

Total hip arthroplasty and lumbar spine disorders: Plain co-existence or mutual influence?

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Abstract

Lumbar spine disorders (LSD) might influence the outcome after total hip arthroplasty (THA). Despite a known common prevalence of LSD and degenerative hip disorders, this study investigates their mutual influence in case of co-existence with the purpose to advance surgeons planning and patient's prognosis. Patients with and without LSD were compared before and at the one-year postoperative examination. For clinical evaluation the WOMAC was assessed. The radiological analysis focused on cup anteversion and inclination. The total group included 203 consecutive patients. The overall incidence of LSD was 51.0%. Patients with LSD were on average 4.3 years older and had a 1.8 higher BMI than non-LSD patients ($P < 0.05$). The cup positioning and the clinical results were comparable between both groups before and at the last time of follow up ($P > 0.05$). No hip dislocations nor clinical signs of impingement were seen. We can conclude that there is a high degree of co-existence of LSD and hip disorders. However, a strong negative impact of LSD to clinical or radiologic results could not be confirmed in our study.

Introduction

Lumbar spine disorders (LSD) and end-stage osteoarthritis of the hip are a common co-existing clinical findings. A literature review by Yeganeh *et al* revealed a prevalence of 21.2% to 60.4% of low back pain (LBP) in patients who are candidates for primary total hip arthroplasty (THA).¹ LSD are supposed to have impact on clinical outcome and life quality following THA.² A higher economic burden has been also discussed due to restrictions in life quality, diminished clinical results and an extended

rehabilitation process.³ It has been proposed that understanding the biomechanics of the hip, spine and their corresponding interactions are important, also in regards to the optimal position of the acetabular component. In detail, in patients with LSD were supposed to be associated with a higher incidence of malpositioned cups resulting in a possible risk for impingement or hip dislocation.^{1,4}

The purpose of this study was to determine the prevalence of coexisting LSD in patients treated with cementless total hip arthroplasty. It was aimed to compare the postoperative cup position of patients who were operated in the lateral decubitus position with and without LSD. Further, the pre- and postoperative clinical outcome was reviewed.

Materials and Methods

This retrospective, single center and single surgeon study included 203 consecutive patients with a primary osteoarthritis of the hip joint, who received a total hip arthroplasty. The operations were performed using the anterolateral approach with the patient in the lateral decubitus position. All patients were treated with cementless implants with 32mm heads and a neutral liner (Pinnacle Cup and Corail® stem - DePuy Orthopaedics, Inc., Warsaw, USA).⁵ The cup was positioned parallel to the transverse acetabular ligament. The Ranawat sign as criterium for combined anteversion was applied and the cup repositioned, if deemed necessary.⁶ For the clinical aspects the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in the German version with 24 questions was used. The index was acquired before surgical treatment and at the one-year consultation. The score ranged from 0.0 (good clinical result) to 4.0 points (poor clinical result) and was converted to a maximum of 100.0 points (worst result). Furthermore, patient specific parameters were reviewed, like gender, age at time of surgery and body mass index (BMI). According to our clinical routine, all patients received prior surgery a radiographic pelvic anterior-posterior (a.p.) and a Lauenstein of the affected hip for preoperative planning, intraoperative for control of implants positioning, before discharge after mobilization with full weight bearing and at the one-year examination. All radiographs were digitally acquired with the Carestream®. The cup inclination (°) and anteversion (°) were analyzed according to the method of Lu.⁷

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The patients were divided into two groups categorized by the presence of LSD (LSD vs. non-LSD). LSD was defined as low back pain and/or sciatica that indicated further radiological diagnostic (conventional x-rays or MRI) in the patient's history or operative treatments with one of following degenerative diagnosis:

- Spondylarthritis (SA)
- Lumbar spinal stenosis (LSS)
- Spinal disc herniation (SDH)
- Lumbar instability (due to spondylolisthesis or degenerative lumbar scoliosis)

The metric parameters were expressed with the mean value, standard deviation (SD) and the range (minimum, maximum). Non-metric values (presence of LSD) were described with the absolute number of counts and the percentage. Metric clinical and radiological parameters (cup inclination/anteversion, pre- and postoperative WOMAC) were compared between the groups (LSD/non-LSD) using independent t-test with a level of significance of $P < 0.05$.

Results

The total group included 203 patients with 129 females (63.5%) and 74 males (36.5%). One female patient was lost to follow-up (0.5%), resulted in a volume of 202 patients with complete data sets. The mean age at the time of surgery was 69.1 years (11.6; 22.9–90.9) and the mean BMI 27.3 kg/m² (4.5; 18.6–44.3). Overall, the WOMAC improved from 49.4 points (12.1; 21.0–84.0) before THA to 3.0 points (3.1; 0.0–22.0) at the one-year examination ($P < 0.001$). The cup had an average inclination of 41.0° (4.9; 32.0–47.0) and an anteversion of 17.1° (4.4; 4.6–29.4) (Table 1). The overall incidence of LSD in our series was 51.0% (103 patients). In 34 cases (16.8%) an additionally lumbar MRI was available. 14 patients (6.9%) had a secondary diagnosis of an LSS and 15 (7.4%) suffered from SDH. From these 29 patients 9 (4.5%) had been already surgical treated with a spine surgery. No hip dislocations nor clinical signs of impingement were seen.

