PREDICTING ARTERIAL STIFFNESS USING SKIN AUTOFLUORESCENCE IN PERITONEAL DIALYSIS PATIENTS

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BACKGROUND & AIMS

Cardiovascular disease (CVD) is the most common cause of death in ESRD patients. Advanced glycation end products (AGEs), e.g., pentosidine and carboxymethyl lysine (CML), which contribute to vascular pathology, are formed at a greater rate in the plasma of these patients. Accumulated AGEs in skin tissue are markers of cumulative oxidative stress and can be measured non-invasively using skin autofluorescence. The autofluorescence reader is a well suited non-invasive technique for clinical usage and does not require extensive training to operate. However, the suitability of the autofluorescence reader in a clinical setting is still not determined.

Aims: To study if skin autofluorescence measurements predict arterial stiffness and associate with the AGE biomarkers pentosidine and CML in PD patients.

PATIENTS & METHODS

A total of 68 patients on PD were included.

Skin autofluorescence was measured using an autofluorescence reader (AGE-Reader®, DiagnOptics, Groningen, The Netherlands).

A sphygmograph (SphygmoCor®, AtCor Medical, Sydney, Australia), measured the peripheral pulse waveform at the radial artery and was used to calculate augmentation index (AIx), which assesses arterial stiffness.

The plasma levels of pentosidine and CML were quantified using HPLC and ELISA, respectively.

RESULTS

Baseline characteristics (n=68)

Age, years	65.0 (56.3 - 76.3)
Female, n (%)	23 (33.8)
Smoking, n (%)	15 (22.1)
Body mass index, kg/m²	24.9 (23.3 - 28.0)
Diabetes, n (%)	19 (27.9)
Mean blood pressure, mmHg	99.5 (90.0 - 108.5)
Skin autofluorescence, AU	3.5 (3.1 - 4.2)
CML, µg/ml	0.8 (0.7 - 1.1)
Pentosidine, pmol/mg albumin	27.3 (16.9 - 39.3)
Albumin, g/l	32.0 (28.0 - 35.0)
Hemoglobin, g/l	120.0 (113.0 - 126.0)
hsCRP, mg/l	4.0 (1.3 - 9.4)
Triglyceride, mmol/l	1.9 (1.4 - 2.4)
Total cholesterol, mmol/l	5.1 (4.4 - 5.9)
LDL cholesterol, mmol/l	2.9 (2.3 - 3.6)
HDL cholesterol, mmol/l	1.2 (1.0 - 1.6)
CVD, n (%)	20 (29.4)
Malnutrition[d], n (%)	27 (39.7)
Dialysis vintage, months	11.2 (6.2 - 29.4)
AIx, %	27.0 (20.0 - 32.0)
Residual GFR, ml/min/1.73m²	2.9 (1.4 – 4.7)

Factors associated with Aix (arterial stiffness)

	Bivariate		Multivariate model (adj r^2 = 0.32)	
	Rho	p	(β ± SE)	p
Gender (female)	-0.45	<0.01	**-0.37 ± 2.24**	**<0.01**
Skin autofluorescence, AU	0.44	<0.01	**0.24 ± 1.34**	**0.03**
Dialysis vintage, months	0.40	<0.01	**0.22 ± 0.04**	**0.03**
hsCRP, mg/l	0.28	0.02	**0.20 ± 0.08**	**0.06**
Age, years	0.24	<0.05		
Albumin, g/l	-0.38	<0.01		
CML, µg/ml	0.29	0.02		

Factors associated with skin autofluorescence

	Bivariate		Multivariate model (adj r^2 = 0.21)	
	Rho	p	(β ± SE)	p
Age, years	0.29	0.02	**0.34 ± 0.01**	**<0.01**
Diabetes	0.32	0.01	**0.31 ± 0.20**	**0.01**
Smoking	0.25	0.04	**0.23 ± 0.21**	**0.04**
Triglyceride, mmol/l	-0.24	<0.05		
CML, µg/ml	0.39	<0.01		
hsCRP, mg/l	0.24	<0.05		
Albumin, g/l	-0.42	<0.01		
Dialysis vintage, months	0.28	0.02		
Gender (female)	-0.23	0.06		

Spearman's rank test was used to assess bivariate associations.
A multiple linear backward regression analysis was performed to assess independent associations.

Skin autofluorescence predicted arterial stiffness irrespective of gender, dialysis vintage and CRP levels.

Skin autofluorescence associated with age, presence of diabetes, smoking, dialysis vintage, and plasma levels of albumin, hsCRP, triglycerides and carboxymethyl lysine (CML).

An unexpected finding was that pentosidine did not correlate with the autofluorescence readings.

CONCLUSIONS

This study showed that skin autofluorescence is a potential measure showing promise as a non-traditional risk factor of arterial stiffness and CVD in PD patients. The study further contributes to existing knowledge of the link between oxidative stress and CVD and warrants an interest for longitudinal studies as well as AGE-degrading (using AGE-breaker substances) intervention studies in ESRD patients.

References

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