Lack of Correlation between Benign Brain Tumors and Markers of Oral Health

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ABSTRACT

Case control studies implicating dental X-rays in the genesis of intracranial meningiomas have yielded conflicting results. To further evaluate what risk, if any, that intracranial meningioma might be associated with dental X-rays, we examined the association of benign brain tumor incidence with the number of dentists and other correlates of oral health in U.S. states and the District of Columbia. We compared these correlations to the association of the same markers of oral health with Alzheimer's death rates. Poor oral health, especially periodontal disease, is a well-established risk factor for dementia.

Results: **Pearson correlations, number of cases (49, no data from Kansas or Maryland) and significance (2 tailed p values) of benign brain tumor incidence and parameters of oral health are presented. None of the correlations approached statistical significance. In contrast, Alzheimer's deaths by state were negatively correlated with number of dentists and other markers of oral health.**

Conclusion: **Our finding of a total lack of correlation between benign brain tumors and markers of oral health and, by implication, dental X-rays, suggests there may be no relationship between dental X-rays and meningioma or other benign brain tumors. This conclusion is strengthened by our demonstration of the known negative correlation between Alzheimer's and dental care.**

Meningioma is the most frequently occurring brain tumor, comprising more than a third of all benign and malignant brain neoplasms.[1] But case control studies implicating dental X-rays in the genesis of intracranial meningiomas have yielded conflicting results.[2-7] Longstreth et al. found that dental X-rays involving full-mouth series performed 15 to 40 years before their 2005 study, when radiation exposure from a full-mouth series was much greater than in 2005, were associated with an increased risk of meningioma.[8] They did not observe an increased risk with bitewings, lateral cephalometric or panoramic radiographs. Claus et al. also reported that exposure to dental X-rays performed in the past, especially bitewings, increased the risk of intracranial meningioma.[9]

TABLE 1
Pearson Correlations, Number of Cases (49, no data from Kansas or Maryland) and Significance (2 tailed p values) of Benign Brain Tumor Incidence and Parameters of Oral Health. (None of the correlations approached significance.)

CLEANED TEETH YES	Pearson Correlation	0.058
	Sig. (2-tailed)	0.691
	N	49
CLEANED TEETH NO	Pearson Correlation	-0.128
	Sig. (2-tailed)	0.382
	N	49
LOST ALL TEETH YES	Pearson Correlation	0.134
	Sig. (2-tailed)	0.359
	N	49
LOST ALL TEETH NO	Pearson Correlation	-0.056
	Sig. (2-tailed)	0.7
	N	49
DENTAL VISITS YES	Pearson Correlation	0.056
	Sig. (2-tailed)	0.7
	N	49
DENTAL VISITS NO	Pearson Correlation	-0.089
	Sig. (2-tailed)	0.545
	N	49
DENTISTS PER POPULATION	Pearson Correlation	0.089
	Sig. (2-tailed)	0.545
	N	49

TABLE 2
Pearson Correlations, Number of Cases and Significance (2 tailed p values) of Age-adjusted Alzheimer's Death Rate and Parameters of Oral Health in 50 U.S. States and District of Columbia. (All of the correlations were significant.)

CLEANED TEETH YES	Pearson Correlation	-.311(*)
	Sig. (2-tailed)	0.027
	N	51
CLEANED TEETH NO	Pearson Correlation	.311(*)
	Sig. (2-tailed)	0.027
	N	51
LOST ALL TEETH YES	Pearson Correlation	.408(**)
	Sig. (2-tailed)	0.003
	N	51
LOST ALL TEETH NO	Pearson Correlation	-.408(**)
	Sig. (2-tailed)	0.003
	N	51
DENTAL VISITS YES	Pearson Correlation	-.313(*)
	Sig. (2-tailed)	0.025
	N	51
DENTAL VISITS NO	Pearson Correlation	.313(*)
	Sig. (2-tailed)	0.025
	N	51
DENTISTS PER POPULATION	Pearson Correlation	-.483(**)
	Sig. (2-tailed)	<0.001
	N	51

*Correlation is significant at 0.05 level, 2-tailed. **Correlation is significant at 0.01 level, 2-tailed.

