Ischemic stroke in young adults: a diagnostic challenge

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Resumen
Introducción. El stroke isquémico en pacientes jóvenes (entre 15 y 45 años) es un evento inesperado, cuyas causas incluyen patologías diversas y poco frecuentes en la población adulta.

Objetivo. Destacar el creciente rol de las neuroimágenes en el diagnóstico, la terapéutica y el pronóstico del accidente cerebrovascular isquémico (ACV) en pacientes jóvenes.

Materiales y Métodos. Se incluyeron retrospectivamente 30 pacientes entre 15 y 45 años con stroke isquémico agudo estudiados en nuestra institución en el último año.

Resultados. De los 30 pacientes, la mitad de ellos fueron hombres con una edad media de 35 años. En el 86% de los casos (n=26) se estableció la causa del ACV: el 7% (n=2) presentó ateroesclerosis de grandes vasos, el 10% (n=3) se relacionó a cardioembolismo, en el 27% (n=8) las disecciones arteriales fueron la causa y en el 43% (n=13) las etiologías fueron misceláneas. En el 13% (n=4) no se estableció la causa.

Conclusiones. El rol de las neuroimágenes en el desafío estudio de pacientes jóvenes con ACV incluye la confirmación de la naturaleza isquémica de la lesión, la determinación de su localización y extensión, y el estudio en forma rápida y no invasiva de los vasos extra e intracraniales. En estos aspectos la tomografía multicorte (TCMS) y la resonancia magnética (RM) de alto campo ofrecen alta sensibilidad y especificidad.

Palabras clave. Adulto joven. RM. Stroke isquémico. TCMS.

Abstract
Ischemic stroke in young adults: a challenging diagnosis

Introduction. Ischemic stroke in patients between the ages of 15 and 45 is an unexpected event. Its causes involve diverse pathologies which are not frequent in the older population.

Purpose. To highlight the important role of neuroimaging in the diagnosis, prognosis, and therapeutic approach of these patients.

Materials and Methods. 30 young adult patients between the ages of 15 and 45 with diagnosis of acute ischemic stroke were retrospectively studied.

Results. Of these 30 patients, half of them were men with a mean age of 35 years. Stroke etiology was established in 86% of the cases (n=26), 7% (n=2) due to atherosclerosis, 10% (n=3) due to cardioembolism, 27% (n=8) because of arterial dissection, and 43% (n=13) due to miscellaneous diseases. In 13% (n=4) of the cases the cause was undetermined.

Conclusions. Neuroimages play a comprehensive role in the neuroradiological work-up which include: the confirmation of the presence of an acute ischemic lesion, determination of its topography, extension and evaluation of extracranial and intracranial arteries. In this sense, Magnetic Resonance Imaging (MRI) and Multislice Computed Tomography (MSCT) offer high sensitivity and resolution.

Key words. Ischemic stroke. MRI. MSCT. Young adult.

INTRODUCTION

Ischemic stroke is defined as a focal neurologic deficit that is present for longer than 24 hours and with no apparent cause other than that of vascular origin. In young adults (15-45 years) it is an unexpected event, and its causes involve diverse pathologies which are infrequent in the older population.¹⁻⁰

OBJECTIVE

The objective is to highlight the increasingly important role of neuroimaging in the diagnosis, therapy and prognosis of ischemic stroke in young adults.

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RESULTS

Of the 30 patients, half were men with a mean age of 35 years. The cause of stroke was established in 86% of the cases (n=26). According to the modified TOAST (Trial of ORG 10172 in Acute Stroke Treatment) classification criteria, 7% (n=2) had large-vessel atherosclerosis. Moderate primary hypertension and dyslipidemia were found as risk factors for this disease.

In 10% of patients (n=3) stroke was associated with cardioembolism (2 with patent foramen ovale and 1 with atrial septal aneurysm). Diagnosis was performed with transthoracic echocardiography in 2 patients and required transesophageal echocardiography in 1 patient.

In 27% of patients (n=8), the cause was arterial dissection.
section (5 in vertebral arteries, 1 in the basilar artery and 2 in the internal carotid arteries). Only one of the patients had a history of trauma. This pathology was the leading cause of stroke in our cases (Figs. 1 and 2).

In 43% (n=13), etiologies were miscellaneous (3 migrainous infarctions, 2 with Moyamoya disease, 2 venous thromboses, 1 primary CNS vasculitis, 2 systemic vasculitis, 1 lupus vasculitis, 1 antiphospholipid syndrome and 1 vasospasm secondary to neurosurgery (Figs. 3, 4 and 5).

