

Early / Late Postoperative Check Radiographs of Total Hip Replacement

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Abstract

Background: The postoperative radiographic assessment of the hip following total hip replacement aims to look for the position of the implant and any complications which may have occurred during the procedure.

Purpose: A comparative analysis of the first postoperative radiographic assessment of the hip x-ray following total hip replacement with another hip radiograph taken few weeks later.

Material and methods: Twenty five patients underwent primary total hip replacement for osteoarthritis of the hip. Postoperative check radiographs in the first 24 hours were compared to late postoperative radiographs (at mean interval of 20 weeks following surgery). Radiographs were assessed using the Trauma Computer Aided Design (CAD) looking for the hip function.

Results: The centre of the hip rotation, the medial, the femoral, the ischiofemoral offset, the hip height and stem alignment of the two radiographs of the patients (early and late) were dissimilar.

Conclusion: Repeated postoperative radiographic assessment of total hip replacement is not consistent and is being affected by confounding factors.

Keywords: Hip; Postoperative; Early; Late; Radiograph; Consistency

Introduction

A modern artificial hip joint is designed to last for at least 15 years. Most people have a significant reduction in pain and improvement in their range of movement. According to the National Joint Registry (NJR), only 7 in 100 hip replacements may need further surgery after 13 years. However, this depends on the type of implant and how it was fixed in place (National joint register). Common complications following total hip replacement are nerve damage, and component malposition resulting in dislocation, and leg length inequality [1]. Any variation in the hip joint centre of rotation (COR) after total hip arthroplasty influences the lever arm and tension of the abductor muscles as well as the lever arm of the body weight, and thus the force required by the muscles to balance the pelvis [2-5]. Increased femoral offset, increases the range of motion of the hip and reduces the risk of dislocation and polyethylene wear [6]. Correspondingly, patients with reduced femoral offset perform

lower on functional tests [7]. Medialization of the cup with a respective increase in femoral offset has been advocated; however, medialization of the COR in THA may have negative effects on joint reaction forces and may cause bone loss and changes in proprioception [3,4,8,9]. The aim of the current paper was to assess the hip X-ray, first day after surgery and weeks later when positioning of the patient and the limb will be easier with the reduction of pain and better mobility. The current paper aims to highlight whether there is discrepancy between early and late radiographic assessment of the hip measurements of the total hip component positioning.

Material and Methods

Twenty-one patients (25 hips) were included in this retrospective radiographic study underwent primary total hip replacement. Male to female ratio was 10/11. Two patients had subsequent total hip replacement at different stages. In 15 patients, the right

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hip was replaced, and the left hip in ten. No ethical approval was required to conduct this study. The mean age of the patients included was 69 years (50-81) with male to female ratio of. There were 17 cemented total hip replacements, 6 uncemented and two hybrid total hip replacements. The procedure was performed in Bridlington district hospital. The osteoarthritis was primary with no unusual deformities. Revision arthroplasty and rheumatoid patients were excluded from this series. All these patients' radiographs were preoperatively templated for the right implant and the total hip procedure were considered satisfactory on hip arthroplasty governance review conducted to check postoperative radiographs by the arthroplasty team. These patients underwent total hip replacement using Harding modified anterolateral approach of hip, and there were no recorded postoperative complications. The early (within 24 hours) postoperative radiographs of the hip and late follow-up radiographs were reviewed and assessed using trauma computerised aided diagnosis (CAD). Radiographs were performed with the patient lying down. For anteroposterior radiographs, the leg is put 15 degrees internally rotated and 10 degrees abduction of both hips. The current study assesses the anteroposterior radiographs using the CAD. Lateral views were also reviewed by the investigator. The magnification error of the radiographs was calculated at 120% of postoperative radiographs.

Results

The postoperative hip outcome measurements were analysed and readings of the two X-rays using CAD, were compared (Table 1). The mean duration between the first and the 2nd X-rays of the hip of the patients was 20 weeks (1-54 weeks).

The hip outcome functions radiologically were studied:

The centre of rotation of the hip. This measures the horizontal and vertical centre of rotation.

The eighteen patients, the range difference of the centre of rotation between the first and second X-ray was (-eleven, +6), with mean difference of 2.4mm. The centre of rotation was similar on early and late postoperative radiographs of seven hips.

Femoral offset: The range femoral offset was -8, +21, with a mean of 6.8mm difference.