To further evaluate what risk, if any, that intracranial meningioma might be associated with dental X-rays, we examined the association of benign brain tumor incidence with the number of dentists and other correlates of oral health in U.S. states and the District of Columbia. People who have the least access to preventive services and dental treatment have greater rates of oral diseases.[10,11]

We compared these correlations to the association of the same markers of oral health with Alzheimer's death rates. Poor oral health, especially periodontal disease, is a well-established risk factor for dementia.[12-15]

Methods

Age-adjusted data on benign brain tumor incidence by state are from CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2005–2009.[1] Data on number of dentists per 10,000 population in 50 U.S. states and the District of Columbia are from Table 1.[12] (Active dentists, by state, 1993-2008, US Centers for Disease Control and Prevention, National Center for Health Statistics, http://www.cdc.gov/nchs.)

Data on Dental Visits: Percent adults aged 18+ who have visited a dentist or dental clinic in the past year (yes and no).

Teeth Cleaning: Percent adults aged 18+ who have had their teeth cleaned in the past year (among adults with natural teeth who have ever visited a dentist or dental clinic, yes and no).

Complete Tooth Loss: Percent adults aged 65+ who have lost all of their natural teeth due to tooth decay or periodontal disease (yes and no).

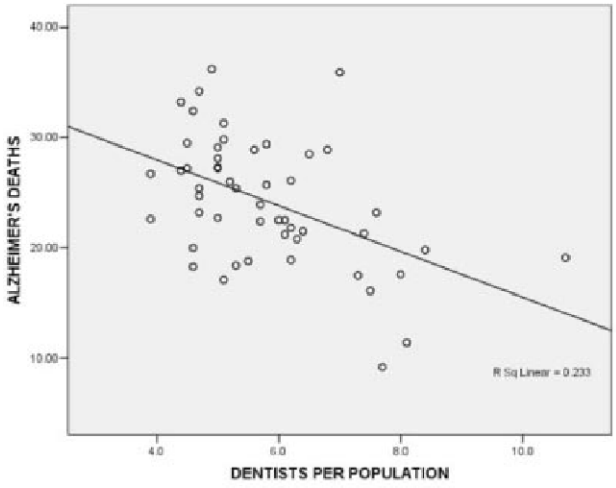
Lost Six or More Teeth: Percent adults aged 65+ who have lost six or more teeth due to tooth decay or periodontal disease (yes and no) are from BRFSS (Behavioral Risk Factor Surveillance System 2008), the US Centers for Disease Control and Prevention survey, which tracks health risks in the United States (www.cdc.gov/brfss). Survey methods have been described in detail elsewhere.[16]

Age-adjusted Alzheimer's death rates by state are from the Alzheimer's Association.[17]

Results

Pearson correlations, number of cases (49, no data from Kansas or Maryland) and significance (2 tailed p values) of benign brain tumor incidence and parameters of oral health are listed in Table 1. None of the correlations approached statistical significance.

In contrast, Alzheimer's deaths by state were negatively correlated with number of dentists (Figure 1). Pearson correlations, number of cases and significance (2 tailed p values) of age-adjusted Alzheimer's death rates and parameters of oral health are listed in Table 2. All of the correlations were significant.



Discussion

White et al. noted that radiation exposure from dental X-rays is too low to cause tumors.[18] Calnon found multiple inconsistencies in the Claus et al. study and that the odds ratios Claus et al. calculated were small and of borderline statistical significance.[19] Jorgensen concluded that radiation-induced meningioma risks cannot possibly be as high as Claus et al. suggested.[20] Our finding of lack of correlation between benign brain tumor and markers of oral health is in agreement with White et al., Jorgensen and Calnon.

A weakness in our analysis is possible confounding by the ecological fallacy (or ecological inference fallacy), a logical fallacy in the interpretation of statistical data where inferences about the nature of individuals are derived from inference for the group to which those individuals belong.[21] In this case, inferences about individuals are being drawn from the characteristics of the U.S. states where they reside, rather than from the individuals themselves.

Nevertheless, our finding of a total lack of correlation between benign brain tumors and markers of oral health and, by implication, dental X-rays, suggests that there may be no relationship between dental X-rays and meningioma or other benign brain tumors. This conclusion is strengthened by our demonstration of the known negative correlation between Alzheimer's and dental care.

Queries about this article can be sent to Dr. Lehrer at stevenlehrer@hotmail.com.

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