Groin Pain after Metal on Metal Hip Resurfacing: Mid-Term Follow-Up of a Prospective Cohort of Patients

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Abstract

Background and Purpose: Groin pain after metal on metal hip resurfacing has been previously reported. The purpose of this study was to determine the natural history of a cohort of patients with groin pain after hip resurfacing previously reported on and incidence of revision surgery.

Methods: Our group previously reported an 18% incidence of groin pain at a mean of 18 months post hip resurfacing. This cohort of groin pain patients was prospectively followed. Patients were evaluated using a visual analog pain rating score, the University of California at Los Angeles (UCLA) Physical Activity Index, and the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index. Functional outcome scores were compared from initial to latest follow up using the paired Student's *t* test. Further diagnostic evaluation and/or intervention or other complication was also recorded.

Results: The latest mean follow up from surgery was 63±15 months. The mean pain rating, UCLA, and WOMAC scores all improved at latest follow up, although WOMAC score improvement was not statistically significant. Mean pain rating score improved from 5.2±2.0 to 2.5±1.4 ($p=0.0001$). UCLA activity score improved from 6.4±2.0 to 6.9±1.6 ($p=0.03$). Total WOMAC score improved from 75.6±20.5 to 84.5±14.8 ($p=0.15$). Only one patient was revised for an adverse local tissue reaction.

Conclusion: Groin pain post hip resurfacing has a multifactorial etiology, and in the vast majority of cases improves over time with no significant functional limitations. However, the surgeon should be aware of the many potential causes, and help minimize the possibility with proper patient selection and surgical technique.

Keywords metal-on-metal · hip resurfacing · groin pain

Introduction

Metal-on-metal hip resurfacing is currently being used as an alternative to traditional stemmed femoral implants in young and active adults as it preserves proximal femoral bone stalk, has a closer resemblance to normal anatomic biomechanics, and enhances patient participation in high activity levels [8, 20, 23]. Although femoral neck fracture is the most commonly reported complication after hip resurfacing, recent reports have focused on adverse soft tissue reactions associated with metal on metal bearings usually presenting in the first 2 years post-operatively [1]. In addition, persistent groin pain post hip resurfacing affecting patient function has been reported by several groups ranging from 15 to 18% [2, 6, 14]. The exact etiology of the groin pain was not definitively established in any of the studies, and although female gender and younger age were associated with groin pain, it is most likely had a multifactorial etiology [2, 6]. Our group had previously reported that groin pain was significant enough to require analgesic medications and limit activities [2]. The purpose of this study was to determine the natural history of a cohort of patients with groin pain after hip resurfacing previously reported on [6] and incidence of revision surgery.

Methods

Ethical approval was obtained from our Institutional Research Ethics Board prior to the study commencing. Between November 2001 and August 2006, 170 hip resurfacings (Conserve Plus, Wright Medical Technology, Arlington, TN, USA) were performed at the Ottawa General Hospital by two fellowship trained arthroplasty surgeons experienced in hip resurfacing. Six patients who had undergone revision of a previous resurfacing were excluded. Of the remaining 164 hip resurfacings, 116 (70%) were

Level of Evidence: Level IV, therapeutic study.

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evaluated at a mean of 18 months postsurgery for their initial assessment. Nineteen patients with 21 hip resurfacings (18%) reported persistent groin pain at that time. The mean age of this groin pain patient cohort at time of surgery was 46 ± 8 years. Male patients accounted for 68% of patients (13 of 19 patients) and 62% of hip resurfacings (13 of 21 hip resurfacings). The patient cohort had their hip resurfacings done through three different approaches: 13 through a posterolateral approach, seven through a surgical hip dislocation, and one through a direct anterior approach. The patient cohort was prospectively followed with clinical and radiographic assessment. Radiographic assessment was made with AP pelvis and sagittal plane X-rays of the resurfaced hip. Radiographs were assessed by an independent surgeon who was not involved with the patient's surgery. As part of the diagnostic evaluation, infection was ruled out with blood work (erythrocyte sedimentation rate and C-reactive protein) and a hip aspiration sent for culture. In addition, patients who had pain with resisted straight leg raise underwent radiographically guided cortisone injections of their psoas tendon sheath. In patients with no response to cortisone injection and/or persistent pain, cross-sectional imaging using computer tomography was used to rule out soft tissue effusion and/or mass. Metal ion levels were not measured during the time frame of this study as this was still only a research tool. All patients were further evaluated using three self-reported outcome questionnaires: a visual analog pain rating score, the University of California at Los Angeles (UCLA) Physical Activity Index, and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). The visual analog pain rating scores are recorded as scale from 0 (no pain) to 10 (extreme pain). Functional outcome scores were compared from initial follow up to latest follow up using the paired Student's *t* test. All other reoperations in this cohort were also recorded.

