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Comparison of the 2-Incision and Mini-Incision Posterior Total Hip Arthroplasty Technique

A Retrospective Match-Pair Controlled Study

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Abstract: We compared the outcomes of the mini-posterior and 2-incision total hip arthroplasty approaches by analyzing 43 matched pairs of patients. The following outcomes were evaluated: (1) Harris Hip Score, (2) Medical Outcomes Study 36-Item Short-Form Health Survey, (3) the Medical Outcomes Study Sleep Scale, and (4) the Western Ontario and McMaster Osteoarthritis Index. Function was regained earlier by patients having the 2-incision total hip arthroplasty as determined by length of hospitalization ($P = .002$) and multiple return to function parameters, although this may be the result of hip precautions placed on the posterior group. Posterior mini-incision patients had less operating time ($P < .0001$) and blood loss ($P = .001$). Complications did not differ between surgical techniques. No patients were revised. The 2-incision operation was better for function and length of stay, and the posterior mini-incision was easier to perform, although these groups used different selection criteria. **Key words:** minimally invasive total hip arthroplasty, match-pair outcome study, total hip arthroplasty functional outcome.

We began the performance of small-incision operations for total hip arthroplasty in February 2002 because we were attracted to the potential benefits of reduced hospitalization, improved function, and reduced pain. Since that time, there have been several publications that have questioned the use and even the safety of small-incision surgery [1-4]. Other mini single-incision series have reported safety and reproducibility in component positioning with short-term patient follow-up [5-10]. Two-incision operations were fraught with more complications but seemed to provide superior functional results [1,3,11-13]. The literature reflects high-volume surgeons having a lower complication rate [14], and adequate training and instrumentation are important for improved results [1,3-6,15]. Because we had experience with both single posterior mini-incision and 2-incision minimally invasive surgery total hip arthroplasties, we were interested in comparing the outcomes of the patients with these 2 different operations. Our study hypothesis was that the 2-incision technique would provide earlier postoperative gains in patient function, better pain relief, and no greater prevalence of complications.

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Materials and Methods

Procedures

Patients aged 18 years or older at the time of total hip arthroplasty, and who were operated on between December 2002 and June 2004, had either a 2-incision or posterior mini-incision operation. Two hundred eighty-four operations were performed on patients between 18 and 75 years of age who were eligible for the matched-pair analysis. Patients had the diagnosis of osteoarthritis, rheumatoid arthritis, posttraumatic arthritis, or a displaced femoral neck fracture. More than 90% of the patients in this initial cohort had the diagnosis of osteoarthritis. All patients who were operated were candidates for total hip arthroplasty and had obtained medical clearance for the operation. The first minimally invasive surgery (MIS) 2-incision technique was performed at our center on April 10, 2001. The mini-posterior and 2-incision techniques have been used for approximately 5 years at our center. Approximately 200 two-incision cases and 300 mini-posterior cases had been performed before this match-pair cohort. These cohorts of patients were not considered part of the initial "learning curve." All patients in the match-pair cohort had the diagnosis of osteoarthritis. The only patients who had a more traditional total hip arthroplasty during this time had hardware inserted from prior hip surgery (3 cases) or had morbid obesity (4 cases). The pairs were matched by the criteria listed in Table 1. All operations were performed by a single surgeon.

Our 43 match-pair series was selected from a pool of 284 patients. This group was the cohort selected because they had completed the weekly patient diaries, which was so important for evaluating early postoperative follow-up and rehabilitation. The mini-posterior and 2-incision techniques have been used for approximately 5 years at our center. Clearly, some patients came to the author for the 2-incision technique and therefore were somewhat self-selected because they wanted this procedure. However, patients who did not meet the author's criteria, which has been well defined, did not receive the 2-incision procedure. There were no selection criteria for the mini-posterior incision; thus, any patient who did not fit the criteria for the 2-incision procedure, whether those patients wanted the 2-incision or not, were included in the mini-posterior group. Patients who were in the 2-incision group had selected criteria of age less than 70 years and body mass index less than 40, do not have a Crowe dysplasia classification of class III or IV, and do not have an excessive anterior-posterior bow of the femur, which would not allow safe use of a straight fully coated femoral stem. In addition, the diameter of the intramedullary canal of the femur could not exceed 18 mm, and the size of the acetabular cup could not exceed 64 mm.

