

Postless Distraction Technique With No Additional Equipment in Hip Arthroscopy



Yaoting Wang, M.D., Haomiao Yu, M.D., Long Wang, M.D., Jing Zhang, M.D.,
Mingxin Wang, M.D., and Chunbao Li, M.D.

Abstract: Hip arthroscopy has become a predominant treatment for hip disorders such as femoroacetabular impingement syndrome and labral injury, and appropriate distraction for the hip joint is necessary for successful surgery. The traditional distraction method uses a perineal post but may cause complications such as perineum injury and nerve damage. For this reason, some surgeons have proposed postless distraction techniques, but they usually require additional equipment purchase and cost, which is not conducive to application. Therefore, we developed a post-free distraction technique without additional equipment. This method uses only surgical draw sheets, safety straps, a hip fracture table, and a hip distractor that are routinely provided in the operating room, and postless hip distraction can be achieved by using the Trendelenburg position, which is reliable, simple, and reproducible to be used in hip arthroscopy.

With the increased understanding of hip disorders and advances in surgical techniques, the number of hip arthroscopic procedures has risen exponentially in recent years.^{1,2} The operation requires lower-extremity distraction to open the joint space for surgical manipulation of the central compartment, and most surgeons prefer to use a perineal post against the continuous traction of the lower extremity in the supine position.^{3,4} Due to the relative complexity of hip arthroscopy and the long learning curve for the operator, the use of perineal post-assisted traction can cause prolonged pressure on the perineum, which may lead

to soft-tissue injuries such as scrotal and labial necrosis, vaginal tears, or nerve injury complications such as pain of the perineal region, hyposensitivity, erectile dysfunction, and ejaculatory dysfunction.^{5,6}

Complications of the perineum are inevitable even for surgeons with a high volume of operations and advanced skills. Nwachukwu et al.⁷ studied 218 hip arthroscopies in an adolescent population and found an overall complication rate of 1.8%, with perineural nerve palsy accounting for 50% of these complications. In contrast, a systematic review showed that the incidence of perineal complications was 7.1% in 17 prospective studies addressing the use of perineal post-assisted traction, which was much greater than the incidence (1.4%) in 74 retrospective studies.^{8,9} Therefore, how to effectively reduce complications due to perineal post distraction is an essential clinical issue. Our center has modified the surgical technique by proposing a method that does not require a perineal post. This technique can be achieved without additional equipment and materials, uses a conventional surgical bed, and follows a simple protocol that allows for adequate distraction on the hip joint and sufficient visualization of the central compartment.

Surgical Technique (With Video Illustration)

Preoperative Evaluation

Preoperative measurements of the patient's height, weight, body mass index, Beighton scores, and a physical examination of the joint laxity degree are

From the Department of Orthopedics, the Fourth Medical Center of Chinese PLA General Hospital, Beijing, People's Republic of China (Y.W., L.W., J.Z., M.W., C.L.); and Department of Orthopaedics, Beijing Friendship Hospital, Beijing, People's Republic of China (H.Y.).

Yaoting Wang and Haomiao Yu have contributed equally to this work and share the first authorship.

The authors report the following potential conflicts of interest or sources of funding: The study was supported by National Key Technologies Research and Development Program (2019YFE0126300).

Received November 14, 2023; accepted January 31, 2024.

Address correspondence to Chunbao Li, M.D., Department of Orthopedics, the Fourth Medical Center of Chinese PLA General Hospital, 28 Fuxing Road, Haidian District, Beijing 100039, People's Republic of China. E-mail: lichunbao301@163.com

© 2024 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/231663

<https://doi.org/10.1016/j.eats.2024.102963>

needed to assess the difficulty of distraction without a perineal post. Typically, patients who are female, with hip dysplasia, have greater body mass index, or multiple ligamentous laxity are easier to be distracted, whereas patients with osteoarthritis, joint stiffness, lower weight, and large cam deformity are more difficult to be distracted.¹⁰ Preoperative images in anteroposterior view, 60° Dunn view, and false-profile view of the pelvis are performed to assess the extent of cam and pincer deformity and to recognize the presence of bony prominence that interfere with traction. Computed tomography 3-dimensional reconstruction and unilateral magnetic resonance imaging of the hip are also commonly performed to further assess the extent and degree of cam and pincer deformity and to evaluate injury of the labrum, cartilage, and other structures.

