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Research Paper

Retrospective cohort study comparing the functional outcomes of direct anterior approach hip arthroplasty: Oblique 'bikini' vs. longitudinal skin incision

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Statistics

Figures	01
Tables	03
References	13

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Abstract

Introduction: The Direct Anterior Approach (DAA) has gained popularity in recent years. Numerous papers have suggested that short-term outcomes are advantageous over alternative approaches. The 'bikini' inguinal crease line incision is a novel variant of the DAA which leave the patient with a cosmetically better scar. We report a single surgeon's experience of the operation and short-term outcomes.

Patients, Materials, and Methods: Patients undergoing a primary THR between 2013-2015 were included in the search. The operative time, Hb drop on day 1, flexion/abduction/strength at discharge and the 6-month change in Oxford and EuroQol scores were evaluated. This was done from patient notes and cloud-based outcomes collection software. Patients who were lost to follow-up at 6-months and had a bilateral THR were excluded.

Results: 89 patients met our inclusion criteria. The average length of operation was 1hr 34mins. The average Hb drop was 2.5 gm/dl on day 1. On discharge, the average abduction was 23 degrees and power was MRC grade 4.7. Between pre-operative and 6-month assessment the EuroQol score increased by 0.49 and the Oxford Hip score by 11.1.

Discussion: The increase in Oxford Hip and EuroQol scores at 6-months were similar to those of a cohort group who underwent a classical longitudinal-incision DAA. Average Hb drop is in line with published norms. The authors were unable to find published results on power and abduction on discharge after a THR for comparison. The operative time was slightly longer than the surgeon's average for classical DAA THR's.

Conclusion: This novel 'bikini-incision' THR has similar outcomes scores to a classic longitudinal DAA. It offers a cosmetically better scar and so may have value in patients who are image conscious.

Keywords: Hip arthroplasty, surgery, health, skin incision

INTRODUCTION

The Direct Anterior Approach (DAA) Total Hip Arthroplasty (THA) has gained popularity over recent years with numerous studies suggesting that DAA patients have a faster recovery, reduced post-operative pain, earlier mobilization and lower rates of dislocation than those with operated through alternative approaches [1]. These benefits have been attributed to the muscle sparing nature of the procedure and the intervascular and internervous plane used [2]. Detractors of the DAA suggest that the operation has a long learning curve, greater blood loss and higher complications than alternative approaches [3].

One of the frequently cited criticisms of the DAA is that because the skin incision runs perpendicular to Langer's lines it leads to widening and discomfort of the scar [4]. The oblique 'bikini' incision for the DAA was developed by Leunig et al. to tackle this problem [2]. By placing the incision within the inguinal skin fold, the scar runs parallel with Langer's lines resulting in a narrower and more subtle scar [4]. Cosmesis is subjectively and objectively improved with this approach [2] and so advantageous for the patient's conscious of aesthetics. In addition, initial papers show this technique to be safe with no difference in lateral femoral cutaneous nerve symptoms [2].

There are no sizeable studies so far that compare outcomes of 'bikini'-incision DAA with longitudinal-incision DAA THAs. This paper addresses this by comparing the functional and general health outcomes of 'bikini' and longitudinal incision DAA THAs at 6-months post-operatively.

METHODOLOGY

PATIENT SELECTION

We conducted a retrospective cohort study to compare the two different surgical incisions used in DAA THAs (i.e., 'bikini' and longitudinal incisions). All the patients who underwent THA in our center between January 2013 and July 2015 were included. Information on patient and operation details as well as Oxford-hip scores and EuroQol scores was previously recorded within a cloud-based medical records platform 'iMedDoc' and so was easily extractable. We excluded all the patients who underwent an approach other than longitudinal or bikini DAA, had an incomplete follow-up at 6-months, had missing pre-operative scores or underwent revision Surgery.

CLINICAL FEATURES AND TREATMENT OPTION

The database was interrogated for the following: age, sex, date of surgery, surgical approach, incision type, pre-operative and 6-month Oxford-Hip, and EQ-5D scores. To minimize potential bias, all patients in both groups were operated on by the same surgeon. The surgeon started performing the 'bikini-incision' DAA in March 2014, prior to which all THAs were performed via a longitudinal DAA. Initially, the surgeon selected thin-female patients for the 'bikini-incision' but over time he used the bikini incision for all THAs.

OPERATIVE DESCRIPTION

The longitudinal-incision DAA was performed as has been described by previous authors [5].

