treated with 0.12% chlorhexidine digluconate mouthwash three times a day, while the moderate xerostomia was treated with chlorine dioxide (ClO₂)-zinc mouthwash three times a day. The patient was also instructed to apply a thin layer of 100% petroleum jelly three times a day to treat the exfoliative

cheilitis. Oral hygiene instruction included brushing the teeth and tongue two times a day and sipping the amount of water according to the fluid restriction. He was also advised to do mouth preparation prior to cardiovascular surgery.

Table 1. Challacombe scale of the patient

Item	Score
Mirror sticks to buccal mucosa	1
Mirror sticks to tongue	1
Saliva frothy	1
No saliva pooling in floor of mouth	1
Tongue shows generalized shortened papillae (mild depapillation)	1
Altered gingival architecture (smooth)	0
Glassy appearance of oral mucosa, especially palate	0
Tongue lobulated or fissured	0
Cervical caries (more than two teeth)	0
Debris on palate or sticking to teeth	1
Total	6 : moderate xerostomia



Figure 1. Clinical features of the initial visit



Figure 2. Panoramic interpretation showed tooth loss, retained root tips, caries, and horizontal periodontal resorption

Table 2. D-E-N-T-A-L questionnaire

Item	Score
Dry mouth or dysphagia	1
Eating difficulty	1
No recent dental care	1
Tooth or mouth pain	2
Alteration	0
Lesions or sore or lumps	2
Total	7 : oral frailty

Table 3. Laboratory results

Hematology (unit)	Initial visit	1-week of follow-up	Normal
Hemoglobin (g/dL)	15,2	13,6	14-17,4
Hematocrit (%)	42,8	37,7	41,5-50,4
Red blood cells (10 ⁶ /uL)	4,9	4,22	4,5-5,9
White blood cells (10 ³ /uL)	7,51	8,99	4,4-11,3
Platelet (10 ³ /uL)	66 (L)	177	150-450
MCV (fL)	87,3	89,3	80-96
MCH (pg)	31,0	32,2	27,5-33,2
MCHC (%)	35,5	36,1	33,4-35,5
CRP quantitative (mg/dL)	3,48 (H)		< 0,3
Urea (mg/dL)	64,8 (H)	38,4	15-39
Creatinine (mg/dL)	0,77 (L)	1,07	0,8-1,3
Sodium (mEq/L)	124 (L)	129 (L)	135-145
Potassium (mEq/L)	3,2 (L)	3,7	3,5-5,1
Ion calcium (mg/dL)	3,64 (L)	4,68	4,5-5,6
Magnesium (mg/dL)	1,7 (L)	1,7 (L)	1,8-2,4
SGOT (U/L)	285 (H)	177 (H)	15-37
SGPT (U/L)	548 (H)	163 (H)	16-63
Urine	Initial visit	Normal	
Protein (mg/dL)	70 (H)		< 10
Serology	Initial visit	Normal	
Anti-CMV IgG	29,00 reactive		Non-reactive: < 4 Grayzone: 4-<6 Reactive: >= 6
Anti-CMV IgM	0,36 non-reactive		Non-reactive: < 0,70 Grayzone: 0,70-0,89 Reactive: >=0,90

After two days of follow-up (Figure 3), the oral cavity looked cleaner than before but still felt the same complaints as at the first visit. He could brush his teeth and take topical medications routinely including 0.12% chlorhexidine digluconate 30-60 minutes before meals, ClO₂-zinc mouthwash 30-60 minutes after meals and 100% petroleum jelly.

After seven days of follow-up (Figure 4), complaints of dry mouth persist due to fluid restriction.

The burning sensation and pain in swallowing had subsided. Therefore, topical medications were still being used.

After the 10th and 14th days of follow-up (Figure 5 and Figure 6), almost all the complaints disappeared. Scaling, restoration of the carious teeth and teeth extraction had been done. He remained in fluid restriction and was scheduled to undergo cardiovascular surgery next week. Meanwhile, he still used topical medications routinely.



Figure 3. Two days of follow-up



Figure 4. Seven days of follow-up

After one month of follow-up, there were no complaints of dryness and pain in the oral cavity. A week before the patient underwent cardiovascular surgery successfully. There was no fluid restriction anymore and planned to be discharged from the hospital. Furthermore, he was advised to maintain oral hygiene, eat a balanced nutritious diet regularly, drink enough water and apply 100% petroleum jelly on his lips.

