Effects of Hip Arthroscopy Without a Perineal Post on Venous Blood Flow, Muscle Damage, Peripheral Nerve Conduction, and Perineal Injury

A Prospective Study

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Background: Prior reports of hip arthroscopy using a perineal post have established the risks of groin soft tissue injury, sexual dysfunction, and altered lower extremity neurovascular function. These parameters have not been investigated for hip arthroscopy without the use of a perineal post.

Purpose: To evaluate the effects of postless hip arthroscopy on lower extremity venous blood flow, nerve conduction, muscle tissue damage, and perineal injury.

Study Design: Case series; Level of evidence, 4.

Methods: Patients between the ages of 18 and 50 years undergoing an elective unilateral or simultaneous bilateral hip arthroscopy were enrolled. Creatine phosphokinase (CPK)–MM levels and D-dimer levels were obtained preoperatively, immediately postoperatively, and 7 to 12 days postoperatively. Bilateral Doppler ultrasonography of the common femoral vein (CFV) and popliteal vein were conducted intraoperatively. Somatosensory evoked potentials (SSEPs) and transcranial motor evoked potentials (TcMEPs) were measured intraoperatively for the lower limbs. Perineal injury was assessed at 7 to 12 days postoperatively.

Results: 35 patients underwent a total of 40 hip arthroscopies. No significant differences were found in venous blood flow between the operative and nonoperative legs for either the CFV or popliteal vein. SSEP monitoring of the peroneal nerve showed no significant reduction when traction was applied to the operative leg, 90.8%, compared with final measurement just before it was removed, 72.4% (P = .09). For TcMEPs measured in the muscles outside of the traction boots, no significant changes were seen in the percentage of cases with abnormal measurements throughout the procedure. CPK-MM levels preoperatively, immediately postoperatively, and 7 to 12 days after surgery were on average 112, 190, and 102 IU/L, respectively (normal, <156 IU/L). No significant relationship was found between abnormal venous flow and altered D-dimer levels. No clinical evidence of nerve or vascular injury was encountered, and no groin soft tissue complications were observed during the study period.

Conclusion: Postless hip arthroscopy is safe, without a notable reduction of venous blood flow or alteration of nerve function in the operative leg. Muscle tissue damage is subclinical, transient, and reduced compared with distraction with a post. No cases of perineal injury were observed during the study period.

Keywords: hip arthroscopy; traction; pathophysiology; nerve injury; complications

Indications for and performance of hip arthroscopy continue to increase exponentially.[1,4,14,17,22,25] Various positions and methods for obtaining distraction of the hip joint to perform arthroscopic work have been described, but most use a perineal post.[2,7] Given that hip arthroscopy is an elective procedure, typically performed on young, healthy, and active individuals, minimizing complications from the surgery itself is of utmost importance.

The rate of complications associated with hip arthroscopy is usually reported as less than 1.5%, with a range of 0.5% to 8%.[9,10,15,18] However, a prospective ongoing

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study reported a 25% incidence of short-term urologic or sexual dysfunction related to the use of a perineal post during hip arthroscopy, suggesting that the true rate of complications is underreported (O. R. Ayeni, MD, PhD, FRCSC, personal communication, December 2018). The most common complication is related to transient neuropraxia of the pudendal, sciatic, and/or peroneal nerves. Conflicting evidence is available as to whether traction time alone, or in conjunction with peak distraction force, is responsible for these injuries.[6,11,19,21] Furthermore, the perineal post may contribute to soft tissue injuries, such as scrotal and vulvar tears, pudendal nerve injury, hematomas, and skin necrosis.[3,6,23] A comprehensive literature review by Gupta et al[8] demonstrated that 23.5% of all intraoperative complications were associated with the perineal post.