Table 1. Baseline and Operative Information

Variable	Two-Incision Matched Patients	Mini-Incision Matched Patients
Age		
N	43	43
Mean	57.4	59.1
SD	6.3	8.2
(Min, Max)	(40, 68)	(43, 74)
Gender, n (%)		
Male	24 (54)	24 (54)
Female	19 (44)	19 (44)
Body mass index category, n (%)	43	43
Normal (<25 kg/m^2)	21 (48%)	21 (48%)
Overweight (25-30 kg/m^2)	15 (35%)	15 (35%)
Obese (>30 kg/m^2)	7 (16%)	7 (16%)
Preoperative diagnosis, n (%)		
Osteoarthritis	43 (100)	43 (100)
Other	0 (0)	0 (0)
Length of follow-up		
N	43	43
Mean	1.2	1.1
SD	0.17	0.17
(Min, Max)	(0.5, 2.0)	(0.5, 2.0)
WOMAC pain		
N	43	43
Mean	9.1	9.0
SD	2.8	2.9
(Min, Max)	(4, 15)	(2, 14)
WOMAC physical function		
N	43	43
Mean	28.4	29.8
SD	9.6	9.8
(Min, Max)	(5, 45)	(8, 50)
WOMAC stiffness		
N	43	43
Mean	3.9	4.4
SD	1.6	1.4
(Min, Max)	(1, 8)	(2, 8)\

There were no restrictive criteria for the posterior mini-incision patients. Preoperatively, there was only one difference in the preoperative education class that patients attended. In the class for the posterior mini-incision patients, the only difference was instruction in dislocation precautions, whereas the 2-incision patients were not restricted by dislocation precautions. No patient in either group had an abduction pillow. The posterior group was instructed in avoidance of extreme flexion and internal rotation. This is the only difference in hip precautions between the 2 groups. Patients were educated on the benefits of early mobility in preventing deep venous thrombosis and the benefits of early discharge in preventing nosocomial infection. Of the 43 patients with the posterior mini-incision and of the 43 patients with the 2-incision operations, 40 and 25 patients, respectively, attended preoperative class. Most patients attended the preoperative class. The only patients who did not attend the preoperative class were nonlocal patients, and they were seen immediately after my preoperative visit, which was usually the day before the procedure. All patients in this category received the same education from our orthopedic nurse practitioner. All patients were instructed to maintain a postoperative diary of their recovery.

In the hospital, all patients were treated with the same clinical hip pathway. Anesthesia was a short-acting spinal anesthetic using hyperbaric 0.75% Bupivacaine (Abbott) adjusted for the height and weight of the patient. The pain management included administration of valdecoxib, 40 mg (Pharmacia and Upjohn); oxycodone SR, 10 to 20 mg (Roxane); and ondansetron, 4 mg (GlaxoSmithKline). In the recovery room, 25 to 50 μg of fentanyl (Abbott) every 5 to 10 minutes was given as needed. Once the patients had returned to their room, only oral medication was used. Deep venous thrombosis prevention included the short-acting spinal anesthetic, rapid mobilization of the patient, calf high compression stockings, calf pneumatic compression, and 325 mg of aspirin each day in the hospital and for 3 months postoperatively.

Patients were discharged home as soon as they were judged safe by physical therapy and internal medicine, and this could be as early as the day of the surgery. Following discharge, patients were encouraged to use aspirin and plain Tylenol for pain medications and to avoid oral narcotics. All patients were instructed to use a regular pillow between their legs while sleeping for 6 weeks for comfort. Neither group used an abduction pillow. They were told they were allowed to drive their car when they were off narcotic pain medication and had appropriate muscle control of their leg. All patients were allowed to achieve weight-bearing as tolerated. Both patient groups were treated equally with respect to weight-bearing as tolerated without regard to stem type. The type of femoral stem did not inhibit or prevent patients from being able to ambulate immediately. A tight press fit was achieved at the time of surgery with either stem to allow full immediate weight-bearing.

