Hip torsional deformities at lumbar disc disease

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Research article

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Abstract

Background

Presence of lumbar spine disorder with hip diseases is defined as Hip-Spine syndrome, there might be a relation between hip torsional deformities and lumbar disc disease which has not clarified previously. Purpose of the present study was to find whether hip torsional parameters (femur, acetabular anteversion) and clinical findings (hip range of motion, hip score) differ at patients with lumbar disc disease.

Methods

Patients with lomber disc herniation (n: 20) and control subjects (n: 20) without any lumbar spine or hip disease were enrolled. Femoral anteversion (FeAv), acetabular anteversion (AA), center of edge angle (CE), degree of hip flexion, extension, Harris Hip scores (HHS) were evaluated bilaterally.

Results

HHS score, degree of extension plus flexion was lower at diseased side when it is compared to the control subjects ($p < 0.001$). Unilaterally affected patients had lower AA than control subjects (AA: 13 ± 4^0 vs16 ± 2^0 p:0.01). Mechanic and /or hip torsional parameters especially the acetabular retroversion may have an etiopathogenetic role at unilateral lumbar disc disease.

Introduction

Presence of lumbar spine disorder with hip diseases is defined as Hip-Spine syndrome and first called in 1983 [1]. Various hip pathologies like flexion deformities, osteoarthritis, and limited hip range of motion, possibly femur retroversion have been related to lumbar pathologies [1-5]. There are reports getting relief of lower back pain when hip conditions are treated with hip arthroscopy or arthroplasty [2,5]. In addition, in a recent biomechanical study, it was shown that limitation of the terminal hip extension due to ischio-femoral impingement led to increase of lumbar facet (L3-4 and L4-5) joint load compared to normal native hips [6].

Additionally, torsional deformities and/ or limited range of motion of the hip have been reported to be linked to hip osteoarthritis that increase in femoral anteversion and /or acetabular retroversion or decreased acetabular anteversion predisposes to hip osteoarthritis [7-12].

The purpose of the present study is to examine the relation of hip torsional parameters (femur, acetabular anteversion), clinical findings (hip range of motion, harris hip score) to lumbar disc disease [13].

Hypothesis is that patients with lumbar disc herniation would have decreased femur and/or acetabular version and ROM compared to control subjects without any hip or spine disease.

Materials And Methods

Patients with lomber disc herniation without any hip related symptoms and osteoarthritis findings at their pelvic x-rays, whom were elected to go surgery at our neurosurgery department, comprised the study group (group P). The control group (Group C) was based on the computed tomographic analysis of hip joints that had already been performed on patients who were referred to our radiology department, because of abdomino-pelvic diseases and who had healthy hip joints in their scanograms without any symptoms related to lumbar vertebrae or hip joint. Our local ethics committee approved this study. Written and informed consents were obtained from both the patients and the control subjects.

20 patients (group P), 20 control subjects (group C) were included. Demographic data is present at Table I.

The CT examinations were performed in supine position with femurs in neutral rotation and the hips and knees in extension and with the patellae pointing directly upwards. Scanograms were obtained between the anterior superior iliac spine and the level distal to the knee joint in the frontal plane.

Patients were scanned according to standard departmental protocols at 120 kVp and 140 to180 mAs depending on patient weight and/or girth. Axial CT images with 3 mm slice thickness were obtained within the framework of standart departmental protocols.

Using Sectra Workstation IDS7 V20.2.10.3376 (Sectra AB, Sweden), femoral anteversion (FeAv), acetabular anteversion (AA), centre of edge angle (CE), degree of hip flexion , extension, Harris Hip scores (HHS) were evaluated bilaterally at both groups [8,14].

The FeAv was calculated as the angle between the projected head–neck line and the line that intersects the anterior and posterior condylar tangents. The tomogram section with largest head diameter was projected on the other section with largest, best vision of femur neck. The centres of femur head and femur neck were identified. The projected head–neck line was determined by connecting these two centres. While measuring acetabular anteversion, A coronal slice (slice B) was selected giving optimum visualization of the pelvic teardrop (Figure 1), obliquity caused by improper positioning of the patient in the CT scanner was controlled by drawing a baseline intersecting the most posterior edges of the ilium (Figure 2). Acetabular anteversion then was measured in the axial section corresponding to slice B in the coronal plane (Figure 2). Acetabular anteversion describes the angulation of a line through the anterior lip of the acetabulum and the lip of the posterior acetabulum with the sagittal plane.

Statistics

The SPSS for Windows version 15.0 (SPSS Inc., Chicago,IL, USA) was used to place the data. Chi-Square test was used to compare the groups for the distribution female and male subjects. Mann–Whitney test

was used to investigate sex, tested variables difference between groups. Wilcoxon signed rank test was used to compare herniated side's parameters to contralateral asymptomatic side.

Results

There was no difference between groups regarding age and Sex ($p>0.05$).

Data is presented at Table II (bilateral sides+unilateral=herniated side, control: mean value of both sides). HHS score, degree of extension plus flexion was lower at diseased side compared to control subjects ($p<0.001$).