Preparation of Surgical Items

Before surgery, a few conventional safety straps, an abdominal belt, several cotton pads, a hip fracture table, and a hip distractor are prepared. One safety strap is wrapped in cotton pads to be used in the inguinal region (Fig 1). The table is covered with a surgical draw sheet to prevent slippage during the traction (Fig 2).

Anesthesia and Positioning

The patient is administered general anesthesia, and muscle relaxants are used to enhance the effect of traction. After that, the patient is placed supine on the surgical bed with the contralateral upper extremity fixed on an abductor frame and the ipsilateral upper extremity suspended and fixed on a brace at the front of the chest. The patient's trunk is in contact with the draw sheet on the surgical bed and the buttocks are attached to the end of the bed (Fig 3). Bony

prominences of bilateral feet and ankles are wrapped in cotton pads and placed in the traction boots, with the contralateral lower limb fixed at 45° of abduction and the affected lower limb in a straightened, internal rotation of 15°. The patient's inguinal region on the contralateral side is secured to the surgical bed with a thickened safety strap wrapped in cotton pads to act as a partial counterbalance to the distraction. An abdominal belt is used around the abdomen to keep the patient's back close to the bed, which increases resistance and protects the patient from falling off the surgical bed (Fig 4). Be careful not to fix the belt too tightly to avoid compression to the abdomen. When the aforementioned preparations are complete, the surgical bed is slowly adjusted to the Trendelenburg position so that the patient's head is low and feet are high by approximately 10° (Fig 5), using the frictional force generated by gravity to counteract the traction force.

Traction Test

Gradually increase the traction force on the affected lower extremity distally, paying attention to the patient's body displacement at this time to ensure that the patient is not pulled out of the surgical bed due to the continuous increase in traction. When the affected limb is tense and it is difficult to lift the knee upward, it indicates adequate tension and the effect of traction can be verified by fluoroscopy (Video 1). It is considered satisfactory if the joint gap can be sufficiently retracted to 8 to 10 mm under fluoroscopy. If the joint gap does not reach 8 mm, it indicates that the traction is not sufficient and the force needs to be increased. At this time, we need to observe whether the patient's body has obvious displacement, and if this happens, attention should be paid to whether the safety straps are fixed

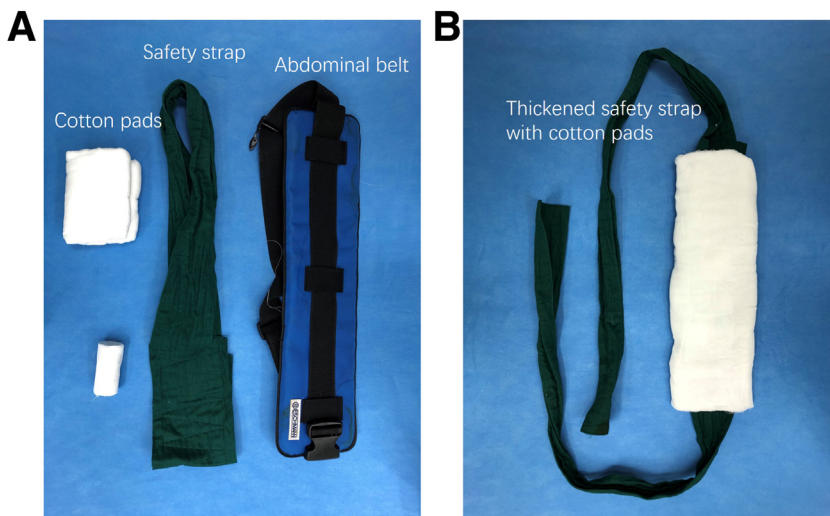


Fig 1. (A) A few safety straps, an abdominal belt, and several cotton pads are prepared before surgery. (B) One safety strap is wrapped in cotton pads to be used in the inguinal region.



Fig 2. (A) A hip fracture table and a hip distractor are prepared. (B) The table is covered with a surgical draw sheet.

firmly. The angle of the Trendelenburg position can be gradually increased until the effect is satisfactory.

