ABSTRACT
Limited research exists on the possible association between duration of symptoms and clinical outcomes following hip arthroscopy for labral tears. The purpose of this study was to evaluate whether duration of symptoms affected clinical and patient-reported outcome (PRO) scores following hip arthroscopy for labral tears. From 2008 to 2011, data were collected prospectively on all patients undergoing primary hip arthroscopy for labral tears. Workers’ compensation cases, dysplasia cases and patients with previous ipsilateral hip surgeries were excluded. A total of 738 patients were identified with a minimum of 2-year follow-up, and clinical and PRO data were available for 680 patients. Uni- and multivariate analyses were performed to determine the relationship between duration of symptoms along with other variables and PROs. Overall, patients experienced significant improvements in all clinical and PRO scores. Results of univariate analysis revealed that all PROs were negatively associated with increasing Log10 months of symptoms as were pain and satisfaction scores. During multivariate analyses, increasing Log10 months of symptoms, age, body mass index and trauma were all negatively associated with PROs (P < 0.05). Our study demonstrates that clinical and PRO scores were negatively associated with increasing duration of symptoms prior to hip arthroscopy for treatment of labral tears. Although this implies that delay in treatment may adversely affect outcome, conservative treatment remains the gold standard first line of treatment. Surgeons should incorporate this information into their treatment algorithm to maximize patient outcomes following treatment for labral tears.

Level of evidence: Level IV, prospective case series.
Hip arthroscopy has become the surgical treatment of choice for labral tears in the US, and the results have been good or excellent in the majority of patients [9–11]. However, concern exists that continued and progressive damage to the labrum and/or cartilage prior to surgery may lead to long-term joint degeneration and diminished outcomes [12]. Because of the risk of progressive and potentially irreversible damage, some surgeons advocate earlier surgical intervention; intuitively however, this may lead to overtreatment.

Few studies have evaluated an association between duration of symptoms prior to surgery and outcomes following hip arthroscopy and results have been conflicting [12, 13]. The purpose of this study was to determine if patient reported outcome (PRO) scores correlated with duration of symptoms prior to hip arthroscopy for labral tears. We hypothesized that increasing duration of symptoms would lead to decreased PROs following hip arthroscopy.

MATERIALS AND METHODS

At our institution, clinical and PRO data are prospectively collected on all patients undergoing hip arthroscopy. We performed a retrospective query of our institutional database for all patients who underwent hip arthroscopy for a labral tear with minimum 2-years’ follow-up. The study period was from 2008 to 2011. Our institutional review board approved this study.

Symptom duration was measured by calculating the time between initial onset of pain (reported on patient intake forms) and day of surgery. Patient reported outcome (PRO) scores including the modified Harris Hip Score (mHHS), the Non-Arthritic Hip Score (NAHS), the Hip Outcome Score–Activities of Daily Living (HOS-ADL) and the Hip Outcome Score–Sport-Specific Subscale (HOS-SSS) were obtained preoperatively, and at 3-months, 1-year and 2-years following surgical intervention. These PROs were collected at clinical follow-up visits when possible, or via email otherwise. In addition, pain and patient satisfaction ratings were obtained. The visual analog scale (VAS) pain score was measured on a scale from 0 to 10, with 0 being no pain and 10 being severe pain. Patient satisfaction was measured on a scale from 0 to 10, with 0 being completely unsatisfied and 10 being completely satisfied. Any conversion to total hip arthroplasty (THA) was noted.

The inclusion criteria for our study included failure of conservative measures (including 6 weeks of physical therapy), a magnetic resonance arthrogram (MRA) confirming a labral tear, Tönnis grade 0 or 1 joint space [14] and a minimum 2-years’ follow-up. Exclusion criteria included workers’ compensation cases, dysplasia (lateral center-edge angle below 25°) [15] and history of prior surgery on the affected hip.

