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Clinical features of low back pain in people with hip osteoarthritis: A cross sectional study

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Abstract.

BACKGROUND: Low back pain (LBP) is commonly reported in people with hip osteoarthritis (OA) and is a poor prognostic indicator of outcome in OA. This study aimed to identify the clinical features associated with LBP in people with hip OA attending orthopaedic and rheumatology clinics.

METHODS: A cross-sectional study was undertaken. Twenty-four people with radiographically confirmed OA were recruited and completed self-report questionnaires for hip and LBP severity (Visual Analogue Scale), hip-related disability (Western Ontario and McMaster Universities Osteoarthritis Index) and back-related disability (Roland Morris Disability Questionnaire). Physical examination comprised spinal palpation, pelvic girdle pain provocation tests and hip and spinal range of motion tests. Between-group (presence/absence of LBP) differences in self-report and physical examination items were compared using Mann-Whitney U and Chi-squared tests.

RESULTS: A total of 16/24 (66.7%) patients reported LBP. Those with LBP were younger, reported more pain locations and had higher self-report pain and disability. On physical examination, people with LBP and OA hip had reduced hip flexion, greater pain provocation with hip abduction, hip lateral rotation, spinal palpation and a greater number of painful pelvic girdle tests and spinal level palpation.

CONCLUSIONS: Assessment of patients with hip OA should incorporate examination of the lumbar spine and pelvic regions. It appears from our study that LBP is a common co-morbidity in those with OA of the hip and may indicate greater severity of hip disease, although the small sample size limits interpretation of results. Further research should investigate the exact relationships between presence of LBP and hip OA.

Keywords: Osteoarthritis, low back pain, examination, hip-spine syndrome

1. Introduction

Hip osteoarthritis (OA) is a common musculoskeletal condition associated with increasing age and has a lifetime prevalence of 25.3% [1]. Low Back Pain (LBP) commonly co-exists with hip OA, with prevalence

varying between 21.2–61.5% [2, 3] and is associated with a poor prognosis [2]. Concurrent hip and lumbar spine symptoms can give a confusing clinical picture [4] as hip pain may also be referred from spinal structures [5, 6]. Age-related hip degenerative changes may also occur in the spine, often referred to Hip-Spine syndrome [4, 7]. Typical referred pain patterns associated with hip OA include the groin, thigh, knee and lateral hip [8] which relate to spinal segmental levels of L1-3 although lateral leg pain may also be associated

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with L5 spinal level. Although pain associated with hip OA is traditionally considered to be due to nociceptive damage at joint level, there is emerging evidence of central sensitisation in some people with hip OA [9, 10] which can present as pain removed from typical nociceptive patterns and therefore may also account for spinal symptoms [2].

Most studies investigating the co-existence of LBP and hip OA have been conducted in people with advanced hip OA awaiting total hip replacement (THR). LBP commonly resolves after hip replacement surgery [5, 11–12], possibly due to improved biomechanics and gait [2]. Conversely, it has been reported that LBP associated with spinal stenosis subsequently required THR to resolve leg pain following spinal surgery [13]. These studies highlight the complexity of the relationship between hip OA and LBP. Although previous research has investigated subjective features associated with concurrent LBP and hip OA, no known studies have investigated the features of physical examination associated with LBP symptoms in those with hip OA. The subjective and physical examinations are key elements of the physiotherapist's assessment, on which principles of clinical reasoning are applied to determine the nature and source of symptoms, and plan the most appropriate treatment.

The aim of this study was to identify the clinical features associated with LBP in people with hip OA attending outpatient clinics in an acute hospital setting based on self-report symptoms and physical examination.

2. Methods

2.1. Design and study population

A cross-sectional observational study was undertaken. Participants recruited from an acute hospital in Dublin, Ireland were included if they had radiographically confirmed hip OA. Participants were excluded if they had any of the following: previous spinal surgery, spondylolisthesis, radicular leg pain, inflammatory, infective or neoplastic disease of the spine, progressive neurological disease or deficit or cauda equina syndrome. Those who were unwilling or unable to participate were also excluded. Ethical approval (REC 13/57) was obtained from Beaumont Hospital Research Ethics Committee, Dublin, Ireland. Orthopaedic surgeons, rheumatologists and

physiotherapists working in musculoskeletal advanced practice roles were asked to identify potentially suitable patients attending outpatient clinics. Potential participants were contacted by the principal investigator, provided with the participant information leaflet and invited to participate in the study. Following verification of eligibility criteria and agreement to participate, an appointment for testing was made. All recruitment and testing was completed between July and November 2013.