Surgical Technique

The surgical technique for the 2-incision operation has been described, [1,11-13] as has the technique for the posterior mini-incision [1,6,8,16,17]. The implants used were a Trilogy acetabular component for all patients (Zimmer, Warsaw, Ind). We used 1 or 2 screws to augment the fixation of all acetabular components. All patients with the 2-incision total hip arthroplasty had a fully coated VerSys femoral stem (Zimmer). All surgeons reporting cases in the initial Journal for Bone and Joint Surgery (JBJS) American Orthopaedic Association (AOA) symposium used the full coat stem [11]. This implant is straight and acts more like a femoral nail, allowing easier insertion and better fit through the small posterior incision. The VerSys FullCoat stem was implanted in 11 (26%) of 43 patients with the posterior mini-incision technique, whereas 32 (74%) of 43 had a VerSys Fiber Metal MidCoat stem (Zimmer). The full coat stem was used in these cases in a Dorr C type femur or when proximal fill or bone quality was thought to be an issue.

Clinical Assessment

Demographics included sex, primary diagnosis, prior operations to the hip, height, weight, range of motion of the hip to be operated, leg length discrepancy, and the presence or absence of a Trendelenburg gait pattern. Clinical assessments were collected preoperatively, and postoperatively at 3 months, 6 months, and 1 year. The data for this study were extracted and summarized on May 25, 2005. At that time, there were 15 of 43 cases in each group with 1-year follow-up data available. This data included 1-year radiographs. The instruments used were the (1) Harris Hip Score, (2) the Medical Outcomes Study 36-Item Short-Form Health Survey (MOS SF-36), (3) the Medical Outcomes Study 6-Item Sleep Scale, and (4) the Western Ontario and McMaster (WOMAC) Osteoarthritis Index. Before surgery, the hospital admission date (and time) was recorded. Data recorded during surgery included the surgical technique, operating room time, fluoroscopy time, blood loss measured from the cell saver, transfusion of blood and blood products, and intraoperative complications.

The MOS SF-36 is a 36-item generic survey that collects information on 8 health concepts: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, mental health, and reported health transition. Individual items were scored on an integer scale, and concept scores were generated from composites of the item scores. Composite scores ranged from 0 to 100, with a score of 100 being the best. In addition, composite mental and physical health scores ranging from 0 to 100 were constructed using population norms.

The WOMAC Osteoarthritis Index is a 24-item disease-specific survey that collects information on

3 areas of patient symptoms: pain, stiffness, and physical function. Individual items were scored on an integer scale, and item scores were combined to generate each area. In addition, a total WOMAC score based on all 24 items was generated.

The MOS Sleep Scale is a 6-item quality of life survey, which assesses patient sleep patterns.

The Harris Hip Scale is a preoperative and postoperative assessment of pain, function, range of motion, and absence of deformity designed to be equally applicable to different hip problems and different methods of treatment [18].

After discharge, for the first 6 weeks, all patients completed a patient diary recording the time they returned to activities of daily living without assistance (bathing, dressing, getting in and out of bed and chair), driving, work, and the discard of an assistive device for ambulation.

Complication Assessment

Complications evaluated in this study included leg length discrepancy, component malposition, subsidence, periprosthetic fracture, sciatic or femoral nerve injury, lateral femoral cutaneous nerve injury, infection, and wound problems.

