Traction Force During Hip Arthroscopy is Affected by Multiple Patient Demographic and Anatomic Factors

Nicholas Girardi BA, Mathew Kraeutler MD, Jessica Lee MD, Omer Mei-Dan MD
University of Colorado Anschutz Medical Campus

Introduction

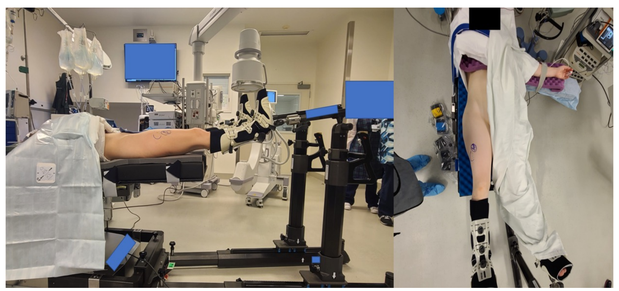
Hip arthroscopy has been increasingly utilized in recent years with expanded indications.[5] During a hip arthroscopy, traction is required to distract the joint in order to safely introduce instrumentation. Maximum traction intensity is the greatest risk factor for postoperative complications such as neurapraxia, skin tearing, and skin necrosis. [1,3,6] Previous studies have sought to determine the effects of age, body mass index (BMI), and hip osteoarthritis on traction force during hip arthroscopy.[4] However, these studies have not been expanded to investigate the effects of other features on traction force such as Beighton Hypermobility Score (BHS) and need for subsequent periacetabular osteotomy (PAO). The purpose of this study was to determine the effects of demographic and anatomic features on initial traction force required during hip arthroscopy.

Objectives

The main objective of this study was to determine the effect of demographic and anatomic factors on initial traction force. This information will help surgeons more accurately outline a patient's risk for complications following hip arthroscopy. This is because the amount of traction force required is directly correlated with numerous complications.

Methods

A prospective database was used to collect data on patients undergoing hip arthroscopy by the senior author including patient sex, age, BMI, Beighton Hypermobility Score (BHS), and hip dysplasia/acetabular anteversion requiring periacetabular osteotomy (PAO). All patients underwent postless hip arthroscopy with or without PAO. At the initiation of hip arthroscopy, the traction force required to distract the hip joint was measured prior to capsulotomy using a postless Stryker Guardian Table. Multiple regression analysis was performed to determine the effects of demographic and anatomic factors on distraction force. Demographic and anatomic variables measured included: patient gender, BMI, clinical diagnosis, age, Beighton Hypermobility Score (BHS), hip range of motion (ROM) in clinic and under anesthesia (flexion, internal/external rotation, abduction), lateral center edge angle (LCEA), femoral torsion, equatorial acetabular version (EQ), initial traction force, and traction force following capsulotomy.



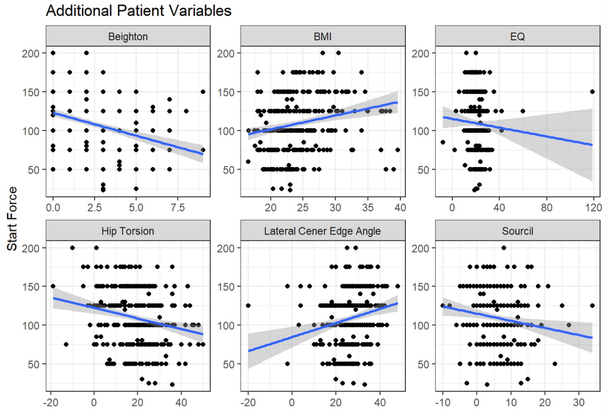
Results

In total, 330 hips (106 male, 224 female) were included with a mean age of 32.9 years and a mean BMI of 24.1 kg/m^2. Mean initial traction force was 109 pounds which decreased to 94.2 pounds following capsulotomy ($p<0.0001$). Multilinear regression analysis showed CAM lesions and male sex were positively correlated with initial traction force. External rotation, internal rotation, labral tear, and female sex were negatively correlated with initial traction force. There was no significant correlation for BHS ($p=0.06$), flexion ($p=0.06$), femoral torsion, BMI, pincer lesion, lateral center edge angle, sourcil angle, and EQ.

Table 1: patient demographics

Patient Demographics	Values (N=330)
Age, y	32.9 (± 11.0)
Sex (male/female)	106/224
BMI, kg/m^2	24.1(± 4.35)
Beighton Hypermobility Score	2.36 (± 2.25)

Figure 1: Correlation between patient variables and starting hip force required



Conclusion

Various demographic and anatomic factors are associated with initial traction force during postless hip arthroscopy. Surgeons can use this information to estimate necessary traction force and also discuss the possibility of traction-related nerve injuries with patients prior to surgery.

References

1. Brumback RJ, Ellison TS, Molligan H, Molligan DJ, Mahaffey S, Schmidhauser C. Pudendal nerve palsy complicating intramedullary nailing of the femur. *J Bone Joint Surg Am*. 1992;74(10):1450–1455. PMID: 1469004

2. Dienst M, Seil R, Gödde S, et al. Effects of traction, distension, and joint position on distraction of the hip joint: an experimental study in cadavers. *Arthroscopy*. 2002;18(8):865–871. PMID: 12368784

3. Harris JD, McCormick FM, Abrams GD, et al. Complications and reoperations during and after hip arthroscopy: a systematic review of 92 studies and more than 6,000 patients. Arthroscopy. 2013;29(3):589–595. PMID: 23544691

4. Kapron AL, Karns MR, Aoki SK, Adeyemi TF, Baillargeon EA, Hartley MK, Todd JN, Maak TG. Patient-Specific Parameters Associated With Traction in Primary and Revision Hip Arthroscopic Surgery. Orthop J Sports Med. 2018; 6(11):2325967118807707. PMID: 30480019

5. 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. *The American Journal of Sports Medicine*. 2018;46(3):632-641. PMID: 29244523

6. Telleria JJ, Safran MR, Harris AH, Gardi JN, Glick JM. Risk of sciatic nerve traction injury during hip arthroscopy—is it the amount or duration? An intraoperative nerve monitoring study. J Bone Joint Surg Am. 2012;94(22):2025-32. PMID: 23052834.

Acknowledgements

Thank you to my primary project mentor Dr. Mei-Dan and thank you to Dr. Kraeutler and Dr. Lee for the assistance throughout the project.