



Research Article

# The Immediate Post-Surgical Effects of Conversion to Post-Free Hip Arthroscopy

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## Abstract

**Purpose:** To determine the effects of a post-free distraction technique compared to a peroneal post cohort undergoing hip arthroscopy on pain and narcotic use during the acute post-operative phase.

**Methods:** Patients who underwent hip arthroscopy for Femoroacetabular Impingement Syndrome (FAIS) within two months before and immediately after the introduction of post-free distraction were identified through our multicenter database. Post Anesthesia Care Unit (PACU) Visual Analog Scale (VAS) Maximum score, VAS on initial presentation to the PACU (VAS Initial), VAS at discharge, and PACU opioid consumption were extracted from the database.

**Results:** A total of 82 patients met the inclusion criteria (41 post-free distraction and 41 peroneal post distraction). Mean VAS Initial score for the post group was  $5.4 \pm 2.8$ , the post-free group was  $4.5 \pm 2.5$ , P - value = 0.16. Mean VAS Max score for the post group was  $7.0 \pm 2.1$ , the Post-free group was  $5.7 \pm 2.2$ , P - value 0.006. Mean VAS for the post group was  $5.6 \pm 2.6$ , the post-free was  $4.7 \pm 2.4$ , P-value = 0.004 (Figure 1). ME for the post group was  $17.5 \pm 11.0$  while the post-free group was  $15.4 \pm 10.2$ , P - value 0.33.

**Conclusions:** Our post-free cohort showed similar demographics, surgical time, ME given and procedures performed to the peroneal post cohort, and the only variable changed was removal of the post. We found that the immediate response to removing the post was significantly decreased maximum and mean PACU pain. With the removal of the peroneal post, although not significant, we identified a decrease trend in narcotic use in the post-free group.

**Clinical Relevance:** Implementing a post-free traction technique may demonstrate decreased postoperative pain and opioid use in patients undergoing hip arthroscopy and thus may reduce postoperative complications such as pudendal nerve injury.

## Introduction

An increased understanding of non-arthritis hip disease has allowed hip arthroscopy procedures to become widely practiced managing numerous conditions. [1,2] The incidence and complexity of these procedures has increased while excellent, sustainable outcomes have been demonstrated. [2-5] Joint distraction, currently required for hip arthroscopy, requires a significant force to be exerted on the groin and perineal area. [6-8] Distraction using a perineal post has recently been demonstrated to produce noteworthy traction-related complications that were previously underreported. [9] Although generally transitory, pudendal nerve injury is a relatively common complication. [10-12] These complications represent a significant, yet resolvable challenge for arthroscopic surgeons. Various techniques have been developed to avoid traction related complications and decrease post-operative pain. A spinal needle can be used to break the suction seal of the joint to allow positive pressure air arthrography to assist distraction. [13,14] Arthroscopic techniques utilizing a peroneal post have shown that the use of air arthrograms significantly decreases pain and the use of opioids while in the PACU when compared to the standard procedure. [14] Post-less, or “post-free”, distraction techniques have also been developed and have shown to eliminate groin and pudendal nerve complications [8,15-17].

There is a dearth of literature describing outcomes following post-free distraction. To the authors’ knowledge, there are no current studies evaluating outcomes following post-free distraction with the pink pad positioning device. The pink pad covers the entirety of the bed and allows for post-free distraction by providing friction between a standard hip arthroscopy table, the pad and the patient. This configuration stabilizes the patient’s hip position without the need for a post. In addition to a lack of existing studies, outcomes following post-free distraction in general are limited to monitoring complications. [8] The authors noted subjective decreases in pain and improved recovery following the conversion to their previously published post-free technique. [17] The purpose of this study is to determine the effects of a post-free distraction technique compared to a peroneal post cohort undergoing hip arthroscopy on pain and narcotic use during the acute post-operative phase. The authors hypothesized that post-free distraction patients would experience significantly decreased acute post-operative pain, decreased time to discharge, and require less narcotics in the acute phase as compared to techniques utilizing a peroneal post.

