

Clinical, Aetiological and Scannographic Aspects of Ischaemic Stroke in Children Aged 1 Month to 15 years at the Ignace Deen National Hospital

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Abstract

Introduction: Stroke in children is dreadful, although it is ten to twelve times rarer than in adults. The incidence of stroke in children has been little studied. It varies between 1.3 and 13/100,000 children/year. The aim of this study was to describe the clinical, aetiological and scanographic aspects of ischaemic strokes in children aged between 1 month and 15 years in the Paediatrics Department of the Ignace Deen National Hospital.

Setting-Materials and Methods: This was a prospective dynamic study conducted in the Paediatrics Department of the Ignace Deen National Hospital over a 12-month period, from 1 April 2020 to 31 March 2021.

All children hospitalised for ischaemic stroke were included. The diagnosis of stroke was based on any sudden onset neurological deficit that persisted for at least 24 hours, with no apparent cause other than a vascular origin.

Results: We recorded 12 cases of ischemic stroke in the department, i.e. 2.27%. The age group of 11-15 years was more represented 41.66% with extremes of 1 year and 15 years. The female sex was dominant in 7 cases (58.33%). The onset of symptoms was sudden (75%) or rapidly progressive over a few hours (25%). The motor deficit of a hemibody was the main clinical sign, found in 91.67% of cases associated with language disorders (4 cases), convulsions (4 cases), fever (6 cases), headaches and/or vomiting (5 cases), impaired consciousness (2) and facial asymmetry (6 cases). Brain CT was the first-line test required to confirm the diagnosis in 100% of cases. The etiologies were dominated by heart disease (4 cases), sickle cell disease (4 cases), central nervous system infection (1 case) and undetermined (3 cases). The evolution was favourable in 91.67%.

Conclusion: Stroke in children remains rare, and there is no clinical difference between children and adults. Early, multidisciplinary monitoring of patients with sickle cell disease and prevention of rheumatic heart disease would help to considerably reduce the incidence of stroke in children.

Keywords: stroke; neuroimaging; child; Ignace Deen

Introduction

Stroke is defined as the rapid development of localised or global clinical signs of cerebral dysfunction, with symptoms lasting more than 24 hours and leading to death with no apparent cause other than a vascular origin [1, 2]. It can occur at any age and affects almost 1,000 children every year [2]. Stroke in children is dreadful, although it is ten to twelve times rarer than in adults. However, this rarity can have adverse consequences on the speed and quality of treatment, due to the lack of a specific, clear and standardised organisation [3, 4]. The incidence of stroke in children has been little studied. It varies between 1.3 and 13/100,000 children/year, but methodological differences, such as the way in which cases are collected or the age of the children involved, make comparisons difficult [2, 3].

In Japan, the incidence of ischaemic stroke in children is estimated at between 1.2 and 2.7/100,000 per year, of which 10 to 15% is caused by Moya Moya disease [5].

In Africa, publications on childhood stroke are relatively rare [6, 7].

In Senegal, for example, Basse A M et al. reported 75 cases of stroke, 64. cases of ischaemic stroke and 11 cases of haemorrhagic stroke [6]. In Guinea, we found no studies on this subject.

Clinical symptoms vary according to the age of the child. Before the age of ten, the onset is sudden and most often takes the form of hemiplegia, frequently associated with hyperthermia and epileptic convulsions, which are often generalised. Speech disorders are of the Wernické aphasia type, whereas mutism is very rarely observed at this age, unlike in adults. Hemidystonia is a frequent and specific complication of stroke in children and involves damage to the basal ganglia. After ten years, clinical symptoms are similar to those seen in adults [3, 4, 8]. The causes are different from those in adults. There are multiple aetiologies, and atheroma is not a dominant cause of stroke, unlike in adults. In most cases, the aetiology is not found and the stroke does not recur [4]. On the other hand, haemorrhagic causes of vascular malformations, cerebral infarctions of genetic origin, cardioembolic and thrombophilic conditions and dissections are frequent [3].

Treatment should be provided by a dedicated unit integrated with the adult stroke unit and involving the paediatrician [3].

The aim of this study was to describe the clinical, aetiological and scannographic aspects of ischaemic strokes in children aged between 1 month and 15 years in the Paediatrics Department of the Ignace Deen National Hospital.

Materials and Methods

This was a prospective dynamic study conducted in the paediatric ward of the Ignace Deen National Hospital over a 12-month period, from 1 April 2020 to 31 March 2021. All children admitted to the department during the study period for ischaemic stroke were included in the study. The diagnosis of stroke was made in the event of a sudden onset of neurological deficit persisting for at least 24 hours, with no apparent cause other than a vascular origin. Cerebral computed tomography (CT) was the first test ordered to confirm the diagnosis. The rest of the paraclinical work-up was prescribed on a case-by-case basis. Epidemiological (age, sex), diagnostic (reasons for consultation, physical signs, risk factors, scanographic signs) and aetiological variables were studied. Verbal consent was obtained from the patients' parents for this study, and anonymity was guaranteed without constraints.

