

Incidence and diagnosis of anosognosia for hemiparesis revisited

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Background: In previous studies, the incidence of anosognosia for hemiparesis has varied between 17% and 58% in samples of brain damaged patients with hemiparesis.

Objective: To determine whether this wide variation might be explained by the different criteria used for diagnosing anosognosia.

Methods: 128 acute stroke patients with hemiparesis or hemiplegia were tested for anosognosia for hemiparesis using the anosognosia scale of Bisiach *et al*.

Results: 94% of the patients who were rated as having "mild anosognosia"—that is, they did not acknowledge their hemiparesis spontaneously following a general question about their complaints—suffered from, and mentioned, other neurological deficits such as dysarthria, ptosis, or headache. However, they immediately acknowledged their paresis when they were asked about the strength of their limbs. Their other deficits clearly had a greater impact. These patients had significantly milder paresis than those who denied their disorder even when asked directly about their limbs.

Conclusions: Patients who do not mention their paresis spontaneously but do so when questioned about it directly should not be diagnosed having "anosognosia." If this more conservative cut off criterion is applied to the data of the present as well as previous studies, a frequency of between 10% and 18% for anosognosia for hemiparesis is obtained in unselected samples of acute hemiparetic stroke patients. The incidence thus seems smaller than previously assumed.

Stroke patients with anosognosia for hemiparesis typically deny their paresis or behave as if the disorder did not exist. They are convinced that their paretic or plegic limb functions normally. They may address their paresis, but then consider it as harmless and state that, for example, their leg "is tired". Anosognosia is not only found in hemiparesis; it may also be observed with cortical blindness, hemianopia, or deafness.^{1 2}

Previous studies have shown wide variation in the incidence of anosognosia for hemiparesis. Bisiach *et al*³ reported that about 33% of right brain damaged patients had medium or severe anosognosia for hemiparesis. Cutting⁴ found that 58% of right brain damaged patients had anosognosia for hemiparesis, while Maeshima *et al*⁵ reported only 24% with this sign. In a study by Starkstein *et al*,⁶ 31% of right and left sided acute stroke patients had anosognosia for hemiparesis. Other studies reported incidences ranging from 17% to 28% for the same disorder.^{7–9}

We wondered whether this wide variation in the incidence might reflect varying criteria for diagnosing anosognosia for hemiparesis. All assessment scales applied in previous studies^{3 4 7 10} used a short interview to consider a patient anosognosic for hemiparesis. However, so far none of the scales has had general acceptance as the standard procedure. The questionnaires suggested by Bisiach *et al*³ and by Cutting⁴ have been widely distributed and frequently used in clinical studies.^{6 8 9 11 12} They both start with a general question about the patient's complaints. The advantage of Bisiach's questionnaire³ is that it allows classification of the degree of anosognosia into "mild", "medium", and "severe", while the scale of Cutting⁴ only uses a dichotomous classification (having anosognosia *v* not having anosognosia).

According to Bisiach's scale, "mild anosognosia" for hemiparesis is diagnosed when patients do not acknowledge their paresis when posed a general question about their symptoms. In this study we ask whether such behaviour

should indeed be regarded "pathological" or whether it is still within the normal range (especially when hemiparesis is not the only symptom involved after a stroke). Should patients who do not mention their paresis but complain spontaneously of other deficits be considered as having "anosognosia for hemiparesis"?

To investigate this question we asked how patients with "mild" anosognosia differ in their clinical variables from patients with "medium" or "severe" anosognosia. We further asked whether it is possible that patients with "mild" anosognosia do not acknowledge their paresis spontaneously because they have other deficits that may have a greater impact subjectively.

METHODS

We investigated patients with circumscribed right and left hemisphere lesions consecutively admitted from a well defined area belonging to the University of Tübingen and six related community hospitals over a period of six months. We included patients who had developed acute stroke within the previous 15 days, with left or right sided hemiparesis or hemiplegia. Lesions were documented by magnetic resonance imaging or computed tomography. Patients who were not alert, not cooperative, or had severe aphasia were excluded only if their communication abilities did not permit a simple interview for anosognosia (see below).

The study group comprised 128 patients with hemiparesis or hemiplegia, 72 with right brain damage and 56 with left brain damage (table 1). The patients gave informed consent for their participation in the study, which was done in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All examinations were carried out immediately after admission—that is, in the acute phase of the stroke.

