Introduction: An aphysiological pattern in computerized dynamic posturography (CDP) may be produced by numerous causes. We analyze the results obtained in this test by a group of malingering patients.

Patients and method: This study analyzes a particular group of 7 malingerers, i.e., patients simulating a false and unreal equilibrium disorder, without any a priori awareness of the gain expected from a pathological report. The condition can only be identified with the very complex postural disorder known as “continuous imbalance.” We analyze the results of the dynamic posturography test following the diagnostic criteria described by other authors.

Results: Of the criteria analyzed, we found Cevette’s to be the most frequently positive for our study group.

Conclusions: The wide diversity in the criteria used makes it necessary to apply them together, assuming a high level of suspicion and great care in the diagnostic process.

Exploración posturográfica de pacientes simuladores

Introducción: El patrón afsiológico en la posturografía dinámica computarizada (PDC) puede observarse en el contexto de muy diversas etiologías. Analizamos un grupo de pacientes simuladores según los resultados obtenidos en esta prueba.

Pacientes y método: En este trabajo analizamos particularmente un grupo de 7 pacientes simuladores, esto es los que, sin que se conozca a priori la ganancia esperada de un informe patológico, muestran una alteración del equilibrio falsa e ideal que sólo se reconoce como “inestabilidad continua” y genera una alteración postural compleja. Analizamos los registros obtenidos en sus PDC según los criterios diagnósticos descritos por otros autores.

Resultados: De los criterios analizados, encontramos que el descrito por Cevette et al es el más frecuentemente positivo en nuestro grupo de estudio.

Conclusiones: La diversidad de criterios utilizados hace necesario utilizarlos todos en conjunto, partiendo de un alto índice de sospecha y mucha cautela en el diagnóstico.

Key words: Malingering. Imbalance. Posturography. Vestibular.


INTRODUCTION

The aphysiological (non-organic) pattern in dynamic posturography was initially described by Hamid.1 In order to comply with its definition, it is necessary for the following criteria to be met:

1. Low score in simple conditions.
2. Significant changes in the sensory deficit pattern on repeating the sensory organisation test (SOT).
3. Voluntary control of posture in terms of improved balance and increased latency in response to disturbances of the support surface and/or visual surroundings.

Later, Cevette et al2 established a formula that enables “normal,” “vestibular,” and “aphysiological” patterns to be easily differentiated by applying a mathematical formula to the results obtained by the patient in the SOT. This has made diagnosis much easier as this is one of the easiest measurements to study. Since then, numerous studies have tried to resolve the dilemma of this diagnosis and different criteria have appeared to define this pattern accurately and objectively.

Generally speaking, the aphysiological pattern appears in malingering patients with somatoform disorders (such as...
as conversion reaction or somatization disorder) and in depression and anxiety disorders.

The objective of this paper is to analyze a small population of patients diagnosed as malingerers and to study the different criteria defining the aphysiological pattern in these patients.

PATIENTS AND METHOD

This paper will review the results of the postural study of 7 patients seen at our clinic complaining of different degrees of instability but who, during follow-up, in one case conducted for 1 year, were diagnosed as malingerers.

The objective of this paper is to analyze a small population of patients diagnosed as malingerers and to study the different criteria defining the aphysiological pattern in these patients.

These patients were seeking some kind of compensation (work-related, economic and/or social) by manifesting a sensation of chronic instability. In almost all these cases, there was an initial vestibular event (vertigo and/or dizziness) with various causes (traumatic in 3 cases, idiopathic in 2 and secondary to vestibular neuritis in 2). During the initial study and prolonged follow-up, a strong clinical-exploratory disparity was detected with a very large variability in results and a lack of response to all forms of therapy indicated. In all cases, after careful monitoring involving their company and/or insurance company doctors, this finding could be identified as secondary to the search for some specific kind of compensation.

Otoneurological Examination

In all cases, a complete audiovestibular study was conducted, including otoscopy, spontaneous nystagmus examination (with and without gaze fixation), positional nystagmus, oculocephalic reflex, head-shaking nystagmus, eye movement and tracking examination, videonystagmography, computerized dynamic posturography (CDP), and pure-tone audiometry. This otoneurological examination was repeated for some specific kind of compensation.

Computerized Dynamic Posturography

For this study, we used equipment known as the SMART Equitest CDP System, version 7.0 (Neurocom International Inc., Clackamas, USA). The system includes a computerized base, a moveable platform referenced to the sway experienced by the patient during the examination, and visual surroundings.

CDP is based on detecting the displacement of the centre of pressure, which is almost always a true reflection of the centre of gravity, in different situations of sensory conflict (visual-somatosensory) or vestibular stimulation.

Each patient is subjected to an SOT, a motor control test (MCT), and an adaptation test (AT).

