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Do accompanying symptoms in women with migraine allow distinction between two separate patient groups?

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Abstract We assessed the prevalence of a number of behavioral and somatic symptoms in women with migraine and investigated whether they were related to personality. In 46 women with migraine, record was taken of 26 symptoms, the MMPI and STAI questionnaires were administered and a psychological assessment was carried out with a semistructured interview using SCID, Italian version. Symptom data were processed through a self-organizing map (SOM) system and K-means cluster analysis. Since two patient clusters were obtained, data relative to headache characteristics and the MMPI and STAI scores were assessed separately for each

group. Group 2 had a significantly higher prevalence of several symptoms, of depressive disorders and higher MMPI and of STAI scores with respect to group 1, while the headache characteristics were substantially the same. It is concluded that a distinction can be made between two categories of female migraine patients with scarce or abundant accompanying symptoms. This difference does not seem related to the headache characteristics but, rather, to the patients' personality and psychopathologic symptoms.

Key words Migraine • Personality • Behavioral symptoms

Introduction

Besides autonomic symptoms, a number of other behavioral and somatic symptoms may be observed in women with migraine and when migraine transforms into a chronic daily headache [1–5]. This issue also relates to the problem whether an association exists between personality changes and migraine. While clinical investigations using the Minnesota multipolar personality inventory (MMPI) in migraine patients led to controversial results [6–13], epidemiologic and prospective studies [14–23] have confirmed this association. On the other hand, since behavioral and somatic symptoms are observed in patients with anxiety, mood and somatoform disorders [24], the assessment of their

prevalence in a migraine patient population may be of help in evaluating the psychogenic component in these patients.

The aim of this study was to:

1. Assess the prevalence of a number of behavioral and somatic symptoms in women with migraine;
2. Investigate if these symptoms are related to the patient's personality characteristics and the presence of psychopathological conditions.

Patients and methods

We studied 46 untreated women with migraine without aura (mean age, 38±11 years) consecutively sent to the Headache and Facial Pain

Unit, Department of Clinical Pathophysiology, University of Turin. The patients were given a diary in which they recorded, on a daily basis for one month, the occurrence, severity (scored 1–5), and duration of the headache episodes. During this period they were asked to refrain from taking drugs as much as possible. In addition they were asked to assess the usual level of the pain episodes before enrolment on a visual analog scale (VAS). The diagnoses were made according to the guidelines of the International Headache Society (IHS) [25].

Inclusion criterium was the presence of migraine for at least one year. A tension type headache (TTH) could be present if it did not meet the criteria for chronic tension-type headache (CTTH), that is, if the frequency was less than 15 days per month. Patients with chronic daily headache, i.e. those who had headache for all or most of the day for more than 15 days per month, were not included. Further exclusion criteria were the presence of drug abuse or of a concurrent relevant medical condition, such as endocrine, immune, blood, nervous or circulatory disorders.

Every patient underwent a semistructured interview and general and neurologic examinations. In particular, we recorded headache characteristics, improvement or aggravating factors and associated symptoms. The semistructured interview recorded 21 symptoms, behavioral and somatic, that in a previous study [26] were found to be significantly different in groups of healthy subjects and patients with systemic or psychological disorders. The Italian MMPI 356-item abbreviated version was administered to all patients. Normative data for this version of the test have been calibrated with an Italian reference population [27] and its validity, compared with the full form has been supported by comparative studies [28, 29]. The MMPI is probably the most widely used instrument in the assessment of personality factors. Depending on the responses (true or false) to a large number of questions, a score is given to three validity scales (L, lie; F, frequency; K, correction or defense) and 10 clinical scales (Hs, hypochondria; D, depression; Hy, hysteria; Pd, psychopathological deviation; Mf, self esteem; Pa, paranoia; Pt, psychasthenia; Sc, schizophrenia; Ma, hypomania; Si, social introversion).