The degree of paresis of the upper and lower limbs was scored with the usual clinical ordinal scale, where 0 is no

Table 1 Demographic and clinical data on all brain damaged patients with hemiparesis or hemiplegia

Variable		Denial grade 0	Denial grade 1	Denial grade 2	Denial grade 3
Number		99	17	8	4
Sex (M;F)		54;45	6;11	6;2	3;1
Age (years)	Median (range)	69 (20 to 100)	70 (45 to 89)	71(51 to 84)	78(54 to 91)
Aetiology		84 inf, 15 haem	12 inf, 5 haem	3 inf, 5 haem	3 inf, 1 haem
Time since lesion (days)	Median (range)	4 (0 to 14)	4 (0 to 11)	3.5 (1 to 15)	3 (0 to 14)
Side of lesion					
Right	% present	56	41	75	100
Left	% present	44	59	25	0
Paresis of contralesional side	% present	100	100	100	100
Arm	Median (range)	4 (0 to 4)	3 (0 to 4)	0 (0 to 4)	0 (0 to 1)
Leg	Median (range)	4 (0 to 4)	3 (0 to 4)	0 (0 to 3)	0 (0 to 3)
Visual field defects	% present	4	0	13	0
	% tnp	3	6		
Neglect	% present	16	24	75	75
	% tnp	13	12	13	25
Extinction					
Visual	% present	19	52	75	75
	% tnp	5	6	13	
Tactile	% present	22	41	75	75
	% tnp	4	12	13	
Auditory	% present	19	18	75	75
	% tnp	6	12	13	
Aphasia	% present	14	24	0	0
MMSE	Median (range)	25 (9 to 30)	18.5 (6 to 29)	13.5 (10 to 21)	15.5 (4 to 24)

Denial grade 0 to 3 according to the anosognosia scale of Bisiach *et al.*³

f, female; haem, haemorrhage; inf, infarct; m, male; MMSE, mini-mental state examination¹³; tnp, testing not possible.

trace of movement and 5 is normal movement. Scoring was carried out separately for the proximal (upper arm, thigh) and distal (forearm, lower leg) parts of each limb. Table 1 presents the averaged scores per limb.

Anosognosia for hemiplegia was examined using a German translation¹⁴ of the anosognosia scale suggested by Bisiach *et al.*³:

- grade 0 (no anosognosia): the disorder is spontaneously reported or mentioned by the patient following a general question about their complaints;
- grade 1: the disorder is reported only following a specific question about the strength of the patient's limbs;
- grade 2: the disorder is acknowledged only after demonstrations through routine techniques of neurological examination;
- grade 3: no acknowledgement of the disorder can be obtained.

Visual field defects were assessed by standard neurological examination. Spatial neglect was diagnosed when the patients showed characteristic clinical behaviour such as orienting towards the ipsilesional side when addressed from the front or the left, and/or ignoring contralesionally located people or objects. In addition, all patients had to show spatial neglect in the bells test.¹⁵ This test consists of seven columns each containing five targets (bells) and 40 distractors. Three of the seven columns are on the left side of the DIN A4 sheet (= 15 targets), one is in the middle, and three are on the right (= 15 targets). The patient is asked to cross out all the bells. Omission of more than five bells within the three contralesional columns compared with the three ipsilesional columns is considered to indicate spatial neglect.

The patients were clinically tested for visual, auditory, and tactile extinction. In each mode, 10 unilateral stimuli on either side and 10 bilateral stimuli were presented in a pseudo-random order. Visual extinction was tested by the usual clinical confrontation technique. Movements of the examiner's left or right index finger were presented in the patient's left or right visual half field. Auditory and tactile stimulation tests were conducted with the patient's eyes

closed. The auditory mode was tested by rustling a small piece of paper near the patient's left or right ear. Tactile extinction was investigated by applying fingertips lightly on the dorsal surface of the patient's left or right hand while the patient's arms lay relaxed. If the patient was not able to report this gentle unilateral tactile stimulation on the contralateral hand owing to left sided sensory loss, the examination was repeated using soft pinching applied to the left or right shoulder. Patients were classified as showing extinction in the respective mode when they reported $\geq 90\%$ of the unilateral stimuli on each side correctly, but failed to perceive the left stimulus during bilateral stimulation in $>50\%$ of the trials.

RESULTS

Ninety nine (77%) of the 128 brain damaged subjects with left or right sided hemiparesis or hemiplegia mentioned their motor deficit spontaneously following a general question about their complaints. Twenty nine patients (23%) were thus rated as showing mild, medium, or severe "anosognosia" for hemiparesis according to the anosognosia scale of Bisiach *et al.*³ Seventeen (59%) of these 29 patients had a denial grade of 1 (that is, they reported their motor impairment only following a specific question about the strength of their limbs); eight (27%) had a denial grade of 2 (recognising their paresis only after demonstration); and four (14%) had a denial grade of 3 (remaining unaware of their deficit even after demonstration). Clinical and demographic variables of these patient groups are given in table 1.