To gain a more objective understanding of how and when some of these intraoperative complications occur, several studies have monitored changes to lower extremity nerve conduction, vascular flow, and soft tissue injury.[14,20,24] Each of these studies used a perineal post to enable hip distraction, and all showed that greater than half of the hip arthroscopies performed resulted in significant alterations of conduction in peripheral branches of the sciatic nerve. In addition, Martin et al[14] demonstrated a significant reduction in venous blood flow to the operative lower extremity during surgery with subsequently elevated D-dimer levels postoperatively. The majority of patients in this study also showed elevated markers of soft tissue injury postoperatively.

A recent study by Mei-Dan et al[16] demonstrated that hip arthroscopy may be safely performed without the use of a perineal post by placing the patient in the Trendelenburg position and using a custom-designed distraction apparatus. This postless technique obviates the need to apply countertraction to the nonoperative limb and still achieves optimal levels of distraction to permit all types of arthroscopic procedures to the hip, including labral reconstruction and ligamentum teres reconstruction.[16] Since the publication of that study, postless hip arthroscopy has increased in popularity. However, the effects of postless distraction on blood flow, nerve function, and muscle injury have not been previously reported. The purpose of this study is to evaluate the effects of postless hip arthroscopy on lower extremity venous blood flow, nerve conduction, muscle tissue damage, and perineal injury.

METHODS

Participants

This was a prospective, nonrandomized case series modeled after the study by Martin et al,[14] who evaluated the same parameters but used a perineal post for hip distraction during arthroscopy. A total of 35 patients (40 hips) were enrolled after institutional review board approval was obtained. Patients between 18 and 50 years of age undergoing an elective unilateral or bilateral hip arthroscopy procedure by the senior author (O.M-D.) were eligible. No data have been published in the medical literature on which to base an estimate of the proportion of patients with hip arthroscopy who are expected to exhibit significant venous, nerve, or tissue compromise secondary to the effects of hip distraction without a perineal post. Lancaster et al[12] suggested that when conducting a pilot study to determine sample size requirements in larger trials, investigators should enroll at least 30 patients. Thus, a sample size of 40 hips was considered sufficient to meet the objectives of this study. Candidates were excluded if they had any of the following:

- Any major systemic or lower extremity trauma or any preexisting medical condition or illness that represents a contraindication for hip arthroscopy surgery
- Significant peripheral vascular disease characterized by a diminished dorsalis pedis or tibial pulse
- Significant peripheral neuropathy demonstrated by nerve conduction velocity test
- Preoperative use of statins or other medications known to elevate serum creatine phosphokinase (CPK)-MM levels within 1 week of surgery
- Total hip replacement of the indicated hip(s)
- History of substance abuse within past 12 months (this includes any chronic narcotic use)
- Any significant psychological disturbance, past or present, psychotic or neurotic, that could impair the informed consent process

Hip Arthroscopy Procedure

After induction of general anesthesia in the operating room, the patient was positioned on a specifically designed hip arthroscopy distraction apparatus in the standard

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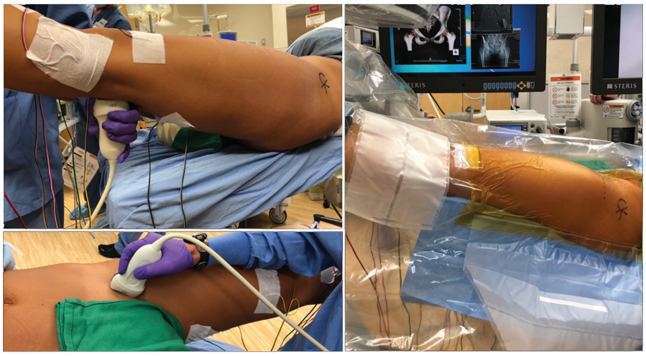

Figure 1. Images of hip arthroscopy setup with intraoperative study measurements.