## Methods

Institutional Review Board University of California San Francisco Institutional Review Board, UCSF IRB, #18-26040 was obtained, and data was obtained from our multicenter database which includes UCSF Fresno, Houston Methodist, Duke and Orthopedic One. Retrospective database review was performed on 41 patients undergoing hip arthroscopy at the implementation of the post-free technique and compared to a cohort of 41 patients undergoing hip arthroscopy utilizing the peroneal post prior to the implementation of a post-free technique. [17] An equal distribution

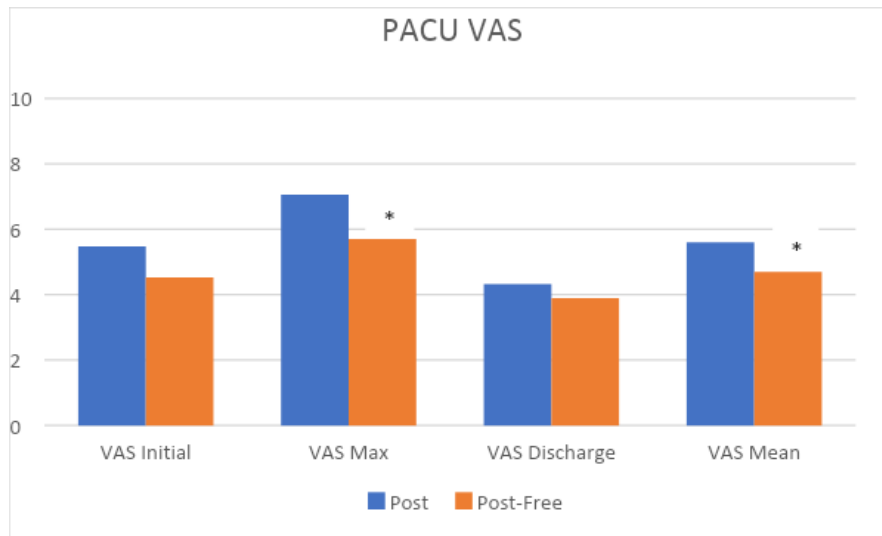
of patients from each site were used in each of the two groups. Inclusion criteria were all patients undergoing hip arthroscopy for Femoroacetabular Impingement Syndrome (FAIS) within two months before and immediately after the introduction of post-free distraction. Exclusion criteria were patients undergoing a concomitant Periacetabular Osteotomy (PAO). Surgical technique was performed utilizing the supine position with either the Hana table or Smith and Nephew traction table. General anesthesia was utilized in all cases. For the post group, the surgical and non-operative leg were placed in well-padded traction boots, and a large well-padded peroneal post was utilized. Venting of the joint was utilized as previously described, and the joint was accessed standardly through the Antero-Lateral (AL), Mid Antero-Lateral (MAL), and Distal Antero-Lateral portals (DAL) [14].

For the post-free group our previously described technique was utilized. [17] Briefly after applying well-padded traction boots, patients were placed in the supine position on the Pink Pad utilizing either the Hana table or Smith and Nephew traction table. Air arthrogram was utilized, and traction applied. The joint was accessed utilizing AL, MAL, and DAL portals. Surgical time, any post or post-free patient safety issues and procedures performed were extracted from the database. Safety issues were defined as any patient needing repositioned or surgery aborted and converted to a post technique. Outcome measures were extracted from the records: Post Anesthesia Care Unit (PACU) Visual Analog Scale (VAS) Maximum score, VAS on initial presentation to the PACU (VAS Initial), VAS at discharge, and PACU opioid consumption. VAS is a common outcome measure for pain and has previously been previously validated for hip arthroscopy for acute and chronic pain. [18] This was measured by the PACU nursing staff on a Likert scale, 0-10. This measurement was based on the question “How much pain do you have in your hip?” and was measured on a 0 (no pain) -10 (worst imaginable pain) scale. VAS measures were defined as: VAS initial, first score recorded on presentation to PACU, VAS maximum, maximum PACU score, VAS mean, mean PACU score and VAS at discharge. In order to standardize opioid usage post operatively in the PACU, all opioid narcotic use was recorded and converted into morphine equivalents (ME) in milligrams utilizing previously validated conversion factors [19].