The state and trait anxiety inventory (STAI X 1 and 2, Italian version) was also administered. This test consists of two groups of 20 statements each, which describe situations that the subject defines as corresponding or not corresponding to his own situation, either at the moment when the test is performed (state anxiety), or usually (trait). The MMPI T-scores and STAI 1 and 2 scores were calculated for all patients.

Finally, a psychological assessment on the Axis I (anxiety, mood and somatoform disorders) of the DSM-IV [24] was carried with a structured interview using SCID (Structured Clinical Interview DSM), Italian version [30].

The data relative to the accompanying symptoms were then processed through a self-organizing map (SOM) system [31], i.e. a technique of artificial intelligence by which a large amount of data from an input space (usually high dimensional) is projected to a lower-dimensional output space using a neural network model. During this nonlinear projection, SOM preserves topological relations between the data, i.e. similar vectors from the input space are projected onto nearby neurons on the map. In commonly encountered applications, SOM consists of three neuron layers organized on a regular grid: input (or pre-process) layer, competition layer, and output (or post-process) layer (Fig. 1). The SOM algorithm comprises the following steps: geometry definition, initialization (preprocessing), map training, testing (post-processing). In the basic SOM algorithm,

the geometrical structure of the map, i.e. the topological relations and the number of neurons, is determined from the beginning. The competition layer is formed of neurons located on a regular 1- to 3-dimensional grid. In the 2-dimensional case, the map topology is usually a rectangle. After SOM geometry has been defined, the initialization of the map follows: during this phase the initial values are given to the weight vectors. Once the weight vectors are properly initialized, the training phase of the neural network follows. In each training step, one sample vector x from the input data set is chosen randomly and similarity measures are calculated between it and all the weight vectors of the map. The best-matching unit (BMU) or “winner”, denoted as w , is the unit whose weight vector has the greatest similarity with the input sample x (Fig. 1). The similarity is usually defined by means of a distance measure. The trained SOM map is a result in itself, but it is also an instrument for obtaining a visual representation of the results of the statistical analysis (post-process phase). In summary, the SOM technique combines the properties of vector quantitation and data projection techniques, in that it searches for good reference vectors and, at the same time, orders them on a regular grid. In addition, SOM offers a very efficient, powerful and highly visual tool in cluster analysis (Fig. 2). Details relative to the application of this methodology to biological data have been described [31].

Since two clusters were identified by SOM analysis (Fig. 2), K-means cluster analysis was further employed. This procedure identifies relatively homogeneous groups of cases based on selected characteristics by means of an algorithm that can handle large numbers of cases but requires the number of clusters be specified [32]. Thus, in our case two patient clusters were obtained. Data relative to symptom prevalence, headache characteristics, MMPI and STAI 1.2 scores, and prevalence of psychopathological disorders were then assessed separately for the two patient groups (Mann-Whitney and chi-square analyses).

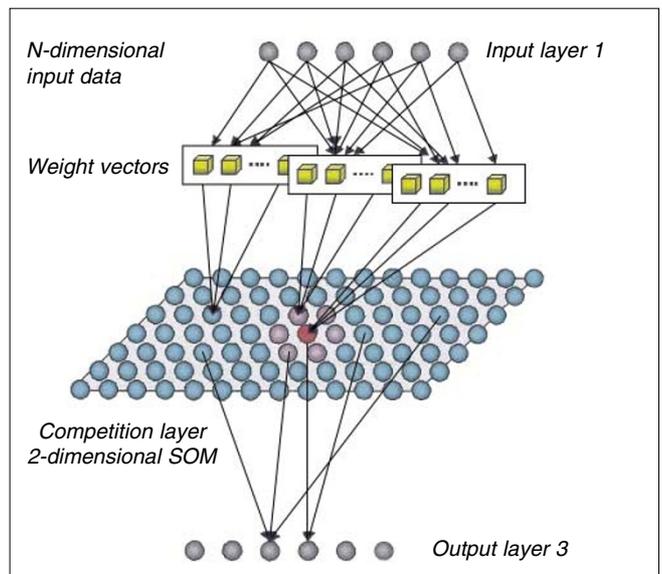


Fig. 1 Self-organizing map (SOM). In the “initialization” phase initial values are given to weight vectors in the input layer. In the training phase, the “best-matching unit” is determined in the competition layer. A visual representation of the results follows in the output layer

Results

Figure 2 shows the patient distribution after SOM analysis. A tendency is observed to concentrate the patients in two groups located towards two opposite map sites with a transversal area that remains relatively empty.

