failure compared to those placed with a flap procedure. Delayed loading did not have any effect on the failure rate of the dental implants regardless of whether the flapless or flap procedure was employed. However, immediate or early loading of dental implants placed using the flapless procedure had a higher failure rate. In addition, marginal bone loss was greater with the flap procedure than with the flapless technique.

DISCUSSION

The flapless procedure was associated with a higher risk for failure. However, this technique offers several advantages, such as less marginal bone loss, compared to the flap technique.

Zhuang J, Zhao D, Wu Y, et al: Evaluation of outcomes of dental implants inserted by flapless or flapped procedure: A meta-analysis. *Implant Dent* 27:588-598, 2018

Reprints available from C Xu, Dept of Prosthodontics, Shanghai Ninth People's Hosp, Shanghai Jiao Tong Univ School of Medicine, 639 Zhizaoju Rd, Shanghai 200011, China; fax: +86-21-56389950; e-mail: imxuchun@163.com

ORAL MEDICINE

Bone fragility, periodontal disease, and tooth loss

BACKGROUND

Links between periodontal disease and general health are a topic of interest especially as the population ages. With age, patients can develop fragile bones and are more susceptible to falls and fractures. Osteoporosis, a systemic skeletal disease, is a major problem among older women especially and can cause fragility fractures, increased mortality, and a significant economic burden. Having both osteoporosis and periodontitis increases the risk for fractures. A longitudinal study on the possible role of skeletal bone fragility on periodontal status and tooth loss was undertaken to determine if there are links between these conditions.

METHODS

This longitudinal study focused on 134 elderly women (age 65 to 80 years) who were evaluated for bone mineral density (BMD) at the lumber spine, femoral neck, and total hip. They also underwent fracture risk assessment (FRAX). Both were done after 6 and 10 years. Seventy-one women were analyzed at 6 years and 49 at 10 years. The BMD and FRAX data were used to indicate bone fragility in structural equation modeling. These women also underwent periodontal examination and offered information regarding postmenopausal tooth loss and the use of antiresorptive drugs, such as bisphosphonates, to manage systemic bone conditions. The models were used to estimate these patients' relative risk (RR) and 95% confidence interval (CI) of BMD and FRAX for sites with clinical attachment loss (CAL) of 6 mm or greater and for tooth loss.

RESULTS

At 6 years, bone fragility was a significant predictor for severe CAL, even when the patient was taking antiresorptive medication. Poor bone condition measurements were associated with a higher risk for periodontal sites with CAL $\geq$6 mm and tooth loss. When the BMD of the femoral neck was higher, the risk of CAL $\geq$6 mm and tooth loss was lower. At this point, fewer than 20% of the women studied had begun antiresorptive treatment.

At 10 years, bone fragility remained a significant predictor of higher CAL, but neither bone fragility nor CAL were linked to tooth loss. A higher number of interproximal sites with CAL $\geq$6 mm was associated with the BMD of the femoral neck, total hip, and lumbar spine as well as the FRAX related to major fracture and hip fracture. Having a greater BMD of the total hip was associated with a reduced risk for CAL $\geq$6 mm. The FRAX of the hip was linked to a higher risk for more periodontal sites with CAL $\geq$6 mm. In addition, with a better BMD in the total hip, fewer teeth were lost.

When the cross-sectional analysis was done, bone fragility was not related to either severe CAL or tooth loss in persons taking antiresorptive medication. Those not taking this medication who had fragile bones had a significant risk for severe CAL and a trend toward greater tooth loss. Tooth loss was directly associated with dental attendance, although CAL was not. With better bone conditions, the number of interproximal sites with severe CAL and the number of teeth lost were both lower. Adjusting for antiresorptive medication and periodontal maintenance eliminated the significance of these associations.

More than half of the women with osteoporosis were receiving antiresorptive drugs, and 65.1% of those taking these medications had been doing so for more than 3 years. About 90% of the women took oral bisphosphonates.

Analysis of the receiver operating characteristics (ROC) curve revealed an area under the curve of 0.70; the sensitivity was 71.0% and the specificity was 70.0%. These data indicated that

Clinical Significance

Bone fragility is associated with periodontal disease and tooth loss, but there are interventions that dentists can make to improve patients' chances of not having oral health problems. Regular visits for these patients should be stressed, ideally at least twice a year. Dentists need to use these occasions to protect the periodontal tissues, provide support for the remaining teeth, and properly manage any periodontal disease that develops. For patients who have osteoporosis and have been prescribed bisphosphonates, dentists should treat and prevent dental infections before patients begin taking these medications. In addition, dental professionals should encourage these patients to take the medication properly. The provision of these oral preventive strategies should be in conjunction with the patient's physician. This coordination of care between health care professionals can provide a significant effect on the oral and systemic health of older women.

women who had been positively diagnosed with osteoporosis had a 71% likelihood of having at least 2 interproximal periodontal sites with CAL $\geq$6 mm. Those with normal BMD had a 70% chance of not having severe periodontal disease.

DISCUSSION

Among these older women, having a compromised skeletal system condition was predictive of severe periodontal disease within 10 years. Taking antiresorptive medications strongly attenuated this relationship. This medication influences bone fragility and can prove effective if it is taken for sufficient time. Another protective measure is making regular visits to the dentist for evaluation and management of oral conditions such as periodontitis.

Penoni DC, Leão ATT, Torres SR, et al: Effects of bone fragility and antiresorptive drugs on periodontal disease and tooth loss: A longitudinal study. *JDF Clin Translational Res* 3:378-387, 2018

Reprints available from DC Penoni, Dept of Preventive Dentistry, Odontoclinica Central da Marinha, Brazilian Navy, Praça Barão de Ladário, 1, Centro, 22091-00, Rio de Janeiro, Brazil; e-mail: ciapenoni@yahoo.com

PEDIATRIC DENTISTRY

Managing cavitated primary molar caries lesions

BACKGROUND

The 3 primary approaches to the management of cavitated primary molar caries are conventional caries removal and restoration (CR), non-restorative cavity control (NRCC), and the Hall technique (HT). CR aims to eliminate carious tissues and restores the tooth, but is associated with a high risk for pulp complications and failure of the restoration. NRCC controls the activity of the lesion by removing overhanging enamel and dentin as indicated, then follows up with repeated, regular biofilm removal and fluoride application, which requires high patient or parent adherence in managing the lesion. HT seals carious tissue in the cavity under a stainless steel crown without removing any tissue or performing tooth preparation. The only preparation is the use of orthodontic separators as indicated to permit the crown to be fitted where teeth fit tightly together. Studies to date have focused on the ability of these various approaches to manage the tooth clinically. A cost-effectiveness evaluation of HT, NRCC, and CR was conducted to determine what each approach costs the payer.

METHODS

The 142 children (ages 3 to 8) each had at least 1 cavitated occlusal-proximal caries lesion in a primary molar. Participants were randomly assigned to receive HT, NRCC, or CR and were followed for 2.5 years. The German health care system perspective was selected, and reimbursement and costs were based on fee items in German item catalogs. The primary outcome was estimated molar survival, with secondary aims of not needing extraction, having no pain or endodontic treatment or extraction, and not needing any re-intervention. The costs included charges for the initial care, maintenance, and endodontic/restorative/extraction retreatment. Bootstrapped samples were used to estimate cumulative cost-effectiveness and cost-effectiveness acceptability.

RESULTS

The longest survival of the molars was with HT treatment, with a mean of 29.7 months and a range from 26.6 to 30.5 months. The NRCC molars survived a mean of 25.3 months with a range from