Results

Out of a total of 529 children hospitalised, 12 cases of ischaemic stroke were recorded in the department, i.e. 2.27%. The age group 11-15 years was most represented (41.66%), with extremes of 1 and 15 years. Females predominated in 7 cases (58.33%). The onset of symptoms was abrupt (75%) or rapidly progressive over a few hours (25%). Motor deficit in one hemibody was the main clinical sign, found in 91.67% of cases. This hemi-body deficit was frequently associated with language disorders (4 cases), convulsions (4 cases), fever (6 cases), headache and/or vomiting (5 cases), consciousness disorders (2) and facial asymmetry (6 cases).

<i>Reason for consultation</i>	<i>Number</i>	<i>Percentage</i>
Motor deficit of a hemicorp	11	91,67
Convulsives seizures	4	33,33
Fever	6	50
Language disorders	4	33,33
Headache and/or Vomiting	5	41,67
Consciousness disorders	2	16,67
Facial asymmetry	6	50

Table 1: Frequency of reasons for consultation for 12 cases of ischaemic stroke in the paediatric department of the Ignace Deen National Hospital from 1 April 2020 to 31 March 2021.

On neurological examination, 11 of our patients (91.67%) presented with a motor deficit of the hemibody, including 3 cases of hemiplegia and 8 cases of hemiparesis; Babinski's sign was present in 8 cases, i.e. 75%; central facial paralysis was noted in 6 of our patients, i.e. a frequency of 50%; tonus disorder (hypertonia/hypotonia) was observed in 4 patients, i.e. a frequency of 33.33%; language disorders concerned 4 children. Cerebral computed tomography (CT) was performed in all our patients and showed involvement of the middle cerebral artery (MCA) in 6 cases, involvement of the internal carotid artery (ICA) in 2 cases, involvement of the anterior cerebral artery (ACA) in 2 cases and multiple involvement in 1 case. It was normal in 1 case, which is why brain MRI was performed in this patient. MRI revealed a thalamic hypersignal in the T2 sequence, indicating an ischaemic stroke in the right sylvian territory. We found a background of known heart disease in 2 cases, sickle cell disease in 2 cases and HIV infection in 1 case. A cardiac work-up (cardiac ultrasound) was performed in 6 patients, revealing IVC (3 cases), dilated cardiomyopathy in 1 case, and normal cardiac function in 2 cases.

<i>Risk factors</i>	<i>Number</i>	<i>Percentage</i>
Heart disease	2	16,67
Sickle cell disease	2	16,67
HIV	1	8,33

Table 2: Distribution of 12 cases of ischaemic stroke according to risk factors in the paediatric ward of the Ignace Deen National Hospital from 1 April 2020 to 31 March 2021.

<i>Territory reached</i>	<i>Number</i>	<i>Percentage</i>
ACM	6	50
ACA	2	16,67
ACI	2	16,67
Multiple involvement	1	8,33
Normal	1	8,33

Table 3: Distribution of the 12 cases of ischaemic stroke according to the results of the cerebral scanner (affected area) in the paediatric ward of the Ignace Deen National Hospital from 1 April 2020 to 31 March 2021.

Etiologies were dominated by heart disease (4 cases), sickle cell disease (4 cases), central nervous system infection (1 case) and undetermined (3 cases). The outcome was favourable in 91.67% of cases.

<i>Ethology</i>	<i>Number</i>	<i>Percentage</i>
Heart disease	4	33,33
Sickle cell disease	4	33,33
Nervous system infections central	1	8,33
Undetermined	3	25
Total	12	100

Table 4: Distribution of 12 cases of ischaemic stroke according to aetiology in the paediatric department of the Ignace Deen National Hospital from 1 April 2020 to 31 March 2021.

Discussion

During the study period, 529 children were hospitalised, including 12 cases of ischaemic stroke, a frequency of 2.27%. In their study, Sounga Bandzouzi et al [2] reported 17 cases of stroke in children, including 16 cases of ischaemic stroke. According to Hernandez L et al [9], the incidence of ischaemic stroke in children is around 5/100,000/year. Stroke is very rare in children, as highlighted by the low incidence in our study. This low frequency could be explained by the fact that risk factors are lower in children. Females were more represented in our series, with 58.33% of cases compared with 41.67%, giving a sex ratio of 0.71. Our result differs from those reported by Heather J et al [10] who consider that for unknown reasons, boys are twice as affected as girls during childhood strokes. We were unable to find any explanation for this female predominance. Our children ranged in age from 10 months to 15 years, with an average age of 8 years. The 11 to 15 age group was the most affected, with 41.66%. The average age in the literature varies between 4 years 7 months and 13 years [2]. N'Diaye M et al [7] reported an age range from 2 months to 15 years, with an average age of 6.91 years. Although rare, ischaemic stroke can occur in children at any age.