Distraction Procedure

Disinfection and sheeting are routinely performed, and traction is gradually applied to the affected lower extremity. The degree of body displacement of the patient needs to be observed at this point. Traction is fixed when the lower extremity is tense and reaches the tension of the traction test. Fluoroscopy is used to verify

whether the joint gap is wide enough (Fig 6), and if the width is insufficient, fine adjustment of the traction is performed until the gap is satisfactory.

Hip Arthroscopy

The anterolateral portal, midanterior portal, and modified distal anterolateral portal are established under fluoroscopy. Exploration and debridement of the central compartment, trimming of the acetabular rim, and repair of the labrum are performed under

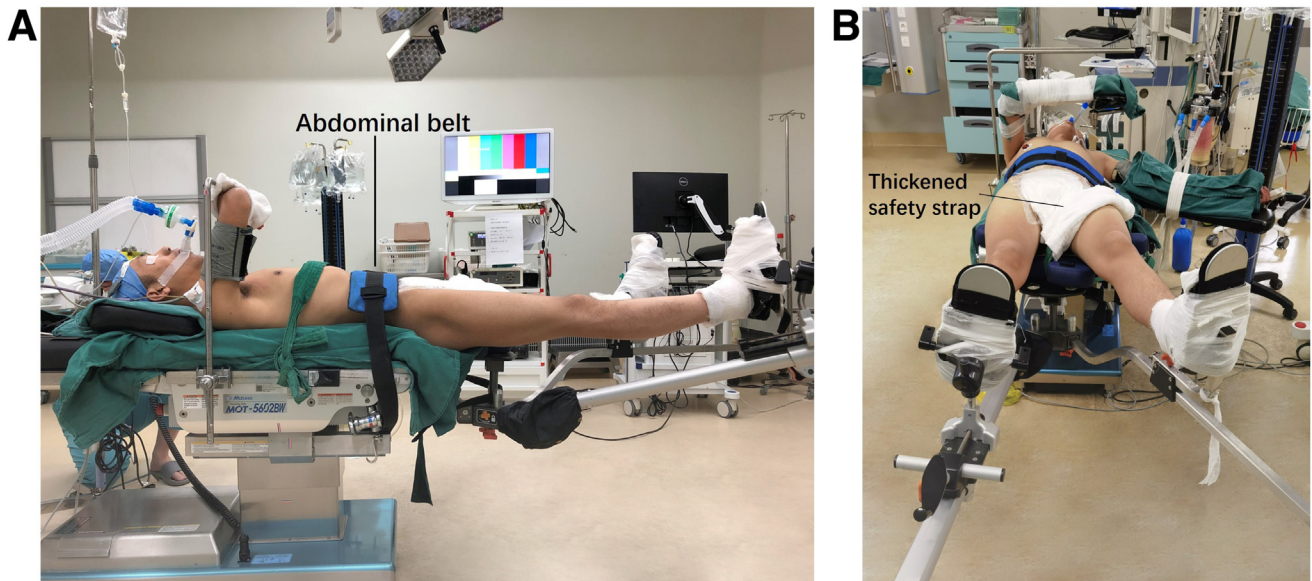


Fig 3. The patient is placed supine on the surgical bed with the trunk in contact with the draw sheet and the buttocks are attached to the end of the bed. The contralateral (left) lower limb is fixed at 45° of abduction and the affected (right) lower limb is in a straightened, internal rotation of 15°. The contralateral upper extremity is fixed on an abductor frame and the ipsilateral upper extremity is suspended and fixed on a brace at the front of the chest.