Through K-means cluster analysis, two patient groups were obtained, with 25 patients and 21 patients, respectively.

Figure 3 reports the prevalence of behavioral and somatic symptoms in the two patient groups: group 2 showed a significantly higher prevalence of several symptoms.

The prevalence of patients with additional episodic TTH was almost identical in the two groups: 12 (48%) patients in group 1 and 10 (47.6%) in group 2 (Table 1). Group 1 had slightly higher frequency and slightly lower intensity and duration of migraine and TTH, but not significantly so.

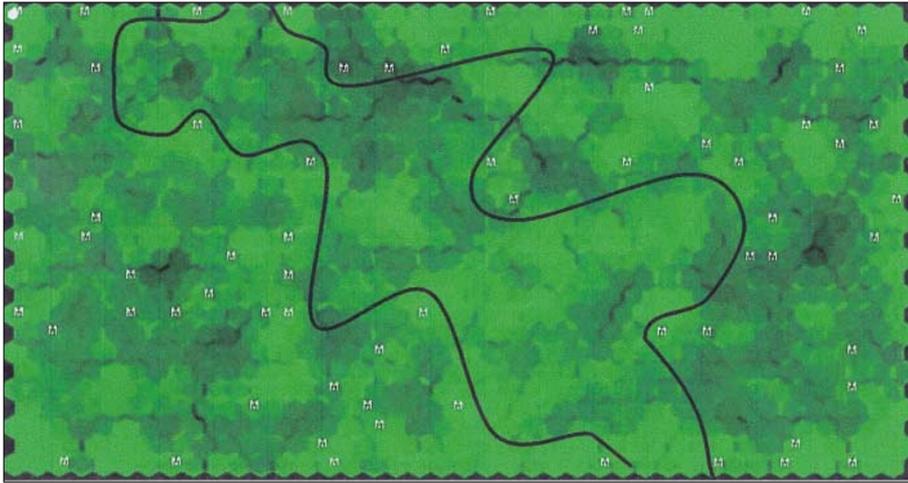


Fig. 2 Self-organizing map (SOM) obtained through the data relative to the accompanying symptoms. Each letter M shows the location of a patient inside the map. Patient location tends to diverge towards two opposite map sites