Results

Functional Outcomes

At a mean follow up of 63 ± 15 months, 18 of 19 patients continued to report groin pain. However, from their initial assessment, their mean pain score decreased from 5.2 ± 2.0 to 2.5 ± 1.4 ($p=0.00001$) and the UCLA activity score improved from 6.4 ± 2.0 to 6.9 ± 1.6 ($p=0.03$, Fig. 1)

Of the 10 patients requiring oral pain medication at the initial assessment, only five were requiring oral pain medication at latest follow up (three of these patients were taking pain medication at initial follow up and two of these patients had not been taking pain medication previously). Only six of the 11 patients who had activity limiting pain at initial follow up were still having pain limiting their daily activities. All individual domains and total WOMAC scores for the patient cohort improved from initial assessment, but this was not statistically significant (Fig. 2).

Fig. 1. Graphic comparison of the visual analog pain rating scale and UCLA scores at short- and mid-term follow-up. F/U1 was at a mean of 18 months post-surgery. F/U2 was at a mean of 63 months post-surgery. There is a statistical difference between the visual analog pain rating scores at the two follow-up points (F/U1=5.2±2.0, F/U2=2.5±1.4; $p=0.00001$). There is a statistical difference between the UCLA scores at the two follow-up points (F/U1=6.4±2.0, F/U2=6.9±1.6; $p=0.03$)

Radiographic Follow-Up

No patients demonstrated radiographic evidence of femoral neck narrowing defined by a change of greater than 10% change of femoral implant-neck ratio on the AP pelvic X-ray [11, 16]. Only one patient had retro-acetabular component lucencies (Fig. 3). All other patients had no evidence of acetabular or femoral component loosening and/or migration. As reported previously, femoral head-neck offset was appropriately restored in all cases [6]. There were no other radiographic findings that could

Fig. 2. Graphic comparison of the WOMAC scores and short- and mid-term follow-up. F/U1 was at a mean of 18 months post-surgery. F/U2 was at a mean of 63 months post-surgery. There is no statistical difference between any of the WOMAC individual or total domain scores at the two follow-up points. Pain: f/u1=77.6±20.2, f/u2=88.1±13.2; $p=0.09$; stiffness: f/u1=71.1±24.7, f/u2=75.7±21.2, $p=0.31$; function: f/u1=75.5±20.7, f/u2=85.5±15.1, $p=0.15$; total: f/u1=75.6±20.5, f/u2=84.5±14.8, $p=0.15$

Fig. 3. Cross-table lateral hip radiograph demonstrating retro-acetabular component. **a** Cross-table lateral radiograph of the left hip 12 months post-surgery. **b** Cross-table lateral radiograph of the left hip 35 months post-surgery. The yellow arrows outline the

new areas of radiolucency at least 1 mm around the acetabular component in De Lee and Charnley zones 1 and 3. These radiolucencies measure 1–3 mm

have attributed to residual symptoms (e.g., femoral neck fracture, heterotopic ossification, etc.).

Computer tomography was obtained in six patients with one showing a massive complex fluid collection inferior to the hip joint and another showing a complex fluid collection around the psoas tendon sheath with associated lucencies around the acetabular component. One patient had a CT scan after two psoas blocks had given him only temporary relief of his groin pain which did not show any adverse local tissue reaction. The CT scans for the other three patients did not show any adverse local tissue reaction.

Additional Interventions

The patient with a complex fluid collection had a revision to a metal on polyethylene total hip arthroplasty at 45 months post hip resurfacing. Twenty-seven months post revision, the patient presented with continued pain as well as recurrence

of the effusion and required re-revision to a ceramic on ceramic bearing.

The patient with radiographic retro-acetabular component lucencies and CT confirmed fluid collection around the psoas tendon sheath was offered revision arthroplasty. However, the patient has declined further surgery at latest follow up.