Statistical analysis was performed utilizing Microsoft Excel and StatPlus:mac. And a priori power analysis was performed based on previous literature on pain outcomes after hip arthroscopy. [14,20] It was determined to power our study to 1-b = 0.80 with  $P < 0.05$ , 31 patients would need to be enrolled in each group, and 41 patients were selected in each group to ensure adequate power. Descriptive statistics were performed between the two groups. Categorical data was analyzed utilizing Pearson chi-squared test, with a significance set at  $P < 0.05$ . Non-categorical data was analyzed utilizing an unpaired Students t-test, significant  $P$  value  $< 0.05$ . 95% Confidence intervals were calculated from the descriptive statistics and reported as lower and upper level. Post hoc analysis between the VAS pain scores was performed and revealed a power value of 100%.

**Results**

The study group consisted of 82 patients. The proportion of female patients did not significantly differ between post and post-free groups. The post group consisted of 24 females and 17 males while the post-free group was 29 females and 12 males, P-value 0.20 using Pearson chi-squared test. Demographics are shown in Table 1 and no significant difference in any demographic between the two groups was observed. Femoroplasty, labral repair and capsular repair were performed in all cases for the post and post-free groups, and no differences were observed in procedures performed, P-value >0.05 (Table 2). Mean surgery time for the post group was 115.0 ± 26.5 minutes, PACU time was 107.2 ± 63.5 minutes, and PACU to discharge time was 165.5 ± 89.9 minutes. The post-free group mean surgery time was 115.2 ± 34.0 minutes, PACU time was 90.2 ± 58.0 minutes, and PACU to discharge time was 143.4 ± 79.9 minutes. No significant differences were observed between surgical time points between the two groups, P > 0.05 (Table 3). Mean VAS Initial score for the post group was 5.4 ± 2.8, the post-free group was 4.5 ± 2.5, P - value = 0.16. Mean VAS Max score for the post group was 7.0 ± 2.1, the Post-free group was 5.7 ± 2.2, P - value = 0.006. Mean VAS for the post group was 5.6 ± 2.6, the post-free was 4.7 ± 2.4, P-value = 0.004 (Figure 1). ME for the post group was 17.5 ± 11.0 while the post-free group was 15.4 ± 10.2, P - value 0.33. No groin related complications nor patient safety issues were noted in either group.



**Figure 1:** Blue represents the Post group, and Orange the Post-Free group. Y-axis the VAS 0-10. \* indicates significant mean differences. (VAS)Visual analog scale, (PACU) Post Anesthesia Care Unit.

| Demographics                            | Post       | Range | Post-Free  | Range | P -value |
|---|------------|-------|------------|-------|----------|
| Number of patients                      | 41         |       | 41         |       |          |
| Age<br>(mean in years ± SD)             | 38.4 ± 2.1 | 15-67 | 35.5 ± 2.4 | 13-68 | 0.27     |
| BMI<br>(mean in kg/m <sup>2</sup> ± SD) | 26.6 ± 0.9 | 17-51 | 26.3 ± 0.6 | 19-37 | 0.28     |
| Sex Female n<br>(% Female)              | 25 (60.9)  |       | 29 (70.73) |       | 0.20     |

**Table 1:** Demographics for the study group. Age listed in number of years. Body Mass Index (BMI) represented as means calculated kg/m<sup>2</sup>. n, represents the number of subjects, percent (%) female shown.