When only unilaterally affected patients were included, AA was also found to be lower compared to control subjects (AA: $13\pm4(12)^0$, p:0.01). At unilaterally affected patients, diseased side had lower degrees flexion and extension, HHS points compared to contralateral asymptomatic side ($p<0.001$). Furthermore, there was a trend of lower AA at symptomatic side compared to contralateral side that came close to statistical significance (p:0.07).

Discussion

As there is a link between hip and spine disorders, present study aims to find whether there is a causal relation between hip torsional deviations and lumbar disc disease. Partially supporting the hypothesis, diseased side had lower degrees of acetabular anteversion compared to control subjects at unilaterally affected patients.

Both femoral anteversion , acetabular antversion abnormalities have been described in pathogenesis of hip osteoarthritis [7-12,15] and hip osteoarthritis is being linked to lumbar spine disease. However; none of study in the literature directly searched causal relationship of these parameters at lumbar disc disease. Present study found no difference when bilateral cases were included; which in turn may point the mechanic and /or hip torsional parameters has an etiopathogenetic role at unilateral disease.

According to a recent review reported, patients with low back pain frequently have limited hip range of motion especially the hip flexion and patients had relief of back pain when hip osteoarthritis was treated with arthroplasty [16]. However; they did not find any study pointing out beneficial effect of the improvement of hip internal rotation after hip arthroscopy for femoro-acetabular impingement on lumbo-pelvic stress. Differing from present study, patient with advanced hip osteoarthritis receiving hip arthroplasty with nonspecific lumbar spine disease were reported [2,16-17].

We also found decreased hip flexion and extension at patient group similarly reported in the literature. Recently Chadayammuri et al reported decreased degree of hip flexion (mean 104^0) with acetabular retroversion with no effect of femoral torsion [7]. At an anatomic study of ischio-femoral impingement model with concamittant decrease of terminal hip extension, Gomes-Hoyos et al reported increase of the L3-4 and L4-5 lumbar facet joint load [6].

There are limitations. Firstly, we excluded hip osteoarthritis with questioning of symptoms and from pelvic radiographs and did not stage specifically status of the hip according to the Tönnis staging which in turn early stages of Tönnis grading might have influenced the results [12]. Secondly, we did not measure the degree of hip rotation and abd/adduction, since we did not specifically look for the presence of femoro-acetabular impingement rather measure the main movement arc of the hip 'flexion/extension' which is reported to be linked to spine disorders [16]. Although patients were under pain medication during the study, loss of hip extension, flexion might have been overestimated by the patient group due to possible muscular spasm secondary to back or leg pain. Lastly, we did not evaluate the effect of grade or the level of the lumbar disc herniation which possibly is the subject of future studies.

List Of Abbreviations

FeAv : Femoral anteversion

AA : Acetabular anteversion

CE : Center of edge angle

HHS : Harris Hip scores

ROM: Range of motion

CT: Computed Tomography

Declarations

Consent for publication

To The Editor

Sub: Submission of Manuscript for publication

Dear Sir,

We intend to publish an article entitled **" Hip torsional deformities at lumbar disc disease"** in your esteemed journal as an Original Article.

On behalf of all the contributors I will act and guarantor and will correspond with the journal from this point onward.

This article has not been published and has no conflict of interest.

We hereby transfer, assign, or otherwise convey all copyright ownership, including any and all rights incidental thereto, exclusively to the journal, in the event that such work is published by the journal.

We would like to suggest following referees for the article.

Thanking you,

Yours' sincerely,

Yagmur ISIN M.D.

Data and Materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Authors' Contribution

	Author List	Contribution contribution to the manuscript
1	Yagmur Isin (corresponding author)	Design, data acquisition, and analysis and interpretation of data, drafting
2	Erol Kaya	Data acquisition
3	Onur Hapa	Design, data acquisition, and analysis and interpretation of data, drafting
4	Ceren Kizmazoglu	Data acquisition
5	Onur Gürsan	Interpretation of data

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Tables

Table I. Demographic data of the geoups.

	Patients	Control
Age	44(23-69)	43(18-58)
Sex	7F,13M	9F,11M
Side and level	$L_{4\text{-}5,\ left}$; 4, $L_{4\text{-}5,\ right}$;6, $L_{5\text{-}S1,\ left}$; 4, $L_{5\text{-}S1,\ right}$;3, $L_{4\text{-}5,\ bilat:}$ 3.	----

Table II. Data for the groups.