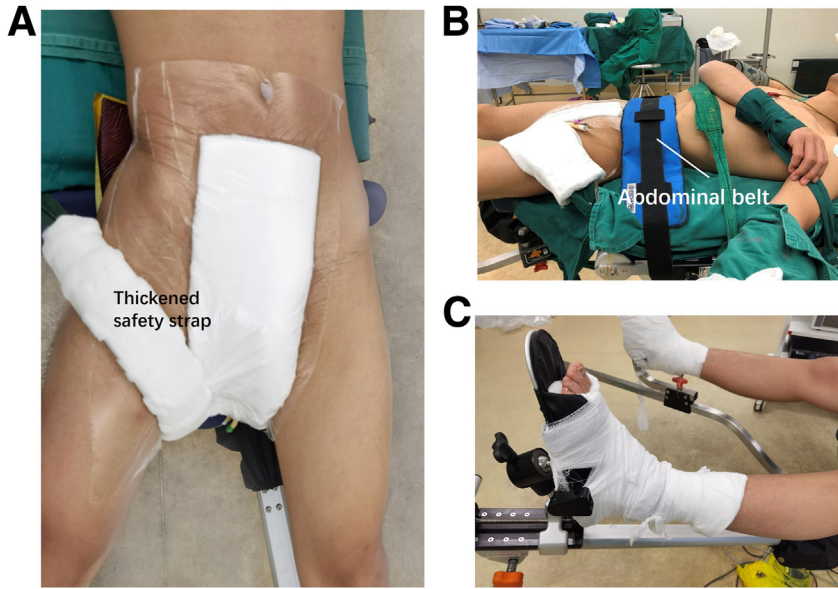


Fig 4. (A) The patient's inguinal region on the contralateral side is secured to the surgical bed by the safety strap wrapped in cotton pads to act as a partial counterbalance to the distraction. (B) An abdominal belt is used around the abdomen to keep the patient's back close to the bed. (C) Bony prominences of bilateral feet and ankles are wrapped in cotton pads and placed in the traction boots.

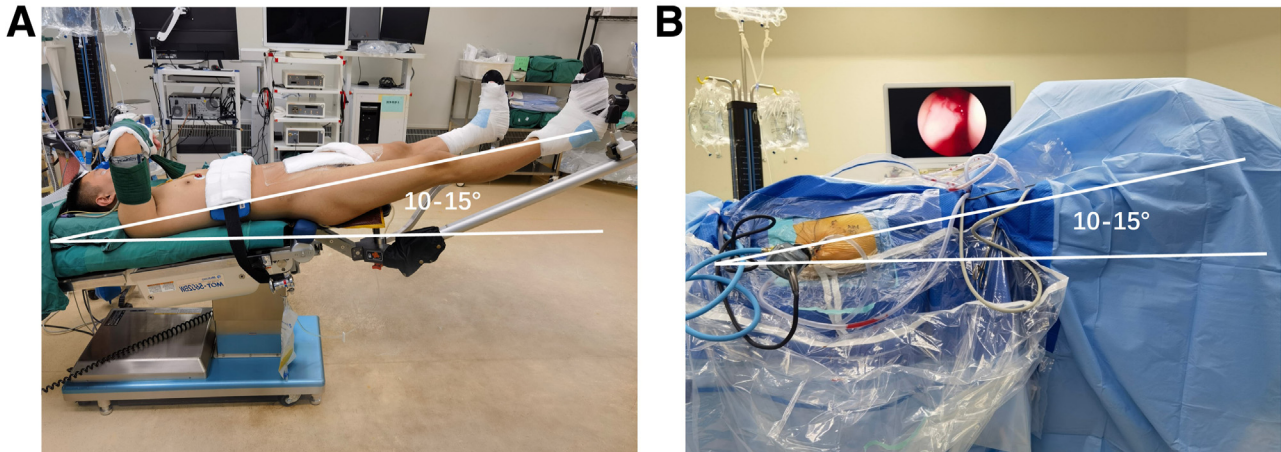


Fig 5. Patient is in supine position, with right hip shown. (A) The surgical bed is slowly adjusted to the Trendelenburg position so that the patient's head is low and feet are high by approximately 10-15°. (B) The Trendelenburg position after disinfection and sheeting.