The Bikini-incision DAA is performed on a standard table with the pelvis placed at the break to enable the extension. Both legs are draped, with the non-operative leg placed on a mayo table to allow adduction of the operative leg. A line is drawn between the anterior superior iliac spine and the fibular head. A 3-5 inch incision is made in the inguinal crease line, with one-third medial and two thirds lateral to the previously drawn line. Subcutaneous tissues are incised with diathermy and the fascia covering the tensor fascia lata was incised longitudinally. Blunt dissection is performed between the sartorius and tensor fascia lata until the lateral aspect of the acetabulum can be palpated. The deep fascia of the tensor fascia lata is incised longitudinally and a capsular flap created. With the femoral head still in the acetabulum, a femoral

osteotomy is performed and the femoral head was removed with a cork-screw. The preparation of the femur and insertion of the stem is done with the foot lowered to extend the hip to 10-30 degrees. The foot-end is then raised back to neutral which allows full visualization of the entire capsule. The labrum is removed, acetabulum reamed and the acetabular component inserted. An alignment rod is used to aid the assessment of inclination of the acetabular component. The stability of the hip is assessed intraoperatively, and the wound closed in layers; skin closure is performed with staples.

Analgesia and physiotherapy regimes are the same for both groups. A local anesthetic is infiltrated into the wound during the operation and oral post-operative analgesia provided. Physiotherapy is commenced at day 1 post-operatively in both groups and patients encouraged to fully weight bear. Discharge is considered once deemed safe by physiotherapists and doctors.

CLINICAL EVALUATION

Functional and general health outcomes were recorded using validated Oxford Hip and EQ-5D Scores [6,7]. These were patient-completed and collected by an outcomes nurse during the patient's pre-operative and 6-month post-operative assessment.

The Oxford Hip Score is a functional score to assess hip function. Made up of 12 questions each with a score of 0-4, it has a maximum score of 48 (i.e perfect function) [7]. The EQ-5D score is a health-related-life-quality score that measures five key tenants: mobility, self-care, usual activities, pain or discomfort, and anxiety or depression which can be graded as 'no problem', 'a moderate problem', or an 'extreme problem' [8]. EQ-5D range is from -0.594 to 1, where 1 is full health and 0 equates to being dead (negative values are valued as worse than being dead) [9]. These measurements have been shown to be valid and reliable [6]. We used the change between pre-operative and 6-month Oxford Hip and EuroQol scores as a proxy for the level of functional and general health improvement after a THA [10].

COMPLICATIONS

All patients within the study were contacted by phone and a standardized script/proforma was followed in collecting the complication data. Complications were verified with the patient's GP. Complication data collection was collected retrospectively between 20-50 months post-operatively.

STATISTICAL ANALYSIS

We used statistical software SPSS 17.0 software (SPSS Inc, Chicago, IL, USA) for statistical analysis. Mean values are presented with their corresponding standard deviations (SD). Normal distribution of continuous variables was tested using the Shapiro-Wilk test. Differences between non-parametric variables were analyzed using the Mann-Whitney U test. The results were considered significant when two-tailed P where $p < 0.05$.

RESULTS

PATIENT DEMOGRAPHICS AND CLINICAL FEATURES

A total of 273 patients underwent THA via the DAA between January 2013 and September 2015; with 214 fulfilling our inclusion criteria (Fig. 1). Of these 90 were performed via a bikini-incision and 124 via a longitudinal incision. There were no significant age and sex differences between the two groups (Table 1).

QUALITY OF LIFE AND FUNCTIONAL SCORES

The pre-operative mean Oxford Hip Scores were in keeping with moderate-severe osteoarthritis in both groups [7]. There were no statistical differences in baseline Oxford Hip Scores between the two groups as shown in Table 2. At 6 months of follow-up, we observed significant differences in the Oxford Hip Scores between the two study

groups; however, no statistically significant differences in an overall change in the Oxford-Hip were observed between the two groups (Table 2).

The Bikini-incision group's baseline EuroQol score was significantly lower than the non-bikini group (Table 3). At 6 months post-operatively, the bikini-incision group had a mean EQ-5D score of 0.71 compared with 0.75 for the longitudinal DAA group. The EQ-5D change from baseline to 6-months was statistically larger in the Bikini- incision than the longitudinal-incision group (0.49 vs. 0.43).

COMPLICATIONS

We report the following complication rates: wound infection 0.49%; Cup Revision for impingement 0.49%; Stem Revision 0.98%; scar dysaesthesia 7.8%.

DISCUSSION

The purpose of this study was to compare the functional and general health outcomes between a 'bikini' and a longitudinal incision in direct anterior approach THAs. We observed that both groups showed significant improvement in the functional score at 6- months. Beard et al. have reported that for the Oxford Hip Score there is a minimally important difference of 5 points [11] and so values under this are considered clinically inconsequential. We found that the two groups had no clinically significant difference in functional outcome in terms of '6-month' or 'change from baseline to 6-month' scores. This finding is consistent with Leuning et al's initial findings that mid- to long-term outcomes are comparable between bikini- and longitudinal-incision DAA [2].

Both groups also showed a clinically significant improvement in 'Health-Related Quality of Life' at 6-months. The 'bikini' group had a statistically significant larger increase in EuroQol score than the longitudinal group. Nevertheless, these differences are less than 0.074 and so should be considered clinically inconsequential [12]. Our findings suggest that general health outcomes are comparable at 6-months post-operatively between the two groups. This is the first time that general health outcomes of the 'bikini-incision' have been compared with a longitudinal incision and so there is no literature to validate our findings against.

