Can Calcium Supplements Prevent Tooth Loss?
Dr. Arthur See-king SHAM and Dr. Kwong-cheung LIM
Faculty of Dentistry, The University of Hong Kong

Introduction

Tooth loss and systemic osteoporosis affect a large number of women and men with incidence increasing with advancing age. Caries, periodontal disease, dental trauma, radiotherapy and poor oral hygiene are predisposing factors of tooth loss. The majority of tooth loss in any age group is caries, and this applies to all tooth-types except incisors, for which periodontal disease is the main cause of tooth loss. Current smokers and diabetics are additional recognizable factors at risk for tooth loss. The number of tooth loss is more severe in poor controlled diabetics due to increased loss of periodontal attachment and alveolar bone from periodontal diseases.

Absorption of calcium and vitamin D, as well as production of vitamin D by the skin declines with increasing age. Reduced ability to absorb calcium mainly contributes to bone loss in aging. Insufficient dietary calcium intake and a reduction in the calcium: phosphorous ratio contributes to osteoporosis because the body tries to maintain the blood calcium level by extracting the calcium from the bony skeleton. The condition of osteopenia or osteoporosis applies also to bone loss in the maxilla and mandible and may potentially lead to loss of teeth. Skeletal bone mineral density was found to be significantly correlated with the alveolar bone loss and to clinical periodontal attachment loss. Women are known to be at greater risk in the development of tooth loss due to acceleration of loss of skeletal bony mass and alveolar crestal height after menopause. Previous studies showed that reduction of bone mineralization may also be linked to increased risk of tooth loss due to periodontal disease, which is characterized by inflammation of the supporting periodontal ligament tissues and resorption of the alveolar bone. It is a major cause of generalized tooth loss leading to complete loss of all teeth in aging adults. In Hong Kong, about 60% of adults aged 35-44 were shown to have abnormally deepened periodontal pocket depth (>3 mm), and 17% had extremely deep pocket depth (>6 mm) beyond self maintenance of oral hygiene. The percentage of those subjects with periodontal pocket depth greater than 3 mm in Hong Kong was found higher than other countries. Alveolar bone destruction observed in periodontal infection is mediated mainly by Actinomyces actinomycetemcomitans - triggered induction of osteoprotegerin ligand (OPG-L), a key modulator of osteoclastogenesis, by CD4 (+) T lymphocytes. This leads to activation of osteoclasts to resorb bone from the jaws, hence compromising the tooth stability.

Low dietary calcium intake and bone mineral density factors are potential risk for periodontal diseases. A study by Nishida et al. 2000 showed that a significant association between low total serum calcium and periodontal diseases was found in younger and older females after adjusting smoking status, gingival bleeding and dietary calcium intake. An elevated level of salivary calcium was found in patients with periodontitis before and after periodontal treatment. Mean dietary calcium intake of Hong Kong Chinese was reported to be 605 mg per day for men and 570 mg per day for women, which was found to be lower than the current Chinese Recommended Dietary Allowances (RDA) for calcium which is 800 mg per day. However, the incidence of hip fractures was found no significantly increased in Chinese when compared with the Australians. Calcium with increased physical exercises has been shown to increase the bone mineral density in elderly women.
Calcium Supplementation

Uhrbom & Jacobson showed that calcium deficiency might not be a cause of destructive periodontal disease. Calcium supplementation for 180 days did not influence the periodontal status of patients with moderate to advanced periodontal diseases. No significant difference was found between patients on a low calcium diet and those receiving an adequate intake measured by plaque index, gingival index, probing depth, mobility, furcation involvement and the radiographic level of alveolar bone. However, other studies demonstrated that increased calcium intake improved the level of inflammatory processes and tooth mobility in patients suffering from gingivitis with bleeding tendency. Nishida et al. suggested that calcium supplementation may modulate periodontal diseases and tooth loss. A correlation of low dietary calcium intake and periodontal diseases was found in young males and females (20-39 years of age), and in older males (40-59 years of age). The relationship between low dietary calcium intake and increased levels of periodontal diseases showed a relative risk of 1.84 for young males, 1.99 for young females, and 1.90 for the older group of males after adjustment for gingival bleeding and tobacco consumption. The dose response was also seen in females with reduced risk of periodontal diseases correlating with increased intake of calcium supplements. A statistically significant correlation between low total serum calcium and periodontal diseases was also confirmed in young females aged 20-39 with relative risk of 6.11 but not in males or older females, after adjusting for tobacco use, gingival bleeding, and dietary calcium intake.

Conclusion

Tooth loss is a multi-factorial problem. Cessation of tobacco smoking, good oral hygiene, and regular dental visits remain the mainstay to prevent periodontal diseases and tooth loss. Increase in communication among medical and dental professionals is important to detect and prevent osteoporosis, periodontal diseases and eventual tooth loss. The question whether calcium supplements can actually benefit the population in preventing tooth loss or not remains controversial at this stage. Further studies are needed to clarify the role of calcium supplementation in the prevention of periodontal diseases and tooth loss.

(For detail of the references, please contact the author, or the Secretariat of the Federation for copy).