Clinical evaluation

Clinical evaluation and radiographic assessments were performed by the senior author (BGD) at each visit. Patients were seen preoperatively and 3 months, 6 months, 1 year and 2 years postoperatively. Plain radiographs obtained at the initial visit included an anteroposterior pelvic view, Dunn view, cross-table lateral view and a false profile view. Measurements were made from these views, including the Tönnis angle (acetabular inclination angle) using the method described by Jessel et al. [16], the lateral center edge angle of Wiberg [15], joint space at its narrowest point in millimeters, crossover sign [17], alpha angle and femoral head-neck offset in millimeters. The alpha angle was measured on the Dunn view using the method described by Nötzli et al. [18] and on magnetic resonance imaging using the modified technique described by Meyer et al. [19]. All radiographs were graded with the Tönnis classification of osteoarthritis [14].

Clinical assessment included range of motion and strength assessment, anterior apprehension test and flexion/adduction/internal rotation (FADIR) test to assess for impingement. In equivocal cases, diagnostic intra-articular injections were performed with ultrasound guidance. MRA was obtained in all patients and was read by a fellowship trained musculoskeletal radiologist, and confirmed by the senior author (BGD).

Surgical technique

All hip arthroscopies were performed by the senior author (BGD). Hip arthroscopy was performed with the patient in the modified supine position on a traction table with a well-padded perineal post. Access to the joint was gained through a standard anterolateral portal, an anterior portal placed under direct visualization, and a distal anterolateral accessory portal for labral repair [20]. The capsule was cut parallel to the labrum, connecting the anterior and anterolateral portals and extending medially as needed to address intra-articular lesions. A T-cut capsulotomy was not performed. Routine diagnostic arthroscopy was performed in all cases. Concomitant procedures were performed if indicated: LT debridement with a radiofrequency device in the case of LT tear; chondroplasty with a motorized shaver for unstable, loose cartilage lesions; microfracture for Outerbridge grade IV lesions after chondral debridement [21]; and iliopsoas fractional lengthening if the patient had pain with internal snapping of the hip noted on preoperative examination or if there was an iliopsoas impingement lesion on the labrum [22]. Figures 1 and 2 show intra-
operative arthroscopic images of a supine left hip viewed from the lateral portal. Intra-operative data were collected on all patients, including the location of labral tears and procedures performed on the labrum, capsule, acetabulum, femoral head-neck junction and iliopsoas tendon.

As a general treatment algorithm, pincer impingement was treated with acetabuloplasty and cam impingement with femoroplasty. Femoroplasty was performed with the goal of restoration of normal femoral head-neck offset and normal sphericity with an alpha angle under 50°. Labral repair was performed when sufficient labral tissue remained following debridement; repair type (simple circumferential loop stitch vs. labral base refixation) was chosen based upon labral thickness and tissue quality [23]. Labral reconstruction with iliotibial band autograft was performed in cases of insufficient or segmental labral deficiency [24]. The capsule was repaired routinely except in whom a release was considered to be therapeutic, such as patients with stiff hips or thickened capsules.

Postoperatively, all patients followed a standard physical therapy rehabilitation protocol initiated within 5 days postoperatively. Crutches were used for 2 weeks with foot flat weight bearing with patients weaning from crutches as gait improved over the next 2 weeks. A hip orthosis was used on all patients for the first 2 weeks postoperatively. Patients were allowed to begin a walk-jog program at 3 months postoperatively, and were cleared to return to all athletics at a minimum of 6 months after surgery.

Statistical analysis
Descriptive statistics were used for patient demographic data and procedures performed. The paired Student t-test was used to test for significance of differences between various groups of continuous variables (Microsoft Excel; Microsoft, Redmond, WA). Uni- and multivariate analyses were performed to examine the predictors of increases or decreases from pre- to postoperatively in all four PRO scores (mHHS, NAHS, HOS-ADL and HOS-SSS). Eight potential preoperative predictors were simultaneously considered for each PRO: age, sex, Log10 months of symptoms, BMI, acute injury, high-energy trauma, labral treatment and capsular treatment. The degree of chondrolabral injury was not available for this study and was therefore could not be analyzed as an independent variable. A strict P values of <0.05 was used to define significance. Regression analysis was used to account for the ceiling effect of the various PROs. For univariate analysis of correlations with VAS and satisfaction, step-down backward robust linear regression was used. Spline analyses revealed that duration of symptoms had a nearly linear relationship with Log10 months of symptoms.

RESULTS
In total, 868 patients were identified, 739 of which had a minimum of 2 years’ follow-up (85% follow-up). Of the 739 patients, 59 patients were converted to THA/resurfacing during the study period and were considered failures (92% survival rate), leaving a total of 680 patients for analysis of 2-year outcome data.