supine and 11° to 15° Trendelenburg position to allow access to the affected hip (Figure 1). Bony prominences of the foot and ankle were padded, and traction was achieved with the use of a limb positioner affixed to a specifically designed distraction setup and operative table enabling unrestricted limb positioning for optimal maneuverability and access during the procedure.[14] When positioning was complete, the leg was prepared in a standard sterile fashion. Surgery was initiated with a needle inserted anteriorly and directed to the femoral neck to vent the joint with 20 to 30 mL of air and break the suction seal. This enabled lower subsequent traction forces to be used in achieving adequate distraction of the hip. Both gross traction and fine traction were applied to the operative limb with the goal of achieving more than 12 mm of lateral distraction (between the lateral rim and the femoral head) to enable safe introduction of instruments. A tensiometer (Transducer Techniques) was incorporated into the traction apparatus to quantitatively measure the amount of traction force applied to the operative extremity throughout the procedure.[14] No traction was applied to the nonoperative limb. A midtrochanteric portal was then established under fluoroscopic visualization. The remaining required access portals were made with standard surgical instrumentation and technique. Diagnostic arthroscopic examination and therapeutic treatment were carried out as indicated by the patient's presenting condition.

Perioperative Assessments

Blood Work. CPK-MM level and D-dimer tests were obtained preoperatively, immediately postoperatively, and 7 to 12 days postoperatively (normal CPK being 0-156 IU/L and D-dimer ≤0.5 μg/mL of fibrinogen equivalent units [FEU]). CPK-MM serum levels were taken to quantitatively estimate the amount of tissue or muscle damage associated with hip arthroscopy procedures. D-dimer assays were used to evaluate whether pre- and postoperative screening for deep venous thrombosis (DVT) using this test correlated with intraoperative venous blood flow measurements. Some patients included in this study underwent hip arthroscopy before a periacetabular osteotomy (PAO) approximately 1 week later. These patients did not have CPK-MM or D-dimer levels drawn within the 7- to 12-day follow-up period because the PAO surgery likely would have skewed the results.

Doppler Ultrasonography. After induction of general anesthesia in the operating room and before application of the tensioning element to the lower extremity, blood flow in the common femoral vein (CFV) and popliteal vein was measured noninvasively by an ultrasound unit (Philips EPIQ). Volume flow analysis was used to record the mean blood flow. The CFV and popliteal vein flows in the nonoperative extremity were also measured. Ultrasonographic blood flow measurements in the extremity were then repeated immediately after the patient was placed in the Trendelenburg position and again after traction force was applied. Measurements were then taken every 30 minutes post traction and after traction was released. A final set of measurements were taken in the recovery room. Marked diminution of flow (>50%) that was sustained for 2 or more timepoints was considered a significant alteration from baseline.

Monitoring of Somatosensory Evoked Potentials and Transcranial Motor Evoked Potentials. After induction of general anesthesia, needle electrodes were inserted subcutaneously over the peroneal and posterior tibial nerves, and baseline somatosensory evoked potentials (SSEPs) were established and run continuously throughout the procedure. Also at this time, sterile needle electrodes for measurement of transcranial motor evoked potentials (TcMEPs) were placed in the ipsilateral vastus lateralis, adductors, biceps femoris, gastrocnemius, and tibialis anterior as well as the nonoperative gastrocnemius and tibialis anterior. TcMEPs were obtained before and immediately after Trendelenburg positioning, immediately after traction application, and every 30 minutes after traction was applied until the procedure was complete. For SSEPs, a 50% decrease in amplitude or a 10% increase in latency relative to baseline was considered a significant alteration. For TcMEPs, a greater than 90% loss in amplitude was considered a significant alteration from baseline.

Postoperative Follow-up

Patients returned for routine postoperative follow-up between postoperative days 7 and 12, when physical examination of neurologic and motor function was performed.

Specific questions related to potential perineal complications of surgery were addressed, including any areas of redness, swelling, or skin discoloration in the perineum; numbness involving the groin or genitals; or difficulty with urologic or sexual function.

