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1 **Is There a Need for Routine Follow-up after Primary Total Hip Arthroplasty?**

2
3 **Running head:** Routine follow-up after primary THA

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36

37 **ABSTRACT**

38 Background:

39 The objective of routine outpatient assessment of well functioning patients after primary total hip
40 arthroplasty (THA) is to detect asymptomatic failure of prostheses to guide recommendations for early
41 intervention. We have observed that the revision of THAs in asymptomatic patients is highly
42 uncommon. We therefore question the need for routine follow-up of patients after THA.

43

44 Methods:

45 A prospective analysis of an orthopaedic database identified 158 patients who received 177 revision
46 THAs over a 4 year period. A retrospective chart review was conducted. Patient demographics, primary
47 and revision surgery parameters and follow-up information was recorded and cross referenced with
48 AOA NJRR data.

49

50 Results:

51 110 THAs in 104 patients (average age 70.4 (SD 9.8 years). There were 70 (63.6%) total, 13 (11.8%)
52 femoral and 27 (24.5%) acetabular revisions. The indications for revision were aseptic loosening
53 (70%), dislocation (8.2%), peri-prosthetic fracture (7.3%), osteolysis (6.4%) and infection (4.5%). Only
54 4 (3.6%) were asymptomatic revisions. A mean of 5.3 (SD 5.2 and 1.9 (SD 5.3 follow-up appointments
55 were required before revision in patients with and without symptoms, respectively. The average time
56 from the primary to revision surgery was 11.8 (SD 7.23) years.

57

58 Conclusions:

59 We conclude that patients with prostheses with excellent long term clinical results as validated by Joint
60 Registries, routine follow-up of asymptomatic THA should be questioned and requires further
61 investigation. Based on the work of this study, the current practice of routine follow-up of
62 asymptomatic THA may be excessively costly and unnecessary and a less resource-intensive review
63 method may be more appropriate.

64

65 Key words: asymptomatic revision; routine follow-up; Total Hip Arthroplasty

66 Abstract word count: 250/250

67

68 **INTRODUCTION**

69 Total hip arthroplasty (THA) is one of the most commonly performed operations in the western world¹.
70 In Australia, the Australian Orthopaedic Association (AOA) National Joint Replacement Registry
71 (NJRR) reports that approximately 19,000 THAs are performed annually². Unfortunately, for various
72 reasons, the primary joint replacement does not always outlive the patient. Subsequent revision THA
73 surgery is more technically difficult. It is usually performed in patients with more comorbidities, and
74 does not offer functional results or quality of life as good as the primary THA whilst leading to
75 significant costs to society^{3,4}. Monitoring asymptomatic patients after primary THA has traditionally
76 been conducted to detect early failure of the prosthesis and to guide recommendations and interventions
77 where necessary.

78
79 In September 2006, the Arthroplasty Society of Australia (ASA) released a position statement on the
80 long term follow-up of hip and knee arthroplasties⁵. It predicted that in the next decade, the number of
81 arthroplasties per annum will double and as such it is becoming increasingly difficult to regularly
82 review all total joint replacements given the anticipated increase in demand for arthroplasty surgery.
83 The ASA recommended that although follow-up of arthroplasty patients is necessary, reviews should
84 be minimised where possible. Currently the Australian Orthopaedic Association (AOA) guidelines
85 recommend follow-up of total knee and hip replacements at 3 months post-operatively, at 1-2 years, 10
86 years and biennially thereafter. It is important to note that these guidelines are empiric and further
87 research needs to be performed to be able to recommend a follow-up regime for patients undergoing
88 TJA.

