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Original article

Semi-automatic measuring of arteriovenous relation as a possible silent brain infarction risk index in hypertensive patients ☆,☆☆



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ABSTRACT

Objective: To evaluate the usefulness of a semiautomatic measuring system of arteriovenous relation (RAV) from retinographic images of hypertensive patients in assessing their cardiovascular risk and silent brain ischemia (ICS) detection.

Methods: Semi-automatic measurement of arterial and venous width were performed with the aid of Imedos software and conventional fundus examination from the analysis of retinal images belonging to the 976 patients integrated in the cohort Investigating Silent Strokes in Hypertensives: a magnetic resonance imaging study (ISSYS), group of hypertensive patients. All patients have been subjected to a cranial magnetic resonance imaging (RMN) to assess the presence or absence of brain silent infarct.

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☆☆ Other results derived from this project have also been presented at: XVIII Jornada de Recerca Sanitària al Maresme. Mataró (Spain), June 18, 2015; 35 Congreso de la Sociedad Española de Medicina Familiar y Comunitaria. Gijón (Spain), June 11-13, 2015; 20th WONCA Europe Conference. Istanbul (Turkey), October 22-25, 2015.

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Arterial hypertension
Retinography
Silent brain infarct
Stroke
Semi-automatic retinal vessel
quantification

Results: Retinal images of 768 patients were studied. Among the clinical findings observed, association with ICS was only detected in patients with microaneurysms (OR 2.50; 95% CI: 1.05–5.98) or altered RAV (<0.666) (OR: 4.22; 95% CI: 2.56–6.96). In multivariate logistic regression analysis adjusted by age and sex, only altered RAV continued demonstrating as a risk factor (OR: 3.70; 95% CI: 2.21–6.18).

Conclusions: The results show that the semiautomatic analysis of the retinal vasculature from retinal images has the potential to be considered as an important vascular risk factor in hypertensive population.

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Medición semiautomática de la relación arteriovenosa retiniana como posible marcador de riesgo de infarto cerebral silente en pacientes hipertensos

R E S U M E N

Palabras clave:

Fondo de ojo
Retinopatía
Ratio arteria vena
Hipertensión arterial
Retinografía
Isquemia cerebral silente
Ictus
Medición semiautomática de la
microcirculación retiniana

Propósito: Evaluar la utilidad de un sistema semiautomático de medición de relación arteriovenosa (RAV) retiniana sobre imágenes retinográficas de pacientes hipertensos en la valoración del riesgo cardiovascular y la detección de isquemia cerebral silente (ICS).

Método: Un total de 976 pacientes de la cohorte Investigating Silent Strokes in Hypertensives: a magnetic resonance imaging study (ISSYS) estudiados mediante resonancia magnética craneal para valorar la presencia o no de ICS fueron invitados a realizar una retinografía para un examen convencional de fondo de ojo y una medición semiautomática del promedio de los calibers vasculares para el cálculo de la relación arteriovenosa (RAV).

Resultados: Se analizaron las retinografías de 768 pacientes. Entre las lesiones observadas, solamente se encontró una asociación con la detección de ICS en aquellos pacientes con microaneurismas (OR: 2,50; IC 95%: 1,05–5,98) o una RAV alterada (<0,666) (OR: 4,22; IC 95%: 2,56–6,96). En el análisis de regresión logística multivariante ajustado por edad y sexo, solamente la RAV alterada continuó manifestándose como un factor de riesgo (OR: 3,70; IC 95%: 2,21–6,18).

Conclusiones: Los resultados muestran que el análisis semiautomático de la vasculatura retiniana a partir de retinografías tiene el potencial de ser considerado como un factor de riesgo vascular importante en la población hipertensa.

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Introduction

The existence of ischemic events in the central nervous system without apparent clinic repercussion has been known under different denominations for a number of decades¹ up to the most recent denomination of silent cerebral ischemia (SCI). However, the advent of modern imaging diagnostic methods, mainly nuclear magnetic resonance (NMR), have enabled in-depth studies of SCI characteristics and incidence.² A recent systematic review by Fanning et al.³ provided epidemiological data that evidence a prevalence in the general population between 5% and 62%, although the majority of reviewed studies report a prevalence between 10 and 20%. Longitudinal studies report annual incidence rates between 2% and 4%.

Factors exhibiting closer association with SCI are age, arterial hypertension (AHT), carotid stenosis, chronic kidney disease and metabolic syndrome.³

The study of the clinic repercussion of AHT on retinal circulation has been the object of numerous studies since Keith and Wagener published their classification.⁴ However, in contrast with diabetic retinopathy, the usefulness of systematically studying changes in retinal circulation of patients with AHT is controversial.⁵ This accounts for the absence of an explicit recommendation studying eye fundus in all hypertensive patients. The guide of the European cardiology and hypertension societies (ESH/ESC) takes into account retinal examination of patients with resistant or difficult to control AHT for detecting advanced retinal lesions, but discards the systematic study of the entire hypertense population due to variability in observations and poor reproducibility.^{6,7} Some authors have proposed an initial retinographic assessment of all hypertensive patients as this would enable the discovery of some advanced retinal lesions.⁸ Recent studies confirm the importance of asymptomatic cerebrovascular disease^{9,10} as well as the main associated risk factors and the need of finding useful markers for the early detection of this condition in order

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