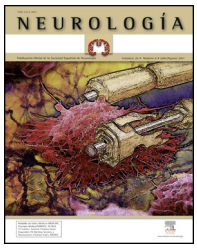
Neurología. 2013;28(7):417—424

NEUROLOGÍA

www.elsevier.es/neurologia



ORIGINAL ARTICLE

Aetiological classification of ischaemic strokes: Comparison of the new A-S-C-O classification and the classification by the Spanish Society of Neurology's Cerebrovascular Disease Study Group☆

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Received 20 July 2012; accepted 20 July 2012
Available online 11 October 2013

KEYWORDS
Aetiological classification;
A-S-C-O classification;
Classification by the Spanish Society of Neurology's Cerebrovascular Disease Study Group;
Stroke of undetermined cause

Abstract
Introduction: The A-S-C-O classification may be better than other methods for classifying ischaemic stroke by aetiology. Our aims are to describe A-S-C-O phenotype distribution (A: atherosclerosis, S: small vessel disease, C: cardiac source, O: other causes; 1: potential cause, 2: causality uncertain, 3: unlikely to be a direct cause although disease is present) and compare them to the Spanish Society of Neurology's Cerebrovascular Disease Study Group (GEECV/SEN) classification. We will also find the degree of concordance between these classification methods and determine whether using the A-S-C-O classification delivers a smaller percentage of strokes of undetermined cause.
Methods: We analysed those patients with ischaemic stroke admitted to our stroke unit (SU) in 2010 with strokes that were classified according to GEECV/SEN and A-S-C-O criteria.
Results: The study included 496 patients. The percentages of strokes caused by atherosclerosis and small vessel disease according to GEECV/SEN criteria were higher than the percentages for potential atherosclerotic stroke (A1) (14.1% vs. 11.9%; $P = .16$) and potential small vessel stroke (S1) (14.3% vs. 3%; $P < .001$). Cardioembolic stroke (C1) was more frequent (22.2% vs. 31%; $P < .001$). No differences between unusual cause of stroke and other potential causes (O1) were observed. Some degree of atherosclerosis was present in 53.5% of patients (A1, A2, or A3); 65.5% showed markers of small vessel disease (S1, S2, or S3), and 74.9% showed signs of cardioembolism (C1, C2, or C3). Fewer patients in the group without scores of 1 or 2 for any of the A-S-C-O phenotypes were identified as having a stroke of undetermined cause (46.6% vs. 29.2%; $P < .001$).

The agreement between the 2 classifications ranged from $\kappa < 0.2$ (small vessel and S1) to $\kappa > 0.8$ (unusual causes and O1).

☆ Please cite this article as: Sobrino García P, García Pastor A, García Arratibel A, Vicente Peracho G, Rodriguez Cruz PM, Pérez Sánchez JR, et al. Clasificación etiológica del ictus isquémico: comparación entre la nueva clasificación A-S-C-O y la clasificación del Grupo de Estudio de Enfermedades Cerebrovasculares de la Sociedad Española de Neurología. Neurología. 2013;28:417—424.

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Conclusion: Our results show that GEECV/SEN and A-S-C-O classifications are neither fully comparable nor consistent. Using the A-S-C-O classification provided additional information on co-morbidities and delivered a smaller percentage of strokes classified as having an undetermined cause.

PALABRAS CLAVE
Clasificación etiológica;
Clasificación A-S-C-O;
Clasificación del Grupo de Estudio de Enfermedades Cerebrovasculares de la Sociedad Española de Neurología;
Ictus de causa indeterminada

Clasificación etiológica del ictus isquémico: comparación entre la nueva clasificación A-S-C-O y la clasificación del Grupo de Estudio de Enfermedades Cerebrovasculares de la Sociedad Española de Neurología

