

Case Report

Excessive Pelvic Incidence Related Anterior Dislocation of Posterior-Approached Total Hip Arthroplasty. A Rare Case Report

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SUMMARY

A 71-year-old man underwent posterior-approached total hip arthroplasty (THA), and an immediate anterior dislocation occurred after surgery. Lumbosacral radiography revealed an excessive pelvic incidence and significant spondylolisthesis. We changed the neck length from standard to +7 mm during the revision surgery, and the increased offset could improve stability. The anteversion of acetabulum cup and stem did not change because posterior dislocation was still a significant concern in posterior-approached THA. After the revision surgery, the patient recovered well, and no recurrent dislocation occurred after that.

Lumbosacral radiographs must be obtained before THA surgery for evaluation. Increasing the offset is an effective method for improving THA stability in patients with abnormal pelvic incidence.

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1. Introduction

The incidence of hip osteoarthritis and lumbar degeneration is increasing in the aging population. Hip-spine syndrome is a distinct syndrome in which both hip and spinal problems occur together. As hip and spine disorders have overlapping presentations and symptoms, it can often be challenging for physicians to determine if a patient's symptoms originate from the hip, spine, or both.¹ Severe hip osteoarthritis can be treated with total hip arthroplasty (THA), but a thorough evaluation of the lumbosacral area is also necessary to decrease surgery complications.

Joint dislocation is a major complication of THA and the overall incidence is approximately 1–3%. Surgeon factors include the surgical approach, adequate restoration of the femoral offset and leg length, component position, and bony impingement. Patient factors include age greater than 70 years, medical comorbidities, female gender, ligamentous laxity, revision surgery, abductor disorder, and patient education.²

Pelvic incidence is a fixed morphological parameter, and it is the angle at which all other sagittal balances are based. It is defined as the angle between a line perpendicular to the sacral plate at its midpoint and the line connecting the same point to the bicoxo-femoral axis center. The normal range is 43°–62°, and it can affect the muscle tension around the hip joint.³ The relationship between abnormal pelvic incidence and THA dislocation has not been previously discussed. In the current case report, we present a rare case of anterior dislocation of posterior-approached THA with excessive pelvic incidence.

2. Case Report

The patient was a 74-year-old man with no relevant medical history. The chief complaint was right hip pain for several years, and radiography revealed right hip grade IV osteoarthritis. He did not have any low back pain or neurologic signs; therefore, we did not order the spinal radiograph at that time.

THA was performed using the standard posterior approach (Moore approach) under spinal anesthesia. We used a Zimmer Biomet M/L Taper Hip Prosthesis with a 56 mm acetabulum cup, standard neck length, and 12.5 cementless stem size. The inclination of the acetabulum cup was approximately 45°, and the anteversion was approximately 20°. The stem's anteversion was about 20° to prevent posterior dislocation, which is a common complication of posterior-approached THA. The standard neck length was chosen for adequate soft tissue tension and equal leg length. The surgery was smooth, and the patient tolerated the entire procedure well. We routinely used an abduction pillow postoperatively for posterior-approached THA.

After the surgery, the patient underwent postoperative radiography, which showed anterior dislocation of the THA (Figure 1). His right leg was externally rotated with the knee in full extension. As the spinal anesthesia was still working, the patient could not feel pain or discomfort. The dislocation could be reduced easily when the hip and knee joints were both passively flexed to 90°. However, it could also be dislocated easily when the foot was passively externally rotated with his hip and knee in full extension.

We decided to immediately perform the revision surgery to correct THA instability while the spinal anesthesia was still working. As anterior dislocation for posterior-approached THA is extremely rare, lumbosacral radiographs were taken before the revision sur-

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gery. It revealed significant L5 on S1 spondylolisthesis and an excessive pelvic incidence of 78° (Figure 2).

During the revision surgery, we confirmed the position of the acetabulum cup and stem with proper inclination and anteversion.



Figure 1. Postoperative radiograph revealed anterior dislocation of total hip arthroplasty.