Table I lists the descriptive statistics for our cohort of patients. 64% of the patients were female, average age of 37.6, and underwent surgery an average of 27 months after onset of symptoms. Figure 3 shows the distribution of
Table I. Patient demographics and mechanism of injury

|                          | Male 36% (315/868) | Female 64% (553/868) |
|--------------------------|---------------------|----------------------|
| Sex                      | 36% (315/868)       | 64% (553/868)        |
| Side of injury           | Right 54% (472/868) | Left 46% (396/868)   |
| Acute injury             | Yes 28% (243/868)   | No 72% (625/868)     |
| High energy trauma       | Yes 5% (45/868)     | No 95% (823/868)     |
| Age at surgery           | Mean 36.6 years     | SD 14.2              |
|                          | Range 13–76 years   |                      |
| Length of symptoms       | 27.4 months         | 42                   |
|                          | Range 1–360 months  |                      |
| BMI                      | 25.0 kg/m$^2$       | 4.8                  |
|                          | Range 16.3–43.6 kg/m$^2$ |

BMI, body mass index.

**Fig. 3.** A histogram distribution plot displaying months of preoperative symptoms in Log$_{10}$ scale is a bell curve.

Preoperative duration of symptoms, demonstrating a bell curve when calculated in Log$_{10}$ months of symptoms. 28% of patients had an acute injury and 5% had a high-energy traumatic injury.

**Table II** shows comparisons between pre- and 2-year postoperative PROs. Overall, patients experienced significant improvements following surgery for all PROs (mHHS 63.0 ± 15.5–82.6 ± 16.7, $P < 0.001$, NAHS 59.8 ± 17.8–81.7 ± 17.5, $P < 0.001$, HOS ADL 65.2 ± 19.2–83.9 ± 18.9, $P < 0.001$, HOS SSS 42.7 ± 24.3–70.9 ± 27.6, $P < 0.001$, VAS 5.9 ± 2.2–2.9 ± 2.4, $P < 0.001$). Figure 4 illustrates the preoperative and postoperative patient reported outcome scores and VAS pain scores with error bars.

Patients requiring conversion to THA were older than those that did not (49.8 ± 9.0 vs. 36.3 ± 14.2, $P < 0.001$). No significant differences were observed for BMI, duration of symptoms or gender between these two groups.

Refer **Table III** for results of univariate analyses. Length of symptoms had a negative correlation for mHHS, NAHS, HOS-ADL, HOS-SSS, VAS pain and patient satisfaction scores at 2 years follow-up. For every one unit of Log$_{10}$ months of symptoms (13 months), each of the PROs decreased by 5–7 points (mHHS $-5.15$, $P = 0.009$, NAHS $-5.65$, $P = 0.0002$, HOS-ADL $-5.1$, $P = 0.0035$, HOS-SSS $-7.59$, $P = 0.004$). In addition, increasing age and BMI were also negatively associated with PROs ($P < 0.05$ for mHHS, NAHS, HOS-ADL and HOS-SSS). Increasing age was also associated with increasing postoperative VAS pain scores, $P = 0.0008$. Finally, patients undergoing labral debridement and those whose injuries were from high energy trauma had significantly lower patient reported outcomes, higher VAS pain scores and lower satisfaction scores ($P < 0.05$) compared to the rest of the cohort.

Refer **Table IV** for results of multivariate analyses. Only age and Log$_{10}$ months of symptoms were independently associated with all four PROs along with pain and satisfaction scores.

**DISCUSSION**

The major finding in this study is that longer duration of symptoms is negatively associated with 2 year PROs following hip arthroscopy for labral tears. Our results show a decrease in PROs with increased duration of symptoms on a logarithmic scale; for every one unit Log$_{10}$ months of symptoms (13 months), the PROs are expected to drop 5–7 points. After 2 Log$_{10}$ units (169 months), PROs are expected to drop another 5–7 points (**Fig. 5**).