Discussion

Co-existing LSD are reported to have a negative impact on life quality following THA.² Also, higher medical charges causing an economic burden in patients with THA and LSD has been described.³ In regards to the surgical procedure, an understanding of spinopelvic alignment is thought to be important both for planning and conducting the surgical procedure, also in regards to the optimal position of the acetabular component.¹ Increased surgical risks e.g. for dislocation are reported in severe cases.^{4,8}

The aim of the study was to get a closer look on potential reasons for negative effects of LSD when performing THA in terms of surgical/radiographic aspects and clinical outcome. To reduce a potential bias the study was designed as single institute and single surgeon series with the same intra- and postoperative protocol of all cases. There was no control group in supine position. In our series, the preoperative scores showed no statistical significances detected in patients with or without LSD. In spite of that the overall incidence of LSD was high with about 50% of the patients. That supports the recent results with up to 60.4% in previous literature.¹ Further, patients with LSD were 4.3 years older and presented a 1.8 higher BMI than non-LSD patients ($P < 0.05$). When performing THA in patients with LSD, these patients report-

Table 1. Patients with LSD were on average 4.3 years older and had a 1.8 higher BMI than non-LSD patients ($P < 0.05$). The clinical baseline and the one-year results for the WOMAC, as well as the cup position were in both groups comparable ($P > 0.05$).

	LSD (n=103; 51.0%)	Non-LSD (n=99, 49.0%)	P
Gender	66 ♀ / 37 ♂	62 ♀ / 37 ♂	-
Age	71.2 ± 10.1	66.9 ± 12.7	0.09
BMI	28.1 ± 4.8	26.3 ± 4.0	0.01
WOMAC preop.	50.0 ± 12.0	48.7 ± 12.2	> 0.05
WOMAC postop.	3.3 ± 3.5	2.7 ± 2.6	> 0.05
WOMAC Δ	46.5 ± 12.1	45.8 ± 11.8	> 0.05
Cup inclination	41.3 ± 4.8	40.7 ± 5.0	> 0.05
Cup anteversion	17.2 ± 4.2	16.9 ± 4.6	> 0.05

ed the same benefit as those without LSD. Reasons for that might be, that spinopelvic disorders often are aggravated in patients with significantly impaired hip function.^{9–13} Due to improvement of the hip function and the reduction of the groin pain, the spine symptoms might be also influenced in a positive way. Further, placing and securing the pelvis in the lateral decubitus position and using clinical parameters and anatomic structures for implant placement (Ranawat sign, transverse acetabular ligament) produced good clinical and radiographic results.^{5,6,14} No dislocations nor clinical signs of impingement were seen. This has been reported potentially to be linked to a certain degree to poor cup placement, related to misjudged anatomic landmarks in case of abnormal spine-pelvic relationships.¹⁵ Understanding the spine-pelvic relationship in the sagittal plane is important for proper implant position. For example, a loss of lumbar lordosis might provoke pelvic posterior rotation and hip extension.¹⁶ Having the patient in the lateral decubitus position, both anterior and superior iliac spines as well as iliac crest can be felt and the pelvis can be positioned accordingly.⁶ The position of the iliac crest can alter the inclination and therefore alter the surgeon's choice of cup position. In our series, all cups, even in patients with severe LSD were placed within the Lewinnek safe zone (40±10° inclination and 15±10° anteversion).¹⁷ This might be in part related to the chosen anatomical landmarks, described earlier, when placing the cup.¹⁸ However, special procedures in regards of soft tissue balancing need to be considered in patients with more severe disorders.¹⁹ This leads to the conclusions of previous studies, that the optimal cup position is depended on the spino-pelvic interaction resulting in a "functional safe zone".²⁰ So, the status of potential spinopelvic disorders is an important information for the surgeon and should be evaluated prior to surgery. Also, when seeing patients

back in the clinic post-surgery one should be aware of the LSD status if patients have remaining symptoms. It might be useful to recruit more patients with LSD as a control group in further studies and ascertain lumbar symptoms to get more information about the interaction between the degenerative process of the spine and hip.

Conclusions

There is certainly a degree of mutual influence of LSD and hip disorders. Surgeons should be well aware of patients with LSD and need to check the pelvic position carefully prior to surgery. The visual control of anatomical landmarks and a check for signs of an impingement, especially in extension, is strongly recommended. However, a strong negative impact of LSD to clinical or radiologic results could not be confirmed in our study.

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