Statistical Analysis

Because this was a single cohort exploratory study, descriptive summary statistics were presented by cohort and for the entire population. Baseline, intraoperative, and postoperative assessment data were compared and summarized. Where appropriate, data were analyzed for

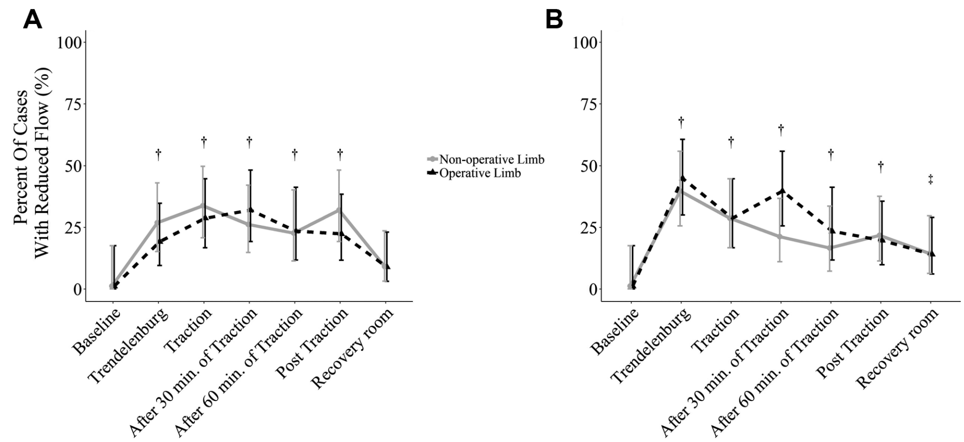

Figure 2. Percentage of cases at each time point exhibiting a marked reduction in venous flow measured at the (A) common femoral vein and (B) popliteal vein. For both figures, no significant differences between operative and nonoperative sides were observed, and at no time point did more than 50% of cases exhibit a marked reduction in venous flow. Figure shows the model predicted proportions and associated 95% CIs. †Significant increase from baseline. ‡Significant decrease from traction.

normality by use of histograms, Q-Q plots, and Shapiro-Wilks/Kolmogorov-Smirnov tests. Descriptive statistics were summarized as means and SDs for quantitative variables and as frequencies and percentages for categorical variables. Continuous outcome variables (ultrasonographic blood flow measurements, CPK, and D-dimer) were analyzed through use of a linear mixed model; assumptions were checked by use of a combination of residual plots and Q-Q plots. Ultrasonographic blood flow data did not meet the assumptions necessary for the linear mixed model, and so secondary analysis was performed on these data by fitting a generalized additive model with a zero-adjusted gamma distribution. Categorical data (SSEP, TcMEP, >50% diminution of venous blood flow compared with baseline, and CPK/D-dimer values greater than the upper threshold) were analyzed by use of a penalized logistic regression model. Within each outcome variable, the Tukey method was used to control for multiple comparisons. Results for ultrasonographic flow data, SSEP, TcMEP, CPK, and D-dimer are given as the model-predicted mean or proportion with associated 95% CIs. Relationships between abnormal D-dimer values and reductions in venous flow were analyzed with a chi-square test. For all analyses, alpha was set at .05, and trends were noted if $.05 < P < .1$. Analysis was performed with R version 3.5.1 (R Foundation for Statistical Computing).

RESULTS

During the study period, 35 patients enrolled and underwent a total of 40 hip arthroscopies. There were 5 bilateral simultaneous hip arthroscopy procedures; of the unilateral procedures, 15 were performed on the left side. Of the 35 patients, 40% (n = 14) were male, and the average patient age was 32.3 years. Of the 40 hip arthroscopies, 20% (n = 8) involved patients who underwent a hip arthroscopy before a staged PAO approximately 1 week later. Of the 40 hip arthroscopies, the average traction time during hip arthroscopy was 73.5 minutes with an average traction force of 69.2 lb. During the clinical follow-up for perineal complications, no patients were identified with either soft tissue perineal injury or reported urologic or sexual dysfunction.

