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Using Computerized Dynamic Posturography in the Medical/legal Setting: How We Do It

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The balance system serves as a template against which all other information is compared before either being utilized or rejected. For instance, being below deck on a boat compromises the ability of the visual system to reference a visual horizon. This is not a concern in the normal person, as the vestibular system reliably stabilizes the body with respect to gravity. When the balance system (the normal template) is impaired, these capabilities are compromised, as the brain becomes dependent on other sensory information. A “visually dependent” patient will now be unable to maintain balance if visual information is removed, or if it is rendered orientationally inaccurate.

Computerized Dynamic Posturography (Equitest®, or CDP) is a validated method of evaluating balance and postural stability under dynamic test conditions. It is designed to challenge a normally function balance system by having a patient stand on a balance platform in a booth, looking at a visual surround of clouds and blue sky.

Posturography provides supplemental, rather than redundant information about vestibular dysfunction. It provides a quantitative measure of how well patients are able to keep balance under conditions where other sets of information are made orientationally inaccurate, and also how effectively they have compensated for damage that might have been done to the balance system. Posturography allows us to detect and quantify such deficits in patients. In addition to allowing us to measure a balance deficit, it also allows us to do something else. If a patient is over-reliant on visual information, a symptom set can be brought on in the presence of visual motion stimuli (a good example of this is motion sickness). The resulting mismatch between the two signals can generate a symptom set which must be regarded as being of vestibular origin.

CDP in the medical legal setting

When assessing the medical legal patient, it is necessary to legitimize and also quantify complaints, for the purposes of diagnosis, treatment options, and return to work potential. CDP findings provide an important objective measurement which can be correlated with a patient’s functional status and symptomatic complaints. (This information is derived both from history taking and also from observations of the patient.) The derived information can be used to help determine whether a patient’s actual posturography performance is genuine. Occasionally there are some aspects of the patient’s performance that are aphysiologic, or suggest an element of embellishment. Documenting the presence or absence of aphysiological performance is an important aspect, and the following is a synopsis of how we accomplish this task in the clinical setting. It is important to state that evaluation of *quantitative* data should also incorporate *qualitative* impressions that might have been formed during an assessment.

When patients are assessed for any medical legal purpose (including return to work, LTD claims,

etc), any assessors must adhere to the tenets of “natural justice.” Natural justice dictates that any person with preconceived opinions about a matter should not be involved in settling the matter, and a decision must be arrived at, based solely on the merits of the case.

Many past studies have attempted to define a set of criteria to identify an “aphysiologic” CDP data set. This is a synopsis of the comprehensive criteria developed at Vancouver General Hospital. It is based on an extensive review of a patient population, both medical legal and non medical legal, with dizziness and/or imbalance after head injuries and/or whiplash type injuries. The authors of this study combined the existing criteria for aphysiologic data with their own clinical experience to develop a list of nine criteria for identifying aphysiologic results and/or symptom embellishment during a CDP assessment.

HOW WE DO IT

In an assessment that often spans four hours, patients are evaluated when aware they are being assessed, and also when unaware that assessment is taking place.The assessment begins as soon as the patient is greeted in the waiting room. The patient is evaluated to see how fluid and natural their movements are as they ambulate through the unit on a route from the waiting room to the CDP testing room. This includes making at least three sharp turns, and navigating up and down an incline. On this route there are also many environmental challenges, including floor-length windows, patterned carpets, and multiple intersecting hallways. A typical curious patient navigating in an unfamiliar environment will visually scan the surroundings, look up and down the halls, and often acknowledge passing staff or other patients. However, this is a difficult challenge for the patient with a balance deficit, and such patients will usually stare at the floor to maintain balance. The patient is also “talked to” while walking. While a patient is being engaged in conversation, it is socially appropriate for them to maintain eye contact; again a challenge for the patient with a balance system deficit. There are also handrails along the halls and it is noted whether or not the patient makes use of them while walking, or stops when talking. The examiner purposefully walks slightly faster than the patient, forcing the patient to attempt to keep up, which is another challenge to the balance compromised patient.

CDP assessment is always carried out after an extensive history is taken, but before any other aspects of the assessment (VNG, caloric testing, Romberg testing, etc.) are carried out. In preparation for CDP testing, the patient is told that “there is no need for you to show us what is wrong because the machine can detect the problems you are having.” It is emphasized that their job is to do nothing except to stand as still as they can on the platform. It is also emphasized that they can take a break at any time or for any reason.

Assessment is started with SOT Conditions 1 and 2 only. This is an important part of the assessment, as the patient is told during trial one that the “platform is being zeroed” (i.e., they are unaware they are being recorded). On trials two and three of each condition, the patient is told that “recording will begin now” (i.e., they are “made aware” that recording is taking place). The same techniques are used for condition 1 and then condition 2. In this way the patient’s performance when they are aware of being recorded (trials two and three of each condition) can be compared with performance when they are unaware of being recorded (trial one of each condition).

When this is complete, the patient is then told that:

- what they are looking at might sway with them,
- what they are standing on might sway with them, and
- both conditions could occur.