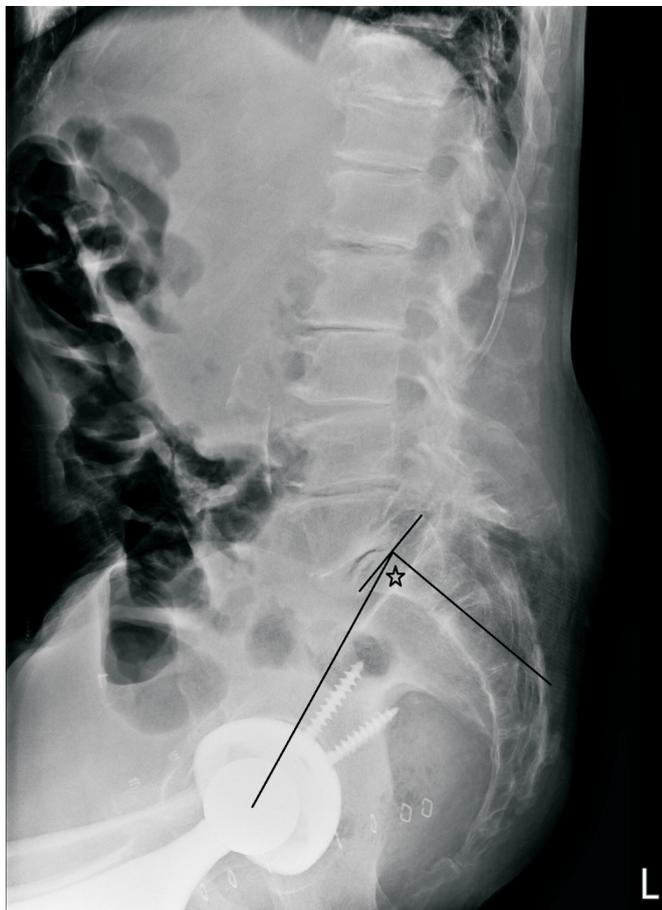


Figure 2. Lumbar radiograph revealed severe L5 on S1 spondylolisthesis, and the excessive pelvic incidence is about 78° (star mark).

The anteversion did not change because posterior dislocation was still a major concern of posterior-approached THA. We assumed that the excessive pelvic incidence should be responsible for the instability, and we only exchanged the neck from the standard to +7 mm neck length. The lengthened offset could increase soft tissue tension around the hip joint and increase stability. Forward and backward stability of the hip joint was confirmed during surgery. The range of motion in any direction was acceptable, except for a slight tightness for hip extension.

Postoperative radiographs were retaken, revealing that all prosthesis components were in a good position (Figure 3). The overall length of the leg was only 5 mm longer than that of the other leg. The patient stood up from the bed the next day with partial weight-bearing and left the hospital three days later.

One week later, the patient could walk slowly without any assistance, and the surgical wound healed properly. The function recovered gradually, and no hip dislocation occurred after that.

3. Discussion

This is a rare case report of anterior dislocation of posterior-approached THA with excessive pelvic incidence. The chief complaint was right hip pain, but some symptoms of spinal disorder can mimic hip osteoarthritis or are covered by hip pain. Preoperative evaluation of THA should include lumbosacral radiography to rule out hip-spine syndrome and decrease complications after surgery. Excessive pelvic incidence could change the whole sagittal balance and influence dynamic tension in the hip joint.

One prospective study analyzing lumbosacral sagittal balance before and after THA surgery revealed that patients with a pelvic incidence larger than 60° tended to have other sagittal balance parameters changed.⁴ Sagittal pelvic kinematics is highly variable among individuals and it will influence the risk of THA prosthetic impingement and dislocation.⁵ Another study showed a significant relationship between sagittal spinal deformity and THA instability. Only 59% of patients undergoing THA had naturally aligned lumbar spines. The relatively high prevalence of spinal deformity in this population



Figure 3. Radiograph after the revision surgery revealed well reduced total hip arthroplasty and increased neck length and offset.

reinforces the importance of considering spinopelvic alignment in THA planning and risk stratification.⁶

Furthermore, sagittal spinopelvic translation (SSPT) is associated with the risk of THA dislocation. SSPT is the horizontal distance from the hip center to the C7 plumb line (C7PL). Complete radiographs from the cervical to the pelvis may be necessary, along with lumbosacral radiographs for high-risk patients. SSPT is an important variable that shows the overall patient balance in different functional positions that could affect hip instability. Pelvic incidence is a critical factor for sagittal balance and must be considered in patients who underwent THA.^{7,8}

Additionally, hip-spine stiffness is another necessary preoperative evaluation for THA. One study demonstrated that patients with fixed spinopelvic alignment from standing to the sitting position were at a higher risk of hip dislocation.⁹ The acetabular component should be implanted with different anteversion and inclination angles according to the hip-spine motion pattern to reduce the risk of impingement and consequent dislocation.^{10,11} Patients with lumbar fusion are especially at increased risk for THA dislocations because of spinopelvic stiffness.¹² Standing and sitting lateral spine-pelvis-hip radiographs may predict the risk of dislocation and must be evaluated before surgery for high-risk patients.

