

Beyond Oral Care: Impact of Oral Pathogens on the Respiratory System

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Abstract

The elderly population and medically compromised patients are at greater risk for the development of aspiration pneumonia. This poster intends to examine the relationships between oral dysbiosis and lung pathogenesis. The basic dental science of how oral pathogens invade the oral cavity will be explained. The link between oral disease and aspiration pneumonia will be discussed. Attention to oral health management will also be applied.

Overview of Oral Bacteria

- ❖ Oral microbial dysbiosis observed in systemic diseases reduces microbial diversity and shifts bacterial composition by increasing pathogenic bacteria and decreasing commensal health-associated bacteria (Georges et al., 2022).
- ❖ In oral microecosystem, microbes like bacteria and fungi attach to the tooth surface and form biofilms called dental plaques (Dong et al., 2022).
- ❖ Dental plaque bacteria are the main factors of periodontal disease (Lu et al., 2019).
- ❖ In elderly persons, aspiration pneumonia is caused almost entirely by anaerobic Gram-negative bacteria, such as periodontal bacteria (Pace & McCullough, 2010).
- ❖ Some studies have also suggested that the quantity of aspirated bacteria is more important than the type (Gomes-Filho et al., 2010).

Relationships between oral cavity and respiratory tract

- ❖ Indigenous oral microbes are likely to be inhaled into the lower respiratory tract and may interact with respiratory pathogens, further modulating the pathogenicity of respiratory pathogens and adhere to mucosal epithelium causing respiratory infection (Dong et al., 2022).

Oral pathogens may cause pneumonia via:

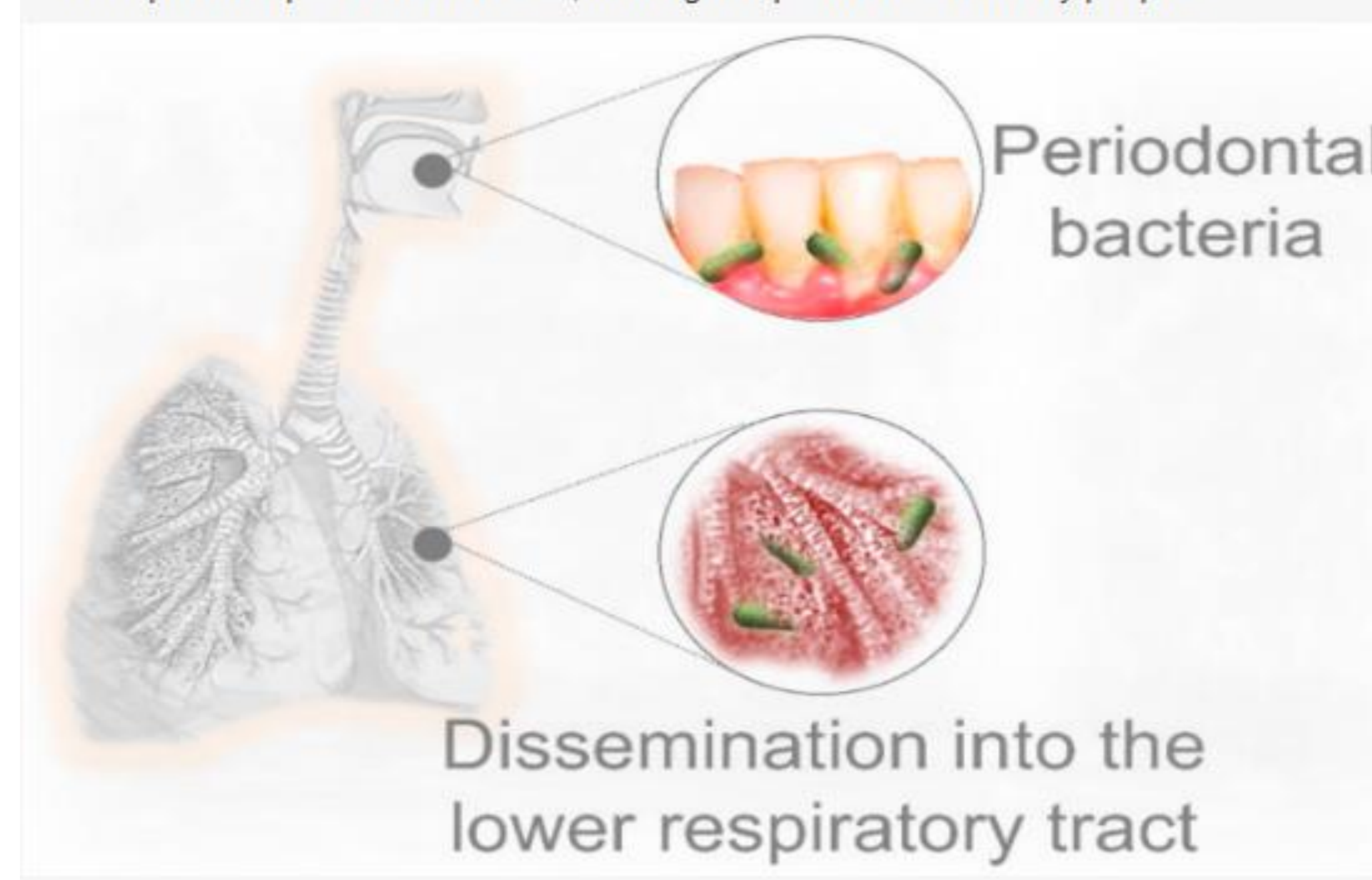
- Aspiration of oral pathogens
- Modification of lung mucosal surfaces by aspirated periodontal disease-associated enzymes and cytokines allowing adhesion and colonization by pathogens
- Destruction of salivary pellicles on pathogenic bacteria by periodontal disease-associated enzymes;
- Airborne translocation
- Systemic bacteremia from periodontal infections