Doppler Ultrasonography

No cases of complete venous occlusion (100% reduction of flow) were encountered. After initiation of Trendelenburg positioning, 22.7% of cases exhibited reduced flow in the CFV (95% CI, 14.7%-33.4%). Compared with the CFV, the popliteal vein had a greater reduction of flow at this time point (odds ratio, 2.48; *P* = .01), in which 42.3% of cases exhibited a reduction in flow (95% CI, 31.7%-53.5%) (Figure 2). After initiation of traction, the reduced flow persisted, but without further reduction in flow for either the CFV or the popliteal vein for the remainder of the procedure. After the operation, the reduction in flow abated such that the venous flow was not significantly different from baseline for both locations. At no point during or after the procedure were there significant differences in venous flow between the operative and nonoperative legs for either the CFV or the popliteal vein, whether traction was applied or not (Figure 2).

SSEP and TcMEP Monitoring

SSEP monitoring of the peroneal nerve showed differing responses between the operative and nonoperative limbs. Measurements in the nonoperative limb exhibited no changes throughout the procedure, with more than 96% of cases maintaining baseline superficial peroneal nerve (SPN) SSEP signals at all points (Figure 3A). However,

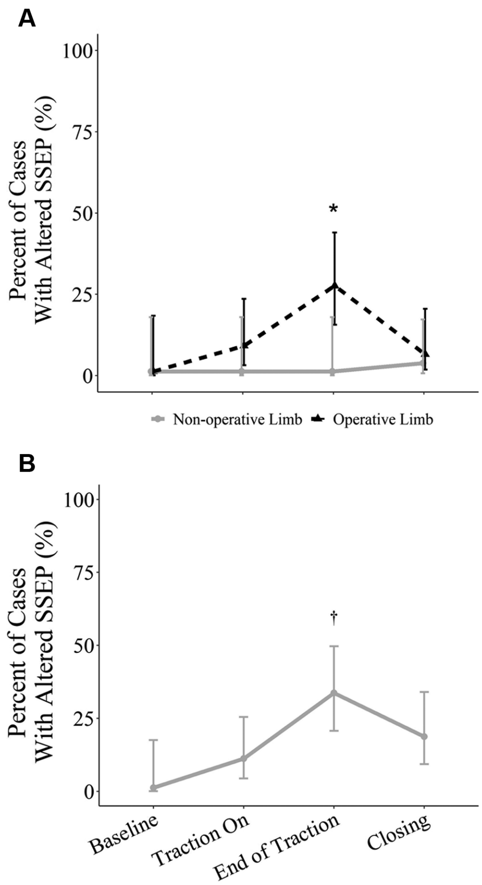

Figure 3. Percentage of cases with an altered somatosensory evoked potential (SSEP) at each time point measured at the (A) superficial peroneal nerve and (B) posterior tibial nerve (PTN). SSEP for the PTN of the operative limb was not reported due to confounding issues with measurements inside of the boot. Figure shows the model predicted proportions and associated 95% CIs. *Significant difference between operative and nonoperative sides. †An increase in abnormal SSEP signals compared with baseline.

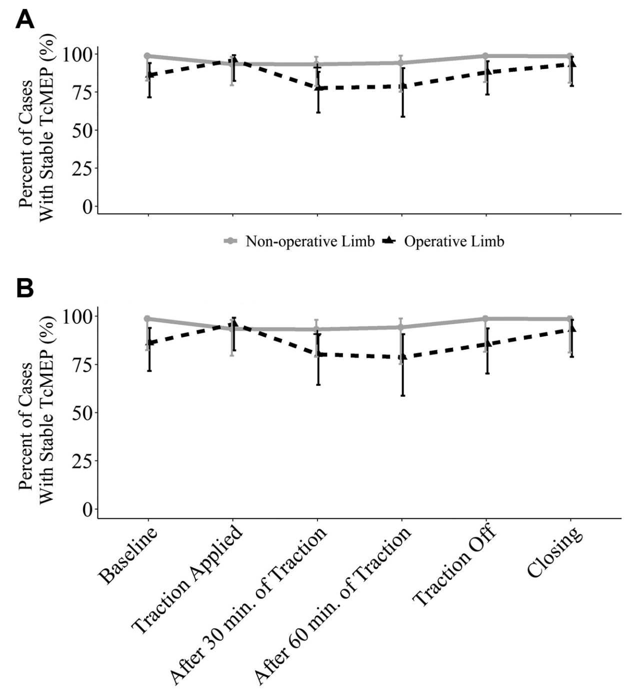

Figure 4. Percentage of cases with stable transcranial motor evoked potential (TcMEP) readings at each time point measured at the (A) tibialis anterior and (B) gastrocnemius. Figure shows the model predicted proportions and associated 95% CIs. No significant differences were observed over time or between sides.