Following receipt of written informed consent, all participants underwent a one-off assessment in the physiotherapy department, Beaumont Hospital. Following collection of demographic details, self-report validated questionnaires were used to measure hip and back-related pain and disability. Pain locations were recorded on a body chart and patients rated their pain severity in the hip and low back regions using a Visual Analogue Scale (VAS) [14]. Hip pain and physical function were measured with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [15]. Disability due to back pain was measured with the Roland Morris Disability Questionnaire (RMDQ) [16]. Following completion of questionnaires, participants underwent the physical examination which was completed by a physiotherapist, with 20 years clinical experience in musculoskeletal practice.

The physical assessment consisted of lumbar spinal palpation, pelvic pain provocation tests [17] and active hip and spinal Range of Motion (ROM) tests. Reproduction of the participant's usual symptoms was recorded by the research assistant during the assessment procedures. Lumbar spine palpation consisted of central and unilateral Passive Accessory Intervertebral Movements (PAIVMS) applied to the spinous processes and articular pillars of T12-S1 [18]. The pelvic pain provocation tests included sacro-iliac joint compression, distraction, long dorsal ligament palpation, posterior shear and the sacral thrust test. It has been shown that three or more positive pain provocation tests which reproduce the patient's pain are indicative of pelvic pathology [17, 19] although different studies have used different clusters of tests [20]. Active ROM of both hips was measured using a universal goniometer using recognised procedures [21], with the mean value of two measures recorded. Hip flexion and abduction were measured in supine and medial and lateral rotation measured in sitting. Flexion-abduction-external rotation (FABER) was measured in supine

using a tape measure [22]. The intra-tester reliability of these ROM procedures has previously been determined, with ICCs of 0.87–0.98 [23]. Symptom reproduction was recorded during the scour test/flexion-adduction-internal rotation (FAIR). Spinal flexion, extension and side-flexion were measured in standing using the tape measure method [24]. Symptom reproduction was recorded for all ROM procedures. Weight and height were measured to calculate body mass index (BMI).

2.2. Statistical analysis

Data were analysed in IBM SPSS v20 (IBM Corp, New York, USA). Descriptive analyses such as means and standard deviations were used for continuous data and frequency counts used for categorical data. Variables were further explored based on presence or absence of back pain. Between-group differences (back pain/no back pain) were assessed using non-parametric Mann-Whitney U tests for continuous variables. Fisher's exact test was used to test between-group differences for categorical data. Statistical significance was set at $p < 0.05$.

3. Results

A total of 31 people with a diagnosis of hip OA were identified by orthopaedic surgeons, rheumatologists and physiotherapists over the 4-month period. Of these, one patient was excluded due to previous spinal surgery, two could not be contacted on further follow-up and three declined participation. One patient was excluded when radiology reports showed no hip degenerative changes, resulting in 24 included participants. A total of 16/24 (66.7%) of participants reported LBP.

Fig. 1 shows pain distribution for those with and without back pain.

Table 1 shows the demographic and self-report variables dichotomised by presence or absence of back pain. Those who presented with LBP were significantly younger, reported more pain locations and higher WOMAC pain and functional disability scores. Although the mean hip symptom duration was over twice that of those without LBP, this did not reach statistical significance ($p = 0.08$). There was no difference in BMI, number of co-morbidities or severity of hip pain between those with and without back pain. Pain severity was similar for both back and hip pain,

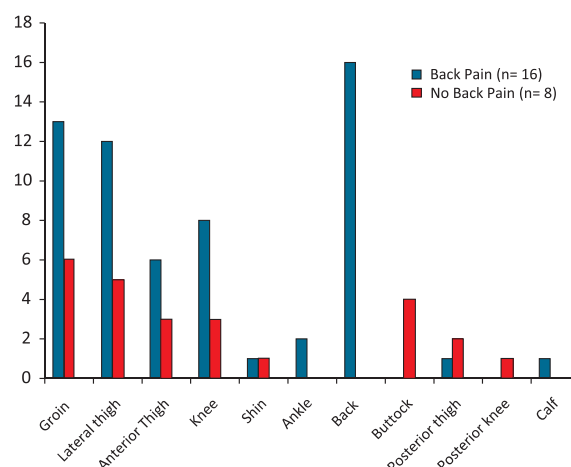


Fig. 1. Location of pain areas by group (back pain/no back pain).

resulting in a significant moderate correlation ($r = 0.62$, $p < 0.001$) but not between hip severity and symptom duration ($r = -0.22$, $p = 0.31$) or LBP symptom severity and duration ($r = 0.42$, $p = 0.14$). There was also a significant correlation between the number of positive pelvic pain provocation tests and number of painful spinal levels on palpation ($r = 0.43$, $p = 0.04$).