Radiographic Assessment

Radiographs were performed immediately postoperative, at 6 weeks, 3 months, 6 months, and annual visits. These were an anterior-posterior pelvic radiograph that included the acetabulum and femoral stem as well as a lateral (cross-table) of the femur and acetabulum. For this study, the acetabular inclination and anteversion were measured from the 6-week or 3-month radiograph. From the radiograph with the longest follow-up, any evidence of component position change (migration) or radiolucent line formation, osteolysis, and heterotopic ossification was measured. The radiographic measurements were performed on the mini-posterior and 2-incision patients at the longest follow-up period. There were 15 of 43 patients with 1-year follow-up in each group. All patients in the 2-incision group had intraoperative fluoroscopy to confirm cup and stem insertion.

Statistical Methods

Forty-three matched pairs provided at least 80% power at a 2-sided α level of .05 to detect clinically meaningful differences in study variables Type I error rates (α level, .05) were adjusted for multiplicity using a Bonferroni correction [19]. For comparisons made only once (eg, comparisons of preoperative, operative, immediate postoperative variables, return to function, and complication rates), statistical significance was inferred at the .05 level. Unmatched analyses were performed on the matched data using SAS (v 9.13) for the Microsoft Windows 2000 platform.

Results

Clinical Assessment

Fig. 1 presents mean scores by surgical technique at each time of assessment. Benefits in both techniques are confirmed by the large positive

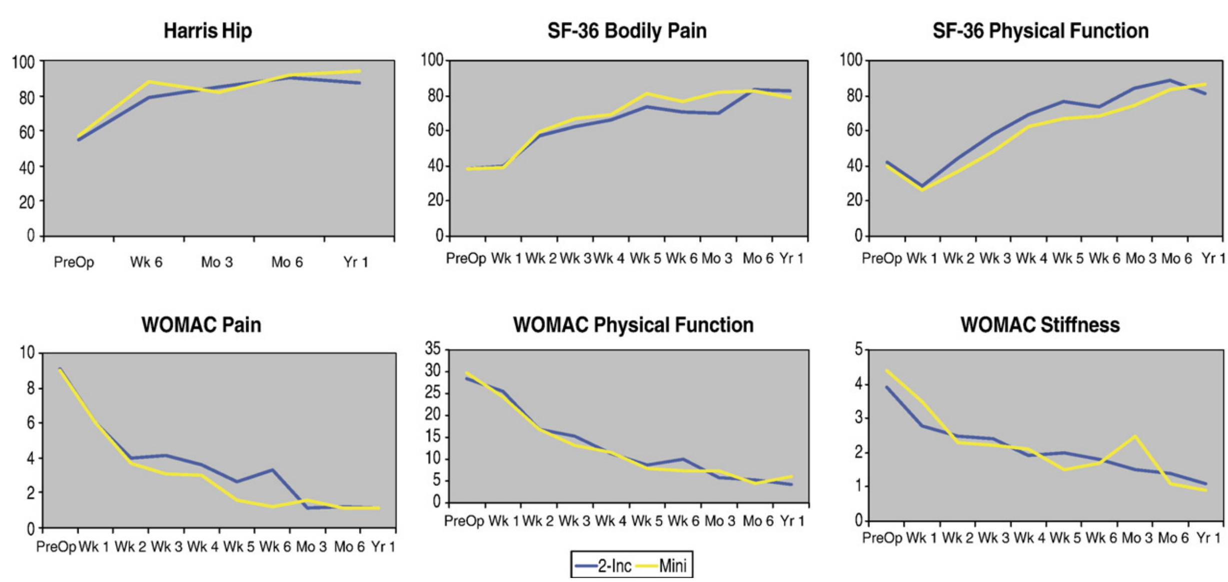

Fig. 1. Average Harris Hip Score and selected SF-36 and WOMAC scores at each time of assessment.