in the operative leg, a trend was noted toward a decrease in SPN SSEP signals from the time traction was applied to just before it was removed, decreasing from 90.8% (95% CI, 76.4%-96.8%) to 72.4% (95% CI, 56.0%-84.3%) (P = .09). With regard to the cases that had an altered signal during this period, the signal was altered 27.6 ± 13.3 minutes after traction was initiated. However, by skin closure, the SPN SSEP had decreased back to baseline levels for both sides (percentage returning to normal, 95.0%; 95% CI, 86.8%-98.2%).

For the TcMEPs measured in the muscles outside of the traction boots, no significant changes were found in the percentage of cases with abnormal measurements throughout the procedure. Furthermore, for the TcMEP of the tibialis anterior and gastrocnemius (which were both measured bilaterally), no significant differences were found between sides in the risk of abnormal readings. Overall, the percentage of cases with normal readings at each point was 94.12% for the tibialis anterior (95% CI, 90.5%-96.4%) (Figure 4A), 94.08% for the gastrocnemius (95% CI, 90.5%-96.4%) (Figure 4B), 91.0% for the biceps femoris (95% CI, 85.7%-94.4%), 91.4% for the adductors (95% CI, 86.2%-94.7%), and 92.9% for the vastus lateralis (95% CI, 87.3%-96.1%).

Blood Work

CPK-MM levels preoperatively, immediately postoperatively, and 7 to 12 days after surgery were 112 IU/L (95% CI, 47-177 IU/L), 190 IU/L (95% CI, 120-262 IU/L), and 102 IU/L (95% CI, 64-204 IU/L), respectively (with normal values ranging from 0-156 IU/L). When these levels were analyzed as a percentage of patients, 4% had elevated CPK levels preoperatively (95% CI, <1%-18.0%), which increased significantly immediately postoperatively to 22.5% of patients (95% CI, 9.0%-46.0%, P = .04). At 7 to 12 days postoperatively, CPK trended to remain elevated compared with baseline, with 20.5% of patients above the normal limit (95% CI, 8.0%-42.6%, P = .05). Secondary analysis revealed that patients who underwent bilateral simultaneous hip arthroscopy were more likely to exhibit elevated CPK levels immediately postoperatively (odds ratio, 22.5; P = .02), although this result should be interpreted carefully given the small sample size.

Average D-dimer levels preoperatively, immediately postoperatively, and 7 to 12 days after surgery were 0.29

μg/mL FEU (95% CI, 0.19-0.40 μg/mL FEU), 0.47 μg/mL FEU (95% CI, 0.33-0.60 μg/mL FEU), and 0.68 μg/mL FEU (95% CI, 0.54-0.82 μg/mL FEU). Preoperatively, 4% of patients (95% CI, <1%-20%) had abnormally high D-dimer values (normal, ≤0.5 μg/mL FEU). Immediately postoperatively, no significant increase was seen in abnormal D-dimer results (11.9%; 95% CI, 3.3%-34.3%, $P > .1$), but at 7 to 12 days postoperatively, a significant increase in D-dimer positive values was found (55.7%; 95% CI, 33.0%-74.0%, $P < .01$). No significant relationship between elevated D-dimer levels and significant venous flow reduction was seen during intraoperative Doppler ultrasonography. No patients were clinically diagnosed with a DVT. No soft tissue or groin-related complications were seen immediately after surgery or at follow-up.