Resumen
Introducción: La nueva clasificación A-S-C-O puede suponer una mejora en la clasificación etiológica del ictus isquémico. Nuestros objetivos son describir la distribución de los fenotipos A-S-C-O (A: aterotrombótico, S: «*small vessel*» pequeño vaso, C: cardioembólico, O: otras causas; 1: causa probable, 2: causa posible, 3: enfermedad presente, pero causa improbable), compararlos con la clasificación del Grupo de Estudio de Enfermedades Cerebrovasculares de la Sociedad Española (GEECV/SEN), conocer la concordancia entre ambas clasificaciones y determinar si la clasificación A-S-C-O reduce la proporción de ictus de causa indeterminada.
Métodos: Analizamos los pacientes con ictus isquémicos ingresados en nuestra unidad de ictus durante el 2010, clasificados según las clasificaciones GEECV/SEN y A-S-C-O.
Resultados: Incluímos 496 pacientes. La proporción de ictus aterotrombóticos y por enfermedad de pequeño vaso según criterios GEECV/SEN fue mayor al porcentaje de ictus aterotrombótico probable (A1) (14,1 vs. 11,9%; $p = 0,16$) e ictus por enfermedad de pequeño vaso probable (S1) (14,3 vs. 3%; $p < 0,001$). Los ictus cardioembólicos probables (C1) fueron más frecuentes (22,2 vs. 31%; $p < 0,001$). No observamos diferencias entre los ictus de causa infrecuente y otras causas probables (O1). Un 53,5% presentó algún grado de ateromatosis (A1, A2 o A3), el 65,5% rasgos de pequeño vaso (S1, S2 o S3) y el 74,9% características cardioembólicas (C1, C2 o C3). Una menor proporción de pacientes se clasificaron como de origen indeterminado al considerar aquellos que no obtuvieron puntuación 1 o 2 en ninguno de los fenotipos A-S-C-O (46,6 vs. 29,2%; $p < 0,001$).
La concordancia entre ambas clasificaciones osciló entre $\kappa < 0,2$ (pequeño vaso y S1) y $\kappa > 0,8$ (causa infrecuente y O1).
Conclusión: Nuestros resultados muestran que las clasificaciones GEECV/SEN y A-S-C-O no son plenamente comparables ni concordantes. La clasificación A-S-C-O aportó información adicional sobre enfermedades coexistentes y permitió reducir la proporción de ictus clasificados como de causa indeterminada.

Introduction

Ischaemic stroke is an entity with very heterogeneous aetiologies. Researchers have identified multiple causes which combine or act alone to produce cerebral ischaemia.

An ischaemic stroke's aetiology must be identified correctly if doctors are to select the most appropriate preventive treatment and thereby lower the risk of recurrence.

Several different aetiological classification systems for ischaemic stroke are currently in use. Some of the most common include TOAST (Trial of ORG 10172 in Acute Stroke Treatment Subtype Classification),[1] the Lausanne Stroke Registry classifications,[2] and in Spain, the classification used by the Spanish Society of Neurology's Study Group for Cerebrovascular Diseases (GEECV/SEN in Spanish).[3,4] These systems only contemplate the most probable cause of the stroke and ignore other possible coexisting causes.

The recently introduced A-S-C-O (phenotypic) system[5] classifies patients with ischaemic stroke according to 4 aetiological phenotypes: atherosclerosis, small vessel, cardiac sources, and other causes. The probability of being the cause of the stroke is determined for each of the phenotypes. This approach provides a more overarching view of the potential causes of stroke in each patient, and also reduces the percentage of strokes classified as being of undetermined origin.

The purposes of this study are to describe the distribution of A-S-C-O phenotypes in a series of ischaemic stroke patients receiving care at our hospital; compare results with those yielded by the GEECV/SEN aetiological classification system; determine the degree of concordance between the systems; and determine if using the A-S-C-O system reduces the percentage of stroke patients placed in the 'undetermined' category.

Methods

Patients

We analysed patients with ischaemic stroke or transient ischaemic attack (TIA) who were hospitalised between