Previous papers have shown that patients have higher satisfaction with the appearance of a bikini-incision scar than longitudinal-incision scar [2]. Since 'bikini'-incision outcomes are comparable to longitudinal-incision DAA we suggest that this variation of the DAA may have a role in patients concerned about scar appearance.

STRENGTHS AND WEAKNESSES

Our study has numerous strengths. Firstly our study groups are the largest reported in the literature comparing bikini-incision with longitudinal-incision DAA outcomes. In addition, our sample size was sufficient to detect significant differences between different approaches with a statistical power >85%, and an α -error of 0.05. Secondly, the patients included were operated on consecutively and had the same pre-operative and post-operative protocols. Thirdly, all the operations were performed by the same surgeon, excluding operative bias. The learning curve for adopting the direct anterior approach has been established at between 40-100 patients [13], but there is currently no data on the learning curve to adapt from the longitudinal-to the bikini-incision DAA. Since the learning curve was unclear we opted to include all his initial cases in the analysis. This, however, introduced two problems. Firstly, whilst initially learning the procedure the surgeon chose patients with perceived easier anatomy which introduced a patient

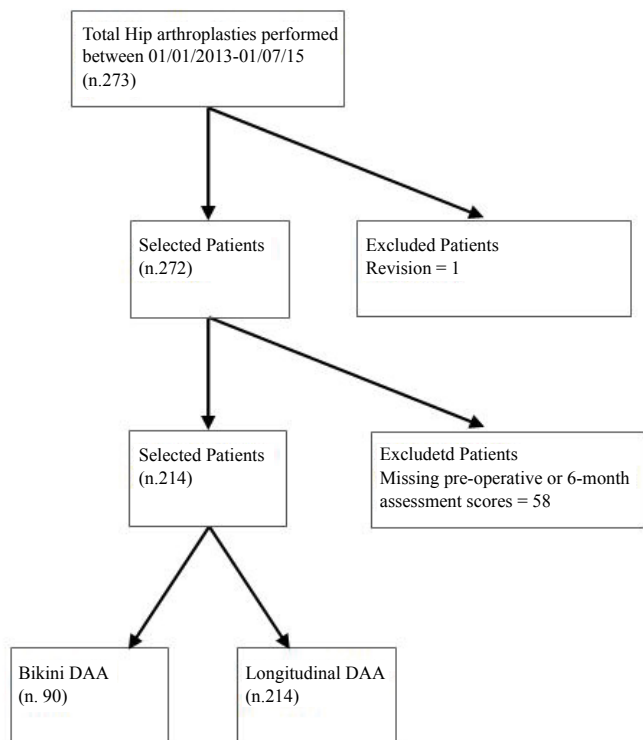


Fig. 1. Patient demographics

Table 1. Demographic features; bikini vs. non-bikini incision

Characteristics	Bikini incision (n =89)	Non-Bikini incision (n=124)	p-value
Age	65.49 SD 8.23	67.44 SD 9.79	0.163*
Gender			
Female	33 (37.1)	54 (43.5)	0.397*
Male	56 (62.9)	70 (56.5)	

SD: Standard deviation; Data are presented as No. (%); *Statistically significant p-values

Table 2. Functional outcome according to the Oxford Hip Score; Bikini vs. non-Bikini incision

Oxford Hip Score	Bikini incision (n =89)	Non- Bikini incision (n=124)	p-value
Pre-surgical assessment Clinic	22.01 SD 5.64	23.44 SD 6.78	0.056
6 months of follow-up	32.89 SD 4.56	36.2 SD 5.66	0.000*
Change baseline to 6 Months	10.88 SD 6.38	12.77 SD 6.57	0.068

SD: Standard deviation; Data are presented as No.; *Statistically significant p-values
 Note: The power analysis 88% at an alpha error of 0.05 considering differences of 3 points in the Oxford Hip Score to be clinically relevant

Table 3. Functional outcome according to the EuroQol 5D; Bikini vs. non-Bikini incision

EuroQol 5D	Bikini incision (n=89)	Non- Bikini incision (n=124)	p-value
Pre-surgical assessment Clinic	0.21 SD 0.19	0.32 SD 0.28	0.001*
6 months of follow-up	0.71 SD 0.13	0.75 SD 0.14	0.036*
Change baseline to 6 Months	0.49 SD 0.21	0.43 SD 0.26	0.008*

SD: Standard deviation; Data are presented as No. (%); *Statistically significant p-values
 Note: The power analysis 97% at an alpha error of 0.05 considering differences of 0.07 points in the EuroQol 5D to be clinically relevant

selection bias. Secondly, a proportion of the 'bikini- incision' group was performed whilst the surgeon was still perfecting his technique, whilst all those in the longitudinal-incision group underwent an operation the surgeon was experienced with. This may consequently have resulted in

bikini outcomes reported under their potential value.

CONCLUSION

The bikini-approach DAA has comparable 6-month functional and general-health outcomes to the longitudinal-approach DAA. Given the

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