Most THA dislocations occur early and are preventable with proper offset adjustments. Inadequate restoration of the offset reduces soft tissue tension and abductor efficiency.¹³ A matched case-control study revealed that the risk of THA dislocation was significantly lower when the femoral offset was at least 3 mm greater than that of the contralateral hip. Restoring the femoral offset is the most important technical factor for preventing THA dislocation.¹⁴ Increasing the acetabular component's anteversion has been suggested to prevent posterior dislocation; however, it will increase the risk of anterior dislocation. Increased offset facilitated a more excellent range of motion before bony impingement, resulting in lower dislocation rates. Therefore, increasing the offset can be considered to improve anterior and posterior hip instability in high-risk patients.¹⁵ In the current case report, the abnormal pelvic incidence was a risk factor for THA dislocation and instability. We increased the neck length, which resulted in an increased offset to improve stability. We did not decrease the acetabulum cup or stem's anteversion because the risk of posterior dislocation should still be considered for posterior-approached THA.

The limitation of this case report was that we did not take a lumbosacral radiograph before the surgery. The original pelvic incidence was unknown because the center of the femoral head might differ after THA surgery. Nevertheless, we found excessive pelvic incidence and significant L5 on S1 spondylolisthesis on postoperative radiographs.

4. Conclusion

Regardless of whether the patient has the symptoms of spine, lumbosacral radiography must be performed before THA surgery for evaluation. Increasing the offset during surgery is an effective method for improving THA stability in patients with abnormal pelvic incidence.

Conflict of interest

No potential conflict of interest is reported by the authors.

References

1. Devin CJ, McCullough KA, Morris BJ, et al. Hip-spine syndrome. *J Am Acad Orthop Surg.* 2012;20:434–442.
2. Lu Y, Xiao H, Xue F. Causes of and treatment options for dislocation following total hip arthroplasty. *Exp Ther Med.* 2019;18:1715–1722.
3. Le Huec JC, Aunoble S, Philippe L, et al. Pelvic parameters: origin and significance. *Eur Spine J.* 2011;20 Suppl 5:564–571.
4. Miranda SF, Corotti VGP, Menegaz P, et al. Influence of total hip arthroplasty on sagittal lumbar-pelvic balance: Evaluation of radiographic parameters. *Rev Bras Ortop.* 2019;54:657–664.
5. Rivière C, Lazennec JY, Van Der Straeten C, et al. The influence of spine-hip relations on total hip replacement: A systematic review. *Orthop Traumatol Surg Res.* 2017;103:559–568.
6. Buckland AJ, Ayres EW, Shimmin AJ, et al. Prevalence of sagittal spinal deformity among patients undergoing total hip arthroplasty. *J Arthroplasty.* 2020;35:160–165.
7. Lazennec JY, Kim Y, Folinais D, et al. Sagittal spinopelvic translation is combined with pelvic tilt during the standing to sitting position: Pelvic incidence is a key factor in patients who underwent THA. *Arthroplast Today.* 2020;6:672–681.
8. Langston J, Pierrepont J, Gu Y, et al. Risk factors for increased sagittal pelvic motion causing unfavourable orientation of the acetabular component in patients undergoing total hip arthroplasty. *Bone Joint J.* 2018; 100-B:845–852.
9. Esposito CI, Carroll KM, Sculco PK, et al. Total hip arthroplasty patients with fixed spinopelvic alignment are at higher risk of hip dislocation. *J Arthroplasty.* 2018;33:1449–1454.
10. Mancino F, Cacciola G, Di Matteo V, et al. Surgical implications of the hip-spine relationship in total hip arthroplasty. *Orthop Rev (Pavia).* 2020;12:8656.
11. Heckmann N, McKnight B, Stefl M, et al. Late dislocation following total hip arthroplasty: Spinopelvic imbalance as a causative factor. *J Bone Joint Surg Am.* 2018;100:1845–1853.
12. York PJ, McGee AW Jr, Dean CS, et al. The relationship of pelvic incidence to post-operative total hip arthroplasty dislocation in patients with lumbar fusion. *Int Orthop.* 2018;42:2301–2306.
13. Brooks PJ. Dislocation following total hip replacement: causes and cures. *Bone Joint J.* 2013;95-B:67–69.
14. Forde B, Engeln K, Bedair H, et al. Restoring femoral offset is the most important technical factor in preventing total hip arthroplasty dislocation. *J Orthop.* 2018;15:131–133.
15. Vigdorichik JM, Sharma AK, Elbuluk AM, et al. High offset stems are protective of dislocation in high-risk total hip arthroplasty. *J Arthroplasty.* 2021;36:210–216.