This is the first study we are aware of specifically reporting a predictive value for outcomes depending upon duration of symptoms prior to surgery. Because the decline in PROs is logarithmic, the greatest decline in PRO’s occurs during the initial period after onset of symptoms and as...
time goes on, the rate of decline diminishes (Fig. 6). This suggests that a delay in surgical treatment early on after symptom onset may adversely impact patient outcomes following surgery. This by no means suggests that surgeons should abandon conservative measures as first-line treatment of labral tears, however surgeons can use the information found in this study to create a more patient-specific treatment algorithm to maximize treatment outcomes for FAI.

One would logically expect continued chondrolabral injury and dysfunction as duration of symptoms increases. It is important to note, however, that patients with a longer duration of symptoms may have self-selected poorer indications for surgery than those with a shorter duration of symptoms. Patients who are initially managed conservatively (and therefore not offered surgery) may have confounding variables (psychosocial, other anatomic sources of pain) which have raised concerns that surgical treatment may not benefit them. Patients with a shorter duration of symptoms may have met surgical indications earlier due to a perceived better candidacy for surgery.

Another thing to consider when interpreting these results is the minimal clinical important difference (MCID) of the PRO measures. Kemp et al. [25] suggest a MCID of 8 points on the mHHS scale, 5 for HOS-ADL and 6 for HOS-SSS. Martin and Phillipon report a MCID of 8, 9 and 6 for mHHS, HOS-ADL and HOS-SSS, respectively [26]. There are no reports of MCID for the NHAS score that we are aware of. A decrease in PRO’s of between 5 and 7 points with every Log10 months of symptoms is statistically significant but may or may not represent a clinically detectable difference. Regardless, we believe that the results of our study can be used to help guide treatment decisions.

Few studies have directly evaluated the possible correlation between duration of symptoms and outcomes following hip arthroscopy, with conflicting findings reported. Byrd and Jones published on their initial series of 38 patients undergoing hip arthroscopy for a variety of indications, including labral tears, in 2000 [27]. They found that duration of symptoms, especially in older men, was predictive of inferior outcomes following hip arthroscopy. Overall, age was not a predictive factor for inferior outcomes but when stratified by sex, older male patients did worse. However, no specific rates of decline were reported, and not all patients were specifically treated for labral tears.

Aprato et al. [12] reported their results in 561 patients undergoing hip arthroscopy for FAI, labral tearing or chondral injury. They prospectively followed all patients, and stratified them into three groups based upon preoperative duration of symptoms: Group A (less than 6 months), Group B (6 months to 3 years) and Group C (more than 3 years). Despite similar preoperative mHHS scores between groups, Group A (79) had significantly higher mHHS scores at 3 years postoperatively compared to groups B (75) and C (69), and group B had significantly better scores than Group C.

In 2009, Byrd and Jones published 10-year outcomes for hip arthroscopy in athletes and found no statistically

### Table II. Preoperative and postoperative patient reported outcomes and P values

|                      | Preoperative (mean, SD) | 2 year postoperative | P value   |
|----------------------|-------------------------|----------------------|-----------|
| mHHS                 | 63.0 ± 15.5             | 82.6 ± 16.7          | <0.0001*  |
| NAHS                 | 59.8 ± 17.8             | 81.7 ± 17.5          | <0.0001*  |
| HOS ADLs             | 65.2 ± 19.2             | 83.9 ± 18.2          | <0.0001*  |
| HOS SSS              | 42.7 ± 24.3             | 70.9 ± 27.6          | <0.0001*  |
| VAS Pain             | 5.9 ± 2.2               | 2.9 ± 2.4            | <0.0001*  |
| Satisfaction         | n/a                     | 7.9 ± 2.4            | n/a       |

mHHS, Modified Harris hip score; NAHS, non-arthritic hip score; HOS ADLs, hip outcome score–activities of daily living; HOS SSS, hip outcome score–sport-specific subscale; VAS pain, visual analog scale.

