P529

VERTIGO & BALANCE DISORDERS

Simple dynamic stability indicators to characterise and diagnose patients suffering from severe bilateral vestibulopathy

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Introduction

Although the symptoms of **bilateral vestibulopathy** (BV) are well known, the **diagnosis** of this pathology remains challenging. Recent studies have focused on understanding **gait impairments**[1,2] mainly based on spatiotemporal parameters. However, few simple objective indicators have been proposed to help clinicians in **diagnosing** these disorders **quickly** and **easily**, and to **monitor** the **evolution** of the disease.

Objectives

To present **relevant parameters** for highlighting **dynamic instability** in BV patients and assisting **diagnosis** and **evaluation**.

Methods

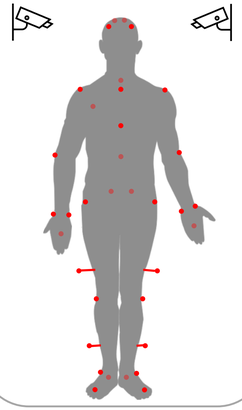
Bilateral Vestibulopathy Patients (BV)

n = 10
Females (5/10)
Age (65.3 ± 8.8)
Height (167.4 ± 11.1)
Weight (73.3 ± 11.7)

Healthy Subjects (HS)

n = 10
Females (6/10)
Age (64.0 ± 10.3)
Height (171.0 ± 7.0)
Weight (72.4 ± 12.8)

Motion capture system



Tasks

Slow

Comfortable

self-selected walking speed

Outcomes

- Spatiotemporal parameters
- Margin of stability[3] (MoS)
- Medio-lateral step distance
- Extrapolated center of mass[4] (XCoM)

Slow and comfortable self-selected walking speeds were recorded using a **motion capture system**. **Spatiotemporal** and **dynamic stability** parameters were calculated. All the parameters were classified to demonstrate the **discrimination** between groups and **ease of diagnosis**.

Results

Classification of each parameter according to quality of the dynamic stability indicator, ease of interpretation, and feasibility of implementation in a simple clinical setting.

Parameters	Possible assessment	Specific dynamic stability indicator	Interpretation	Clinical implementation	BV & HS discriminating capacity		Rapid clinical parameters
Walking speed		🔴	🟢	🟡			
Step width		🟡	🟢	🟢			
Step length		🔴	🟢	🟡			
Cadence		🔴	🟢	🟡			
Double support time		🟡	🟢	🟡			
Lateral / Anterior MoS		🟢	🟡	🔴			
*Max ML step distance**		🟢	🟢	🟢			
ML XCoM movement		🟢	🟡	🔴			
Straight walk deviation		🟢	🟢	🟢			
Step crossing		🟢	🟢	🟢			
Nonlinear analysis		🟢	🔴	🔴			
Foot placement estimator		🟢	🟡	🔴			

Motion capture system / Inertial sensor / Visual observation / Video

🟢 Good 🟡 Moderate 🔴 Poor

🟢 Easy 🟡 Moderate 🔴 Difficult

: Significant : Not significant : Not analysed

: Easily observable for assessment in clinical settings

Conclusion

- Identifying the parameters of **dynamic instability** is of great interest to better **understand** BV.
- **Step width** and **ML step distance** appear to be **relevant** for their simplicity of observation and their ability to discriminate between groups.
- This study will provide clinicians with **simple information** to improve **diagnosis** and **evaluation**, help identify patients at risk and enable long-term follow-up of patients.
- **Further studies** are needed, including larger cohorts, to test all **psychometric properties**: validity, reliability, sensitivity to change.
- These parameters should be assessed under more **difficult conditions** (for example, in the dark) where other sensory inputs do not compensate for the absence of vestibular function.

[1] Grouvel et al., 2024
[2] McCrum et al., 2019
[3] Curtze et al., 2023
[4] Hof, 2008

Let's connect !

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