The result of each test is classified according to the following criteria:

SOT. The degree of stability is determined under each condition. This is calculated by comparing the angular difference between the patient’s maximum anteroposterior sway during each test and the maximum normal anteroposterior stability limits. Therefore, under each condition, an equilibrium score (SOT equilibrium store, 1-6) is obtained, based on the hypothesis that an individual can make an anteroposterior displacement of 12.5° around an axis collinear with the individual’s ankles without falling over. The score is calculated by comparing the maximum displacement from the centre of gravity with this theoretical maximum and is expressed as a percentage between 0% and 100%, whereby the first represents a maximum displacement, and therefore the need to take a step on the platform to avoid falling over, and the second represents minimum displacement or zero sway with perfect stability. The SOT is represented by: the equilibrium percentage, the sensory analysis or relative contribution of the somatosensory, visual and vestibular inputs in the patients’ overall stability, as well as their ability to maintain balance with incorrect sensory information and an analysis of their response strategy.

MCT. The patients’ automatic postural responses when faced with certain disturbances in the supporting surface are studied. The measurements taken are: mass distribution symmetry, response speed or latency and response strength and symmetry. For these measurements, six stimuli are used. In three of them, the platform is displaced forwards from the centre, and in the other three, it is displaced backwards from the centre. Each of these movements is made with different intensities, small, medium and large, respectively, defined according to the amplitude of the movement and the displacement speed.

AT. Two types of movements are made with the platform, toes-up and toes-down, referred to the axis of the ankles. Each of the two conditions is repeated on five occasions and each repetition is always performed with the same time (400 ms) and movement amplitude (8°) parameters. The purpose of this test is to objectify the patient’s degree of adaptation or improvement as the test is repeated under the same conditions (gradual decrease in sway at the expense of ankle strategy).

Aphysiological Pattern Criteria

We have taken the following criteria from the bibliography reviewed in order to analyze them in our patients (Rey-Martínez JA, Rama-López J. Posturographic examination of malingerer patients. Pamplona: Clínica Universitaria de Navarra. Universidad de Navarra; 2005. Available from: http://www.aeternum.tv/vertigo).

Criterion 1 (Cevette). A strategy is “aphysiological” when the patient behaves better in terms of posture under more difficult conditions with greater sensory conflict than under simple conditions with less sensory conflict. In other words, results are better in SOT 5 and SOT 6 than in SOT 1-4.

Criterion 2 (Cevette). In patients with an aphysiological pattern, there is a large variability between attempts,
Figure 1. Methodology to obtain Cevette score. Starting with the mean value obtained from the attempts under each condition, Cevette’s formulas are applied and the pattern obtained is that with the highest score — in this case, the aphysiological pattern. AP indicates aphysiological pattern; ES, equilibrium score; NP, normal pattern; VP, vestibular pattern.

\[
\text{AP} = \frac{-12.5° - (\theta_{\text{max}} - \theta_{\text{min}})}{12.5°} \times 100
\]

Figure 2. In this case, the prolonged swaying in the adaptation test is striking, although the criterion in the motor control test is also met. This case also complied with criterion 1 (higher score under more complicated conditions). Time lines have been added to the adaptation test and motor control test graphs. The first second of the test is on the first stretch. According to these criteria, everything to the right is considered aphysiological as it has an excessive duration.
which represents an “erratic” response. Under each condition of the sensory organization test, three attempts are made. Normally, the response is identical on each attempt or improves with each repetition (adaptation). An erratic response is easy to recognize due to variation in each result under the same conditions (Figure 1). This phenomenon is more easily recognizable in the MCT and the AT.

Criterion 3. Score according to Cevette et al. These authors defined three formulas, each of which determines the normal, aphysiological, and vestibular patterns. These formulas are as follows:

Normal pattern = –238.14 + (2.24 × µ1) + (1.45 × µ2) + (1.7 × µ4) − (0.13 × µ5)

Aphysiological pattern = –158.2 + (1.94 × µ1) + (1.09 × µ2) + (1.37 × µ4) − (0.15 × µ6)

Vestibular pattern = –251.21 + (2.31 × µ1) + (1.54 × µ2) + (1.89 × µ4) − (0.58 × µ6)

From the results obtained for each patient, the appropriate value is obtained and the definitive pattern is the one with the highest value (Figure 2).

Criterion 4. According to Goebel et al., the aphysiological pattern is defined through a multifactorial analysis combining the following results: pathological result in SOT1, exaggerated response in MCT with a small stimulus, and an inconsistency in response by obtaining an identical response in MCT with small and large stimuli or even a better response in the first than in the second.

Criterion 5 (Allum et al.). In the MCT and/or AT, there is an exaggerated and disproportionate response 1 second after a stimulus. This delay after the stimulus places the response in the sphere of voluntary control of stability and reflects an exaggerated destabilization (Figure 3).

Criterion 6 (Shepard). Disparity between clinical observation and examination result. Despite a highly deteriorated posturographic pattern, the patient is capable of moving, walking, getting onto the equipment, helping position the harness, etc., ie he or she shows normal posture and gait control, in no way consistent with the highly deteriorated response later shown. The disparity is sometimes so clear that this becomes evident with other parts of the examination, such as the study of stability limits.