In relation to ROM, only hip flexion was significantly different between the two groups (Table 2). Differences in pain provocation between the two groups occurred for hip abduction and external rotation (Table 3).

There was no difference in spinal ROM between those with and without LBP (Table 4).

The proportion of those reporting pain during spinal movement ranged from 25–37.5%. The mean number of positive pelvic pain provocation tests in those with LBP was 1.50 (SD = 1.10), compared with those without LBP (mean = 0.38 (SD = 0.52)), resulting in a significant difference ($p = 0.01$). Just three of the cohort, all with LBP, had three or more positive pelvic girdle tests, indicative of pelvic girdle pathology. Palpation of the long dorsal ligament was the most commonly pain provocative in both those with LBP ($n = 10$; 62.5%) and without LBP ($n = 2$, 25%). There was also a significant difference ($p = 0.045$) in the total number of painful spinal levels on palpation between the LBP group (mean = 6.56; SD = 4.93) and those without LBP (mean = 3; SD = 4.50). The most pain provocative level was Right L5/S1, followed by Right L4/L5, centrally over L5 and Right L3/L4.

Table 1
Profile of participants by presence or absence of LBP

	All (n = 24)	Back pain (n = 16)	No back pain (n = 8)	p-value ¹
Age (years)	65 (8.67)	62.44 (7.19)	70.13 (9.54)	0.03
Female (%)	13 (54.2%)	10 (62.5%)	3 (50%)	NT
Side affected				NT
Left	11 (45.8%)	6 (37.5%)	5 (62.5%)	
Right	11 (45.8%)	8 (50%)	3 (37.2%)	
Both	2 (8.3%)	2 (12.5%)	0	
	Mean (SD)	Mean (SD)	Mean (SD)	
BMI (kg/m ²)	29.21 (5.40)	28.97 (6.28)	26.69 (3.35)	0.53
Number of Pain locations	3.46 (1.69)	3.88 (1.67)	2.63 (1.51)	0.04
Number of Co morbidities	0.96 (0.91)	0.81 (0.92)	1.25 (0.89)	0.26
Hip symptom Duration (months)	53.92 (121.17)	37.19 (37.8)	15.50 (22)	0.17
Back symptom Duration (months)	77.40 (106.71)	89.31 (110.51)	0	N/A
Hip Pain severity (VAS) (0–10 cm)	4.54 (2.90)	4.98 (2.86)	3.65 (2.96)	0.35
Back Pain severity (VAS) (0–10 cm)	3.65 (3.93)	5.48 (3.61)	0	N/A
WOMAC Pain (0–20)	8.54 (4.44)	10.0 (4.03)	5.63 (3.93)	0.03
WOMAC Function (0–68)	37.42 (15.70)	37.81 (12.31)	18.63 (14.28)	0.007
RMDQ (0–24)	6.71 (6.60)	10.06 (5.56)	0	N/A

¹Based on Mann-Whitney test; NT = Not tested due to small sample size; N/A = Not applicable. BMI = Body Mass Index; RMDQ = Roland Morris Disability Questionnaire; VAS = Visual Analogue Scale; SD = Standard Deviation.

Table 2
Hip range of motion classified by presence or absence of LBP

	Affected Hip/LBP (n = 16)	Affected Hip/No LBP (n = 8)	p value ¹	Unaffected Hip/LBP (n = 16)	Unaffected Hip/No LBP Pain (n = 8)	p value ¹
Flexion (°)	73.91 (17.17)	93.63 (8.66)	0.006	87.25 (14.11)	92.56 (8.66)	0.38
Abduction (°)	15.03 (5.42)	19.19 (9.79)	0.42	19.12 (6.51)	24.44 (11.30)	0.21
Internal Rotation (°)	22.09 (8.38)	25.13 (13.31)	0.53	27.5 (9.75)	26.88 (14.58)	0.70
External Rotation (°)	16.09 (8.39)	19.50 (6.35)	0.42	17.56 (6.67)	18.69 (5.69)	0.60
FABER (cm)	31.65 (5.94)	27.13 (6.6)	0.12	28.01 (7.76)	28.65 (7.85)	0.99

¹Based on Mann-Whitney test; ° = degrees; FABER = Flexion/Abduction/External Rotation; cm = centimetres.