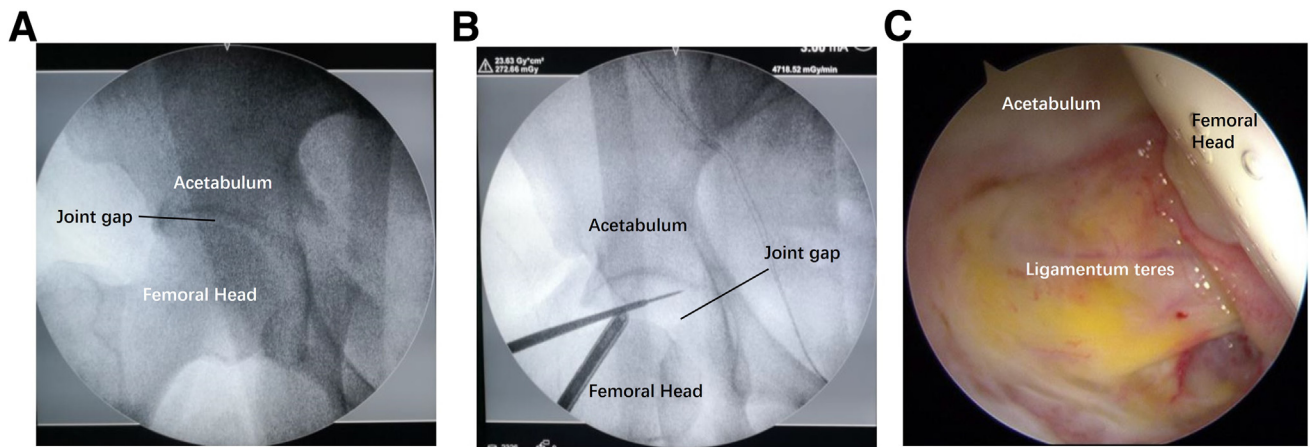


Fig 6. Patient is in supine position, with right hip shown. (A) The image without traction under fluoroscopy. (B) The effect of traction under fluoroscopy. The joint gap can be sufficiently retracted to 8 to 10 mm. (C) Arthroscopic view from the anterolateral portal. Satisfactory traction effect can be achieved under arthroscopy.

Table 1. Pearls and Pitfalls

Pearls	Pitfalls
The inguinal safety trap and abdominal belt should be placed in the proper position and secured firmly	Poorly secured safety straps may cause the patient's body to slide and thus slip off the bed
The safety traps in the inguinal region need to be wrapped with thickened cotton pads to reduce local compression	Overtightening of the abdominal belt may interfere with the patient's abdominal breathing
Attention should be paid to extra cotton padding protection for bony prominences such as ankles and heels	Inadequate protection may cause local pressure injuries
Adjust the head-low-foot-high angle according to the ease of distraction; generally 10-15° is needed	Too small of the angle may lead to difficulty in distraction; too large may increase the cardiopulmonary burden and raise intracranial and intraocular pressure
Perform the traction test before disinfection to ensure adequate joint space retraction	Avoid repeated adjustment of position due to inappropriate traction after disinfection and sheeting
Observe the sliding of the patient's body during distraction	Risk of falling from the surgical bed due to body sliding

distraction. Subsequently, the traction is slowly released, the hip is flexed to 30°, cam deformity is removed, and capsule suturing is performed in the femoral head–neck junction area. Because there is no blockage by the perineal post, the affected hip is able to perform adduction, abduction, internal rotation, and external rotation more freely at the time of cam removal and joint capsule suturing.

Postoperative Rehabilitation

Postoperative observation is required for numbness and pain in the perineal area, as well as distraction complications such as muscle weakness and numbness in the lower extremity. The rest of the rehabilitation process is the same as that of conventional hip arthroscopy. After surgery, the affected limb wears a neutral positioning shoe to prevent external rotation of the hip joint, and functional exercises such as ankle pump and core muscle strength training are started on the second day after surgery. The range of motion of the hip joint is controlled within 90° of flexion to prevent adhesions, and partial weight-bearing walking exercises are performed with crutches until 4 weeks after surgery.

Discussion

Hip arthroscopy techniques have been widely used in the treatment of hip disorders such as femoroacetabular impingement since the beginning of the 21st century.^{11,12} Currently, most hip arthroscopic procedures are performed with the perineal post against distraction in the supine position.³ However, the use of the perineal post can lead to prolonged compression of the perineum, which may cause nerve disorders, impaired circulation, and even persistent tissue ischemia, increasing the risk of pressure injury.¹³ Park et al.¹⁴ found that the incidence of pudendal nerve dysfunction was 2.0% in 200 patients undergoing hip arthroscopy, and although most of the injuries were mild and could be recovered within a few months, they still caused great distress to the patients.³ A study showed that the operation time and postoperative pain with the postless technique were similar to that of perineal post distraction, but the hospital stay was shorter in the postless group.¹⁵ Another study showed that there was no significant reduction in venous blood flow or neurologic changes in the affected limb, muscle tissue damage was subclinical and transient, and no