Criterion 7 (Shepard). Repeating the test or performing it at random gives different, non-repeatable results. When the
SOT or MCT is repeated, changing the presentation order of conditions and stimuli, the patient exhibits results different to those obtained initially.

RESULTS

Of the patients taking part in our study, 57.1% were male, with a mean age ± standard deviation of 39±7 (34-55) years. After applying the criteria to our patients, the following gave the highest positive results: criterion 3 (score of Cevette et al) with 88.8% true positives (the results obtained by applying Cevette’s formulas with our population are detailed in Table 1), and criterion 5 (voluntary response time) with 100% true positives, although this criterion could not be evaluated in the first of the tests performed on the patients with repeated tests during the study time (patients 3 and 7).

As for the criterion that was positive the least number of times in our study, this corresponded to criterion 1 (SOT scores do not get worse in theoretically more complicated conditions) with 90% false negatives.

In our study, the largest number of positive criteria in a single patient was shown by patients 5 and 7, each complying with 4/7 criteria. Patient 1 is the patient who complied with the lowest number of criteria, only 2. Finally, the number of positive criteria most frequently shown by patients is 3 (57.1%). The complete list of criteria applied to each patient is shown in Table 2.

DISCUSSION

We can say that there is evidently no single criterion enabling us to define a pattern as aphysiological and that it is necessary to consider all criteria. This must start with a reliable clinical suspicion that takes into consideration the dynamic examination of both gait and posture. It would be wrong to take a single, inexplicable finding as definitive and

<table>
<thead>
<tr>
<th>Patient</th>
<th>Mean 1</th>
<th>Mean 2</th>
<th>Mean 3</th>
<th>Mean 4</th>
<th>Mean 5</th>
<th>Mean 6</th>
<th>NP</th>
<th>AP</th>
<th>VP</th>
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<td>0</td>
<td>-184</td>
<td>111</td>
<td>-195</td>
</tr>
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<td>25</td>
<td>-212</td>
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</tbody>
</table>

*AP indicates aphysiological pattern; NP, normal pattern; VP, vestibular pattern. Mean is the mean value obtained in the score from the sensory organisation test (SOT) under each condition. The 1 or 2 in brackets next to the patient number identifies the repetition of the posturographic tests in chronological order.

Table 2. Patients’ Results for Each Criterion

<table>
<thead>
<tr>
<th>Patient</th>
<th>Criterion 1</th>
<th>Criterion 2</th>
<th>Criterion 3</th>
<th>Criterion 4</th>
<th>Criterion 5</th>
<th>Criterion 6</th>
<th>Criterion 7</th>
</tr>
</thead>
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<td>No</td>
<td>A</td>
<td>No</td>
<td>Yes</td>
<td>na</td>
<td>na</td>
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<td>A</td>
<td>No</td>
<td>Yes</td>
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<td>na</td>
</tr>
<tr>
<td>3 (1)</td>
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<td>Yes</td>
</tr>
<tr>
<td>3 (2)</td>
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<td>No</td>
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<td>na</td>
<td>Yes</td>
</tr>
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</tr>
<tr>
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<td>A</td>
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<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>5 (2)</td>
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<td>No</td>
<td>A</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>No</td>
<td>No</td>
<td>A</td>
<td>Yes</td>
<td>Yes</td>
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<td>7 (1)</td>
<td>Yes</td>
<td>No</td>
<td>V</td>
<td>na</td>
<td>na</td>
<td>No</td>
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<tr>
<td>7 (2)</td>
<td>No</td>
<td>No</td>
<td>A</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*A indicates aphysiological pattern; No, patient does not comply with the criterion; na, non-assessable criterion; Yes, patient complies with the criterion; V, vestibular pattern. The 1 or 2 in brackets next to the patient number identifies the repetition of the posturographic tests in chronological order.
establish a diagnosis based on that pattern, with all that this implies.

Although we have selected very specific patients for this study, it must not be forgotten that patients with certain psychiatric illnesses also develop patterns of this type.6

With regard to our reviewed of other authors’ criteria, we believe that Cevette’s formulation is the most suitable. It is easy to perform and is objective. In our study, we can say that this formulation is met by all subjects. In patient number 7, however, this is not true in the first examination but it is in the second. Unlike patient number 5, patient number 7 shows great variability between criteria.

We feel, as confirmed in our study, that the MCT and AT are probably more suitable than the SOT1. All the subjects in our study comply with this statement.

The other posturographic criteria are shown in our patients less frequently. Furthermore, we have not found any association when other criteria are complied with that enables us to establish a useful pattern for diagnosis to help us assess these patients in the event that any of the other tests are positive.

Therefore, in order to define a posturographic pattern as being aphysiological, it is necessary to:

– Assess adequately the patient’s postural behaviour from a clinical perspective

– Observe a disparity in his or her normal gait when performing the MCT and AT

– Apply Cevette’s formula in suspicious cases

– Appreciate the dysfunction of this pattern in alterations of the SOT that to some degree reflect an inappropriate (illogical) use of sensory inputs. The complexity of the cognitive phenomenon in posture control makes it difficult to assess this test

REFERENCES