89
90 Resource utilisation and cost-effectiveness of routine follow-up following primary THA is difficult to
91 assess. To the knowledge of the authors, there is no information in the current literature that assesses
92 the yield of routine outpatient assessment of well functioning, asymptomatic patients after primary
93 THA. Givon et al. in 1998 performed an audit of outpatient follow-up of hip and knee arthroplasties
94 and demonstrated a low yield of problematic joint replacement⁶. If detection of asymptomatic failure of
95 the prosthesis is required to guide recommendations for early intervention, then a protocol of follow-up
96 reviews should direct best current management based on the cost and time involved in reviewing
97 asymptomatic patients. The aim of this study is to look at revision surgery undertaken at a tertiary

98 referral arthroplasty centre and to determine the incidence of asymptomatic patients undergoing
99 revision THR.

100

101 Significant resources and financial expenditure are involved in the regular review of asymptomatic
102 patients after THA. The clinics in which post arthroplasty patients are reviewed, traditionally require
103 staffing by medical and nursing staff and radiology support. From a patient perspective, postoperative
104 assessment of joint replacement often requires radiation exposure and inconvenience in terms of time
105 and expense, with questionable compliance⁷.

106

107 Controversy exists between lower limb orthopaedic surgeons as to the quantity and regularity of routine
108 post-operative follow-up required. A large variation in not only the number and timing of follow-up
109 appointments, but the nature of the appointments, has been shown in orthopaedic surgeons performing
110 THAs⁸. Each individual surgeon decides a protocol of the timing of patient reviews during follow-up
111 clinics in which they monitor the patient clinically and radiographically for signs or symptoms of
112 prosthesis failure. Balance must be sought by the surgeon when planning the follow-up protocol in
113 order to maximise efficiency of the health system and minimise the strain on patient and out patient
114 clinics.

115

116 **MATERIALS AND METHODS**

117 Ethics approval was obtained by The Prince Charles Hospital Health Service District Orthopaedic
118 Research and Data Management Unit through the Human Research & Ethics Committee prior to
119 commencement of the project (Approval Number EC2006/2). Survival data was collected from a
120 prospective orthopaedic clinical database (Orthowave™, Stryker, Michigan, USA) and medical charts
121 and was cross-referenced with the AOA National Joint Replacement Registry (NJRR) data.

122

123 A prospective analysis of an orthopaedic database at a large Australian tertiary teaching hospital was
124 performed from January 2003 to December 2006. Patients were included in the study regardless of
125 which institution performed the primary THA. Only the first stage was considered in staged revisions.
126 Procedures were excluded if the revision arthroplasty was performed on a hip joint that was not a

127 primary THA: revision of a hemiarthroplasty or; ORIF or; previous revision THA; or the second or
128 subsequent stage of a staged revision THA.

129

130 Various parameters were recorded for each patient including: patient demographics, date and type of
131 primary surgery performed, indication for primary THA, primary prosthesis parameters, date and type
132 of revision surgery performed, indication for revision THA and revision prosthesis parameters. For
133 each consultation between the date of primary THA and the date of revision THA, 3 parameters were
134 recorded; the date, patient symptoms and notes to illustrate the clinical situation including the
135 management plan. Patients reviewed at our institution all receive an x-ray at each appointment.

136

137 **RESULTS**

138 One hundred and ten revision THAs, performed in 104 patients, met the inclusion criteria and had
139 complete medical records over the 4 year period. Fifty-four (49.1%) had the primary THA at our
140 institution while 56 (50.9%) had the primary THA performed elsewhere. The primary THAs performed
141 elsewhere were either referred from the General Practitioner with symptoms or referred by regional
142 orthopaedic surgeons advising revisions that should be performed at a specialised centre. The cohort
143 consisted of 61 males (55.5%) and 49 females (44.5%) with a combined average age of 70.4 (SD 9.8)
144 years.

145

146 Only 4 (3.6%) of revision THAs were performed for an asymptomatic indication (in 3 patients as one
147 patient had bilateral revision THAs in the 4 year period). One of the 3 patients had the primary THA at
148 the study centre.