| Procedure               | Post<br>N(%) | Pad<br>N (%) | P - value |
|-------------------------|--------------|--------------|-----------|
| Femoroplasty            | 41 (100)     | 41 (100)     | 1.0       |
| Labral repair           | 41 (100)     | 41 (100)     | 1.0       |
| Abductor repair         | 0            | 2 (4.8)      | 0.0       |
| Labral reconstruction   | 0            | 2 (4.8)      | 0.0       |
| Trochanteric bursectomy | 0            | 3 (7.3)      | 0.0       |
| Capsular repair         | 41 (100)     | 41 (100)     | 1.0       |
| Subspine decompression  | 6 (14)       | 8 (19)       | 0.16      |
| Acetabuloplasty         | 1 (2.4)      | 3 (7.3)      | 0.16      |

**Table 2:** Procedures Performed. (n) represents the number of patients in each cohort. % represents percent of the cohort with each procedure.

| Outcome Measures                          | Post         | Range  | 95% CI<br>(LL,UL) | Post-Free    | Range  | 95% CI<br>(LL,UL) | P-value      |
|---|--------------|--------|-------------------|--------------|--------|-------------------|--------------|
| <b>Surgery Time (min)</b><br>Mean ± SD    | 115.0 ± 26.6 | 69-173 | 106.6, 123.4      | 115.2 ± 34.0 | 75-217 | 104.5,125.9       | 0.90         |
| <b>PACU Time (min)</b><br>Mean ± SD       | 107.2 ± 63.5 | 21-242 | 87.1, 127.2       | 90.2 ± 58.0  | 28-319 | 71.9, 108.6       | 0.18         |
| <b>PACU to DC time (min) Mean</b><br>± SD | 165.5 ± 89.9 | 10-352 | 137.1, 193.9      | 143.4 ± 79.9 | 30-400 | 118.2, 168.6      | 0.22         |
| <b>VAS Initial</b><br>Mean ± SD           | 5.4 ± 2.8    | 0-10   | 4.5, 6.4          | 4.5 ± 2.6    | 0-10   | 3.7, 5.3          | 0.16         |
| <b>VAS Max</b><br>Mean ± SD               | 7.0 ± 2.1    | 3-10   | 6.3, 7.7          | 5.7 ± 2.2    | 0-10   | 5.0, 6.3          | <b>0.006</b> |
| <b>VAS at Discharge</b><br>Mean ± SD      | 4.3 ± 2.0    | 0-8    | 4.5, 6.4          | 3.8 ± 2.2    | 0-8    | 3.6, 4.9          | 0.35         |
| <b>VAS Mean ± SD</b>                      | 5.6±2.6      | 0-10   | 5.1, 6.0          | 4.7±2.4      | 0-10   | 4.2, 5.15         | <b>0.004</b> |
| <b>ME</b><br>Mean ± SD                    | 17.5 ± 11.0  | 0-46   | 14.1, 21.0        | 15.4 ± 10.2  | 0-43   | 12.2, 18.6        | 0.18         |

**Table 3:** Post versus Post-Free outcomes. Surgery, PACU, and PACU to discharge times represented in minutes. Standard deviations and ranges are shown in each column. Unpaired Students-T test results with P < 0.05 for significant difference. 95% Confidence intervals (CI), 95% CI Lower level (LL), 95% CI Upper Level (UL). P values bolded indicated significant scores. Post Anesthesia Care Unit (PACU), minutes (min), SD (standard deviation), Visual Analog Score (VAS), Morphine Equivalents (ME), Discharge (DC).

## Discussion

Recent publications on post-free hip arthroscopy are limited to descriptive techniques and studies on blood flow to the groin. [17,21] While post-free arthroscopy gains attention, showing benefits other than eliminating groin complications is of importance. Our study finds that on the immediate conversion to a post-free technique, in patients treated for FAI syndrome, as compared to a post cohort, had significantly less maximum and mean PACU pain across multiple institutions and resulted in no pudendal nerve injuries nor patient safety issues. Additionally, although not statistically significant, there was decreased time to discharge, decreased initial PACU pain and decreased opioid use with the post-free group. While the risk of nerve injury with distraction through a perineal post is well documented in the literature, this is the first report on the immediate effects of post-free arthroscopy [10,11]. Pain in the PACU following hip arthroscopy is multifactorial and can be related to various reasons such as: institutional anesthesia practices, surgical procedure, patient factors and medications administered, among others. [22] Our cohort showed similar demographics, surgical time, ME given and procedures performed, and the only variable changed was removal of the post. We found that the immediate response to removing the post was significantly decreased maximum and mean PACU pain. Both of these values met MCID threshold (1.3) for acute pain reduction in a hospital setting, between-group difference VAS Max (1.3) VAS Mean (1.9) [23].