(Pu et al., 2020)

Review of Literature

- ❖ Nocturnal denture wearing has been found to present a comparable risk of developing pneumonia as a history of swallowing difficulties, stroke, or respiratory disease (Lim, 2018).
- ❖ Internal and external factors such as aging, dysplasia, disease progression and treatment which influence salivary function or oral immunity have potential impacts on oral colonization of respiratory pathogens (Dong et al., 2022).
- ❖ Medication including anticholinergic drugs, diuretics, alpha-adrenergic agents, and antihypertensive agents are able to change the saliva composition or affect the secretion or flow rate of saliva, and subsequently result in dry mouth and poor oral hygiene (Dong et al., 2022).
- ❖ More recent evidence has indicated a possible role of the microbiota of dental plaque associated with periodontal diseases in the development and progression of Alzheimer disease (Kapila, 2021).

Figure 2. Established periodontal disease is an important source of pathogenic bacteria that can influence the onset and development of lung infection. Periodontal bacteria can disseminate into the lower respiratory system as a consequence of saliva or food aspiration, especially in older individuals, but also inoculation during endotracheal intubation. *P. gingivalis* is a prominent Gram-negative pathogen implicated in the development of periodontal disease, with highest prevalence in elderly people.



(Aquino-Martinez & Hernández-Vigueras, 2021)

Preventative Measures

- ❖ Incorporating higher fluoride content (i.e., greater than 1000ppm of fluoride into the enamel crystal structure of the teeth reduces the critical pH at which dissolution occurs, thereby increasing its resistance to demineralization from plaque acids (Lim, 2018).
- ❖ There has been evidence showing that mechanical oral care combined with povidone iodine (PVP-I) significantly reduced the risk of pneumonia in nursing home residents (Dong et al., 2022).
- ❖ 0.12% chlorhexidine gluconate (CHX) under the brand name of Peridex is a broad spectrum antiseptic rinse that reduces both Gram-positive and Gram-negative bacteria and it remains chemically active on tissue for up to 6 hours (Pace & McCullough, 2010).

Peridex vs Listerine

- ❖ In a group treated with CHX, patients undergoing open heart surgery showed a 52% reduction in the rate of nosocomial pneumonia versus the Listerine group. In patients who were intubated for over 24 h, the rate of nosocomial pneumonia was 72% lower in the CHX group versus the Listerine group. These results demonstrated a lower rate of nosocomial pneumonia for patients treated with chlorhexidine gluconate versus those treated with Listerine rinse (Pace & McCullough, 2010).

Conclusion

- ❖ Maintenance of good oral hygiene has been shown to decrease the risk of aspiration pneumonia across several clinical settings ranging from residential aged-care facilities to neurologic intensive-care units (Kapila, 2021).
- ❖ The observation that aspiration pneumonia occurred less in older people who received professional oral care compared with no such care, indicates the importance of oral health in reducing aspiration pneumonia risk (Dong et al., 2022).
- ❖ However, access to dental hygiene services in the nursing home setting is poor given the supervision restrictions placed on dental hygienists, an area where legislation at the state level must be addressed and changed (Pace & McCullough, 2010).

References