149

150 In the symptomatic group, the most common symptom reported in the first symptomatic follow-up visit
151 was pain (75%) (Graph 1). Other symptoms were far less common and were almost always followed by
152 pain in subsequent follow-up visits. There were 8.2% cases revised for dislocation and 6.4% for
153 fracture, however these patients all presented to the Emergency Room or their GP with pain or
154 instability and so would not have been asymptomatic at routine follow up.

155

156 A mean of 5.3 (SD 5.2, median 4, range 1-36) follow-up appointments were required before revision in
157 patients with symptoms. In asymptomatic patients, a mean of 1.9 (SD 5.3, (median 0.5, range 1-15)
158 follow-up appointments were required before revision surgery. The average time from the primary
159 THA to revision THA in the sample was 141.6 (SD 86.76) months. The average time from primary to
160 revision THA was 161.3 (SD 16.92) months in the asymptomatic group and 140.4 (SD 88.04) months
161 in the symptomatic group.

162

163 There were 70 total, 13 femoral and 27 acetabular revisions (table 1). The indications for revision
164 surgery were well categorised. The majority (77) of revision THAs were for aseptic prosthetic
165 loosening. Causes for revision are displayed in Table 2.

166

167 The first asymptomatic case was of a 61 year old female who had bilateral non-cemented THAs for
168 osteoarthritis performed elsewhere over a decade previously. She developed symptoms (most notably
169 pain) in the right hip and following investigation of her right hip pain, pelvic X-rays showed a superior
170 acetabular osteolytic lesion and severe poly wear on the contralateral left side. The right hip was
171 revised first due to a large recurrent iliopsoas bursa secondary to marked polyethylene wear. After full
172 recovery from the surgery and upon the surgeon's recommendations, the patient elected to undergo an
173 acetabular revision procedure on the left hip (Figure 2).

174

175 The second asymptomatic case was of a 62 year old female who had bilateral cemented THAs for
176 osteoarthritis performed at the study institution more than 15 years previously. The right hip was
177 revised prior to the 4 year period and upon routine post-operative follow-up for the revised right hip,
178 routine x-ray demonstrated a superior acetabular osteolytic lesion in the left hip. The surgeon elected to
179 monitor the progress of the osteolytic lesion. 8 years after the onset of the osteolysis, the surgeon
180 recommended revision of the acetabular component as the risk of fracture or gross prosthetic failure
181 outweighed the risk of the revision procedure (Figure 3).

182

183 The third and fourth asymptomatic revisions were both in a 68 year old obese gentleman who had
184 bilateral cemented THAs performed elsewhere more than a decade previously for osteoarthritis. He was
185 referred to our institution for investigation of left knee pain and routine pelvic radiographs showed
186 global hip osteolysis and severe poly wear bilaterally. The surgeon elected to revise the right hip first

187 due to the severity of osteolysis and the inherent risk of fracture. The left hip was revised 7 months
188 later after full recovery from the first revision. The surgeon remarked that clinically the knee pain was
189 unlikely to be referred from the hip but he could not be certain. It was decided to include this hip in the
190 asymptomatic group however the true pick up rate of asymptomatic hips requiring revision may be
191 even less than 4% (Figure 4).

192

193 **DISCUSSION**

194 Of the 4 asymptomatic cases discussed, 3 of these revisions were deemed necessary following
195 investigation for other comorbidities not directly related to the THA that was subsequently revised. It is
196 of note that in **no** cases of 110 revisions did routine, elective follow-up of primary THAs result in the
197 detection and subsequent revision of an asymptomatic joint.

198 It is of note that symptomatic patients requiring revision had significantly more out patient visits. This
199 is because once symptomatic, a patient is often carefully followed for progression of pain or osteolysis.
200 Often mildly symptomatic patients can be followed over a number of years if there is no radiographic
201 deterioration. Asymptomatic patients offered revision are those that present with significant bone loss
202 and are at risk of fracture or more rapid osteolysis. These patients are prioritised for surgery.