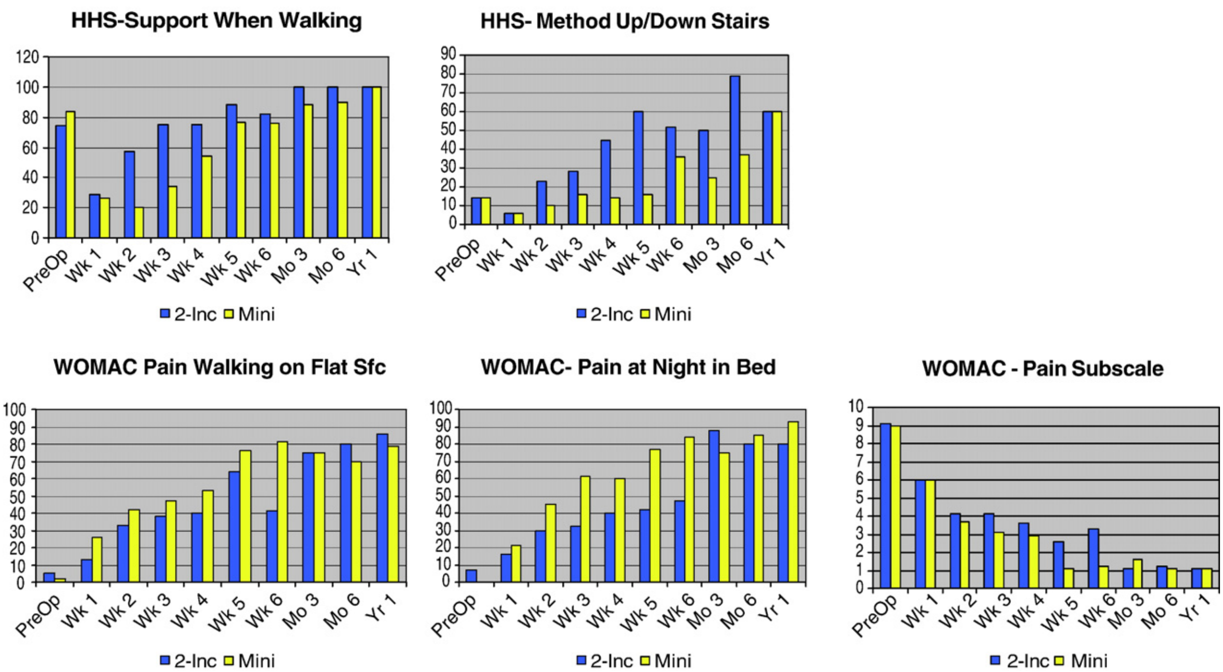

Fig. 2. Statistically significant patient outcomes at each time of assessment.

gains (improvement) in Harris Hip Scores, MOS SF-36 Physical Health and Physical Function scores, as well as large negative gains (improvement) in WOMAC pain, stiffness, and physical function seen with increasing time since total hip arthroplasty.

Patients were considered compliant if they completed the patient diary entries during postoperative weeks 1 through 6 or if a scheduled clinical examination was attended at postoperative weeks 2 and 6, months 3 and 6, and at 1 year. Two-incision patients had a mean compliance of 91% (range, 86%-95%) during the first 6 postoperative weeks, whereas posterior mini-incision patients had a mean of 88% (range, 77%-95%) (P = .68). At 6 weeks postoperatively, the compliance was 41 (95.3%) of 43 patients in both groups; at 6 months, 33 (76.7%) of 43 two-incision patients and 28 (65.1%) of 43 posterior mini-incision patients (P = .23); and at 12 months, 26 (70.3%) of 37 two-incision patients and 26 (86.7%) of 30 posterior mini-incision patients (P = .09). At 12 months, not all patients had attained their 1-year postoperative check-up.

