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# A CLINICAL ANATOMY INSIGHT INTO THE BIOMECHANICS OF THE IDIOPATHIC ROTATIONAL DEFORMITIES OF LOWER EXTREMITIES

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## INTRODUCTION

An increase in the physiological torsion angle of the extremities leads to rotational deformities. It is usually accompanied by pain in the hip and patellofemoral joints or tibia. The etiology of this disease is not clarified.

### *Purpose of the study*

is to examine and to make a theoretical reconstruction of the idiopathic rotational deformities of lower extremities from the clinical anatomy point of view.

## MATERIALS AND METHODS

The method for this research was an analysis of the data of rotational deformities of lower extremities obtained by CT and MRI.

## RESULTS

Rotational deformities in transverse plane (comparing with frontal and sagittal) frequently remain undetected via visual examination therefore the diagnosis of this condition is made with accurate techniques CT and MRI. Further 3D modeling makes it possible to clearly localise the topography of deformations.

According to the data obtained by CT and MRI, there is an increase in the cross-sectional area of the gracilis muscle and the medial head of muscle gastrocnemius and a decrease in the cross-sectional area of the muscle sartorius and the long head of biceps femoris muscle. This is consistent with the biomechanical characteristics of their functions: muscle gracilis rotates the tibia medially, the medial head of muscle gastrocnemius raises the heel during gait; accordingly, their compensatory hypertrophy indicates an increased need for their strength in rotational deformity of the tibia externally and of the femur internally. Also, muscle sartorius rotates laterally the femur, the long head of biceps femoris muscle rotates laterally the

tibia, their cross section is reduced in comparison with the normal, which allows us to conclude a reduced need for the functions they perform. A turned inward axis of patellofemoral joint motion is observed when there is a combination of medial femoral and lateral tibial rotation. It has been established that the normal foot position during locomotion is maintained when the external tibial torsion compensates for the laterally directed forces in the patellofemoral joint due to an increased medial femoral anteversion which itself results in an internally oriented gait. Rotational deformities of femur and tibia dramatically influence on biomechanics of a knee which results in osteoarthritis of hip and patellofemoral joints as complications which require surgical treatment (endoprosthesis implantation) in the long run.

## CONCLUSIONS

For the purposes of eliminating rotational deformity of lower extremities in children, we recommend to take preventive steps in preschool and school institutions and at home, to ensure ergonomically optimal working and resting environment. It will allow us to form muscle memory in a biomechanically correct position. If medial femoral rotation is more than 20° and lateral tibial rotation is more than 25°, derotational osteotomy is the treatment of choice. Numerous studies have revealed that surgical treatment of rotational deformities normalises the biomechanics of extremities, relieves pain improving the quality of life for years. More research is required to understand the causes of this disease.

### *Keywords:*

Biomechanics, Cross-Sectional Anatomy, Lower Extremity, Osteotomy, Tomography.