*Significance at P < 0.05.
Table III. Univariate regression analysis of positive predictive factors for improved patient reported outcome scores

| variable                                | NAHS          | mHHS          | HOS-ADLs       | HOS-SSS        | VAS pain       | Satisfaction |
|-----------------------------------------|---------------|---------------|----------------|----------------|----------------|--------------|
|                                        | Rate SE P     | Rate SE P     | Rate SE P      | Rate SE P      | Rate SE P      | Rate SE P    |
| Log10 months of symptoms                | -5.65 1.51 0.0002* | -5.15 1.55     | 0.0009*        | -5.10 1.75 0.0035 | -7.59 2.64 0.0040 | 0.852 0.195 <0.0001* | -0.683 0.15 <0.0001* |
| Age at surgery                          | -0.29 0.051 <0.0001* | -0.24 0.052 0.0000* | -0.34 0.059 <0.0001* | -0.398 0.089 <0.0001* | 0.023 0.007 0.0008* | -0.059 0.005 0.2815 |
| BMI (kg/m²)                             | -0.65 0.154 <0.0001* | -0.47 0.157 0.0026* | -0.88 0.174 <0.0001* | -0.824 0.267 0.0020* | 0.024 0.020 0.2340 | 0.003 0.016 0.8730 |
| Female Sex                              | 1.45 1.577 0.3589 | 1.36 1.615 0.4000 | 2.676 1.809 0.1390 | 2.94 2.727 0.2816 | -0.110 0.206 0.5945 | 0.238 0.164 0.1469 |
| Acute injury                            | -0.01 0.007 0.2792 | -0.01 0.008 0.2138 | -0.01 0.008 0.2278 | -0.016 0.013 0.2199 | 0.002 0.001 0.1037 | -0.001 0.001 0.4248 |
| High energy trauma                      | -11.91 3.546 0.0008* | -8.61 3.661 0.0186* | -13.9 4.094 0.0007* | -17.69 6.342 0.0053* | 1.324 0.476 0.0056* | -0.304 0.382 0.4264 |
| Pre op mHHS                             | 0.34 0.046 <0.0001* | 0.311 0.047 <0.0001* | 0.431 0.052 <0.0001* | 0.514 0.080 <0.0001* | -0.023 0.006 0.0002* | -0.002 0.005 0.6862 |
| Pre op NAHS                             | 0.36 0.039 <0.0001* | 0.318 0.041 <0.0001* | 0.449 0.044 <0.0001* | 0.504 0.069 <0.0001* | -0.026 0.005 0.0000* | 0.001 0.004 0.8608 |
| Pre op HOS ADLs                         | 0.32 0.036 <0.0001* | 0.289 0.038 <0.0001* | 0.409 0.041 <0.0001* | 0.461 0.065 <0.0001* | -0.019 0.005 0.0002* | -0.002 0.004 0.6275 |
| Pre op HOS SSS                          | 0.18 0.030 <0.0001* | 0.153 0.031 <0.0001* | 0.247 0.034 <0.0001* | 0.323 0.052 <0.0001* | -0.004 0.004 0.3011 | -0.004 0.003 0.2078 |
| Pre op VAS                              | -1.09 0.337 0.0013* | -0.927 0.346 0.0075* | -1.065 0.389 0.0062* | -0.438 0.587 0.4559 | 0.166 0.044 0.0002* | 0.016 0.035 0.6507 |
| Labral base refixation                  | 6.14 2.18 0.0048* | 5.52 2.21 0.0125* | 7.59 2.48 0.0022* | 10.45 3.76 0.0055* | -0.542 0.287 0.0591 | 0.507 0.227 0.0255* |
| Labral stitch                           | 4.93 1.66 0.0030* | 6.27 1.70 0.0002* | 6.42 1.89 0.0007* | 7.53 2.86 0.0084* | -0.418 0.220 0.0577 | 0.543 0.174 0.0019* |
| Labral combined repair/debridement      | 3.92 5.80 0.4991 | 2.47 5.64 0.6612 | 1.23 6.44 0.8483 | 9.13 9.78 0.3505 | -0.816 0.746 0.2746 | 0.066 0.590 0.9107 |
| Labral resection                        | 5.56 4.38 0.2040 | 8.74 4.61 0.0583 | 5.02 4.95 0.3110 | 11.80 7.57 0.1191 | 0.021 0.586 0.9710 | 0.791 0.464 0.0883 |
| Labral reconstruction                   | 6.65 6.57 0.3119 | 11.43 6.74 0.0897 | 3.77 7.35 0.6084 | 16.30 11.13 0.1430 | -0.637 0.857 0.4571 | 0.766 0.677 0.2588 |
| Labral debridement                      | -4.44 1.68 0.0082* | -5.71 1.710 0.0008* | -5.31 1.93 0.0059* | -5.83 2.908 0.0451* | 0.472 0.222 0.0338* | -0.475 0.176 0.0071* |
| Capsular closure                        | 2.46 1.52 0.1066 | 1.51 1.560 0.3318 | 4.45 1.75 0.0110* | 3.18 2.632 0.2267 | -0.288 0.199 0.1473 | 0.021 0.159 0.8973 |
| Capsular plication                      | 2.15 3.69 0.5608 | 1.26 3.778 0.7392 | 1.23 4.22 0.7701 | -4.17 6.336 0.5107 | 0.110 0.479 0.8187 | -0.161 0.383 0.6750 |
| Partial capsulectomy                    | 5.24 4.88 0.2824 | 3.04 4.923 0.5371 | 5.36 5.50 0.3303 | 15.30 8.454 0.0704 | 0.408 0.625 0.5142 | 0.307 0.501 0.5394 |