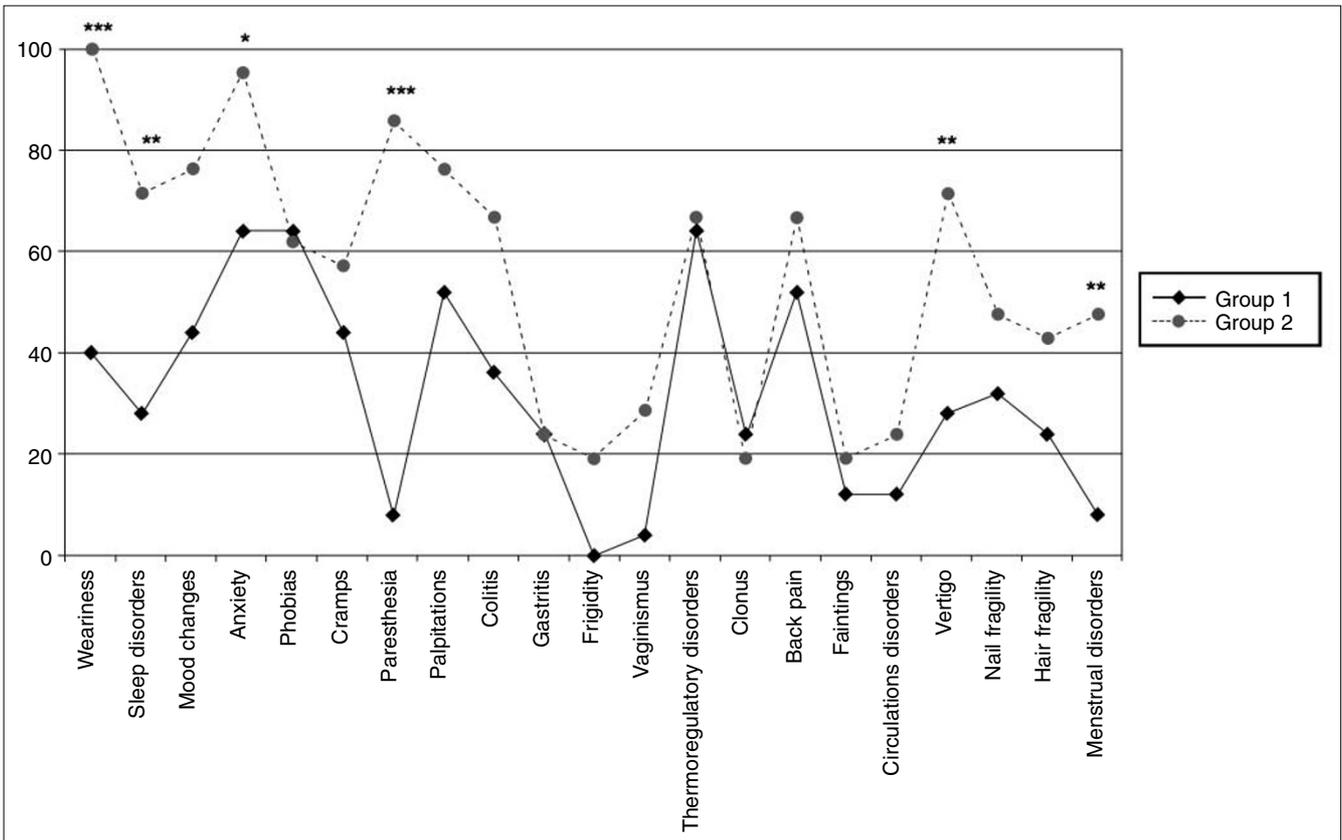


Fig. 3 Prevalence of behavioral and somatic symptoms in the 2 groups of patients, as assessed by semistructured interviews. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1 Characteristics of tension-type headache in the two patient groups. No differences between groups are significant

	Group 1 (n=12)	Group 2 (n=11)
Pain characteristics		
Frequency (per month)	5.82 (3.89)	7.70 (5.12)
Intensity (1–5)	1.44 (0.39)	1.22 (0.25)
Duration (hours)	6.01 (3.10)	3.88 (1.87)

Mean age was also somewhat higher in group 2, not significantly so (Table 2).

In Table 3, the MMPI profiles and the STAI data are given. Group 2 showed a consistent score elevation with respect those of group 1. In particular, in group 2 mean scores for the “neurotic” scales (Hs, D, Hy) were well above 70 and significantly higher than of group 1. Other scores significantly higher in group 2 were: Pa, Pt, Sc and Si. STAI

Table 2 Pain parameters for migraine, according to group defined by K-means cluster analysis. No differences between groups are significant

	Group 1 (n=25)	Group 2 (n=21)
Age, years ^a	34.76 (12.47)	40.95 (9.12)
Pain characteristics		
Frequency (per month)	6.65 (5.22)	8.63 (4.56)
Intensity (1–5)	4.01 (0.71)	3.80 (0.62)
Duration (hours)	7.91 (4.53)	6.37 (4.37)
Time since onset (months)	86.64 (45.34)	73.80 (48.48)
Pressing, %	24.00	38.00
Throbbing, %	72.00	71.43
Stabbing, %	16.00	19.05
Pain location, %		
Frontal	48.00	33.33
Orbital	36.00	33.33
Temporoparietal	40.00	57.14
Occipital	28.00	23.81
Accompanying symptoms, %		
Nausea	76.00	80.95
Vomiting	40.00	42.86
Photophobia	80.00	66.67
Phonophobia	52.00	71.43
Sweating	32.00	42.86
Lacrimation	32.00	47.62
Conjunctival injection	24.00	23.81
Visual disturbances	20.00	14.29