They are told that this is not a ride and that if they stand still, nothing will happen. They are asked

if they understand the details and again reminded that they can take a break any time they want to. When performing the rest of the SOT, the order of the remaining SOT trials (i.e., conditions 3 through 6) is randomized.

After the SOT is performed, the Motor Control assessment (MCT) is undertaken. The actual purpose of this test is to measure the latencies of the vestibulospinal or “long loop” reflexes, which are automatic responses to platform perturbations. The fact that they are *reflexes* is useful, as they are highly reproducible when repeated three times each. Any intertrial variation or discrepancy (i.e., any suggestion that these responses are anything but “automatic”) raises suspicions of embellishment.

During the MCT, Instructions for this are that “the platform will jiggle” and that the purpose of the test is to measure “how the balance system responds to the platform movements.” The MCT and adaptation tests are then completed. Examiner one then assesses the patient’s CDP performance and scores it on the aphysiologic scale.

The main aspect of CDP is that it measures “reflexive” (i.e., non cortical) motor responses and these reflexes should be highly stereotyped and reproducible.

NINE POINT aphysiologic scale

(This assumes some familiarity with carrying out a CDP assessment.)

1. High Intertrial Variability On All SOT Trials

As SOT trials assess innate ability to maintain balance control, they should be reproducible with respect to each other.

2. Conditions 1 and 2 Markedly Below Normal

SOT conditions 1 and 2 can be performed reasonably well by almost anybody, even a patient with no vestibular function. Very poor performance on these easy conditions raises suspicions of embellishment.

3. Better Performance on Condition 1 and 2 when Unaware

When a patient is given a golden opportunity to “fake,” a dishonest patient will often take this opportunity. An individual with a legitimate problem has no reason at all to do so, and the fact that a patient does not take such an opportunity suggests that they are genuine.

4. Conditions 5 and 6 Relatively Better than Conditions 1 and 2

Performance on conditions 5 and 6 requires intact vestibular function because both somatosensory and visual information are orientationally inaccurate. Basic physiology dictates that it is not possible for a patient to perform better (relative to the normative performance values) on Conditions 5 and 6 than on Conditions 1 and 2. Common sense suggests that raw scores on conditions 5 and 6 should be lower than on conditions 1 and 2.

5. Circular Sway (i.e., Lateral and AP Together) without Any Falls

Patients with known neurologic disorders or clinical signs may exhibit circular, ataxic sway patterns. For normal people, “circular sway,” (A/P and lateral sway together), is difficult to perform during an anterior/posterior testing task and actually requires good balance control. We believe that the patient with circular sway has learned where his limits of stability are and is operating at very close to those limits.

6. Repeated Suspiciously Consistent Sway Patterns throughout SOT

Trials

If a patient wishes to “demonstrate” just how bad his balance is, they sometimes adopt an anterior-posterior “swaying” tactic to illustrate the fact that they are unable to stand still. This is unphysiologic and the rhythmic swaying pattern is easily seen in the raw data. The swaying tracing often looks sinusoidal and is noticeably different from the genuinely unsteady patient who may sway, but not in a controlled rhythmic manner.

7. Exaggerated MCT Responses

The small platform translations of the MCT are standardized to provide a sub-threshold stimulus and as such, small translations should not generate a robust response during or after the stimulus. Dramatic responses during the small translations or responses that do not increase in amplitude with gradually increasing force plate translations should be viewed suspiciously.

8. Inconsistent MCT Responses

MCT responses occur within milliseconds. They are produced reflexively and should be of appropriate amplitude to maintain balance control. They should also be reproducible because they *are* reflexive responses and not cortical motor programs. They should also be appropriately larger for larger translations. They should also be in keeping with the results of the SOT assessment. A patient attempting to embellish the underlying reflexive response may take the opportunity to “show” how unstable he is when the floor is shifted only slightly and respond in ways that are not physiologically appropriate. These dramatic “demonstrations of imbalance” are not consistently reproducible, especially when we randomize the order of presentation of the MCT trials.

9. “Gut Feeling” (i.e., Clinical Judgment)

As discussed previously, a subjective or qualitative assessment of a patient is a very important aspect of the evaluation: aspects of the evaluation such as:

- Distracted gait differing from observed gait
- Ability to bend over and pick up a purse without any support
- Ability to stand on one foot to remove shoes or boots
- A patient who repeatedly emphasizes that all of their problems are related to an accident.
- A story that is too “perfect” (e.g., perhaps obtained from the Internet)

This “gut feeling” aspect is an important aspect of a thorough evaluation.

A score of <3/9 is considered to be acceptable. A score of 4 or 5 is suspicious and a score of >6 is flagrant malingering.

Summary

This is meant to be a brief outline of posturography assessment in the medical legal patient. It does not go into the details of history taking, but suffice it to say that it is important to take a history. The other aspect of CDP assessment is that it helps in reproducing a patient’s symptoms, many of which can be vague, atypical or difficult to describe, and this can often make it simpler to delineate a patient’s complaints as originating from the vestibular system. It is important to remember that vestibular pathology can result in a number of characteristic signs but also a set of characteristic *symptoms,* which must be regarded as being of balance system origin.

BIBLIOGRAPHY

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