mHHS, Modified Harris hip score; NAHS, non-arthritic hip score; HOS ADLs, hip outcome score—activities of daily living; HOS-SSS, hip outcome score—sport specific subscale; VAS pain, visual analog scale.

*Significance at $P < 0.05$. 

Analysis of prospectively collected outcomes
| variable                        | NAHS (rate, S.E., p value) | mHHS (rate, S.E., p value) | HOS-ADLs (rate, S.E., p value) | HOS-SSS (rate, S.E., p value) | VAS pain (rate, S.E., p value) | Satisfaction (rate, S.E., p value) |
|--------------------------------|----------------------------|----------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------------|
| Intercept                      | 74.74 (3.56, <0.0001)      | 73.40 (4.07, <0.0001)      | 82.68 (5.59, <0.0001)          | 36.53 (9.86, 0.0002)          | 1.86 (0.70, 0.0078)            | 9.00 (0.20, <0.0001)              |
| Log10 months of symptoms       | −4.60 (1.42, 0.0012)       | −4.31 (1.47, 0.0035)       | −4.10 (1.58, 0.009)            | −5.80 (2.50, 0.0205)          | 0.716 (0.19, 0.0002)           | −0.67 (0.15, <0.0001)             |
| Age at surgery                 | −0.20 (0.05, 0.0000)       | −0.18 (0.05, 0.0012)       | −0.17 (0.05, 0.0030)           | −0.27 (0.09, 0.0023)          | 0.016 (0.007, 0.0155)          |                                   |
| BMI (kg/m²)                    | 3.27 (1.60, 0.0420)        |                            |                                |                               |                               |                                   |
| Acute injury                   |                           |                            |                                |                               |                               |                                   |
| High energy trauma             | −6.57 (3.29, 0.0457)       | −7.61 (3.71, 0.0406)       |                                |                               | 0.95 (0.46, 0.0387)            |                                   |
| Preop mHHS                     |                            |                            |                                |                               | 0.28 (0.12, 0.0238)            |                                   |
| Preop NAHS                     | 0.200 (0.078, 0.0093)      | 0.170 (0.081, 0.0355)      | 0.182 (0.087, 0.0365)          | 0.40 (0.11, 0.0003)           | −0.03 (0.008, 0.0001)           |                                   |
| Preop HOS ADLs                 | 0.149 (0.074, 0.0446)      | 0.218 (0.080, 0.0062)      |                                |                               |                               |                                   |
| Preop HOS SSS                  |                            |                            |                                |                               | 0.016 (0.005, 0.0043)          |                                   |
| Preop VAS                      |                            |                            |                                |                               | 2.03 (0.65, 0.0017)            | 0.097 (0.048, 0.0430)            |
| Labral base refixation         |                            |                            |                                |                               |                               | 0.312 (0.15, 0.0412)            |
| Labral stitch                  | 3.95 (1.49, 0.0080)        |                            |                                |                               |                               |                                   |
| Labral combined repair/debridement |                       |                            |                                |                               |                               |                                   |
| Labral resection               |                            |                            |                                |                               |                               |                                   |
| Labral reconstruction          |                            |                            |                                |                               |                               |                                   |
| Labral debridement             |                            |                            |                                |                               |                               |                                   |
| Capsular closure               | −3.61 (1.72, 0.0353)       |                            |                                |                               |                               |                                   |
| Capsular plication             |                            |                            |                                |                               |                               |                                   |
| Partial capsulotomy            | 8.85 (4.43, 0.0456)        |                            |                                |                               |                               | 22.04 (8.10, 0.0065)            |