Groups	FeAv (^{0})	AA(^{0})	CE(^{0})	Flex(^{0})	exten(^{0})	HHS(points)
Herniated side (n:23)	11±7(9)	14±5(13)	43±5(43)	94±6(95)	4±1(4)	62±12(64)
Control group(mean) (n:20)	13±6(14)	16±2(16)	40±5(40)	102±5(101)	8±1(8)	92±2(91)

Figures

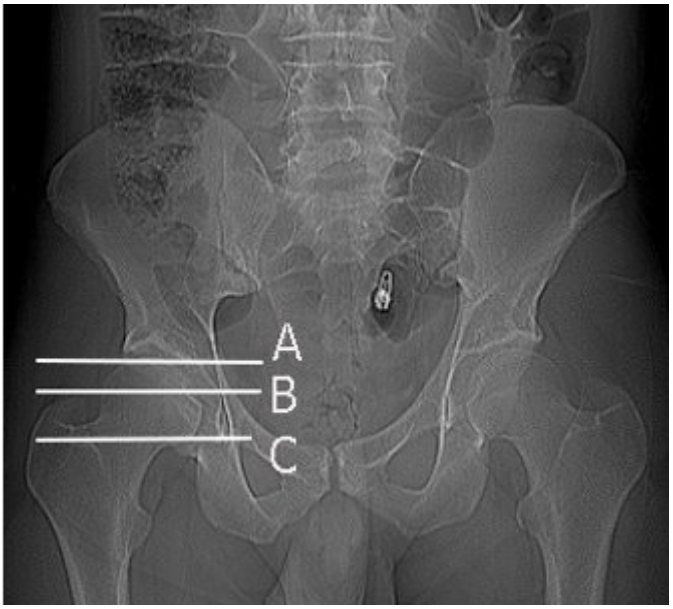

Figure 1

Coronal image showing the acetabulum divided by three lines

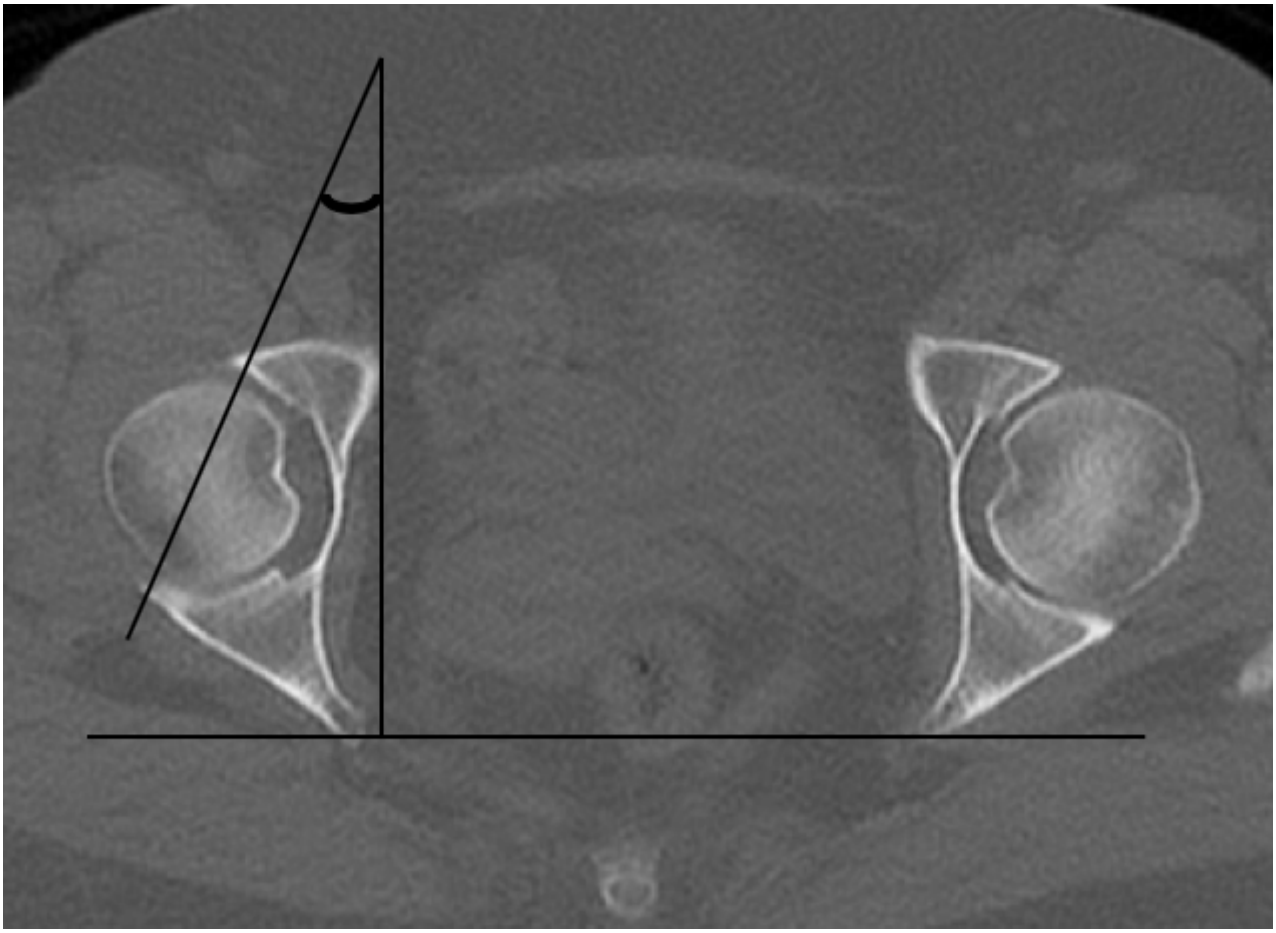

Figure 2

An axial CT image showing how acetabular anteversion is measured