Table 2. Advantages and Limitations

Advantages	Limitations
Avoids complications of the perineal injury.	Patients with protrusio acetabuli and joint stiffness may have difficulty with traction.
No additional instruments are required and no additional cost. The operation can be performed with ordinary surgical sheets and safety traps in the operating room.	When the angle of Trendelenburg position is too large, it may increase the cardiopulmonary burden. Patients with significantly elevated intracranial pressure, intraocular pressure, and severe gastroesophageal reflux should be operated on with caution.
Simple with high reproducibility	Potential risk of the patient falling from the surgical bed.
Suitable for patients of any weight and for most hip disorders.	
The central compartment is sufficiently exposed for regular operations	
No perineal post blockage allows for free adduction, abduction, internal rotation, and external rotation during cam resection and joint capsule suturing.	

cases of perineal injury were observed in the postless group during the study period.¹⁶

For these reasons, the use of perineal post-free distraction is more supported in current opinions,¹⁷ and many surgeons have made improvements to this technique. Salas et al.¹⁸ reported the “Tutankhamun technique” without the use of the perineal post, but the maneuvers were complicated, excessive restraint of upper extremities and chest tended to interfere with anesthesia, and rehydration through upper extremity veins was not available. Kollmorgen et al.¹⁹ and Perry et al.²⁰ reported a technique for perineal post-free hip arthroscopy with a dedicated commercial pink pad positioning device placed on the surgical bed, but the cost of the equipment is relatively high. Salas et al.¹³ reported a distraction technique without perineal post using a yoga mat to increase friction, which is less expensive but also requires additional equipment. All of the aforementioned techniques have limitations in the application because of the need for additional equipment and materials.

To avoid complications caused by perineal post while not adding extra devices, we have improved the postless distraction technique (Table 1). This technique allows for effective traction of the hip joint through friction between the patient’s weight and the surgical bed in the Trendelenburg position and the reverse force generated by the safety trap on the contralateral thigh. In this case, operations such as chondroplasty, labrum suturing, and trimming of the acetabular rim can be accomplished effectively. In our experience, a Trendelenburg position of 10° is sufficient to achieve satisfactory distraction, even for a lighter-weight patient who is difficult to retract, a position of no more than 25° is adequate to make an effective distraction.

This technique also provides good safety (Table 2). Although there is a theoretical risk of the patient falling out of the surgical bed, it is usually difficult to distract the patient to the point of slipping in practice due to the presence of the abdominal belt; this risk can be avoided by the assistant watching the position of the patient’s body during distraction. It has been reported that the Trendelenburg position may increase the cardiopulmonary burden, intracranial and intraocular pressure, and the degree of gastroesophageal reflux when the angle is too large.²¹ This technique usually uses a smaller head-low-foot-high angle (10-15°). It was observed that there was no significant influence on the respiratory and circulatory status under anesthesia and no complications happened as described previously.

This technique also has some limitations. First, the technique may have difficulties in traction for patients with specific disorders. Meek et al.²² reported a patient with protrusio acetabuli in which portals were finally established using perineal post distraction after several unsuccessful attempts by post-free technique. Second, it

should be used with caution in patients with poor cardiopulmonary function, high intracranial pressure and intraocular pressure, and severe gastroesophageal reflux when the angle should not be adjusted too large.

In our experience, in more than 200 operations, we have not experienced any failure of distraction using the postless technique nor any adverse events due to this method. The technique is effective in avoiding complications due to compression to the perineum, does not require any additional equipment, is simple to perform and easy to learn, and is worthy of application in hip arthroscopy.

