TRENDS BETWEEN MEDIAL ARTERIAL CALCIFICATIONS AND CHOLESTEROLEMIA

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Objective

To evaluate the association between hypercholesterolemia and medial arterial calcifications. Describe incidental findings detected on CBCT scans of persons with hypercholesterolemia compared with matched controls.

Background

2 in 5 adults in the United States have high cholesterol (total blood cholesterol ≥ 200 mg/dL). High cholesterol puts you at risk for heart disease and stroke, two leading causes of death globally. Atherogenesis is the formation of fatty plaques in arteries resulting in inflammation and mineral deposits within the medial and internal regions of arteries. Crystallization leads to vascular calcification which can be detected on radiographs. The prevalence of incidental findings on CBCT scans taken for dental treatment is high, with vascular calcification being a significant finding. Due to the high morbidity and mortality rates associated with CVD, it is imperative to identify CVD biomarkers as early as possible. If a patient's dental CBCT scan is reviewed and radiographic markers such as vascular calcifications or other incidental findings are displayed, prompt referral to a specialist can be instituted.
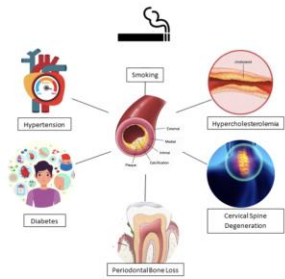
Schema

Figure 1: Possible Risk Factors for Medial Arterial Calcifications (MAC)

Methods

Large field of view (FOV) CBCT scans of the head and neck were collected from the data bank of the TORCH vascular calcification study at Penn Dental School (IRB number 849252). Electronic Health Records of participants was reviewed for history of comorbidities such as hypertension, hypercholesterolemia, diabetes, and habits such as smoking. Fifty one cases, those with hypercholesterolemia, were matched with controls on age (+/- 5years and gender). All CBCT scans of participants were analyzed for periodontal bone loss severity, presence of MAC, cervical spine degenerative changes, other types of calcifications and other findings.

Images

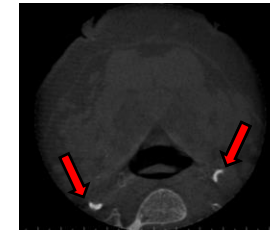Figure 2: Coronal section CBCT showing severe MAC of the Internal Carotid Artery

Figure 3: Axial section CBCT; Severe External Carotid Artery Calcifications
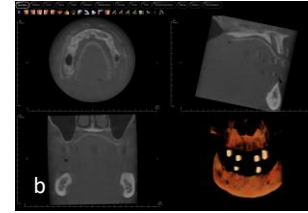

Figure 4a & b: Same patient in figure 3 with severe periodontal bone loss in 2018 (left), becoming edentulous in 2019 (right)

Results

Characteristics	Cholesterolemia Present (n=51)	Matched Subjects (n=51)	p-value
Sex: Female	33 (65%)	33 (65%)	1.00
Mean Age (s.d.)	66.7 (9.7)	65.9 (10.0)	0.70
History of Smoking	19 (38%)	14 (28%)	0.40
Diabetes Mellitus present	23 (45%)	9 (18%)	0.005
HTN present	39 (76%)	25 (49%)	0.007
Periodontal Bone Loss: Mild/Moderate	32 (63%)	25 (49%)	0.23
Severe	19 (37%)	26 (51%)	

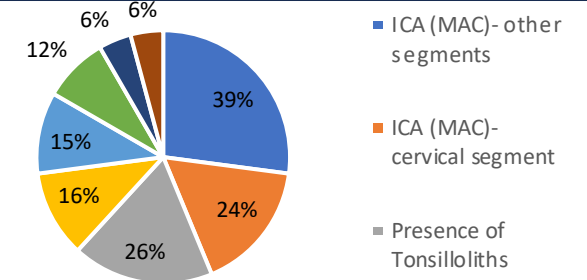Table 1: Characteristics of Participant Population

Results

Figure 5: Prevalence of Calcifications Among the Sample Population

Cholesterolemia Status	DM Status	ICA present	p-value
Present	Present	10/23 = 43%	0.78
	Absent	14/28 = 50%	
Absent	Present	6/9 = 67%	0.02
	Absent	10/42 = 24%	

Table 2. Presence of ICA by Diabetes Status Broken Out by Cholesterol Status

Discussion

☐ The prevalence of vascular calcification is high among the participants
☐ Those with hypercholesterolemia were more likely to have either MAC on CBCT scans than those without hypercholesterolemia
☐ Those who have hypercholesterolemia and periodontal lesions are more likely to demonstrate signs of MAC on CBCT scans

Clinical Significance/ Future Directions

The trends found between medial arterial calcifications, diabetes and hypercholesterolemia using CBCT scans can provide definitive radiological biomarkers that aid early diagnosis. Our next step is to recruit more participants to increase the sample size.

References:

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