Medial offset: The range difference between the two radiographs was -12, +5 (mean of 2.5mm).

Ilioischial offset: the range variance for ilioischial offset was -6, +6 (mean of 2.2m).

The hip height range of difference between the two readings was -16 to +4 mm (mean change of 5.4mm). In 17 patients the hip height was 5.4 mm shorter, in 8 patients, the hip height was 5.2 higher in the 2nd reading. Varus stem alignment of 1.3 degrees were noticed between the two hip outcome reading in 11 patients and in 13 patient the stem was 1.84 degrees valgus, the stem was neutral in one hips on both reading (Figure 1) (Table 1).

The above findings when abnormal were statistically significant p value 0.05 using Mann-Whitney test.



Figure 1: Trauma Cad measurement of postoperative x-ray of the hip function.

Discussion

The analysis of the two radiographs taken in the first postoperative day and few weeks later, were not concordant in the current study; this highlights the issue of the lack of consistency of the radiographic assessment of the total hip replacement using CAD assessment of the two x rays taken for each patient in the first postoperative day and later. We believe that the difference in the readings is because of the limb positioning errors affected by pain and range of movement. There often is muscle spasm and swelling of the thigh in the first postoperative day restricting a good positioning of the hip. We assume the 2nd radiograph performed once the pain and positioning of the limb during X ray have improved is a better reflection of the component positioning of the total hip. Limb position and quality of X-ray, is not the only factor making the proper assessment of the hip radiographic assessment inadequate; inter-observer error is another factor. Routine recovery room radiographs are ineffective for screening and unsuitable as baseline for longitudinal follow-up evaluation immediate recovery room hip radiographs following total hip arthroplasty rarely reveal unknown complications. The X-rays are often of suboptimal quality, have minimal clinical utility, and are less cost-effective [10,11]. In a comparative study on radiographs of patients who underwent primary unilateral THA taken in the theatres and later on, it was concluded that postoperative radiographs in the department of X-ray are characterized by better penetration (69.1% vs 27.3%, $p < 0.001$) [12]. There is a lack of national consensus on the use of postoperative radiographs. In a study on 46 patients who underwent total hip replacement, it was demonstrated that the late post-operative radiographs following THR are of better quality than the early ones. These early radiographs were of poor quality and we question their role as a baseline for further examinations [13]. In a study on 50 consecutive patients that underwent a primary total hip replacement and had post-operative period A-P and lateral check radiographs of the hip, it was concluded that initial post-operative radiographs are of inferior quality and do not alter the management of the patient. Consideration should be given to

performing check radiographs at the first out-patient clinic follow-up as an alternative [14].

Table 1: Radiological assessment of hip outcome.

	CR	FO	MO	IO	HH	SA	Week gaps between the first and last x-ray
1	3	12	0	-1	-1	1	10
2	-4	5	-1	-1	-12	1	15
3	-2	1	1	0	6	0	9
4	-3	-8	-2	-5	1	4	12
5	-1	2	0	1	3	0	53
6	-1	6	1	-6	-9	-1	11
7	-2	-5	5	-1	-4	1	54
8	6	17	0	-3	-3	-4	42
9	-11	0	-4	0	4	1	8
10	1	-3	3	2	-9	0	20
11	0	6	-6	-4	-3	-2	7
12	-3	4	5	-4	2	0	40
13	6	21	0	0	15	-5	10
14	0	4	-1	-1	-3	-1	49
15	0	12	-1	0	-1	0	13
16	-2	8	-3	-2	-16	1	17
17	4	6	-12	2	-7	-1	16
18	8	3	-6	-4	-14	1	19
19	0	6	1	-4	-1	-2	16
20	0	13	-1	-2	-2	-2	6
21	0	5	-3	-2	2	-6	13
22	-1	6	3	1	3	1	3
23	0	7	-1	6	-4	1	15
24	2	-2	-3	2	-8	1	39
25	-1	5	0	-2	-2	1	2
- stem alignment moving from valgus to neutral or varus, positive degrees is the opposite. Centre of rotation CR, Femoral offset FO, Medial offset MO, Iliioischial offset IO, Hip height HH, Stem alignment Weeks gap between the first and second radiograph was 20 weeks (2-54)							

Conclusion

The current paper compares plain radiographic assessment on the hip on two occasions. It is hard to justify a successful litigation using plain radiograph as the best examination of the quality of total hip arthroplasty because of the lack of consistency.

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