Disclosures

All authors (Y.W., H.Y., L.W., J.Z., M.W., C.L.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Zhao FY, Dong HM, Huang HJ, et al. The application of arthroscopic techniques in the diagnosis and treatment of hip-related conditions in China. *Orthop Surg* 2021;13:1697-1706.
2. Kyin C, Maldonado DR, Go CC, Shapira J, Lall AC, Domb BG. Mid- to long-term outcomes of hip arthroscopy: A systematic review. *Arthroscopy* 2021;37:1011-1025.
3. Habib A, Haldane CE, Ekhtiari S, et al. Pudendal nerve injury is a relatively common but transient complication of hip arthroscopy. *Knee Surg Sports Traumatol Arthrosc* 2018;26:969-975.
4. Kraeutler MJ, Fasulo SM, Dávila Castrodad IM, Mei-Dan O, Scillia AJ. A prospective comparison of groin-related complications after hip arthroscopy with and without a perineal post. *Am J Sports Med* 2023;51:155-159.
5. Haipeng L, Ji L, Juanli Z, et al. Portal setup: The key point in the learning curve for hip arthroscopy technique. *Orthop Surg* 2021;13:1781-1786.
6. Brand JC, Rossi MJ, Lubowitz JH. Hip arthroscopy complications are rare, but there is room for improvement. *Arthroscopy* 2019;35:1297-1299.
7. Nwachukwu BU, McFeely ED, Nasreddine AY, Krcik JA, Frank J, Kocher MS. Complications of hip arthroscopy in children and adolescents. *J Pediatr Orthop* 2011;31:227-231.
8. Winger AE, Mei-Dan O, Ellis TJ, et al. Post-related complications in hip arthroscopy are reported significantly greater in prospective versus retrospective literature: A systematic review. *Arthroscopy* 2022;38:1658-1663.
9. Dippmann C, Thorborg K, Kraemer O, Winge S, Hölmich P. Symptoms of nerve dysfunction after hip arthroscopy: An under-reported complication? *Arthroscopy* 2014;30:202-207.
10. Mei-Dan O, Kraeutler MJ, Garabekyan T, Goodrich JA, Young DA. Hip distraction without a perineal post: A prospective study of 1000 hip arthroscopy cases. *Am J Sports Med* 2018;46:632-641.
11. Zhang S, Dong C, Li Z, et al. Endoscopic iliotibial band release during hip arthroscopy for femoroacetabular impingement syndrome and external snapping hip had

- better patient-reported outcomes: A retrospective comparative study. *Arthroscopy* 2021;37:1845-1852.
12. Crofts H, Proceviat C, Bone J, et al. Outcomes after hip arthroscopy show no differences between sexes: A systematic review. *Arthroscopy* 2023;39:2211-2227.
 13. Salas AP, Mendez-Perez E, Mazek J, Velasco-Vazquez H, Castillo-Trevizo A. The yoga mat technique in postless hip arthroscopy. *Arthrosc Tech* 2021;10:e1525-e1530.
 14. Park MS, Yoon SJ, Kim YJ, Chung WC. Hip arthroscopy for femoroacetabular impingement: The changing nature and severity of associated complications over time. *Arthroscopy* 2014;30:957-963.
 15. Schaver AL, Mattingly N, Glass NA, Willey MC, Westermann RW. Hip arthroscopy with and without a perineal post: A comparison of early postoperative pain. *Arthroscopy* 2021;37:2840-2845.
 16. Welton KL, Garabekyan T, Kraeutler MJ, et al. Effects of hip arthroscopy without a perineal post on venous blood flow, muscle damage, peripheral nerve conduction, and perineal injury: A prospective study. *Am J Sports Med* 2019;47:1931-1938.
 17. Kollmorgen R. Editorial Commentary: Post-free arthroscopy reduces complications and pain: To post or not to post? Is that still a question? *Arthroscopy* 2021;37:2846-2847.
 18. Salas AP, Mazek J, Araujo-Reyes D, Gonzalez-Campos M, Castillo-Trevizo A, Garcia JM. The Tutankhamun technique in hip arthroscopy. *Arthrosc Tech* 2018;7:e1167-e1171.
 19. Kollmorgen RC, Ellis T, Lewis BD, Harris JD. Achieving post-free distraction in hip arthroscopy with a pink pad patient positioning device using standard hip distraction tables. *Arthrosc Tech* 2019;8:e363-e368.
 20. Perry AK, GURSOY S, Singh H, Vadhera AS, Mehta N, Chahla J. The pink pad: A method of post-free distraction during hip arthroscopy. *Arthrosc Tech* 2021;10:e1897-e1902.
 21. Arvizo C, Mehta ST, Yunker A. Adverse events related to Trendelenburg position during laparoscopic surgery: Recommendations and review of the literature. *Curr Opin Obstet Gynecol* 2018;30:272-278.
 22. Meek WM, Abraham PF, Kucharik MP, Martin SD. Limitations of postless hip arthroscopy for a patient with coxa profunda: A case report. *JBJS Case Connect* 2021;11, e20.00347.