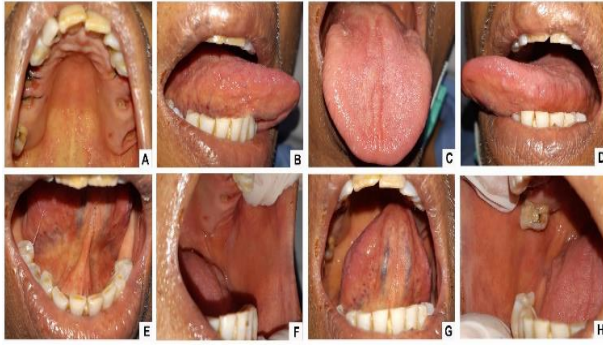


Figure 5. Ten days of follow-up

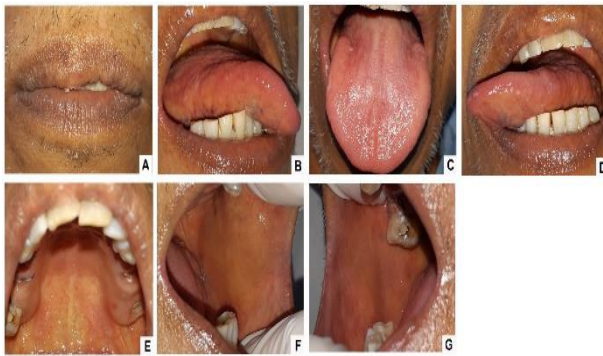


Figure 6. Fourteen days of follow-up

DISCUSSION

This case report focuses on the condition of oral frailty in a medically compromised geriatric patient with comprehensive management. The elderly tend to have a frailty condition. Frailty is theoretically described as an identifiable state of older adults with greater vulnerability, brought on by age-related declines in physiological status and function across various organ systems, such as a decrease in the ability to cope with chronic or acute stressors.⁴

The oral cavity is the main gate and reflects the overall health of the body. It has several essential functions, such as chewing, swallowing and communicating. Therefore, oral health is crucial to overall well-being, as well as to the quality of life and self-perception. Elderly people frequently experience oral function impairment and this unfavorable aspect of aging can have indirect impact with some frailty criteria. Age-related functional oral degeneration is characterized by poor dental hygiene, ill-fitting denture and dietary deficiencies will increase the risk of nutritional frailty. Poor oral health is common in the elderly population and involved in frailty.^{5,6} It may influence eating habits and food preferences, therefore impact on diet quality. Partial or complete loss of teeth has been associated with frailty, disability in daily living, limited mobility and decreased walking speed.⁶ Depression can occur in the elderly which will affect frailty and oral health status. This

depression results in a lack of interest in maintaining good oral hygiene and a tendency to have a cariogenic diet, reduced salivary flow, caries and periodontal diseases. In addition, socio-economic status also plays a role in this path.⁵

Oral frailty refers to a deterioration in oral function which is associated with a reduction in cognitive and physical abilities.⁵ This developmental phenomenon and cycle can lead to changes in different conditions of the oral cavity such as the number of teeth, oral hygiene and oral capacity, which is associated with aging.⁷ The four oral and maxillofacial dysfunctions that are common in the elderly population are closely related to multimorbidity and polypharmacy including oral health status deterioration, oral pain, deterioration of oral motor skills, and chewing, swallowing and saliva disorders.⁸

Our patient had some debilitating diseases including infective endocarditis, acute kidney injury, type II diabetes mellitus, thrombocytopenia and electrolyte-fluid imbalance. Uncontrolled diabetes that he suffered giving negative effects on the oral cavity because hyperglycemia is an important predisposing factor for invasive fungal infection and oral ulcers due to this condition.⁹ He also complained of dry mouth that may be due to multifactorial factors including a smoking habit, fluid restriction, a history of uncontrolled diabetes and taking some medications.