A total of four patients had a clinical exam consistent with psoas impingement and underwent psoas blocks with a local anesthetic and a corticosteroid under radiographic guidance. One of these patients required a total of three injections. All patients had symptomatic relief of their groin pain with pain scores improving from 5.0 ± 3.0 to 2.3 ± 1.5 ($p=0.27$) and UCLA scores improved from 4.7 ± 1.2 to 7.0 ± 1.2 ($p=0.23$). Figure 4 shows that all individual domain and total WOMAC scores improved in the patients with psoas blocks, but the improvement was not statistically significant. No patients required surgical intervention for their psoas tendon.

Four of the seven patients who had their hip resurfacing done through a surgical hip dislocation had their symptomatic greater trochanteric screws removed at least 1 year post resurfacing. Five patients had their contralateral hips resurfaced despite the continued groin pain in their index hip resurfacing. Furthermore, three patients are currently awaiting to have their contralateral hip resurfaced.

Discussion

Although our cohort of patients continues to experience groin pain at mid-term follow up of 63 months, the intensity of pain was reduced as shown by the improved visual analog pain rating scale as well as the need for oral pain medication. In addition, both the UCLA and WOMAC scores improved, although the WOMAC score improvement was not statistically significant. From initial assessment, the total WOMAC score for our patient cohort improved from 75.6 ± 20.5 to 84.5 ± 14.8 . WOMAC scores after primary total hip arthroplasty (THA) have been reported in the Global Orthopaedic Registry at 76.6 at a mean of 3 months postsurgery [7]. In the Swedish National Registry, WOMAC scores have been reported between 68 and 71, 2–5 years post-THA [24].

Fig. 4. Graphic comparison of the WOMAC scores and short- and mid-term follow-up in patients who had psoas block. F/U1 was at a mean of 18 months post-surgery. F/U2 was at a mean of 63 months post-surgery. There is no statistical difference between any of the WOMAC individual or total domain scores at the two follow up points. Pain: $f/u1=50.0 \pm 15.0$, $f/u2=93.8 \pm 6.3$, $p=0.08$; stiffness: $f/u1=45.8 \pm 14.4$, $f/u2=75.0 \pm 17.7$, $p=0.32$; function: $f/u1=50.0 \pm 16.3$, $f/u2=91.2 \pm 12.9$, $p=0.16$; total: $f/u1=49.7 \pm 14.0$, $f/u2=88.9 \pm 10.9$, $p=0.15$

Consequently, based on the latest WOMAC scores of this patient cohort (mean of 84.5), the presence of groin pain after hip resurfacing appears to be of little clinical significance in the majority of patients. Lavigne et al. reported similar findings where residual groin pain after at a minimum of 2 years was present with either 28 mm diameter femoral heads, large-diameter femoral heads, or hip resurfacing, and the incidence of the groin pain decreased over time [14].

Our findings of minimal groin pain intensity post resurfacing at mid-term follow up are in keeping with the other previous short term follow up studies of groin pain post resurfacing [2, 14]. Bartelt et al. found that the intensity of groin pain in their cohort of seven resurfacing patients was mild in four, moderate in two, and only severe in one [2]. Lavigne et al. found that in their cohort of 15 resurfacing patients with groin pain, eight did not want any further investigation of the groin pain at 2 years, indicating that the severity of the pain was not significant [14]. Furthermore, the fact that five patients in our cohort had their contralateral hips resurfaced despite the continued groin pain in their index hip resurfacing and three patients in our cohort are currently awaiting to have their contralateral hip resurfaced, is an indication that the groin pain experienced is not significant and has minimal impact on patient satisfaction.

Our study also showed that at mid-term follow up, fewer patients (six versus the initial 11) reported that their groin pain affected their activities of daily living. It is interesting to note these six patients still reported that the pain limited their daily activities despite low pain rating scale scores, and improved UCLA and WOMAC scores. At our center, resurfacing is reserved for younger patients with higher activity levels, and as a result of possible higher expectations, it may be a bias towards reporting more groin pain post operatively, as noted by Bartelt et al. [2]. One common cause of groin pain post total hip arthroplasty is failure of fixation of the implant. Kim et al. noted that the most common cause for revision in multicenter trial using the Conserve Plus® (Wright Medical Technology, Memphis, TN, USA) hip resurfacing system was aseptic loosening of the acetabular component or secondary to fibrous in-growth [12]. The cup design is a cobalt chrome alloy with a porous beaded surface for osteointegration. In the previous two studies noting groin pain post hip resurfacing, there were more patients who required revision surgery for failure of implant fixation. Lavigne et al. reported three revisions of the femoral component for loosening [14]. In our study, no patient within the cohort had any evidence of femoral loosening and only one patient had radiolucencies around the acetabular component. This further emphasizes the importance of proper patient selection as well as surgical technique when performing hip resurfacing [5, 12, 18].

