Relationship between dynamic penile duplex ultrasound and retinal microcirculation in patients with erectile dysfunction

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INTRODUCTION

Vascular erectile dysfunction (ED) is closely associated with increased cardiovascular risk and may precede major cardiovascular events. Dynamic-penile duplex ultrasound (D-PDU) is the gold standard for discriminating between vascular and non-vascular etiologies of ED. Retinal microcirculation, assessed non-invasively by adaptive optics, reflects systemic microvascular remodeling and may provide an early marker of vascular damage.

OBJECTIVES

To inquire the relationship between retinal microcirculatory parameters can differentiate between vascular and non-vascular ED and support cardiovascular risk stratification .

MATERIALS AND METHODS

This is a prospective longitudinal observational study including adult males with clinically diagnosed ED undergoing D-PDU. Clinical history, ongoing treatments, and IIEF-5 score will be recorded. D-PDU will include cavernous artery caliber, peak systolic velocity (PSV), end-diastolic velocity (EDV), and cavernous intima-media thickness (IMT). We used a cutoff of ≤35 cm/s for PSV, >5 cm/s for EDV, and ≥0.3 mm for IMT to consider impairment. Retinal microcirculation assessment was performed using adaptive optics, with measurements of inner and outer diameters, wall thickness, wall cross-sectional area (WCSA), and wall-to-lumen ratio (WLR); flicker light stimulation was used to measure vasodilatory responses.

RESULTS

Patients with impaired PSV were older and had a higher cardiovascular risk profile. No significant association was observed between PSV and retinal structural or functional parameters. Conversely, patients with pathological EDV showed lower flicker-induced retinal vasodilatation ($p = 0.042$), and EDV values correlated with percentage vasodilatation ($r = -0.353$, $p = 0.017$). Patients with increased IMT had higher retinal WLR ($p = 0.026$), and IMT values correlated with WLR ($r = 0.274$, $p = 0.017$). In multivariable analysis, IMT and hypercholesterolemia were independent predictors of mean PSV, whereas age and waist circumference predicted pathological PSV.

Variables	PSV, cm/s	EDV, cm/s	IMT, mm	IIEF-5	WCSA, µm²	WLR	Vasodilatation, %
PSV, cm/s	-						
EDV, cm/s	-0.225*	-					
IMT, mm	-0.632†	0.314**	-				
IIEF-5	0.326**	-0.272*	-0.256	-			
WCSA, µm²	0.076	-0.118	-0.173	0.034	-		
WLR	-0.167	0.116	0.274*	-0.292*	-0.155	-	
Vasodilatation %	-0.008	-0.353*	-0.114	0.011	-0.049	0.000	-

Correlation results between main D-PDU and AO – *p<0.050; **p<0.01; †p<0.001

EDV = end-diastolic velocity; IIEF-5 = international index of erectile function-5; IMT = intima-media thickness; PSV= peak systolic velocity; WCSA = wall cross-sectional area; WLR = wall-to-lumen ratio.

DISCUSSION AND CONCLUSIONS

These preliminary findings suggest a novel link between D-PDU abnormalities and retinal microcirculation in men with ED. In particular, IMT was associated with WLR, while impaired EDV was associated with a reduced vasodilatory response. These data support the hypothesis that penile and retinal microcirculation may share a common vascular substrate. Further in-depth studies are warranted to confirm the findings and assess their diagnostic and prognostic relevance

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