The postoperative clinical outcomes, which had statistically significant differences, are displayed in Fig. 2. There were 2 items in the Harris Hip Score that favored the 2-incision patients, and these were no assistive device needed at 2 weeks postoperatively (P = .001) and negotiating stairs without a railing at 5 weeks postoperatively (P = .004). There were 2 WOMAC pain subscale items that favored the posterior mini-incision, and these were no pain at night at 6 weeks (P = .0028) and pain at night in bed at 6 weeks (P = .004). At 6 weeks postoperatively, the total WOMAC pain subscale score for the posterior mini-incision patients was a mean of 1.22 (range, 0-10), and for the 2-incision group was a mean of 3.31 (range, 0-11) (P = .003). Prescription antiinflammatory use had significantly greater prevalence in 2-incision patients (47%) versus mini-incision (23%) (P = .04). At 6 weeks postoperatively, there were 2 MOS Sleep Scale items that favored the posterior mini-incision patients, which were no trouble falling asleep (P = .0004), and if awakened, no trouble falling back to sleep (P = .003). We have looked closely at the pain scores and graphs, and we cannot say with certainty that there is a difference in looking at our aggregate data. The numerous pain graphs at different points give data to support either group being beneficial in regards to pain relief but at different times.

Results, which measured return to function, favored the 2-incision patients for 8 of the 9 items. Two of these items had statistical difference: the time to resume driving, which was 13 days (range, 2-31) for 2-incision patients and a mean of 24 days (range, 6-32) for posterior mini-incision patients (P= .04); and the time to resume shopping, which had a mean of 14 days (range, 3-24) for 2-incision patients and a mean of 26 days (range, 6-37) for mini-incision patients (P = .01). Length of hospital stay was significantly shorter (<0.0001) for 2-incision patients with a mean of 30.7 hours (range, 12.9-55.7) versus mini-incision patients with a mean of 44.6 hours (range, 13-102). There were only 3 patients in the mini-posterior group who stayed longer than day 2. Two patients were discharged on postoperative day 3. None of these outliers in the mini-posterior group were related to any orthopedic problems. One patient aged 58 had dizziness and had difficulties being cleared by physical therapy. Another 68-year-old female patient had diabetes that was difficult to manage postoperatively and experienced lightheadedness and extreme calf spasms that significantly delayed mobilization. One patient was discharged on postoperative day 4. A 73-year-old woman was unable to rehabilitate quickly secondary to multiple medical problems and required 2 units of packed red blood cells (PRBCs). She also had a nutritional consult. None of these outliers in the mini-posterior group were related to any orthopedic problems.

Data from the operation that has statistical difference was blood loss (as collected in a cell saver), which had a mean of 366 ± 215 mL (range, 150-1400 mL) for the 2-incision group and a mean of 247 ± 90 mL (range, 100-450 mL) for the posterior mini-incision patients (P = .001). Three 2-incision patients and one posterior mini-incision patient received allogenic blood transfusions. Although we had 1 outlier for blood loss in the 2-incision total hip arthroplasty group, there were no adverse encounters with early discharge in either group. In fact, the patient with an estimated blood loss (EBL) of 1400 mL was discharged the next day after receiving 1 unit of blood. This 65-year-old woman completed all of our discharge requirements and was discharged on the following day. Operative time for the 2-incision patients was a mean 93.7 ± 90 minutes (range, 72-135 minutes) as compared to a mean 61.7 ± 60 minutes (range, 39-111 minutes) for posterior mini-incision patients (P = .002). There were no complaints of leg length discrepancy, and only 3 patients had a measured length difference (<5 mm) from the preoperative evaluation.

Radiographic Results

The mean cup abduction angle for the 2-incision hips was 49.4° ± 4.2° (range, 41°-60°), and for the posterior mini-incision hips was 45.6° ± 5.3° (35°-57°) (P = .0003). Our target number was 45° for both approaches. We had 4 outliers in the 2-incision group that were greater than 50° and 2 in the mini-posterior group. Most of the 2-incision cup abduction angles were between 45° and 50°. The cup anteversion for the 2-incision hips had a mean 20.2° ± 5.3° (range, 5°-25°), and for the posterior mini-incision hips was 18.4° ± 7.9° (range, 0°-35°) (P = .2624). The stem was implanted in 5° varus in 1 hip in the posterior mini-incision group, and in one 2-incision patient, the stem was in 3° varus. All other stems were in neutral alignment.