In our current study, there was one patient who had a revision arthroplasty and one patient who declined a revision arthroplasty both with the presence of a fluid collection. These adverse tissue reactions could be related to metallic wear debris or a hypersensitivity/allergic response to the metal [1, 6]. The incidence of severe adverse local

soft tissue reactions after resurfacing is rare, quoted between 0.10 and 1% [3, 17, 22]. However, there is a concern that the occurrence of these reactions may be insidious in nature, with some authors qualifying them as “asymptomatic” pseudotumors [13]. Surgeons should therefore be vigilant of the possibility of an adverse local tissue reaction in patients with groin pain post hip resurfacing. From the experience with this cohort of patients, we recommend that cross-sectional imaging be reserved for patients who have persistent pain despite a full clinical and radiographic work up, including the consideration of radiographically guided hip or psoas block.

Bartelt et al. reported two patients who were revised to total hip arthroplasty for apparent femoral neck impingement resulting in mild pain, with excellent pain relief after revision [2]. It should be noted that five of the seven patients in this study were noted to have femoral neck impingement as a cause for their groin pain. Although this means that the remaining three patients with neck impingement did not require revision, the fact that femoral neck impingement was the main reason for groin pain post resurfacing in this cohort of patients is a finding much different than our study. Bartelt et al. did not elaborate on the exact cause of the femoral neck impingement, but it does raise important points to remember intra-operatively during hip resurfacing. Orienting the acetabular component in sufficient anteversion is important to prevent such impingement [19]. Furthermore, optimal translation of the femoral component can also be used to restore femoral head neck offset [15]. It has been established that most hips undergoing resurfacing have an abnormal femoral head/neck offset due to asphericity of the femoral head and flattening of the head-neck junction [4]. This can contribute to prosthetic impingement because of the loss of anterior femoral head neck offset ratio.

Even with a proper restored femoral head/neck offset patients can still have symptoms of impingement due psoas tendon irritation. Four patients in our study did have relief of pain from radiographically guided psoas tendon sheath injections, as indicated by improved functional outcome scores. Both Bartelt et al. and Lavigne et al. had one hip resurfacing patient each in their studies who had a iliopsoas tendon sheath injection with improved pain relief [2, 14]. This is in keeping with the total hip arthroplasty literature, where local injection can be a therapeutic modality by providing temporary or sustained pain relief [21, 25, 26]. Surgical release of the iliopsoas tendon has been reported post THA with reasonable results [9, 10]. Although our group has not had to resort to this post hip resurfacing, it should be considered if psoas tendon blocks fail to provide pain relief.

This paper has several limitations. First, the relatively small number patients included. However, because this is a follow up of an initial cohort, this obviously limited the number of patients that could be included. The lack of a control and/or comparison group to better define the clinical importance of this complication as well as provide insight into its etiology is another limitation. Having said that, our findings are similar to that of Lavigne et al. [14] where the

majority of patients had resolution of their symptoms. Despite these limitations, our study provides important information in regards to how to counsel patients suffering from groin pain as it is the only study in the literature which reports mid-term follow up of patients with groin pain post hip resurfacing.

In conclusion, groin pain post hip resurfacing has a multifactorial etiology and in the vast majority of cases improves over time with no significant functional limitations. However, the surgeon should be aware of the many potential causes, and help minimize the risk of developing groin pain with proper patient selection and surgical technique. More importantly, all patients should be thoroughly investigated with a full history and physical examination, radiographic evaluation, and septic work-up. When psoas tendinitis is present, image-guided injection of the psoas sheath appears effective in reducing symptomatology. Finally, cross-sectional imaging to rule out an adverse tissue reaction should be reserved for those patients who have persistent pain after careful work up and proper rehabilitation.

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Each author certifies that his or her institution has approval for the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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