^a Values are means (SD)

Table 3 MMPI and STAI data for patients of groups 1 and 2

	Group 1	Group 2	<i>p</i>
MMPI			
L (lie)	42.76 (9.69)	41.29 (7.26)	NS
F (frequency)	52.20 (13.12)	61.76 (15.23)	<0.05
K (defense)	48.72 (10.24)	45.33 (10.07)	NS
Hs (hypochondria)	61.12 (12.75)	77.67 (11.41)	<0.001
D (depression)	63.92 (13.37)	76.00 (13.37)	<0.01
Hy (hysteria)	62.52 (11.89)	74.76 (10.54)	<0.01
Pd (psychopathological deviation)	56.48 (12.25)	61.76 (10.79)	NS
Mf (self esteem)	45.40 (10.31)	47.81 (5.80)	NS
Pa (paranoia)	50.24 (9.12)	59.24 (11.80)	<0.01
Pt (psychasthenia)	55.60 (14.77)	71.57 (14.37)	<0.001
Sc (schizophrenia)	54.64 (13.91)	68.00 (16.33)	<0.01
Ma (hypomania)	49.32 (14.09)	54.24 (8.99)	NS
Si (social introversion)	54.48 (12.61)	60.33 (11.61)	NS
STAI			
STAI1	42.00 9.48	49.92 12.28	<0.01
STAI2	49.67 11.20	52.00 10.07	<0.05

NS, not significant

Table 4 Prevalence of depressive disorders in the two groups, as assessed by SCID. $p < 0.02$ for group 2 vs. group 1, chi-square analysis

	Yes	No	Total
Group 1	6	19	25
Group 2	13	8	21
Total	19	27	46

1 and 2 scores were significantly higher in group 2 with respect to group 1. Finally, group 2 showed a significantly higher prevalence of depressive disorder as assessed by the SCID (Table 4).

Discussion

Studies on the relationship between personality and migraine have led to different results. Using the MMPI in migraine patients, some authors found normal profiles or, at least, a lower scale elevation than in patients with chronic tension-type headache or with migraine and tension-type headache superimposed [3, 5, 6], while others found a marked elevation of several MMPI scales and, in female migraine patients, a typical V configuration of the neurotic triad of the MMPI (with high scores of hypochondria and hysteria and depres-

sion score still high but lower than those of the two other scales) [7]. Using the Eysenck personality questionnaire, higher scores of psychoticism were found [13]. In epidemiologic studies an association was found between migraine and panic attacks [11] and both depression and anxiety disorders [12–17]. This was confirmed by prospective studies [18–20].

Some caution in interpreting our data is requested by the fact that the work was performed on a selected sample of patients seeking treatment in a specialty center. Nevertheless, depending on the presence of accompanying symptoms in our patients, the data at hand seem to allow a distinction between two categories: scarce in one type of patient and abundant in the second type. In fact, two groups were assessed on the basis of these symptoms. This difference does not seem to relate with the headache characteristics, in terms of frequency, severity and duration of the headache attacks, since these were not significantly different between group 1 and 2 patients. However, it appears that the prevalence of such symptoms is rather related to the patient personality: group 2 patients had several MMPI and STAI scores significantly higher than group 1 patients. Moreover after the SCID structured interview, a higher prevalence of depressive disorders was found in group 2. These findings may explain the conflicting results obtained in previous studies using the MMPI. Moreover, if the relationship between accompanying symptoms and personality changes is confirmed, this may help when planning the treatment. However, further studies are needed to confirm these issues.

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