Xerostomia and hyposalivation are frequently caused by dehydration, especially in elderly people with insufficient fluid intake. Uncontrolled diabetes can lead to polyuria, which in turn causes dehydration. Individuals with renal diseases, diarrhea and alcoholic habit may exhibit dehydration and imbalance in the homeostasis of the body's salt and water. Diuretics (in this case, the patient consumed furosemide), which influence the regulation of this homeostasis, can produce xerostomia, decrease salivary flow rates and alter the composition of saliva. Dehydration affects oral mucosal immunity by decreasing the release of antimicrobial proteins including lysozyme and α -amylase as well as the overall flow rate of saliva.³

Diabetes is linked to oral and maxillofacial movement disorders, taste disturbances, dry mouth, burning mouth syndromes and swallowing problems.⁶ Dehydration caused by prolonged hyperglycemia and polyuria, are considered significant factors in the development of xerostomia and salivary gland hypofunction in diabetics. Salivary hypofunction and xerostomia also seem to be common conditions, especially in uncontrolled diabetes.³

Medications such as antihistamines, antihypertensives, antidepressants, anticholinergics, antipsychotics, sedatives, analgesics, muscle relaxants, diuretics and anticonvulsants can cause xerostomia.³ Angiotensin-converting enzyme (ACE) inhibitors are associated with dry mouth, such as ramipril and captopril that he consumed during hospitalization. He was treated with these drugs due to eliminate the proteinuria and to

prevent cardiorenal disease that can develop during his course of diseases. ACE inhibitors therapy significantly reduces the tendency of proteinuria and postpones the decline in renal function.^{10,11} It will slow down the progression of chronic kidney disease in the presence or absence of diabetes, particularly in patients with mild to moderate renal insufficiency.^{12,13}

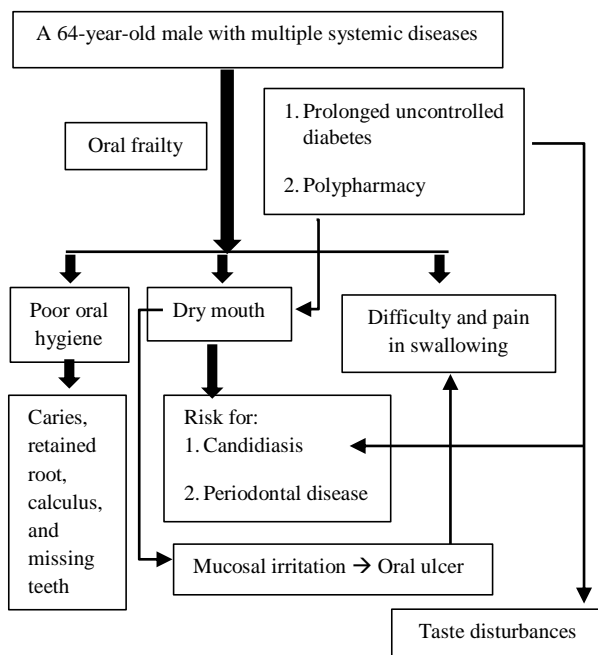


Figure 7. The schematic of oral frailty in a 64-year-old male patient with multiple systemic diseases

This patient complained of 12 kg weight loss in one month. During one month before, the patient had eating difficulty because there was taste disturbance (loss of appetite) which was also exacerbated by his systemic complaints and bad habit such as smoking. He also complained of sore and dry mouth along with pain in swallowing. The appearance of oral mucosal will change over time, especially aggravated with underlying systemic diseases. The oral epithelium becomes thinner, loses elasticity and atrophies with age, making it more susceptible to pathology.⁹ Oral-maxillofacial movement disorders can lead to swallowing problems, while chronic oral mucosal pain disorders can contribute significantly to taste disturbances and vice versa. It should be noted that several geriatric diseases are also closely related to these four dysfunctions mentioned above.⁶

Older patients are more susceptible to intraoral candida infections due to systemic disease, compromised immune system, medication- or disease-induced dry mouth and removable dentures. The very young, the very old, the very dry and the very ill patient are considered to be most vulnerable to developing candidiasis. Candidiasis begins when commensal *Candida* becomes

pathogenic due to local or systemic factors. The systemic conditions including diabetes, anemia, or HIV, while the local factors such as hyposalivation (drug-induced xerostomia, autoimmune diseases, head-neck radiotherapy), wearing dentures and taking topical steroids, antibiotics, or immunosuppressive medications.⁹ Additionally, like a vicious cycle, additional medications administered to treat these conditions may have negative side effects due to polypharmacy. For instance, oral mucosal pain may be caused by salivary gland hypofunction due to polypharmacy and drugs used to alleviate this pain may worsen the salivary gland hypofunction.¹⁴

