Carotid ultrasound with plaque quantification is predictive of occlusive coronary artery disease in patients with and without CKD

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Background

▪CKD is an important risk factor for cardiovascular disease, and CVD related causes are the most common causes of death for CKD patients.

▪Coronary angiography is the clinical standard test to evaluate for occlusive coronary disease, but can be nephrotoxic.

▪Non-invasive methods to detect coronary disease in chronic kidney disease (CKD) patients are desirable to enable risk stratification, cardiovascular disease (CVD) treatment and improved CVD morbidity and mortality in CKD.

▪Quantification of maximal carotid artery plaque height is an emerging surrogate for coronary intimal atherosclerosis, and has been correlated with coronary events in the general population. [1,2]

▪In CKD, maximal carotid artery plaque height has not been extensively evaluated as a means of quantifying coronary intimal atherosclerosis.

Objectives

Our primary hypothesis was that the maximal carotid plaque height would be associated with clinical significant epicardial coronary artery stenosis in patients with and without CKD.

The primary objective was to determine if carotid artery disease quantified by two different non-invasive methods, carotid intimal media thickness (CIMT) and maximal carotid artery plaque height, would be predictive of occlusive coronary artery disease in a population with and without CKD.

Methods

•320 consecutive outpatients referred for clinically indicated coronary angiography were recruited. Of these, 266 patients had data to estimate kidney function and were included. All patients had coronary angiography and carotid ultrasound on the same day.

• Maximal carotid artery plaque height, and CIMT were measured by carotid ultrasound. CKD was defined as eGFR < 60 ml/min/1.73 m^2. Coronary artery disease was defined as at least 1 major epicardial coronary artery with greater than 50% luminal narrowing as per coronary angiography.

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Results

•Table 1 describes patient characteristics by the presence or absence of greater than 50% stenosis by angiography. Patients with coronary stenosis had significantly increased maximal carotid artery plaque height, whereas CIMT did not differ between patients with and without coronary stenosis.

Table 1: Comparison of patients with and without coronary stenosis (N=266)

Variable	Stenosis < 50 %	Stenosis > 50%	P
Age	64 ± 13	66.5 ± 11	0.07
BMI	29.5 ± 6	30.0 ± 6	0.6
eGFR	73.0 ± 19	67.8 ± 23	0.07
Smoker	13%	18%	0.44
HTN	69%	74%	0.52
Lipids	58%	80%	0.001
Male	48%	75%	0.0001
Diabetes	26%	32%	0.43
CIMT (mm)	0.84 ± 0.2	0.88 ± 0.3	0.18
Plaque Height (mm)	1.81 ± 1	2.64 ± 0.9	0.0001

Table 2: Logistic Regression Risk Factors for > 50% stenosis

•By multivariable logistic regression adjusted for age, sex, hyperlipidemia , hypertension and CKD, maximal carotid plaque height was a predictor of coronary artery stenosis of 50% or more. In considering only patients with renal disease (eGFR < 60; N=76) this relationship remained robust.

Factor	Odds ratio	P
Plaque Height (all pts)	3.15 (95% CI 1.99-4.98)	0.0001
Plaque Ht (CKD only)	4.5 (95% CI 1.6 – 13)	P=0.005

Conclusions

•The maximal carotid plaque height, and not CIMT, was associated with clinically significant epicardial coronary stenosis in patients with and without CKD.

•Selecting which CKD patients could benefit from coronary angiography despite the potential nephrotoxicity is important since CVD remains the most common cause of death in CKD.

•Future directions: Carotid ultrasound with plaque quantification may serve to aid the selection of patients who would benefit from coronary angiography and these results appear to be generalizable to the CKD population.

References

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183--MP

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