DISCUSSION

The purpose of hip distraction without the use of a perineal post is to minimize outcomes, such as nerve- and soft tissue–related complications, that are known to arise from other surgical hip arthroscopy techniques. This is paramount, especially when elective operations are performed on young, active, and athletic individuals. This is the first study to perioperatively evaluate nerve, vascular, and soft tissue injury arising from hip distraction with a postless surgical bed.

This study was modeled after a study by Martin et al,[14] who evaluated venous blood flow, nerve conduction, and tissue damage in the lower extremity with hip arthroscopy performed using a perineal post. Consequently, our study shares many similarities in method but with some additional key differences. For the vascular- and nerve-related measurements, we studied more than twice the number of subjects. Martin et al measured venous blood flow only before traction, at the start of traction, and in the postanesthesia care unit, whereas we performed Doppler ultrasonography of the popliteal vein and CFV before surgery, upon placing the patient in the Trendelenburg position, immediately after traction, at 30-minute time intervals after initiation of traction, and at skin closure. We also monitored SSEPs continuously, compared with intermittently, once patients had received general anesthesia until skin closure, and we added TcMEPs to obtain more detailed information. Vascular- and nerve-related monitoring was more thorough and comprehensive in this study, and we recorded complete hip distraction force measurements, which were not reported by Martin et al.

Blood Work

Average CPK-MM values were higher preoperatively in our study at 112 IU/L compared with 82 mU/mL in the study by Martin et al.[14] Despite this, the average CPK-MM values were more elevated and above normal in the Martin et al study immediately postoperatively (232 mU/mL), compared with 190 IU/L in our study. CPK-MM values in the present study and that by Martin et al showed reduction at final follow-up into the normal range, 102 IU/L and 138 mU/mL, respectively. Interestingly, our study cohort had overall lower final CPK-MM levels, despite much higher preoperative baseline values. This difference between the studies could indicate that postless distraction results in less soft tissue damage, or the difference could be attributable to the timing of the final blood draw—our final blood draw was 2 to 7 days later than that by Martin et al. However, when we consider that our traction time was nearly 3 times longer than that in the study by Martin et al (73.5 vs 27.3 minutes, respectively), it is reasonable to attribute the lower CPK values as evidence of minimal soft tissue damage associated with a postless distraction technique. Other potential reasons for this difference may include technical differences in how the hip arthroscopy was carried out, including number of portals used and extent of soft tissue dissection.

D-dimer values were positive at the same time points in a greater number of patients in the study by Martin et al[14] compared with ours, despite traction being used for 63% less time in their study. D-dimer levels were positive in 4.7% of our study population preoperatively and only 10% immediately postoperatively, compared with 11.9% and 40%, respectively, in the study by Martin et al. Similarly, 70% of patients in the Martin et al study had a positive D-dimer at 5 days postoperatively, whereas only 55% of patients in our study had a positive test result at final follow-up. No patients in either study were diagnosed postoperatively with DVT.

Doppler Ultrasonography

In our study, similar to the study by Martin et al,[14] the popliteal vein appeared to be more sensitive to hip arthroscopy (regardless of the methods of positioning and distraction) than the femoral vein. Martin et al reported that complete occlusion occurred 100% of the time in the popliteal vein and reduced flow of the femoral vein was encountered in 27% of cases immediately after traction was applied. Analogously, immediately after traction in our study, the popliteal vein had reduced flow in 53.8% of cases compared with only 38.5% of cases for the CFV. Fortunately, no instances of complete venous occlusion of either the CFV or popliteal vein were encountered in our study. The higher rate of popliteal vein occlusion found by Martin et al is likely attributable to the post pressing against the thigh, thereby causing compression to the venous vasculature and resulting in mechanical stasis and reduced flow. Although our study cohort did experience reduction in flow, this is likely due to the physiologic reduction in venous filling seen when patients are placed in the Trendelenburg position,[13] particularly because similar reduction in flow was recorded in the nonoperative leg, which did not receive traction.

