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Morphofunctional Assessment in People with Diabetes

What Is It and What Can It Offer?

Morphofunctional assessment is a crucial tool that allows for the comprehensive evaluation of a person's health status and functional capacity. Its purpose is to identify alterations in body morphology and

physical functionality that may affect the individual's quality of life. This method uses advanced tools such as bioelectrical impedance analysis (BIA) with phase angle (PhA), nutritional ultrasound, and functional tests like dynamometry and gait speed.

Diabetes mellitus (DM) is a heterogeneous metabolic disorder, primarily characterized by hyperglycemia. DM is considered, along with age, male sex, hypertension, dyslipidemia, and smoking, as a cardiovascular risk factor (CVR).

Morphofunctional assessment can be especially important in patients with diabetes due to the multiple effects this disease has on body composition and physical functionality. These effects include changes in muscle mass, fat mass, muscle strength, and metabolic status, which cannot be fully assessed with traditional parameters such as body mass index (BMI) or body weight.

Diabetes, especially T2DM, is often associated with abnormal fat distribution and increased visceral fat. This can contribute to insulin resistance and worsen glycemic control. Morphofunctional assessment, using techniques such as **bioelectrical impedance analysis (BIA)** and **muscle ultrasound**, allows for accurate evaluation of muscle mass and adiposity. The accumulation of visceral fat, common in diabetic patients, increases the risk of cardiovascular complications. Nutritional ultrasound is useful for measuring the amount of subcutaneous and visceral fat, providing valuable information about cardiovascular risk and helping to guide therapeutic strategies aimed at reducing these deposits.

On the other hand, people with diabetes, especially those of advanced age, are more susceptible to developing **sarcopenia** (loss of muscle mass and function). **Dynamometry** (measurement of muscle strength with a dynamometer) detects this loss of strength early, which can be a key indicator for adjusting nutritional interventions and physical exercise. Diabetes can affect functional capacity, worsening the patient's quality of life. Including functional tests, such as the **Timed Up and Go or Sit-to-Stand** tests, in morphofunctional assessment allows for an objective evaluation of the patient's physical capacity. This is essential for designing appropriate rehabilitation and physical activity programs.

Within the **morphofunctional assessment**, we find:

1. Anthropometric Evaluation:

- **Waist and Hip Circumference:** Evalua-

tes the distribution of body fat. Waist circumference is considered a measure of central adiposity and is associated with a higher cardiovascular risk.

2. Body Composition:

- **Bioimpedance:** Allows estimating body composition through electrical parameters (measuring resistance and reactance). It allows us to estimate fat mass, lean mass, body water content, and can calculate the phase angle. This is a measure of cellular health and cell membranes.
- **Nutritional Ultrasound:** Differentiates between subcutaneous fat (superficial and deep layers) and visceral fat. In specific areas, such as the rectus femoris muscle of the quadriceps, nutritional ultrasound is used to assess muscle morphology and quality. It allows measuring muscle thickness, fascicle length, and pennation angles (fiber arrangement). From a metabolic perspective, we can see if the muscle presents myosteatosis (infiltration by ectopic fat).

3. Physical Functionality:

- **Dynamometry:** Evaluates grip strength, the most common being hand dynamometry. It is an indicator of muscle strength and has been linked to overall and cardiovascular morbidity and mortality. A low dynamometry result would indicate dynapenia.
- **Timed Up and Go (TUG):** Measures the time it takes for a patient to stand up from a chair, walk 3 meters, turn, and sit back down. It evaluates mobility and balance, being useful in detecting the risk of falls.
- **Walking Speed:** Evaluates the speed of walking a short distance. Indicative of functional capacity and prognosis in frail patients.
- **Chair Test:** Evaluates muscle strength and balance. There is the 5-repetition sit-to-stand test, which measures the time it takes to complete 5 repetitions of sitting and standing from a chair as quickly as possible. Or the 30-second »

MORPHOFUNCTIONAL ASSESSMENT, USING TECHNIQUES SUCH AS ELECTRICAL BIOIMPEDANCE AND MUSCLE ULTRASOUND, ALLOWS FOR ACCURATE EVALUATION OF MUSCLE MASS AND ADIPOSY



- » chair stand test, which measures how many times the patient sits and stands from a chair in 30 seconds.

4. Metabolic Status and Diabetes Control

Through biochemical parameters such as the lipid profile, glucose levels, and glycated hemoglobin A1c, among others.

Morphofunctional assessment could help health care professionals individualize therapeutic interventions, such as exercise plans, dietary plans, and phar-

macological treatments, to improve the patient's quality of life and prevent long-term complications.

Because of it, we can work on different aspects:

- **Risk Identification:** Helping to detect health problems such as obesity, malnutrition, or muscular imbalances that may predispose to chronic diseases or injuries.
- **Early Detection of Complications:** Allowing for the identification of early complications such

as neuropathies or cardiovascular problems.

- **Exercise Program Design:** Based on the evaluation of muscle strength, endurance, and flexibility, specific exercise programs can be designed to improve the patient's physical and functional condition.
- **Nutritional Planning:** By evaluating body composition, professionals can develop personalized nutritional plans to optimize lean body mass and reduce body fat, improving metabolic control. »

MORPHOFUNCTIONAL ASSESSMENT COULD HELP HEALTH CARE PROFESSIONALS PERSONALIZE THERAPEUTIC INTERVENTIONS, SUCH AS EXERCISE PLANS, DIETARY PLANS, AND PHARMACOLOGICAL TREATMENT, TO IMPROVE THE PATIENT'S QUALITY OF LIFE

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- **Proper Monitoring and Progress Evaluation:** Allowing for the assessment of the effectiveness of therapeutic interventions (such as exercise programs or medical treatments) by comparing the results of initial and subsequent assessments.
 - **Education and Awareness:** Providing the patient with information to help them understand their health status and the importance of following therapeutic recommendations. Through morphofunctional assessment, patients become more aware of the benefits of maintaining a healthy weight, engaging in regular exercise, and adopting a balanced diet. This way, they stop focusing on isolated data, such as weight, and shift toward a more comprehensive and effective assessment of their health.

What is the perspective on the application of morphofunctional assessment in people with diabetes?

Morphofunctional assessment in people with diabetes is crucial for evaluating nu-

tritional status and muscle functionality, aspects that are frequently affected in this population. Morphofunctional assessment could help identify risks of metabolic and functional complications early in people with diabetes. Parameters such as the phase angle (PhA), measured by BIA, reflect the state of the cell membrane and the water balance, and are associated with poorer prognosis in patients with malnutrition and comorbidities. This allows for individualized adjustments to nutritional and physical treatment, improving clinical outcomes.

The accumulation of visceral fat, detectable through nutritional ultrasound, is linked to cardiovascular complications commonly seen in people with diabetes. Continuous monitoring of these fat deposits could allow for preventive interventions, reducing the risk of cardiovascular events. Frequent monitoring using these non-invasive and portable techniques, such as BIA and nutritional ultrasound, enables closer tracking of the nutritional and functional status of patients, helping adjust interventions based on the progression of the disease. Thanks to these tools and their clinical utility, we can optimize the management of diabetes. **D**

CONCLUSIONS

Morphofunctional assessment in people with diabetes is essential for early detection of complications and the planning of personalized treatment strategies, which are key for successful disease management. It is an indispensable tool for the prevention, diagnosis, treatment, and follow-up of various health conditions, improving the individual's quality of life and optimizing therapeutic strategies.

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