One might assume that the classification of a verbal behaviour scored as denial grade 1, representing *mild anosognosia*,^{3,6} could be an overinterpretation leading to an artificially high percentage of "anosognosia" in a sample of stroke patients. If such behaviour is instead regarded as non-pathological, one would expect these patients not to differ in their clinical variables from those with a denial grade of 0—that is, those with no anosognosia. Further, we would expect that such patients in denial grade 1 would differ from those in denial grades 2 or 3, as both latter groups show consistent failure to acknowledge hemiparesis or hemiplegia following a specific question about the strength of their limbs (subjects

Table 2 Comparison of clinical variables between the patient groups with different denial grades (grades 0 to 3 according to the anosognosia scale of Bisiach *et al*³)

	Denial grade		
	Grade 0 v 1	Grade 1 v 2/3	Grade 0 v 2/3
Age	p=0.555	p=0.710	p=0.300
Side of lesion	p=0.272	p=0.023	p=0.065
Paresis of contralesional side			
Arm	p=0.154	p=0.030	p<0.001*
Leg	p=0.062	p=0.012 *	p<0.001*
Visual field defects	p=0.597	p=0.345	p=0.669
Neglect	p=0.470	p=0.002*	p<0.001*
Visual extinction	p=0.063	p=0.033	p<0.001*
Tactile extinction	p=0.548	p=0.049	p<0.001*
Auditory extinction	p=0.969	p=0.001*	p<0.001*
Aphasia	p=0.323	p=0.070	p=0.163
MMSE	p=0.001*	p=0.258	p<0.001*

*Significant with a Bonferroni corrected α level: $p=0.0167$.
MMSE, mini-mental state examination.¹³

in denial grade 2 only acknowledge hemiparesis/hemiplegia after demonstration; subjects in denial grade 3 do not acknowledge it at all). For the following analyses, we thus amalgamated patients in denial grades 2 and 3.

In fact, comparison of the patients in denial grade 1 (the 17 patients who first reported their motor impairment after a specific question about the strength of their limbs) with those in denial grade 0 revealed a significant difference only for the MMSE score ($U = 410.5$; $p < 0.001$) (table 2). All other variables such as age, severity of hemiparesis, aphasia, visual field defects, neglect, and extinction were comparable between the two groups. In contrast, comparison of patients in denial grade 1 with those in denial grades 2 or 3 showed more severe paresis of the lower limb ($U = 48.0$; $p < 0.001$), a higher incidence of spatial neglect ($\chi^2 = 9.64$; $df = 1$; $p = 0.002$), and more frequent auditory extinction ($\chi^2 = 10.71$; $df = 1$; $p < 0.001$) in the latter groups. (These differences were still present if patients in grade 1 were compared only with those in grade 2.) Comparison of patients rated grade 0 with those in grade 2 or 3 revealed significant differences in the severity of upper and lower limb paresis, visual, tactile, and auditory extinction, spatial neglect, and the MMSE score. Table 2 summarises the statistical results of all these comparisons.

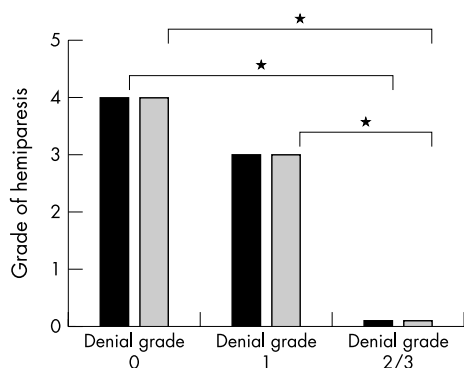


Figure 1 Median severity of contralesional hemiparesis. The degree of paresis was scored separately for the proximal and distal parts of each limb using the usual clinical ordinal scale, where 0 is no trace of movement and 5 is normal movement. Scores were averaged per limb. Black bars indicate scores for the upper limb; grey bars for the lower limb. Anosognosia for hemiplegia was examined using a German translation¹⁴ of the anosognosia scale suggested by Bisiach *et al*.³ Asterisks indicate significant differences using a Bonferroni corrected α level of $p=0.0167$.

We wondered whether the subjects in denial grade 1—that is, who reported their motor impairment first after a specific question about the strength of their limbs—might not have mentioned their paretic limb spontaneously because the paresis was relatively mild and their other neurological symptoms were subjectively more prominent. Our investigations showed that these patients did indeed have significantly less severe paresis than those in denial grade 2 or 3 (fig 1).