Complications

There were 2 (4.6%) of 43 hips with complications in the 2-incision group and none in the posterior mini-incision group. The 2 complications were 1 intraoperative femoral neck fracture, which was treated with a cerclage wire, and 1 suture abscess, which was treated with irrigation and debridement and antibiotics. For the 2-incision patients, 6 of 43 complained of some numbness in the anterolateral thigh, but none had frank myalgia paresthetica symptoms. Of 43 patients, 3 have permanent numbness in the distribution of the lateral femoral cutaneous nerve, the other 3 resolved completely. No patients complained of nerve pain. All patients selected for the 2-incision surgical technique are told of this possibility preoperatively because this is not a complication with the mini-posterior approach. Leg length assessment at 6 weeks revealed that 33 (85%) 2-incision and 32 (84%) mini-posterior incision patients had equal leg lengths. There were 6 (15%) patients in the 2-incision group with leg length discrepancy at 6 weeks. There were 6 (16%) patients in the mini-posterior group at 6 weeks with leg length discrepancy. Of the 20 cases per group with leg length assessment available at 6 months, both groups were 100% equal. No patient had a leg length discrepancy greater than one fourth of an inch. There were no sciatic, peroneal, or common femoral nerve injuries. There were no components that subsided. No patient in this series required revision.

Discussion

The hypothesis of this study was not proven. Although the patients with the 2-incision operation had overall better function and there were no statistically greater number of complications for the 2-incision than the posterior mini-incision operation, the posterior mini-incision patients had similar pain relief. Neither procedure clearly benefitted consistently in regard to decreased pain. Both operations were effective in improving pain and function, and both were safe. We were closer to our target cup abduction angle more consistently with the mini-posterior than with the 2-incision despite the ancillary use of fluoroscopy. Outliers continue to exist with cup position despite the use of fluoroscopy and navigation. Both operations successfully decreased the hospital stay with the mean discharge for 2-incision patients being 30 hours and for the posterior mini-incision patients being 45 hours. All 2-incision patients were the first or second case of the day, which allowed for a faster recovery time on the day of surgery. The 2-incision hospital stay was probably shorter because of patient expectations and preoperative education. This average hospital length of stay is lower than reported for traditional total hip arthroplasty operations in the National Data Base (4 days) [20]. This average is also lower than our average hospital stay of between 4 and 5 days with the traditional total hip arthroplasty and before the newer clinical hip pathway. We believe one of the reasons for the decreased hospital stay was the preoperative education and the total hip arthroplasty clinical pathway used for all patients. Shorter hospital stays are beneficial to health care costs and for reduction of nosocomial infections. Considering the longer operating time for the 2-incision technique and an average hospital stay for the mini-posterior incision, there is not much difference in the hospital costs between the two; however, both showed the advantage of shorter hospital stay and reductions in rehabilitation center costs. This study was not designed to compare small-incision operations to the traditional length operations. In this study, 2 small-incision operations were compared, and both could be completed successfully with advantages differing for the two. The matched-pair analysis allowed us to identify outcomes that differed between the techniques with statistical accounting for the multiple tests performed. We believe that the match-pair analysis method has inherent benefits, which are much greater than the 2 large series of patients, which could be disparate in their characteristics [21-26].

In the comparison of these 2 small-incision operations, there were 3 advantages for the 2-incision operation. First, the average stay was 1 day less; second, these patients had no postoperative hip precautions; and third, there was earlier better postoperative function with statistical difference for return to driving and return to shopping. Admittedly, two of these advantages may have been influenced by the preoperative education. Posterior mini-incision patients were instructed to follow dislocation precautions because it was felt to be safer for them. The necessity for postoperative hip precautions in patients may have influenced their return to driving and to shopping. Surgeons may no longer advocate these restrictions because of posterior capsular repair and newer implants where the neck and acetabulum do not impinge (especially with larger femoral heads). The 2-incision patients preoperatively were self-assessed to have better general health (P = .03) versus 1 year ago (P = .03) and have the ability to walk more than 1 mile (P = .04) in comparison with the posterior mini-incision patients. Otherwise, preoperative activity levels did not differ between the groups following matching.