Table 3
Pain reproduction associated with hip range of motion classified by presence or absence of LBP

	Affected Hip/LBP (n = 16)	Affected Hip/No LBP (n = 8)	p value ¹	Unaffected Hip/LBP (n = 16)	Unaffected Hip/No LBP Pain (n = 8)	p value ¹
Flexion	11 (68.7%)	2 (25%)	0.08	7 (43.8%)	2 (25%)	0.66
Abduction	13 (81.3%)	3 (37.5%)	0.047	7 (43.8%)	1 (12.5%)	0.19
Internal Rotation	11 (68.7%)	4 (50%)	0.41	4 (25%)	1 (12.5%)	0.63
External Rotation	8 (50%)	0	0.02	2 (12.5%)	0	0.54
FABER	14 (87.5%)	4 (50%)	0.13	7 (43.8%)	4 (50%)	0.65
Scour Test	9 (56.3%)	5 (56.3%)	0.66	5 (31.3%)	2 (25%)	1

¹Based on Fisher's Exact test; ° = degrees; FABER = Flexion/Abduction/External Rotation; LBP = Low Back Pain.

4. Discussion

This study aimed to identify if, in a cohort of people with hip OA, there were any differences in self-report

symptoms and physical examination signs between those with and without LBP. Results showed that people with LBP were younger, reported more pain locations, greater hip pain and self-report disability.

Table 4
Spinal movements classified by presence or absence of LBP

	Back pain (<i>n</i> = 16)		No back pain (<i>n</i> = 8)		<i>P</i> value ¹
	Mean ROM (SD)	Proportion reporting pain	Mean ROM (SD)	Proportion reporting pain	
Spinal Flexion (mm)	51.38 (12.9)	4 (25%)	60.63 (13.54)	1 (16.7%)	0.11
Spinal Extension (mm)	9.49 (5.65)	5 (31.3%)	9.13 (2.17)	0	0.79
Left Side flexion (mm)	153.25 (34.55)	5 (31.3%)	150.750 (37.76)	0	0.83
Right Side flexion(mm)	136.44 (36.24)	6 (37.5%)	149.88 (44.31)	0	0.38

¹Based on Mann -Whitney test for spinal range of motion; *p*-value represents difference in ROM; mm = millimetres.

On physical examination, the LBP group had reduced hip flexion and more pain provocation with hip abduction, hip external rotation, spinal palpation and pelvic girdle pain provocation tests.

The study population was recruited from orthopaedic and rheumatology outpatient clinics in an acute teaching hospital, which may not reflect the presentation of hip OA in primary care. This may explain why the overall proportion of those with LBP was high, at 66.7%. The small sample size may also be a factor and therefore, results should be interpreted with caution. LBP prevalence rates of 21%–49% have been reported in studies of patients awaiting hip arthroplasty [5, 11, 12], with a lower proportion of 21.7% reported when patients with severe radiological spinal changes were excluded [11].

The most common areas of pain were groin, lateral thigh, anterior thigh for those with and without LBP. Groin pain indicates true hip joint involvement [8, 25–26] and is the most common pain location in hip OA [11, 12]. Groin, thigh and knee pain are associated with sensory distribution of the femoral, sciatic and obturator nerves and root levels L1–L3 [27], and therefore pain could also be referred from the lumbar spine. Although buttock pain is commonly associated with LBP [28–30], it may also be due to referral from the hip joint [12, 31]. A minority of patients reported pain in the shin, calf, or ankle as well as posteriorly in the thigh or buttock, the majority of whom presented with LBP. Although pain referred below the knee is not commonly associated with hip OA, lower leg pain has been reported in a minority of people [8, 11, 31] and may be due to pain referral along the saphenous nerve [8]. Therefore, the ability to differentiate the source of pain based on pain referral is limited, particularly based on the small sample in our study.

A large population cohort study (*n* = 983) similarly found that more females had greater pain and disability and more troublesome joints in those with coexisting

spinal symptoms and hip OA. They also found a higher number of co-morbidities in those with LBP, which was not found in this study [2]. Studies have shown the peak age of prevalence of LBP is age 41–50 and it declines thereafter [32] which may explain the age differences in this cohort. Although radiographically determined spinal degenerative changes may occur in this age group these are not necessarily associated with pain [32], therefore radiology may provide misleading information. In relation to the physical examination, ROM was lower for all movements on the affected hip in those with LBP, although significant differences occurred only for flexion. It is unsurprising that flexion would be most compromised by LBP due to the concurrent movements in the lumbar spine, pelvic girdle and hip during hip flexion. Back pain has previously been associated with reduced hip flexion, although this was measured during forward bending [33], whilst in our study, hip flexion was measured in supine lying. Pain reproduction differed between the groups for both abduction and lateral rotation, and to a lesser extent, hip flexion.