Given that Martin et al[14] evaluated CPK, D-dimer, and venous flow in concert, it is not surprising that those investigators demonstrated a higher incidence of elevated CPK and D-dimer as well as complete occlusion of venous flow in the popliteal vein. Demers et al[5] demonstrated that a tourniquet time of more than 60 minutes was significantly associated with the development of DVT. Thus, a perineal post, although not circumferentially compressing the entire leg, may affect both venous flow and soft tissue markers of damage when compared with postless hip arthroscopy, despite the fact that traction was nearly 3 times longer in the present study.

SSEP and TcMEP Monitoring

The SSEP recordings observed in our study upon initiation of traction and for the first 27 minutes were similar to those reported by Martin et al.[14] The SPN was affected in 8 of 37 operative legs (21.6%) in our study versus 3 of 15 cases (20%) in Martin et al's study. This appears to be related to traction itself, as none of the nonoperative legs showed reduction in signal throughout the duration of the case, except a single recording abnormality at skin closure.

In the Martin et al[14] study, 5 of 15 SPN signals (33.3%) and 8 of 15 posterior tibial nerve signals (53.5%) were altered in the nonoperative limb; in our study, no SPN signals were altered during the actual procedure and only 15 of 39 posterior tibial nerve signals (38.5%) were altered despite our use of longer traction times. This potentially highlights that use of a perineal post negatively affects both the operative and nonoperative leg, as the nonoperative side is used as a counter force around the post.

TcMEP recordings in our study emphasized the effect that compressive boots can have on neuromonitoring. The abductor hallucis was the only muscle recorded from within the boot, and 32.4% of the nonoperative limbs showed alteration in abductor hallucis, while no other muscle group was altered. This was seen despite the fact that the nonoperative limb was kept much looser in the boot relative to the operative limb. Furthermore, an abnormal TcMEP in abductor hallucis was maintained at skin closure in 21.6% of cases. This indicated to us the need for improvement in the boot component of the postless setup. To address this issue, we have started using a double-padded foot liner inserted into a hard shell that distributes the compressive forces over a much larger surface area. Unfortunately, we do not have data for this new boot apparatus to determine whether objective improvements have been made.

The present study adds to several recent publications advocating for the universal adoption of the postless hip arthroscopy technique to reduce the incidence of devastating groin soft tissue and perineal complications. In the past, one of the major limitations to the widespread use of this technique included the lack of a commercially available table enabling postless hip distraction. However, a postless bed is now available to the market (Guardian; Stryker Sports Medicine) and will help surgeons who perform hip arthroscopy to generalize the results of our study.

Limitations

The limitations of this study should be noted. No control group was included in this study because using a perineal post to achieve hip distraction during arthroscopy is not our standard of practice. Also, as previously mentioned, this study was modeled after the study by Martin et al,[14] and although many parameters were kept the same such that comparisons could be drawn, certain differences do exist, as we desired to gather more data and improve the overall design of the study. One of these differences is that our study included 40 cases for all data parameters, whereas the Martin et al study included only 30 patients and only laboratory data were acquired in all 30 patients, with neuromonitoring and vascular data split into groups of 15. Another difference is that our last collection point of laboratory data occurred on days 7 to 12 postoperatively, whereas Martin et al last collected data on postoperative day 5. A key difference is the increased amount of data collection points gathered for neurovascular monitoring. Whereas Martin et al conducted Doppler ultrasonography only preoperatively, at immediate initiation of traction, and in the postoperative recovery area, we took data measurements preoperatively, after placing the patient in the Trendelenburg position, immediately after traction, in 30-minute increments until traction was released, immediately after traction completion, and in the postoperative recovery area. We performed SSEP neuromonitoring preoperatively and then continuously upon initiation of traction until skin closure, whereas Martin et al performed neuromonitoring only every 5 to 15 minutes. Furthermore, we included TcMEPs as another modality of neuromonitoring that was not performed by Martin et al.

CONCLUSION

Postless hip arthroscopy is safe, without a notable reduction of venous blood flow or alteration of nerve function in the operative leg. Muscle tissue damage is subclinical, transient, and reduced compared with distraction with a post. No cases of perineal injury were observed during the study period.

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