The Journal of International Medical Research
1999; 27: 130 – 133

Seasonal Variations in the Incidence of Cranial Nerve Paralysis

M GALLERANI[1], *C DELLI GATTI*[1], *R SALMI*[2], *H KUWORNU AFI*[3], *O LA CECILIA*[3] *AND R MANFREDINI*[3]

[1]Second Internal Medicine, Department of Clinical and Experimental Medicine, University of Ferrara Medical School, Italy; [2]Second Medical Division, St Anna Hospital, Ferrara, Italy; [3]First Internal Medicine, Department of Clinical and Experimental Medicine, University of Ferrara Medical School, Italy

The aim of the study was to verify whether there is a seasonal pattern in the occurrence of cranial nerve paralysis. All patients admitted to the Emergency Department of St Anna Hospital, Ferrara, Italy, from 1 January 1991 to 31 December 1997, were reviewed. Cranial nerve paralysis was diagnosed in 126 cases: the oculomotor nerve accounted for 46 cases, the trochlear nerve for 14, and the abducens nerve for 66. The frequencies of cases involving the oculomotor nerve and of all cases were significantly higher in winter than in the other seasons. Compared with other 2-month periods, the highest number of total cases occurred in November to December. Chronobiological analysis of the data for individual months showed a rhythmic 12-month pattern for the total population, with a weakly significant peak in January.

KEY WORDS: PARALYSIS; CRANIAL NERVES; SEASONAL VARIATIONS; CHRONOBIOLOGY

INTRODUCTION

There is considerable evidence that major unfavourable cerebrovascular events are not randomly distributed over time, but are unevenly distributed at certain times of the day and year.[1] Higher frequencies of both ischaemic[2] and haemorrhagic[3,4] cerebrovascular accidents in winter than in other seasons have been reported.

The present study was designed to determine whether the incidence of

paralysis of the cranial nerves also shows a seasonal pattern.

PATIENTS AND METHODS

PATIENTS

We reviewed all of the patients who were admitted with paralysis of the cranial nerves (in particular, the oculomotor, trochlear and abducens nerves) to the Emergency Department of St Anna Hospital, Ferrara, Italy, from 1 January 1991 to 31 December 1997. This hospital deals with all of the medical emergencies that occur in the city and suburban area of Ferrara, which has a population of about 150 000.

ANALYSIS

Cases of paralysis were grouped (according to the time at which they occurred) both into four periods of 3 months (winter, spring, summer and autumn) and six periods of 2 months, and analysed using the χ^2 test for goodness of fit. The cases were also divided into groups according to the individual month in which they occurred, and chronobiological analysis was done by partial Fourier series with up to four harmonics.[5]

RESULTS

Cranial nerve paralysis was diagnosed in 126 cases. Of these, the oculomotor nerve accounted for 46 cases (27 men, mean ± SD age 67 ± 15 years; 19 women, mean age 74 ± 8 years), trochlear nerve for 14 (seven men, mean age 68 ± 6 years; seven women, mean age 71 ± 8 years), and abducens nerve for 66 (29 men, mean age 64 ± 12 years; 37 women, mean age 60 ± 19 years).

Seasonal analysis showed significantly higher frequencies of total events and of oculomotor paralysis in winter ($P = 0.016$ and 0.026, respectively; Table 1). Sub-analysis of 2-month periods identified the highest peaks in November to December, both for total events ($P < 0.001$; Table 2) and for oculomotor events ($P < 0.001$; Table 2), but the total number of cases in March to April was only slightly lower. Trochlear paralysis appeared to have its highest incidence in

TABLE 1

Seasonal distribution of the incidence of paralysis of the cranial nerves in all 126 patients admitted to an emergency department over 7 years

	No. (%) of patients			
	Oculomotor nerve (*n* = 46)	**Trochlear nerve (*n* = 14)**	**Abducens nerve (*n* = 66)**	**Total cases (*n* = 126)**
Winter (22 December – 21 March)	18 (39)	5 (36)	19 (28)	42 (33.3)
Spring (22 March – 21 June)	10 (22)	2 (14)	22 (33)	34 (27)
Summer (22 June – 21 September)	4 (9)	2 (14)	11 (17)	17 (13.5)
Autumn (22 September – 21 December)	14 (30)	5 (36)	14 (21)	33 (26.2)
P[a]	0.026	0.463	0.221	0.016

[a]*P*-value for the comparison of observed versus expected cases (χ^2 test for goodness of fit).

