



Clinical report

Stroke in young adults: incidence and clinical picture in 280 patients according to their aetiological subtype[☆]Adrià Arboix^{a,*}, Joan Massons^a, Luís García-Eroles^b, Montserrat Oliveres^a^a Unidad de Enfermedades Vasculares Cerebrales, Servicio de Neurología, Capiro-Hospital Universitari del Sagrat Cor, Universitat de Barcelona, Barcelona, Spain^b Unitat d'Organització i Sistemes d'Informació, Hospital Germans Trias i Pujol, Badalona, Barcelona, Spain

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ABSTRACT

Background and objective: To assess the clinical features and incidence rate of stroke in young adults (less than 55 years of age).**Methods:** Hospital-based descriptive study of 280 young inpatients consecutively admitted for stroke over a period of 24 years. We conducted a comparison with the remaining 4,312 patients admitted for stroke.**Results:** Stroke in young adults represented 6.1% of all strokes, 5.7% of transient ischaemic attacks, 5.8% of cerebral infarctions and 8.4% of brain haemorrhages. However, reported minimal frequency of cardioembolic (2.1%) and atherothrombotic (3.4%) infarctions, accounted for 5.9% of lacunar and for 10.7% of essential infarctions and showed a maximum frequency in those infarctions of unusual aetiology (36%). Factors independently associated with stroke in young adults were cigarette smoking (OR 4.23; 95% CI 3.02–5.93; $P=.000$), unusual aetiology (OR 4.97; 95% CI 3.15–7.84; $P=.000$), headache (OR 4.57; 95% CI 2.59–8.07; $P=.000$), alcohol abuse (OR 3.93; 95% CI 2.46–6.29; $P=.000$), oral contraceptives (OR 14.07; 95% CI 2.37–83.40; $P=.004$), atrial fibrillation (OR 0.15; 95% CI 0.08–0.28; $P=.000$), arterial hypertension (OR 0.43; 95% CI 0.33–0.57; $P=.000$), COPD (OR 0.20; 95% CI 0.09–0.44; $P=.000$), atherothrombotic infarction (OR 0.51; 95% CI 0.34–0.77; $P=.001$), female sex (OR 0.71; 95% CI 0.52–0.97; $P=.029$), diabetes mellitus (OR 0.66; 95% CI 0.46–0.98; $P=.030$), ischaemic heart disease (OR 0.56; 95% CI 0.33–0.95; $P=.032$) and intermittent claudication (OR 0.48; 95% CI 0.24–0.94; $P=.033$).**Conclusions:** Stroke in young adults is infrequent (6.1% of the total), but represents the highest frequency of cerebral infarcts of unusual aetiology (36%). We conclude that stroke in younger patients presents its own and differentiated clinical profile.

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Ictus en adultos jóvenes: rasgos clínicos y frecuencia de presentación en 280 pacientes según el subtipo etiológico

RESUMEN

Fundamento y objetivo: Analizar los rasgos clínicos y la frecuencia de presentación de los ictus en adultos jóvenes (55 o menos años de edad).**Métodos:** Estudio hospitalario de 280 pacientes jóvenes consecutivos ingresados por presentar un ictus durante un período de 24 años. Se efectúa una comparación con los 4.312 pacientes restantes ingresados con ictus.**Resultados:** Los ictus en adultos jóvenes representan el 6,1% del total de los ictus, el 5,7% de los ataques isquémicos transitorios, el 5,8% de los infartos cerebrales y el 8,4% de las hemorragias cerebrales. Su frecuencia fue mínima en los infartos cardioembólicos (2,1%) y en los aterotrombóticos (3,4%). Se observó en el 5,9% de los lacunares y en el 10,7% de los infartos esenciales, y su frecuencia fue máxima en los infartos de causa inhabitual (36%). Las variables asociadas a los ictus jóvenes de forma independiente fueron el tabaquismo (OR 4,23; IC del 95% 3,02–5,93; $p=0,000$), la etiología inhabitual (OR 4,97; IC del 95% 3,15–7,84; $p=0,000$), la cefalea (OR 4,57; IC del 95% 2,59–8,07; $p=0,000$), el abuso de alcohol (OR 3,93; IC del 95% 2,46–6,29; $p=0,000$), los anovulatorios (OR 14,07; IC del 95% 2,37–83,40; $p=0,004$), la

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fibrilación auricular (OR 0,15; IC del 95% 0,08–0,28; $p=0,000$), la hipertensión arterial (OR 0,43; IC del 95% 0,33–0,57; $p=0,000$), la EPOC (OR 0,20; IC del 95% 0,09–0,44; $p=0,000$), el infarto aterotrombótico (OR 0,51; IC del 95% 0,34–0,77; $p=0,001$), el sexo femenino (OR 0,71; IC del 95% 0,52–0,97; $p=0,029$), la diabetes mellitus (OR 0,66; IC del 95% 0,46–0,98; $p=0,030$), la cardiopatía isquémica (OR 0,56; IC del 95% 0,33–0,95; $p=0,032$) y la claudicación intermitente (OR 0,48; IC del 95% 0,24–0,94; $p=0,033$).

Conclusiones: Los ictus en adultos jóvenes son infrecuentes (6,1% del total), pero representan el 36% de los infartos de causa inusual. Los ictus en adultos jóvenes presentan un perfil clínico propio y diferenciado.

