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Hip abductor re-attachment audited using a wire marker

Gulraj MATHARU, Andrew THOMAS, Paul PYNSENT

From the Royal Orthopaedic Hospital, Birmingham, United Kingdom

A braided wire suture marker was used to assess the integrity of abductor muscle repair following direct lateral approaches to the hip. The effect of a failed abductor repair on functional outcome was determined.

Patients underwent total hip arthroplasty performed by a single surgeon using the direct lateral approach. Following hip abductor repair a braided wire suture marker was stitched into the lower end of the flap. Subsequent suture movement was measured using radiographs. Oxford hip scores were collected prospectively.

Fifty six arthroplasties were performed with no complications. Eleven percent (n = 6) of the repairs detached and 89% (n = 50) of the repairs were either intact or showed only slight movement. No association was demonstrated between wire movement and pre-operative, post-operative, or post-operative change in Oxford hip score.

Abductor repair failure did not significantly impact on functional outcome. It is proposed that the wire marker provides a simple method of making a standard follow-up hip radiograph more informative.

Keywords : direct lateral approach ; functional outcome ; hip arthroplasty ; tendon repair ; wire marker.

INTRODUCTION

Direct lateral approaches to the hip require detachment and re-attachment of the anterior part of the gluteus medius and minimus tendon attachments (*8*). This approach allows good exposure of the acetabulum, facilitating cup positioning which may reduce the risk of hip dislocation and also diminishes risk of injury to the sciatic nerve (*4*). A disadvantage of the direct lateral approach is that limping can occur postoperatively due to damage to the superior gluteal nerve or damage to the gluteus medius muscle (*1,2,7,10*). Failure to establish abductor muscle re-attachment with the greater trochanter can also result in limping (*9*). Wire markers have previously been attached to the surface of repaired abductor muscles during hip arthroplasty to assess the integrity of repairs postoperatively (*5*).

In the present study a braided wire suture marker was used to assess the integrity of abductor muscle repair associated with the direct lateral approach. The effect of a failed abductor repair on functional outcome was subsequently determined.

PATIENTS AND METHODS

Functional outcome was assessed using Oxford hip scores collected prospectively and scored according to Pynsent *et al*. (*6*). Total hip replacements and hip resurfacings were performed by a single consulting surgeon (AT) using a modified Freeman approach (*8*). The stan-

■ Gulraj Matharu, Specialist trainee in Trauma and Orthopaedics.
■ Andrew Thomas, Consultant Orthopaedic surgeon.
■ Paul Pynsent, Director of Research and Teaching.
Royal Orthopaedic Hospital, Northfield, Birmingham, United Kingdom.
Correspondence : Dr Gulraj Matharu, BSc (Hons), MBChB, Research and Teaching Centre, Royal Orthopaedic Hospital, Northfield, Birmingham, B31 2AP, United Kingdom. E-mail : gsm@doctors.org.uk

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Fig. 1. — Pelvic radiograph illustrating braided wire suture markers. Bilateral total hip resurfacings were inserted using a direct lateral approach. Following repair of the anterior one third of the gluteus medius and underlying minimus tendons, a 3-0 braided wire suture (arrowed) was stitched into the lower end of the flap. The wire suture markers are clearly visible on pelvic radiographs.

dard Freeman approach detaches the anterior one third of the gluteus medius tendon and the gluteus minimus tendon ; these are repaired using two simple sutures (*7*). The modified Freeman approach involves a more thorough suture repair and the anterior one third of the gluteus medius and underlying minimus tendons are repaired using a number 1 PDS suture with a series of interlocking Kessler sutures. In addition, a 3-0 braided wire suture was stitched into the lower end of the flap. This suture was clearly visible on routine anterior-posterior (AP) postoperative pelvic radiographs and its movement relative to bony landmarks could be measured (Fig. 1).