TABLE 2

Distribution, in 2-month periods, of the incidence of paralysis of the cranial nerves in all 126 patients admitted to an emergency department over 7 years

Months	No. (%) of patients			
	Oculomotor nerve (*n* = 46)	Trochlear nerve (*n* = 14)	Abducens nerve (*n* = 66)	Total cases (*n* = 126)
January and February	8 (17)	4 (29)	9 (14)	21 (16.7)
March and April	12 (26)	1 (7)	20 (30)	33 (26.2)
May and June	3 (7)	1 (7)	13 (20)	17 (13.5)
July and August	2 (4)	3 (21)	6 (9)	11 (8.7)
September and October	4 (9)	–	6 (9)	10 (7.9)
November and December	17 (37)	5 (36)	12 (18)	34 (26.9)
P[a]	< 0.001	0.137	0.027	0.001

[a]*P*-value for the comparison of observed versus expected cases (χ^2 test for goodness of fit).

November to December, but this was not statistically significant ($P > 0.05$), probably because of the paucity of cases. Abducens nerve paralysis showed a significant peak in March to April ($P = 0.027$). Chronobiological analysis (partial Fourier series) showed a main harmonic (period: 12 months), indicating a significant circannual rhythm, with a significant ($P = 0.040$) peak in January, but only for the total population.

DISCUSSION

The results indicate that cranial nerve paralysis does not occur uniformly throughout the year. In particular, with the possible exception of events affecting the abducens nerve, these events are more frequent during the winter months. To our knowledge this is the first report of this phenomenon, though a similarly increased frequency of events in winter has been reported in studies of ischaemic stroke.[2] In a review of studies spanning more than a century and conducted worldwide, 64% of the studies reported a higher incidence of cerebrovascular accidents in winter, and 86% reported higher rates in winter or spring than in summer or autumn.[6] Our data show similar trends over the seasons. Exposure to cold temperatures can determine an increase in sympathetic activity and blood pressure levels,[7,8] in red cell and platelet counts, and in blood viscosity.[9] Moreover, infections or other inflammatory events have been suggested as possible triggers of acute cerebrovascular accidents in winter, with acute-phase proteins as the possible link.[10] Although definite conclusions cannot be drawn from these preliminary data, acute disorders of cranial nerves seem to share the same temporal window, and perhaps the same risk factors, as the acute cerebrovascular diseases.

ACKNOWLEDGEMENTS

This study was supported by an educational grant and a scientific research grant (60%) from the University of Ferrara.

REFERENCES

1 Manfredini R, Gallerani M, Portaluppi F, *et al*: Chronobiological patterns of acute cerebrovascular diseases. *Thromb Res* 1997; **88:** 451 – 463.

2 Gallerani M, Manfredini R, Ricci L, *et al*: Chronobiological aspects of acute cerebrovascular diseases. *Acta Neurol Scand* 1993; **87:** 482 – 487.

3 Gallerani M, Trapella G, Manfredini R, *et al*: Acute intracerebral haemorrhage: circadian and circannual patterns of onset. *Acta Neurol Scand* 1994; **89:** 280 – 286.

4 Gallerani M, Portaluppi F, Maida G, *et al*: Circadian and circannual rhythmicity in the occurrence of subarachnoid hemorrhages. *Stroke* 1996; **27:** 1793 – 1797.

5 Mojòn A, Fernàndez JR, Hermida RC: Chronolab: an interactive software package for chronobiologic time series analysis written for the Macintosh computer. *Chronobiol Int* 1992; **9:** 403 – 412.

6 Vinall PE: An inquiry into the seasonal nature of cerebrovascular disease. *J Stroke Cereb Dis* 1995; **5:** 202 – 220.

7 Hata T, Ogihara T, Maruyama A, *et al*: The seasonal variation of blood pressure in patients with essential hypertension. *Clin Exp Hypertens* 1982; **4:** 341 – 354.

8 Kunes J, Tremblay J, Bellavance F, *et al*: Influence of environmental temperature on the blood pressure of hypertensive patients in Montreal. *Am J Hypertens* 1991; **4:** 422 – 426.

9 Keatinge WR, Coleshaw ERK, Easton JC, *et al*: Increases in platelet and red cell counts, blood viscosity, and arterial pressure during mild surface cooling: factors in mortality from coronary and cerebral thrombosis in winter. *BMJ* 1984; **289:** 1045 – 1048.

10 Grau AJ, Buggle F, Becher H, *et al*: The association of leukocyte count, fibrinogen and C-reactive protein with vascular risk factors and ischemic vascular diseases. *Thromb Res* 1996; **82:** 245 – 255.

M Gallerani, C Delli Gatti, R Salmi, H Kuwornu Afi, O la Cecilia and R Manfredini
Seasonal Variations in the Incidence of Cranial Nerve Paralysis
The Journal of International Medical Research
1999; **27:** 130 – 133
Received for publication 7 April 1999
Accepted 14 April 1999

Address for correspondence
DR R MANFREDINI
First Internal Medicine, Department of Clinical and Experimental Medicine, University of Ferrara Medical School, via Savonarola 9, I-44100 Ferrara, Italy.