In 4 patients (13%), the cause was undetermined, and only 3 of them were adequately studied (Fig. 6).

For a study to be considered adequate, it had to include at least images of the brain, of intra- and extracranial and cardiac vascularization, routine lab testing, complete hematological tests, coagulation times and lipid profile. In addition, risk factors (blood hypertension, diabetes, smoking history, family history of ischemia, etc.) had to be analyzed and drug consumption had to be documented.

In 46% of cases (n=14) the vertebrobasilar territory was involved: in 43%, the carotid territory was affected (n=13), in 7% the cause was venous thrombosis (n=2), and in 1 patient multiple territories were affected by vasculitis.

DISCUSSION

Twelve percent of strokes occur in patients younger than 45 years old, and 45% of these strokes are ischemic (1). Finding the etiology of an ischemic stroke in a young person is a true challenge for physicians (1, 2).

The causes of stroke in young adults are widely diverse and these patients usually require more extensive and thorough diagnostic testing than older adults to determine the cause underlying ischemic infarction. This is particularly important, since many of the etiologies can be treated and their identification provides an opportunity to change their specific risk as a factor of relapse (1, 2, 3).

Data from various studies indicate that approximately 20% of ischemic strokes in young adults are caused by the atherosclerotic occlusion of large arteries, 25% are due to non-atherosclerotic occlusive disease (dissections account for up to 10%-20% in some studies and Moyamoya disease also has a high incidence within this group – approximately 3.5%), and 17% are due to cardioembolism (mainly patent foramen ovale, atrial septal aneurysm, rheumatic disease and endocarditis), 3% are caused by perforating vessels disease, 5% by prothrombotic states and 10% are due to miscellaneous causes (including migraine, drug abuse and use of oral contraceptives). In 20%-30% of cases, the cause of stroke is undetermined and, if after a thorough study physicians do not come to a diagnosis, the stroke is said to be cryptogenic (1,2,3).
Computed tomography (CT) and Magnetic Resonance (MR) are the most valuable tools for the diagnosis of stroke. Unenhanced CT, which is widely available, can help quickly identify early signs of ischemia (such as the hyperdense vessel sign and the loss of contrast between gray matter and white matter), and also rule out hemorrhage. Conventional MR imaging sequences can depict acute ischemic lesions within 6 hours after the onset of a neurological event. State-of-the-art diffusion MR imaging, which is based on the movement of water molecules, detects the presence of cytotoxic edema in areas of irreversible ischemic damage. These areas are characterized by restricted water diffusion and appear hyperintense on diffusion images with a decreased apparent diffusion coefficient. Diffusion has a high sensitivity (88%-100%) and specificity (86-100%) to detect areas of ischemia, even within 30 minutes of their occurrence. Multislice CT angiography and MR angiography of the intracranial and neck vessels allow visualization of the arterial tree in few minutes, in a non-invasive manner, searching the vascular pathology that triggered the acute neurological event. CT perfusion and MRI perfusion maps of Relative Cerebral Blood Flow, Relative Cerebral Blood Volume and Mean Transit Time predict the presence of penumbra (tissue that is potentially salvageable with adequate therapy) (8,9).

In our series, in agreement with other papers, dissections were the main cause of stroke in young adults. Multislice CT angiography with multiplanar reconstruction, MR angiography of the neck vessels and MR T1-weighted sequences with fat saturation can demonstrate, with excellent resolution, pathognomonic findings of arterial dissection such as intimal flap, double lumen, and the presence of irregular stenosis and of pseudoaneurysms (10,11,12).

Among miscellaneous etiologies, we highlight stroke-associated migraine. Different papers have reported an association between migraine and the risk of stroke, especially in premenopausal women, women who smoke and women who use oral contraceptives. Classic migraine with aura may be a more powerful predictor of stroke than migraine without aura. Of the patients included in our study, 2 were women of 28 and 30 years of age and 1 was a 30-year-old man. All of them had a history of migraine with aura (13,14).

Unlike findings reported in the literature, atherosclerosis was an infrequent cause of stroke in our population sample, and strokes of undetermined etiology accounted for a lower percentage than those reported in other studies.

In our study, the sample is small and has selection bias. We think that multicenter, randomized and prospective studies are needed to analyze the causes, incidence and prognosis of stroke in young adults.

**CONCLUSION**

The role of neuroimaging in the workup of young adults with stroke includes confirmation of the ischemic nature of the lesion, determination of its location and extension, and a quick and non-invasive study of extra- and intracranial vessels. In this sense, multislice CT and high-field MRI provide high sensitivity and specificity.
References