To evaluate whether the patients in denial grade 1 mentioned other neurological defects or symptoms that might have a greater personal impact for them, we analysed the verbal responses of all 17 subjects. The responses were classified into four categories and each patient was assigned to one of these categories (table 3). Following the general question about their complaints, the majority of the 17 patients mentioned other deficits like “I had difficulty in talking” or “my hand and leg felt numb” (table 3). One male patient with hypertrophy of his prostate mentioned that he had problems with his prostate and pain when he urinated. All these complaints were real. Four further patients complained about general symptoms like “tiredness”, “head-ache”, or “feeling sick” (table 3). Two patients had no memory for the stroke event, and one claimed that he came to the hospital “with the help of the ambulance after having a stroke”. This latter response was categorised as “inappropriate” in table 3 as she mentioned the way in which she reached hospital but not the reason for being admitted. All

Table 3 Categories of responses given by the 17 patients in denial grade 1 following a general question about their complaints (the first level of severity of anosognosia in the anosognosia scale of Bisiach *et al*³)

Category	Response
<i>Other deficits</i>	59% (n = 10)
Patients reported speech arrest, dysarthria, sensory deficit, ptosis, facial paresis, etc	
<i>General symptoms</i>	23% (n = 4)
Patients reported tiredness, dizziness, headache, etc	
<i>No memory</i>	12% (n = 2)
Patients reported having no memory for the stroke event	
<i>Inappropriate response</i>	6% (n = 1)

The response of each of the 17 patients was assigned to only one of the four categories.

the 17 patients recognised their paresis at once when the examiner asked them about the strength of their limbs.

DISCUSSION

In this study we investigated whether patients who do not mention their neurological defect (hemiparesis) spontaneously but only when asked about it directly by the examiner should be regarded as anosognosic. In particular, we asked whether hemiparetic stroke patients diagnosed as being in denial grade 1 according to the anosognosia scale of Bisiach *et al*³ should be classed as having "mild anosognosia" for hemiparesis or should be considered non-pathological.

Previous studies have shown that patients with anosognosia differ significantly from those without this feature with respect to the side of the lesion, additional neglect, and presence of extinction.^{4-6,7} In contrast, in the present study we found a high degree of similarity between patients in denial grade 0 (no anosognosia for hemiparesis) and those in denial grade 1. Except for the MMSE score, there were no significant differences between these two groups for any of the clinical variables tested.

The question arises as to why patients rated grade 1 did not mention their paresis spontaneously. Is it possible that they simply did not mention their paretic limb because the paresis was mild or because other deficits were subjectively more prominent? We found that the paresis of patients in denial grade 1 was indeed significantly milder than in denial grades 2 and 3. Moreover, analysis of the verbal responses showed that 59% of the patients in denial grade 1 complained spontaneously about other neurological deficits such as speech arrest, dysarthria, sensory deficit, ptosis, and so on. All these symptoms were real. An additional 35% of the grade 1 group spontaneously mentioned symptoms such as tiredness, dizziness, headache, and loss of memory for the stroke event. Such symptoms are indeed common in stroke patients^{16,17} and thus may be assumed to be real and not just a pretense. Thus the data suggest that 94% of those patients rated as being in denial grade 1 did not appear to have a problem in accepting their hemiparesis but simply perceived other symptoms as being more prominent when asked a general question about their complaints. When the examiner asked about the strength of their limbs, all these patients immediately acknowledged their paresis. In contrast, when the patients in denial grade 2 and 3 were asked specifically about the strength of their limbs, they insisted that everything was all right. In conclusion, we think that a denial grade of at least 2 is the appropriate cut off point for a diagnosis of anosognosia for hemiparesis.

If we consider denial grade 1 to be non-pathological and only regard grades 2 and 3 as indicating anosognosia, our study gives an incidence of 10% for anosognosia for hemiparesis in a sample of 128 acute stroke patients. Applying the same cut off post hoc to previous studies on this issue leads to a more homogeneous incidence of anosognosia in patients with hemiparesis. Starkstein *et al*⁶ investigated a sample of 80 patients for anosognosia for hemiparesis. If these investigators had considered only those patients in denial grade 2 or 3 as anosognosic, the incidence of anosognosia for hemiparesis in that study would have been 18%. Appelros *et al*,⁹ who used the same anosognosia scale as Starkstein *et al*, would similarly have obtained an incidence of 12%.

In conclusion, we suggest that patients who do not mention their paresis spontaneously following a general question about their complaints but acknowledge it when asked about it directly should not be considered as having anosognosia. Our study showed that most patients in this category suffer from and report other deficits which are obviously more prominent for them. These patients have significantly milder paresis than those who deny their disorder even when they are asked specifically about their limbs; moreover, the clinical variables found in such patients do not differ from those in patients who report their disorder spontaneously.

If the present cut off criterion is applied post hoc to previous datasets from other investigators, the incidence of anosognosia for hemiparesis ranges from 10% to 18% in unselected samples of acute stroke patients with hemiparesis or hemiplegia. The incidence of anosognosia thus seems to be lower than previously assumed.^{3,6,8,9}

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