

Clinical gait analysis in patients with Osteonecrosis of the Femoral Head secondary to cortisone use

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Summary

Osteonecrosis of the Femoral Head is a condition that causes the collapse and deformity of the femoral head due to a disruption of blood supply to the area. This study compared the gait of six patients with this condition against a matched control group, finding reduced range of motion for hip flexion, extension and internal rotation.

Introduction

Osteonecrosis of the Femoral Head (ONFH) is a disorder of unclear pathogenesis that can arise from various aetiologies and causes the disruption of blood supply to the femoral head. This condition may cause subchondral bone collapse and deformity [1], progressing to diseases such as hip Osteoarthritis (OA). ONFH is estimated to be responsible for 10% of all Total Hip Arthroplasties secondary to OA[2]. Severity of ONFH can be assessed through the Ficat and Arlet system, that is based on radiographic findings, from stages 0 through IV [3].

Traumatic and atraumatic conditions may originate ONFH, with femoral neck fractures and chronic cortisone use being important examples of these conditions, respectively [4].

Methods

This was a cross-sectional observational study, approved by the institution's Research Ethics Committee (CEP). Six patients who attended regular follow-up consults at the clinical hospital, were diagnosed with ONFH secondary to cortisone use and elected to participate were included in this study. Six healthy individuals, with no gait-affecting pathologies and matching ages and gender volunteered to participate as a control group. ONFH patients were classified for gravity using the Ficat and Arlet classification system.

Gait analysis was performed using a 12-camera Vero Vicon motion capture system (Vicon, Oxford, United Kingdom) at 100Hz. Three-dimensional (3D) reconstruction and data analysis were performed using The Motion Monitor xGen system (Innovative Sports Training Inc., Chicago, IL, USA). Seven four-marker clusters were positioned in the lower limbs and sacrum and a stylus was used to digitize anatomical landmarks. The participants were asked to walk at a comfortable pace for 60 seconds over a 10 meter long fixed walkway.

Results and Discussion

Average age for the ONFH group was 40.8 years old, against 39.5 of the control group. For both groups, four participants were men and two women. The ONFH group comprised five participants with bilateral hip disease and one with unilateral, thus eleven hips were evaluated. Ficat and Arlet classification was stage IV for nine of the evaluated hips and

III for two. Gait speed (m/s) of the ONFH group was 0.68 (\pm 0.09) and cadence of 89.4 (\pm 15.2) steps per minute, which were similar to those found by Cho [5].

Movement	ONFH		Control	
	RoM	SD	RoM	SD
Obliquity	9.1°	2.6	10.2°	2.3
Flexion	24.9°*	9.5	44.1°	8.4
Extension	22.8°*	6.4	42.3°	7.9
Abduction	14.5°	3.4	13.9°	2.5
Adduction	8.7°	2.1	11.8°	7.6
Internal Rotation	0.5°*	0.2	1.1°	1.6
External Rotation	2.1°	1.5	1.4°	2.4

Table 1: Pelvic and hip Range of Motion (RoM) for the ONFH and control groups. *Statistically significant ($p < 0.05$).

The ONFH group presented statistically significant decreased hip flexion, extension and internal rotation when compared to healthy controls. RoM angles were also smaller than the ones found by Cho [5] in patients with ONFH pre-operatively, this may be because of the severity of the disease, which were at a late stage in this study.

Conclusions

Patients with Osteonecrosis of the Femoral Head presented with decreased range of motion for hip flexion, extension and internal rotation when compared to a healthy control group. Those values were also smaller than what was found in literature and this may be due to the gravity of the cases in this study, which were advanced.

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