mHHS, Modified Harris hip score; NAHS, nonarthritic hip score; HOS ADLs, hip outcome score—activities of daily living; HOS SSS, hip outcome score—sport-specific subscale; VAS Pain, visual analog scale. Only significant values with \(p < 0.05\) displayed.
significant correlations between length of symptoms and outcomes, although they did comment that based on the limited number of patients (15) the study was underpowered to detect differences [29]. In contrast, Kamath et al. found that longer duration of symptoms led to improved outcomes following hip arthroscopy [13]. They retrospectively reported on 52 consecutive patients undergoing hip arthroscopy for labral tears. During multivariate analysis, left-sided surgery, higher preoperative activity level and duration of symptoms greater than 18 months were found to be positive predictors of good to excellent results.

Clearly, predicting outcomes from hip arthroscopy is complex and cannot simply be based on duration of symptoms in light of the conflicting data.

Despite recent publications suggesting age does not preclude good to excellent outcomes following hip arthroscopy, our study showed that older age negatively correlated with outcomes [30–32]. The overall rate was roughly —0.2 PRO points/year, or for every 5 years in age after controlling for all other variables, the PRO would be expected to be 1 point lower. This small but significant difference may be due to unrecognized chondral damage, as

Fig. 5. Plot of the patient reported outcome scores versus the Log10 of months of preoperative symptoms demonstrating the negative slope for all patient reported outcome scores and positive slope for VAS pain scores with longer preoperative symptom duration.

Fig. 6. Plot of the patient reported outcome scores versus the months of preoperative symptoms demonstrating logarithmic worsening of outcome scores and VAS pain scores with increasing preoperative symptom duration.
other variables including visible chondral damage grade were controlled for.

We also found that patients with a high-energy acute traumatic injury had significantly lower PRO scores than their counterparts. These patients had PRO scores roughly 12 points lower controlling for other variables. Other studies have reported similar findings as our study [13]. In contrast, Byrd and Jones found that patients with traumatic injuries had greater improvements following hip arthroscopy than patients with an insidious onset of symptoms. In addition, patients with an atraumatic acute onset of symptoms actually had lower postoperative scores [27].

Patients with labral debridement did worse than patient receiving labral repairs in our study group. Overall, patients with labral debridement had PRO scores five points lower after controlling for other variables. This is consistent with several other studies [6, 33]. This intuitively makes sense as debridement alone may disrupt the biomechanical function of the labrum. Anatomic repair is the preferred approach in our practice when possible.

Strengths
This is the first study specifically reporting a predictive value for outcomes depending upon length of symptoms. Also, it is a large group of patients prospectively followed for a specific condition with a high percentage of follow-up.

Limitations
This study has limitations. It is a retrospective study without a control group, which precludes the ability to compare operative versus non-operative treatment for labral tears. This is a short-term follow-up study, so it is unknown whether the differences in outcome persist in the long-term or if they normalize over time. Because symptom duration was calculated based off of a patient reported intake form, recall bias is another potential limitation. There is also concern for selection bias because patients with a longer duration of symptoms may have self-selected poorer indications for surgery than those with a shorter duration of symptoms, as mentioned above. Another limitation of our study is its heterogeneity. We included labral repairs, labral debridements, labral reconstructions, femoroplasty, acetabuloplasty, psoas recession, capsular repair and many of these in combination, which adds heterogeneity to the study. Finally, data regarding the degree of chondrolabral injury was not available for this study and therefore its effect on outcomes and symptom duration could not be assessed.

Conclusions
Our study demonstrates that clinical and PRO scores were negatively associated with increasing duration of symptoms prior to hip arthroscopy for treatment of labral tears. Although this implies that delay in treatment may adversely affect outcome, conservative treatment remains the gold standard, first line of treatment. Surgeons should incorporate this information into their treatment algorithm to maximize patient outcomes following treatment for labral tears.

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Dr. Dierckman is a consultant for Depuy Mitek and is a paid presenter and speaker.

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