This patient also revealed oral ulceration at the posterior part of the oral cavity (soft palate and uvula). Oral ulceration is a complex and varied condition, characterized by damage or destruction in the integrity of the oral epithelium, followed by loss of the underlying connective tissue, resulting in a crateriform appearance.¹⁵ At the first visit, the major ulcerations were suspected as CMV oral ulcers. Therefore, the serology test was conducted but the result (Table 3) was negative for IgM and reactive (29,00) for IgG. However, the link between ulcers and CMV cannot be confirmed without further testing using Polymerase Chain Reaction (PCR).¹⁶ Additionally, a diagnosis of active CMV infection is supported by acute and convalescent serum samples showing a fourfold rise in IgG antibodies to CMV combined with the presence of either IgM antibodies to CMV or a positive CMV culture. In transplant patients and other immunocompromised individuals, plasma viral load (determined by real-time quantitative PCR) may be monitored to assess the need for CMV treatment or response to CMV therapy.¹⁷

Several pathways have described the relationship between oral health and frailty. The first pathway involves the relationship between oral health and poor nutrition, food intake and food choices. According to the evidence, poor nutrition may be a serious risk for the occurrence of frailty.⁸ Inflammation is yet another potential link between oral health and frailty. Inflammatory indicators may be more prevalent as a result of periodontal disease. The relation between oral health and degree of frailty may potentially be mediated by periodontal disease-related tooth loss and its impact on dietary habits and nutritional status.⁵

The oral frailty screening was done for this patient using a D-E-N-T-A-L questionnaire examination (Table 2). The comprehensive management in this patient including mouth preparation prior to cardiovascular surgery, topical medications as pharmacological therapy, and dental health education (oral hygiene instruction) as non-pharmacological therapy. Scaling and root planning, tooth extraction, as well as restorations for the carious teeth were done as the mouth preparation. The aim of this treatment was to eliminate the focus of infection prior to cardiovascular surgery and support the overall management of oral frailty.

The topical medications included rinsing with ClO₂-zinc mouthwash and 0.12% chlorhexidine digluconate mouthwash three times a day and applying a thin layer of 100% petroleum jelly on the lips. Petroleum jelly (also called petrolatum), available since 1872, which is mostly composed of long-chain aliphatic hydrocarbons, has been widely used as a moisturizer. Trans epidermal water loss (TEWL) in both healthy and irritated human skin has been down-regulated by petroleum jelly.¹⁸

Water and biofilms are both easily penetrated by chlorine dioxide. It contains antiviral, anti-fungicidal and antibacterial properties. Furthermore, it may possess size-selective antibacterial effects, making it harmful to noneukaryotic microbes at considerably lower doses than to eukaryotic ones.¹⁹ Zinc acetate preserves the oral cavity's humidity and moisture, while the stabilized chlorine dioxide can help to maintain the normal pH of the oral cavity. Oral rinse may stimulate and increase the saliva flow rate or temporarily replace the lost saliva secretions.²⁰

Chlorhexidine is a bisbiguanide made up of two chloreguanide chains connected by a hexamethylene chain (1:6-di[4-chlorophenyldiguanido]-hexane). It is a strong base at physiological pH. The phosphate-containing protein components of the bacterial cell wall are adsorbed by chlorhexidine. Additionally, it acts as bacteriostatic, bactericidal, fungicidal, fungistatic and some virus-killing properties.^{21,22} This treatment resulted in a very significant improvement.

Geriatric patients who are exposed to polypharmacy and multiple systemic diseases may develop a range of oral and maxillofacial dysfunctions that cause more complex clinical issues. Therefore, it is imperative to highlight that patient-specific care strategies and strong multidisciplinary collaboration are always needed.¹⁴

In conclusion, oral frailty should be an important concern as the elderly population is increasing. Initial screening should be done in assessing the geriatric patient to make better further plans. The comprehensive management of oral frailty is also necessary to minimize multimorbidity and improve the quality of life. We thank the staff of the Department of Cardiology, Faculty of Medicine, Universitas Padjadjaran/Dr. Hasan Sadikin General Hospital and also the patient for the consent.

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