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In modern industrialized societies there is a change in the presentation age of strokes, being the segment of very elderly patients (over 85 years) the age group which is experiencing a greater increase in frequency of presentation.^{1,2}

In contrast, less attention is given to strokes in young adults, possibly due to its lower incidence, despite its significant health impact. That is why, in the young patients with stroke subgroup, there are aspects of natural history that are still poorly understood, for example, clinical profile and frequency of presentation in the different disease entities of cerebrovascular disease.

The aim of this study is twofold. On the one hand, analyze the frequency of occurrence and clinical features of stroke in young adults globally, subsequently analysing the frequency at different etiologic subtypes. On the other, to make a comparative analysis between young adults with stroke and the rest of patients. We analyzed a sample of 280 consecutive young stroke patients, taken from a hospital prospective registry of 4592 consecutive patients with acute cerebrovascular disease, who received healthcare during a period of 24 years.

Patients and methods

We present a clinical study conducted in the Neurology Department of the Sagrat Cor University Hospital in Barcelona for 24 years (1986–2009 inclusive) from the analysis of its prospective stroke registry. This registry has been previously published and validated.³ Stroke subtypes, cardiovascular risk factors and clinical and etiological features were classified according to the recommendations of the Expert Committee on Cerebrovascular Diseases of the Catalan Society of Neurology,⁴ which are used by our group in other work.^{1,5}

Following the methodology and the classification of a recently published study, strokes in young adults were defined as those strokes occurring at 55 years of age or less.⁵

To meet the objective of our study, 4597 patients of the registry who were admitted due to transient ischaemic attack (TIA), ischaemic strokes (cardioembolic, atherothrombotic, lacunar, of uncommon cause or of undetermined origin) and cerebral haemorrhage (intracerebral haemorrhage, subarachnoid haemorrhage, subdural hematomas and spontaneous epidural hematomas) were initially included. Five patients were excluded because of incomplete essential clinical data. The final study sample contained a total of 4592 stroke patients, and included 760 patients with TIA, 3266 patients with cerebral infarctions (956 with cardioembolic infarctions, 944 with atherothrombotic strokes, 864 lacunar infarctions, 374 essential cause strokes and 128 strokes of uncommon aetiology) and 566 brain haemorrhages (473 intracerebral haemorrhages, 52 subarachnoid haemorrhage, 40 spontaneous subdural hematomas and one patient with a spontaneous epidural haematoma). Finally, the subgroup of 280 young patients with stroke at 55 years of age or less was individualized and analyzed, which is the sample of this study.

Demographic, clinical and prognosis variables of the patients included in the database of the hospital's stroke registry were

collected. The stroke was considered of essential or unknown cause when the patient had no risk factors for stroke and did not meet the criteria for cardioembolism, atherothrombosis, lacunar ischaemia or uncommon cause ischaemia according to the nomenclature of the Cerebrovascular Diseases Study Group of the Spanish Society of Neurology or the Official Guide of Cerebrovascular Diseases of the Catalan Society of Neurology.⁴ It was felt that the stroke was of uncommon cause when manifested in a patient who had the atherothrombotic, cardioembolic or lacunar origins ruled out and was caused by, among others, haematological disease, connective tissue disease, infection, neoplasm, metabolic abnormalities or other entities such as arterial dissection, fibromuscular dysplasia, arteriovenous malformation, cerebral venous thrombosis, Moya Moya syndrome or complicated migraine.⁶ In such cases, the stroke could be the onset form of the disease or a complication of its progression course.

Subsequently a comparative analysis between the variables analyzed in young stroke patients ($n=280$) and the remaining patients ($n=4.312$) was performed. Univariate analysis for each variable in relation to the presence of young stroke cases was performed by the Student's t -test for continuous variables and χ^2 test, with the Yates's correction for continuity, if necessary, for categorical variables. A p value <0.05 was considered statistically significant. Subsequently, significant variables underwent a multivariate study following a logistic regression method using a *Step by Step* procedure.

The study was approved by the CREC of our hospital.

Results

Of the 4592 stroke patients, 280 (6.1%) were aged 55 years or less, constituting the group of young stroke patients. The mean age (SD) of these patients was 46.1 (9.5) years. 67.1% were male ($n=188$) and 32.9% were female ($n=92$). The main risk factors for stroke in decreasing order of frequency were: smoking 37.5%, hypertension 33.6%, dyslipidaemia 24.6%, alcohol abuse (>80 g/day) 15.7%, diabetes mellitus 14.3%, obesity 6.1% and atrial fibrillation 3.9%. The hospital mortality was 2.9% ($n=8$). The causes of death were cerebral herniation in 6 patients, sepsis and respiratory infection in another. Absence of functional limitation at discharge was observed in 13.9% of cases. The median hospital stays (interquartile range) was 11 (7–19) days.

The incidence of stroke in young patients was similar when the TIA (5.7%), cerebral infarctions (5.8%) and cerebral haemorrhages (8.4%) were analyzed. However, when an analysis based on their different etiologic subtypes was performed, the results showed a minimum percentage differences in cardioembolic stroke (2.1%) and atherothrombotic strokes (3.4%), an intermediate frequency in lacunar infarction (5.9%) and essential infarction (10.7%), and a maximum frequency in strokes of uncommon cause (36%).

When the comparative analysis between young stroke cases and the rest of the strokes (Table 1) was carried out it was observed that in the former the following was significantly more frequent: male sex, history of headache, alcohol abuse, taking anovulatory

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