The main reason for consultation was deficit of one hemicorpus (right or left) with 91.67%, followed by facial asymmetry, headache and/or vomiting with 50% and 41.67% respectively. Our results are similar to those of N'Diaye M et al [7] in Senegal, which reported a frequency of 84.3% of motor deficit in ischaemic strokes in children. These main complaints on admission reflect the vascular nature of these reasons for consultation.

The mode of onset was abrupt in 9 of our patients, compared with 3 with a rapidly progressive onset (75% and 25% respectively). According to the literature, strokes generally have a sudden or rapidly progressive onset within a few hours in both children and adults.

In our study, 2 children had heart disease, 2 had sickle cell disease and 1 had HIV.

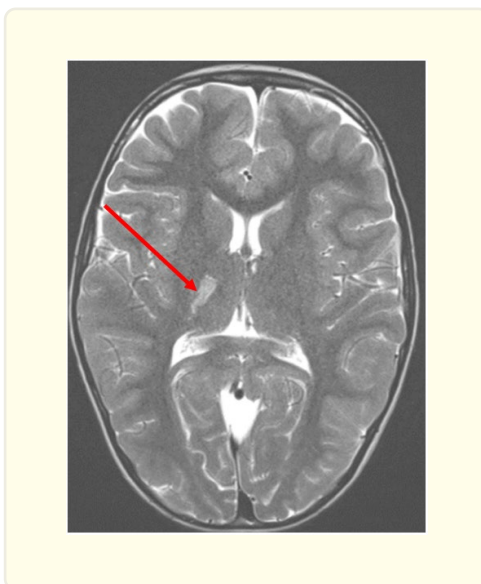
According to Béjot Y et al [8], sickle cell anaemia is common in the black African population, and the disease increases the risk of cerebral infarction by a factor of 200 to 400. As a result, 10% of people with sickle cell disease suffer a cerebral infarction before the age of 20. Mackay MT et al [11] found that the risk factors for ischaemic stroke were 53% arterial disease and infection and 31% heart disease. Eleven of our patients (91.67%) presented with a motor deficit of the hemibody, including 3 cases of hemiplegia and 8 cases of hemiparesis. Babinski's sign was present in 8 cases, i.e. 75%, and central facial paralysis was noted in 6 of our patients, i.e. a frequency of 50%, tonus disorders (hypertonia/hypotonia) were observed in 4 patients, i.e. a frequency of 33.33%; language disorders concerned 4 children. As for Ould Mohamed Lemine S. et al [12], hemiplegia affected 96.66% of cases and isolated aphasia was observed in 63.33% of cases. According to Castelnau P et al [4], acute hemiplegia is the usual mode of onset of stroke in children.

All our patients underwent cerebral CT scans and 1 underwent MRI. Ischaemia involved the ACM in 50% of cases.

Our results are similar to those of Ould Mohamed Lemine S et al [12] who found that ischaemia affected the ACM in 66.66% of cases. As for Ndiaye M et al [7], ischaemia involved the ACM in 81.42% of cases.

The most frequent aetiology was heart disease with a frequency of 50%, followed by sickle cell disease which represented 16.67% of cases and central nervous system infection in 8.33% of cases. No aetiology was found in 3 children (25% of cases).

These results are in contrast to those of Mackay et al [11], who found that arteriopathy and infection were the main causes, accounting for 53% each. This result also differs from that of S. Ould Mohamed Lemine et al [12], who found that sickle cell disease was the primary aetiology in 20.83% of cases, followed by heart disease in 12.5% of cases and central nervous system infections in 6.25% of cases. The outcome was favourable in 11 of our patients, a frequency of 91.67%, and only one was in a stationary state.



15-year-old adolescent, HCG motor deficit, brain MRI on day 5 of admission revealed a thalamic hypersignal in T2 sequence testifying to an ischaemic stroke in the right sylvian territory.



Infant aged 1 year 8 months admitted with HCG motor deficit, brain CT scan performed on day 3 of admission showed right parietal hypodensity, indicating a superficial sylvian cerebral infarction.



3-year-old sickle-cell anaemic child admitted for low HCG levels, cerebral CT in axial section without injection of contrast medium reveals right fronto-parietal hypodensity in relation to ischaemic stroke.

Conclusion

Stroke in children remains a relatively rare condition in our setting, with 12 cases reported in 12 months. The causes and prognosis of ischaemic stroke in children are very different from those observed in adults. However, a very high proportion of ischaemic strokes in children remain 'idiopathic'. In most cases, these strokes do not recur. Clinically, there is no difference between strokes in adults and children. However, advances in imaging techniques enabling the diagnosis of minimal lesions may be responsible for an increase in the number of identified cases of stroke in children. This means that neurologists need to have a good understanding of this condition, so that they can share with paediatricians their skills in managing the acute phase and complications of stroke in children. Early, multidisciplinary monitoring of patients with sickle cell disease and prevention of rheumatic heart disease would help to considerably reduce the incidence of stroke in children.

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