Maximum pain in PACU, before the patient is discharged, is likely the peak pain a patient may experience and may dictate need for long term opioid use. Mean pain is more representative of the patient's post-operative pain course. Opioids given for outpatient surgeries, which are considered relatively minor procedures, increases the risk for opioid addiction. [24] Also, it has been shown that more than 25% of patients after hip arthroscopy are still on opioids after 3 months. [25] Thus, any potential intervention to reduce pain post operatively without the use of opioids should be considered. Our post-free group showed significantly less maximum and mean pain as compared to a post group. The reduction of post-operative opioid consumption is of vital importance for any Orthopaedic procedure. Following hip arthroscopy, Cunningham et al have shown that pre-operative opioid use was the single strongest predictor of post-operative opioid consumption. [26] Baker et al have shown that PACU VAS max to be decreased with intra-operative morphine use. [27] Our cohorts showed no significant difference in regard to Morphine Equivalents utilized, and this can be explained by a lack of anesthetic standardization between the institutions. With the removal of the peroneal post, although not significant, we identified a decrease trend in narcotic use in the post-free group.

Additional variables exist that can also lead to decreased immediate post-operative pain. Hodax et al. reported on breaking the suction seal with an air arthrogram prior to placing the operative hip under traction utilizing a post. This group concluded

that utilizing a post with an air arthrogram reduced pain scores and opioid consumption in the acute phase. [14] They found significant reduction in Numeric Pain Rating Scale (NPRS) and opioid use in the PACU. Our study observed this with our post-free technique. While our technique also utilized the air arthrogram, which may have decreased baseline post op pain in both groups, the addition of removing the post may have an additive effect in pain reduction.

Our study is not without limitations. As a retrospective multicenter cohort study, the patients were not randomized, post-operative pain protocols were not standardized and may vary between institutions. The small size of our standard deviations and the confidence intervals alludes to the homogeneity of our combined data and we believe these findings to be valid. An equal distribution of patients from each center were included for each group so we expect no discrepancy in the results due to differences in site specific pain analysis. Also, post-operative narcotic administration is BMI dependent, not site specific, between groups since the BMI difference between the groups is not significantly different. Another limitation is the use of VAS for pain scoring. This patient reported outcome measure can be poorly defined by staff, asked at different time points and is subjective by nature. A final limitation to consider regards differences in traction times between groups. All post-group surgery traction times were limited to 60 minutes and post-free surgery traction times were not recorded but were no more than 120 minutes. However this may not be a major limitation as studies have shown that traction intensity, not traction time, is the predominant factor in post-operative nerve injury, more specifically pudendal nerve injury. [28] Despite these limitations, we feel our study is the first to show the immediate effects of conversion to post-free distraction for hip arthroscopy.

## Conclusion

In conclusion, previously published studies have described surgical techniques and neurovascular benefits of post-free distraction. Schaver et al. retrospectively reviewed a consecutive series of patients who underwent hip arthroscopy before and after the adoption of a post-free technique. [29] This study found that the adoption of the post-free technique decreased total operative time, traction time, operating room time, and time from surgery to hospital discharge when compared to the post-group. Although this study highlighted various benefits of post-free distraction, they were unable to show the efficacy of the post-free technique on postoperative pain as final VAS pain scores in the PACU were similar between both groups. Conversely, we have demonstrated that with the removal of the post, patients experience significantly less maximum and mean PACU pain. This is the first study, to our knowledge, demonstrating decreased pain following hip arthroscopy using a post-free traction technique.

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