A greater number of pelvic girdle tests were positive in the LBP group, but only three participants, all with LBP, had three or more positive tests, suggestive of pelvic girdle pathology. One of the challenges of using and interpreting clusters of pelvic pain provocation tests is the choice of tests to use, due to a variety of available test clusters [17, 19–20, 35]. Tests which involve significant hip movement such as Gaenslen's test were not used as they would most likely be limited and painful in a cohort with hip OA. Although FABER is considered a pelvic pain provocation test, it is also used to test for hip joint pathology [21], so was excluded from this test cluster. The posterior shear test which involves hip flexion to 90°, was the second most positive pelvic pain test, reproducing pain in 31.2% of the LBP group and 12.5% in those without LBP. The remaining pelvic pain provocation tests were chosen as they do not include hip joint movement.

4.1. Clinical implications

These results demonstrate differences in the clinical presentation based on self-report symptoms and examination findings in people who present with hip OA with or without coexisting hip OA. Co-existing LBP has previously been identified as a negative prognostic indicator of outcome in hip OA [2]. The results of this study highlight the complex presentation of hip OA. Spinal palpation and pelvic pain provocation tests were more frequently positive in people with LBP, although were sometimes positive in the non-LBP group. Spinal ROM does not appear to be very useful in the physical examination, but certain hip ROM tests are more commonly symptomatic in those with LBP. However, point tenderness and pain provocation tests are insufficient to confirm the source of LBP or its relationship with hip pathology.

It is possible that some of the clinical signs and symptoms identified in those with LBP are due to widespread and referred pain associated with central sensitisation. This widespread sensory hypersensitivity caused by altered processing of nociceptive information in the central nervous system can occur in up to 30% of people with hip OA [36–37]. It may present as non-anatomic areas of pain and tenderness and disproportionate, inconsistent and non-anatomical patterns of pain provocation during movement or mechanical testing. Quantitative sensory testing [38] and evaluation of psychosocial factors may further elucidate the predominant pain pattern [39].

Other elements of a musculoskeletal assessment such as observation of motor control patterns [40–41] which was not undertaken in this study could be informative in determining treatment approaches related to spinal or hip movement impairments.

The relevance of positive examination findings of associated LBP in people with hip OA needs to be evaluated, using robust clinical reasoning principles as management may require alleviation of spinal symptoms. Therefore, the authors recommend that all patients who present with hip OA routinely undergo examination of the lumbar spine and pelvic region.

4.2. Study limitations

There are some limitations to this study. Firstly, the small sample size limits the interpretation of results. Patient recruitment was confined to secondary care,

so may not reflect clinical presentation in primary care. The small proportion of those without LBP also limited interpretation and statistical analysis. The cross-sectional study design means that a cause and effect relationship between hip OA and LBP cannot be determined. The high prevalence of LBP may be influenced by volunteer bias, both on the part of participants but also the referring clinicians, although it was emphasised by the researchers that potential participants did not need to have LBP to be included in the study.

A larger sample size would enable more definitive patterns to be identified in relation to coexisting LBP and hip OA. Future research should include prospective study designs to determine predictors of outcome in hip OA based on co-existing LBP. The diagnostic accuracy of the pelvic pain provocation tests to differentiate hip, spinal and pelvic pain require further validation research.

5. Conclusion

This study has identified a high proportion of people with hip OA attending outpatient clinics in an acute hospital who reported co-existing LBP. Those with LBP were younger, reported more pain locations and had higher levels of hip-related pain and disability. There was a significant difference in hip flexion ROM and pain reproduction in hip abduction and lateral rotation between those with and without LBP, but no differences in hip medial rotation, FABER or spinal movement. Those with LBP had a greater number of positive pelvic pain provocation tests and more pain provocation on spinal palpation. All patients presenting with hip OA should undergo a physical examination of the lumbar spine and pelvic regions and a clinical reasoning approach applied to determine relevance of spinal symptoms in the clinical presentation. Further research is warranted to explore the cause and effect relationship and underlying pain mechanisms associated with co-existing hip OA and LBP.

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Conflict of interest

The authors have no conflict of interest.

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