203 Currently approximately 19,000 THAs are performed in Australia per year¹ and we can expect this
204 figure to double within the next decade⁵. With this increase in demand, the routine follow-up of
205 standard primary THAs is becoming more resource intensive. According to the data from this study, an
206 extremely low pick-up rate of asymptomatic patients requiring revision arthroplasty was found. This
207 may have substantial economic and resource implications.

208 The majority (96.4%) of revision THAs performed on standard primary THAs were for symptomatic
209 indications. It could be argued that if these patients were not followed-up on a routine basis they would
210 have been referred back for investigation of their complaints upon failure of their arthroplasty. One of
211 the weaknesses of our study is that those patients referred from other institutions did not have those
212 charts reviewed to determine if there was any evidence of a failing prosthesis in the absence of
213 symptoms. However, the majority were symptomatic (with pain) at their first appointment at our
214 institution and with the low rate of asymptomatic problems in those with complete histories, it is
215 unlikely that this would unduly influence the results.

216

217 In the future, as we can expect the arthroplasty demand to increase, should we continue to review all
218 our THAs as regularly? Alternate methods of post-arthroplasty surveillance need exploring if we are to
219 accommodate such an increase in demand. The establishment of the AOA NJRR and other such joint
220 registries around the world are already providing invaluable information regarding implant survival.
221 Other resources are being sought in providing appropriate post-arthroplasty follow-up and may be of
222 some benefit in the near future⁹.

223

224 Alternatives to outpatient attendance such as telephone interviewing schemes are being trialled as
225 follow-up tools to reduce the economic and resource impact on the surgical community¹⁰. In patients
226 after total knee or hip replacement, Sethuraman, McGuigan et al. found that patients believed that their
227 care was not compromised by conducting follow-up by mailed questionnaires and radiographs¹¹.

228

229 Specific prostheses may need to be followed-up more vigorously if proven to be problematic. As data
230 is continually collected, correlated and analysed via the AOA NJRR, information on individual
231 prostheses is becoming evident demonstrating specific peaks at which complications arise with respect
232 to time from the primary procedure. Using such information, specific and more tailored protocols for
233 individual prostheses, based on joint registry survivorship data and long term complications may lead
234 to a more time-, cost- and patient- effective model for routine follow-up following standard primary
235 THA.

236

237 In conclusion the authors encourage the exploration of less resource-intensive and more cost-effective
238 review methods for the routine follow-up of primary THAs.

239

240

241 **Tables**

242

243 Table 1- Components Revised

	n (%)	Time to revision Av (months)	SD (months)
Global revision	70 (63.6)	154.4	90.63
Acetabular revision	27 (24.5)	132.9	77.20
Femoral Revision	13 (11.8)	89.2	67.58

244

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246

247 Table 2 – Indications for Revision

	n (%)	Time to revision Av (months)	SD (months)
Aseptic loosening	76 (69.1)	139.0	85.16
Global loosening	30 (27.3)	171.6	86.25
Cup loosening	30 (27.3)	156.8	77.81
Stem loosening	16 (14.5)	131.1	95.05
Dislocation	9 (8.2)	99.2	117.04
Femoral fracture	7 (6.4)	127.4	75.80
Infection	5 (4.5)	27.0	29.15
Cup osteolysis	4 (3.6)	112.8	60.36
Femoral osteolysis	2 (1.8)	105.0	22.63
Global osteolysis	2 (1.8)	155.0	7.07
Cup wear	1 (0.9)	85	
Cup fracture	1 (0.9)	164	
Other	3 (2.7)	154.3	33.61

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251 **Figure Legends**

252 Figure 1. Pie chart indicating first symptom reported at first symptomatic follow-up visit.

253 Figure 2. Plain Radiograph of first asymptomatic case (left hip).

254 Figure 3. Plain Radiograph of second asymptomatic case (left hip).

255 Figure 4. Plain Radiograph of third case with bilateral asymptomatic hips.

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