There were 2 advantages between the groups for the posterior mini-incision patients. These patients had favorable differences in the technical performance of the operation with (1) less time in the operating room and (2) less blood loss. This mini-posterior approach is easier to teach and has a lower learning curve. Neither group had a clear benefit in regard to pain. The numerous pain graphs at different points give data to support either group being beneficial in regards to pain relief but at different times.

The strengths of this study include the match pairing that reduces the effect of several variables on the outcome, the statistical treatment, and the comparison of several clinical outcome measures [21-26]. The patient self-assessment of short-term functional weekly outcome has not been previously reported. Physicians score pain differently than patients. Surgeons may tend to perceive patients' function differently, and the patients' perception of their own functional improvement is what is more important [27]. The only difference in the 2 groups was that the mini-posterior group received instructions in total hip precautions whereas the 2-incision group did not. To decrease the effects of bias, the patients were matched to reduce patient selection bias and differences in preoperative quality of life measures. The matching process allowed us to control for differences in preoperative pain, function, and stiffness, reducing the confounding of patient benefits from related differences. Although additional preoperative variables could have been matched upon (eg, patient activity level), they would have certainly led to fewer matched pairs and thereby reduce the number of study patients and statistical power. Although there still may be selection bias inherent with any study and uncontrolled confounding effects, short of a randomized prospective study, this is the strongest approach for valid comparisons. The match-pair criteria we used were similar to other well-established and reported series [21-26].

The limitations of this study include the fact that it is not a randomized prospective study. Two-incision patients were subselected based on age, body mass index, and femoral and acetabular anatomy. There may have been other selection bias such as the personality of patients seeking this operation and patients having higher expectations with the 2-incision operation. One of the possible causes of the differences in walking assistance postoperatively may have been the preoperative education and the potential fear instilled into patients when dislocation precautions are emphasized. These factors may influence their return to driving and their postoperative confidence.

In this study, we had fewer complications with the 2-incision operation than had been reported by White and Archibeck [3]. These authors reviewed results of the 2-incision operation among several surgeons and reported a 6% incidence of fracture of the femur and 0.2% incidence of dislocation [3]. These complications were from the first 10 operations performed by the surgeons, and our results are better, most likely, because we continued to perform this operation and improve our technique. In the multicenter review of the 2-incision technique among surgeons who routinely perform the operation, the complications were 1.3% femoral fractures, 1.0% dislocation, and 0.3% revision rate [1]. Caution should be advised in performing any of these techniques with inadequate training or low volume use. Our experience reported here suggests that for surgeons who do not want to or who cannot participate in the necessary learning process for the 2-incision operation, the posterior mini-incision total hip arthroplasty provided excellent patient satisfaction with minimal morbidity. Woolson et al [4] has questioned the safety of the posterior mini-incision operation based on their experience with their first 50 small-incision operations. Our experience with the posterior mini-incision patients in this matched-pair series, and that of Ogonda et al [9] in a large randomized study, does not confirm the safety concerns of Woolson et al [4].

This matched-paired series of patients has adequate statistical power to detect meaningful differences between the two operative techniques studied. We conclude that these operations were safe for both groups of patients. We can also conclude that the type of outcome differed between the different types of incision. Just because we were making a conclusion that the type of outcome differed between the two approaches does not mean we were making a qualitative judgment that one was better that the other. The results of this study provides confirmation that the use of either one of these incisions, when performed safely and effectively, provides pain relief, a high level of postoperative function, decreased hospital stay, and low complication rates. What we have instead studied is two different approaches, and we reported to the orthopedic community the differences that we have found by the use of these techniques. We feel the orthopedic community needs to have information about the different techniques currently being suggested for small-incision surgery. We are simply trying to provide some information for them to make decisions. This study does not provide any information comparing the outcomes of these 2 small-incision operations with the outcomes of traditional total hip arthroplasty incisions. This study supports the use of a clinical hip pathway, the perioperative pain management protocol, and the inherent benefits of smaller incisions.

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