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Archives of Gerontology and Geriatrics 43 (2006) 157–164
ARCHIVES OF GERONTOLOGY AND GERIATRICS
www.elsevier.com/locate/archger

Professional oral care reduces influenza infection in elderly

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Received 24 May 2005; received in revised form 4 October 2005; accepted 11 October 2005
Available online 2 December 2005

Abstract

Influenza is a major cause of respiratory infection and has a high mortality rate in the elderly. Neuraminidase (NA) on the surface of the influenza virus and bacterial trypsin-like proteases (TLP) play key roles in influenza virus infections. We investigated the effects of oral care on influenza, evaluating in particular the activities of NA and TLP in saliva, as they may contribute to an increased risk of infection with influenza. One hundred ninety elderly patients who visited day care service facilities once a week were randomly assigned to either a professional oral care group or to an own oral care group as the control group. Nine individuals in the control group and one person in the professional oral care group were diagnosed with influenza during the follow-up period. The relative risk of developing influenza while under professional oral care compared to that in the control group was 0.1 (95% CI 0.01–0.81, $p = 0.008$). Significant decreases in numbers of salivary anaerobic bacterial CFUs, and NA and TLP levels were observed in the professional oral care group compared to that in the control group ($p < 0.01$). This study suggests that maintenance of oral hygiene is effective in the prevention of influenza in the elderly.

Keywords: Influenza; Oral care; Oral bacteria; Respiratory tract infections; Risk assessment

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0167-4943/$ – see front matter
doi:10.1016/j.archger.2005.10.004

1. Introduction

Influenza is a serious infectious respiratory disease in the elderly (Nicholson et al., 1997), and the prevention of an annual pandemic of influenza is a matter of urgency (Nicholson et al., 2003). Persons aged over 65 years are at particular risk from influenza, and the infection has a high mortality rate in this age group (Simonsen et al., 1998). A recent study has suggested a relationship between oral care and aspiration pneumonia in the elderly (Yoneyama et al., 1999, 2002). Professional oral care has been found to reduce both cryptogenic fever (Yoneyama et al., 1996; Adachi et al., 2002) and aspiration pneumonia, along with reducing number of oral bacteria (Abe et al., 2001). Impairment of the swallowing reflex in the elderly has been shown to increase the risk of aspiration, providing greater opportunity for oral bacteria to enter the lower respiratory tract with the saliva (Kikuchi et al., 1994). Compromised host defense mechanisms and aspiration both increase the risk of aspiration pneumonia, especially in the elderly (Kikuchi et al., 1994). Deterioration in oral hygiene may lead to an increase in levels of oral bacteria and bacterial enzymes. Bacterial enzymes may injure the oral mucosa and possibly accelerate the onset of viral and bacterial infections (Scannapieco, 1999). It has been reported that bacterial proteases increase the risk of infection with the influenza virus, thus, triggering a further increase in the incidence of pneumonia (Tashiro et al., 1987a,b; Scheiblauer et al., 1992).

Hemagglutinin (HA) and neuraminidase (NA) on the surface of the virus play important roles in infection by and multiplication of the influenza virus. NA cleaves sialic acid at the cell's viral binding site, which may lead to an increased risk of viral infection. NA inhibitors are an important class of influenza drug that prevents both diffusion of the virus and viral activity, and their safety has been confirmed (Kim et al., 1997; Gubareva et al., 2000). Trypsin-like proteases (TLP) produced by bacteria (e.g., *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and pneumococcus) also play a significant role in activating infection by mediating influenza virus HA modification (Tashiro et al., 1987a,b; Scheiblauer et al., 1992). These bacteria reside and multiply in the oral cavity, especially in the elderly (Abe et al., 2001). It has also been reported that NA and TLP are produced by oral bacteria (Leach and Hynes, 1967; Laughon et al., 1982; Loesche et al., 1987). An increase in oral bacteria due to poor oral hygiene increases the activity of both NA and TLP in the oral cavity, and this may increase the risk of infection by and multiplication of the influenza virus.

In this study, we investigated the effects of professional oral care on influenza infection in the elderly by evaluating the total number of colony forming units (CFUs) of anaerobic bacteria and NA and TLP activities in saliva.

2. Patients and methods

2.1. Subjects

The participants consisted of elderly people who lived in their own residences in Tokyo, and who visited day care service facilities once a week. Fully-informed written and verbal