Two pelvic radiographs (AP views) were reviewed for each patient, the immediate postoperative and the most recent follow-up radiographs. Figure 2 illustrates how wire position was determined. A straight line was drawn intersecting the most inferior points of the ischial tuberosities. The central point of the wire was marked and the perpendicular distance from this point to the ischial tuberosity line provided a measurement for the wire. A constant point was taken on both the greater and lesser trochanters and the perpendicular distance from each of these points to the ischial tuberosity line was similarly measured. Wire position in each film was calculated as a ratio of the wire distance divided by the difference between the measured distances of the greater and lesser trochanters. Wire movement for each patient was the difference between the wire positions in the two pelvic radiographs.

Functional outcome was assessed using Oxford hip scores collected prospectively. All patients had Oxford

Fig. 2. — Determining wire position. A straight line was drawn intersecting the most inferior points of the ischial tuberosities. Lines perpendicular to this ischial tuberosity line were drawn to three constant points and the distances were measured. These three points were the centre point of the wire marker, the greater trochanter, and the lesser trochanter. Wire position in each hip radiograph was calculated as a ratio of the perpendicular wire marker distance divided by the difference between the measured perpendicular distances of the greater and lesser trochanters.

hip scores collected at preoperative assessment and at the time of the most recent follow-up radiograph. Relationships between measured wire movement and other covariates (age and Oxford hip scores) were analysed using scatter plots and linear regression.

RESULTS

There were 56 joint replacements carried out in 51 patients. Mean age was 65 years (range : 19 to 87) and 80% (n = 41) were female. No patient was lost to follow-up. Post-operative Oxford hip scores were collected at a minimum of 24 months and up to 38 months following surgery.

No major surgical complications were recorded, including no dislocations, and further surgery was not performed on the replaced hip in any patient. Mean wire movement for the cohort was 0.17 of the distance between the greater and lesser trochanter (range : 0.11 to 0.55). Repairs appeared to be detached in 11% (n = 6) and the remaining 89% (n = 50) of the repairs were either convincingly intact or showed only minimal movement cephalad. Mean postoperative Oxford hip score was 38.7% (range 11.5% to 67.7%).

No clear pattern emerged when examining the relationship between wire movement and patient age, with regression accounting for 2% of the variance (R^2). Similarly, there was no clear pattern when examining the relationship between wire movement and Oxford hip scores (preoperative, postoperative, and change in score postoperatively), with regression accounting for 0% of the variance (R^2).

DISCUSSION

The interlocking PDS suture repair of the anterior abductor attachment was used to achieve reliable re-attachment, with the aim of improving on the simple suture repair used in the originally described technique (*8*). The wire marker proved to be a revealing method of auditing the integrity of this type of abductor repair following hip arthroplasty. As a result of performing a thorough tendon repair only a small proportion of patients had clear movement of the wire suture marker during follow-up suggesting failure of the repair. There was no demonstrable difference in functional outcome in relation to wire movement. This situation is similar to total hip replacement using trochanteric osteotomy where patients with failed repairs may still have a good outcome (*3*). However, the present findings may be a result of only a small number of repairs failing in the cohort when using this suture technique (i.e. a type 2 error). On this basis we feel the wire suture marker is worthy of further appraisal.

A limitation of this study was the assumption that movement of the wire marker in a cephalad direction indicates a failed abductor repair, without consideration of the axial plane. To confirm this would require additional imaging techniques, such as magnetic resonance imaging or ultrasound which are costly and operator dependent, or direct visualisation at revision surgery. It is likely that in a failed repair the wire marker will move in the line of the anterior fibres of the gluteus medius, and given the anatomy the wire movement will be mainly cephalad. There will be some anterior movement, however such movement is likely to be small and would be difficult to measure on lateral radiographs. Lateral radiographs are not part of our routine patient follow-up.

The surgeon's experience with using this technique in over 1000 routine hip joint replacements is that the wire marker never moves laterally or significantly medially and never moves distally. Unlike monofilament wires it is firmly fixed in the tissue which it is sutured into.

This audit method of using a braided wire suture as a marker would have an application in assessing the integrity of other large tendon repairs, such as repair of the short rotator attachment in a posterior approach to the hip. The wire marker may also be useful to assess the association between abductor repair failure and dislocation in hemiarthroplasty for fractured neck of femur.

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