

to unity. Similar results were obtained in a gender-specific analysis.

For MI/IS, the AIRRs after high-risk IDTs were similar to those for the primary analysis. AIRRs for burns were 0.75 for 1 to 3 days and 1.18 for 8 to 14 days after IDTs. The burn AIRRs for the other risk periods showed no statistical significance.

A subgroup analysis of AIRRs of MI/IS focused just on patients over age 50 years yielded results similar to those for the primary analysis.

The sensitivity analysis that excluded patients with previous comorbidities yielded AIRRs of MI of 1.16 for 1 to 3 days and 1.13 for 4 to 7 days after IDTs. Those for the remaining risk periods were close to unity and of no statistical significance. The AIRRs of IS in this population were 0.97 for 1 to 3 days but increased thereafter to 1.10 to 1.13, which were statistically significant results, when the risk exposure periods increased. A sensitivity analysis excluding patients who died within 30 days of MI/IS yielded results similar to those of the primary analysis.

## DISCUSSION

IDTs and transient risk of either MI or IS showed no substantial association. High-risk IDTs, which can cause more bleeding, also lacked any relationship to either MI or IS. The evidence for

various subgroup analyses also did not support a relationship between IDTs and MI or IS.

### Clinical Significance

No strong association could be found between the risk for MI/IS and IDTs or high-risk IDTs in this Taiwanese population. A modest relationship was noted for IDTs and an acute incidence for MI in otherwise healthy participants, but age did not influence this relationship. Studies are needed to determine if a long-term relationship is present between dental infections and diseases and MI/IS.

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# Missing teeth indicate cardiovascular event risk



## BACKGROUND

Caries and periodontal disease are the primary reasons for the loss of teeth. Poor oral health has been found to be associated with subclinical atherosclerosis and cardiovascular disease (CVD), although no causality has been clearly proved. Oral disease and CVD share risk factors such as age, male sex, smoking, diabetes, hypertension, and obesity. The link between oral disease and CVD may be explained by chronic inflammation and repeated bacteremia from the oral cavity. Tooth loss is a simple way to indicate the accumulated inflammatory burden of oral disease and has been associated independently with cardiovascular events and mortality in epidemiologic studies. The association between oral health as represented by tooth loss and long-term cardiovascular outcomes was evaluated in a nationwide population-based cohort in Korea.

## METHODS

The data were taken from the National Health Insurance Service (NHIS), which provides health care benefits and regular health checkups for the Korean population. A total of 4,440,970 subjects were included in the analysis and followed up to 2016. Each had standardized health examinations performed in

hospitals. These included dental examinations by a dentist, completion of a questionnaire for dental hygiene, and oral health instructions. Number of teeth lost and presence of periodontal disease were noted. The maximum number of teeth was defined as 28, excluding third molars. Groups were then divided according to the number of teeth lost as 0, 1-4, 5-14, 15-27, and 28, which was considered edentulous. The outcomes investigated were myocardial infarction (MI), ischemic stroke, heart failure (HF), and all-cause mortality. Follow-up lasted a median of 7.59 years.

## RESULTS

The mean age of the population at baseline was 42.5 years, and 61.6% were men. Just 2.2% had 5 or more teeth missing, with 97.8% having fewer than 5 teeth missing. Higher tooth loss was noted in the older patients, who also had a higher prevalence of chronic diseases and a higher proportion of low-income individuals.

During follow-up, 68,063 subjects (1.5%) died. Among the survivors, 31,868 (0.8%) had MIs, 22,637 (0.5%) had HF, and 30,941 (0.7%) suffered stroke. Overall incidence rates were 0.95 per

1000 person-years for MI, 0.67 for HR, 0.92 for stroke, and 2.0 for all-cause death among the total population.

The incidence rates for cardiovascular events increased nearly linearly in proportion to the number of teeth lost. Higher levels of tooth loss were associated with an increased risk for MI, HR, stroke, and death. Tooth loss was an independent risk factor for cardiovascular events in multivariable analysis.

A graded and independent risk was observed between tooth loss and all cardiovascular outcomes. Persons at highest risk were those having 15 or more missing teeth. The association tended to be stronger as the number of teeth lost increased and persisted after adjusting for other cardiovascular risk factors. A substantial increase in the risk for all cardiovascular outcomes was seen in those having 5 or more teeth missing. However, even missing 1 to 4 teeth was associated with a higher risk for MI, stroke, and death. The highest cardiovascular risk was found for edentulous persons, except for MI. The association between tooth loss and mortality was the strongest. An increase by 1 missing tooth was associated with a 1.0% risk increase for MI, a 1.6% risk increase for HF, a 1.5% risk increase for stroke, and a 2.2% risk increase for death.

Subgroup analyses were also done for sex, presence of periodontitis, hypertension, body mass index (BMI) and dyslipidemia, drinking, diabetes mellitus, smoking, income level, and exercise habits, among other variables. In general, the subgroup analyses yielded the same results, except those focused on age and presence of periodontitis. Thus residual confounding by sex, socioeconomic status, smoking, or comorbidities is unlikely to explain the relationships between tooth loss and cardiovascular outcomes.

## DISCUSSION

Consistently strong and dose-dependent relationships were shown between the number of missing teeth and incident MI, HF, ischemic stroke, and mortality after adjusting for age, BMI, other cardiovascular risk factors, and socioeconomic status. The strongest association was seen for mortality, with other relationships, in order, being those with MI, HF, and stroke. An increase of 1 missing tooth was associated with about a 1% increase in MI, a 1.5% increase in HF, a 1.5% increase in stroke, and a 2% increase in mortality. Even a small number of missing teeth carried an increased risk for MI, stroke, and death. Sex, socioeconomic status, smoking and comorbidities were unlikely to provide any residual confounding in these relationships.

### Clinical Significance

With these data in mind, physicians may be able to help distinguish which of their patients are at higher cardiovascular risk simply by determining the number of missing teeth they have. Number of missing teeth appears to be a very good predictor of incident MI, HF, ischemic stroke, and all-cause death.

Lee HJ, Choi EK, Park JB, et al: Tooth loss predicts myocardial infarction, heart failure, stroke, and death. *J Dent Res* 98:164-170, 2019

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## PAIN CONTROL

### Articaine versus lidocaine for inferior alveolar nerve block



#### BACKGROUND

Lidocaine has been considered the 'gold standard' for local anesthetics since 1949. Other alternatives have been developed to permit a faster action with a shorter half-life. Articaine is popular because it produces a more profound anesthesia than lidocaine, achieves anesthesia in a shorter period of time, and has a longer duration of anesthesia. Many studies find articaine to be more efficient than lidocaine. The only downside to the use of articaine involves safety. Articaine has been associated with a risk of damaging the inferior alveolar nerve and causing temporary or permanent paresthesia, but the evidence is not conclusive. A

mini systematic review of the literature was done to determine if a 4% articaine solution is more likely than a 2% lidocaine dose to injure the inferior alveolar or lingual nerve when given to produce an inferior alveolar nerve block.

#### METHODS

The databases consulted were the MEDLINE with Full Text, Dentistry & Oral Sciences Source, and Cochrane Library. Seven studies met the inclusion criteria. One was a double-blind random controlled trial (DBRCT) and 6 were retrospective cohort studies.