TROCHANTERIC FIXATION BY CABLE GRIP IN HIP REPLACEMENT

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We used the stainless steel cable grip system described by Dall and Miles in 1983 to fix trochanters in 40 hips after total arthroplasty with trochanteric osteotomy. The cable broke in 32.5% of the hips; the trochanter failed to unite in 37.5%. Significantly more cables broke when placed inside the femoral canal than when the cable was placed round the femoral shaft (58% as against 9.5%, difference $p < 0.01$).

The high incidence of breakage may have resulted from contact between the stainless steel cable and the titanium prosthesis, from the acute angulation, or because of the lower fatigue strength of stainless steel. Better results have been obtained using cables with a higher fatigue strength, passed outside the proximal femur.

Trochanteric osteotomy is no longer a standard procedure in primary total hip arthroplasty, but detachment of the trochanter may be necessary in difficult revision cases or to alter alignment (Schutzer and Harris 1988). The reattachment of the trochanter is important, since it is subject to strong vertical, shearing, and rotational forces. Among the many types of trochanteric fixation which have been reported, we have reviewed the trochanteric cable grip system proposed by Dall and Miles (1983).

MATERIALS AND METHODS

In the six months from January to June 1986, 40 total hip arthroplasties with trochanteric osteotomy were performed by the senior author (MAR), 16 being revision procedures. Of the primary procedures, 23 were for osteoarthritis and one for rheumatoid arthritis. The average age of the patients was 62.9 years (26 to 85); there were 18 men (two bilateral) and 17 women (three bilateral).

Several designs of prosthesis were used, including the Precision Stem and Neck (PSN) prosthesis (Biomet, Warsaw, Indiana) in 24 hips, the Low Modulus Polyethylene Coated Hip (LMPCH) (Biomet) in 12, the Müller (Zimmer, Warsaw, Indiana) in two, and the PCA long-stem prosthesis (Howmedica, Rutherford, New Jersey) in two.

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In all cases the greater trochanter was reattached with the trochanteric cable grip system (Howmedica) described by Dall and Miles (1983). This system uses a multi-filament cable rather than a single strand of wire. Wire can kink and bend easily, but cable has a high resistance to fatigue and a high breaking strength. The cable used in the system was originally available in several different metals; we used stainless steel cables.

In the operation described by Dall and Miles (1983), the cable was looped around the stem of the prosthesis within the femoral canal. This placement was intended to stabilise both the cable and the trochanter. We considered, however, that contact between the stainless steel of the cable and the titanium alloy of the prosthesis, might cause corrosion of the metals. We therefore changed the method slightly.

The stem of the prosthesis was cemented into the femoral canal. Then, if there was enough bone and cement proximal and lateral to the stem, we drilled transverse holes through the cement to anchor the cables. If there was little cement, we looped the cables around the medial aspect of the proximal femur just below the lesser trochanter. Nineteen hips, all with the PSN prosthesis, had the cable threaded through the cement; the other 21 had the cable looped around the femur.

Follow-up examinations were performed at two months, six months, one year, and three years postoperatively, with radiographs to detect broken cables and ununited or fragmented trochanters. All data was recorded and, when appropriate, analysed using the SAS software system (SAS Institute Inc, North Carolina).

RESULTS

All patients had at least six months follow-up, 18 hips had the one-year review and 20 were followed for three years postoperatively. Figure 1 shows an ideal result on

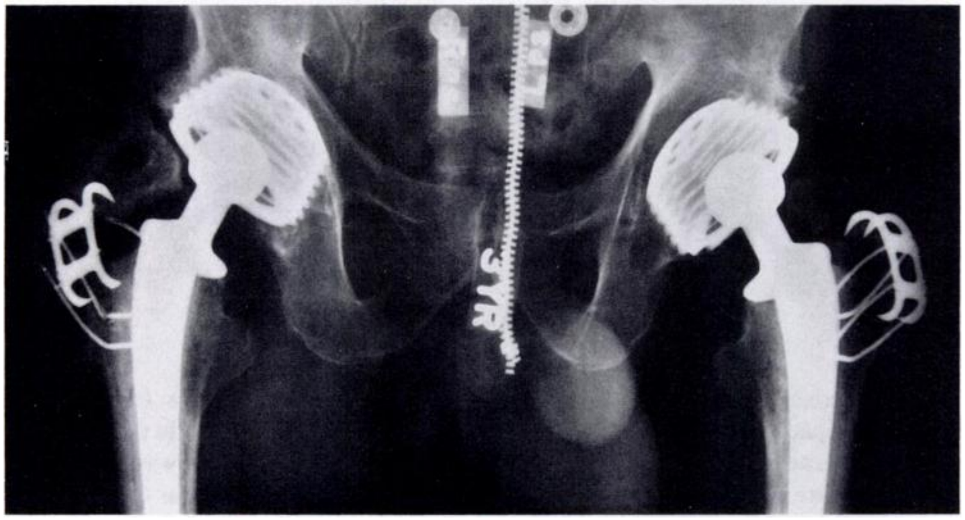

Fig. 1

Radiograph three years after bilateral hip replacement, using cables through the cement. The cable grip apparatus on the right has broken, and the trochanter has displaced.

the left with no cable breakage and complete union of the greater trochanter. On the right, the cable is broken and there is trochanteric nonunion.

The results of the study are given in Table I. Thirteen hips (32.5%) showed cable breakage and there was a higher incidence of breakage in cables threaded through the femoral canal ($p < 0.01$, two-tailed Fisher's exact test).

Table I. Results in 40 hips after using stainless steel cables to fix the greater trochanter

	Cable		
	Broken	**Intact**	**Significance**
Cable through cement	11	8	$p<0.01$
Cable round femur	2	19	
Trochanter union	2	23	$p<0.01$
Trochanter nonunion	11	4	

DISCUSSION

The cable grip system of Dall and Miles (1983) was designed to improve fixation and stability. Traditional fixation techniques with monofilament wire have often been associated with breakage and nonunion. Schutzer and Harris (1988) reported wire breakage in 27% of 188 hips followed for at least two years. Clarke, Shea and Bierbaum (1979), reported 33.2% failure in 277 hips and Ritter, Gioe and Stringer (1981) found 33.5% breakage in 635 hips after three years.

Dall and Miles (1983), describing their cable system, reported only 3.1% breakage in 130 hips. In our series, however, the incidence of cable breakage (32.5%) was comparable to that reported for monofilament wires.

Our high incidence could be related either to the environment or to the composition of the cables. The higher incidence of breakage in cables threaded through the cement in the femoral canal could be due to contact between the stainless steel of the wire and the titanium alloy prosthesis. This might produce a galvanic reaction, weaken the fibres and facilitate breakage. However, we took great care to avoid metal-to-metal contact and a more likely factor is the disposition of the cables. A cable threaded through the canal must bend through two sharp angles at the sites of the drill holes, while a cable looped around the outside of the femur follows a smooth curve with no acute angles. Stainless steel has a relatively low fatigue strength, so acute bends may weaken the strands of the cable.

Both possible factors could be resolved by using a different metal and looping it round the femur. Since October 1989 the senior author has used looped vitallium cables in 22 hips. There have been signs of cable breakage at follow-up in only one case, in which one of two cables broke. The other cable held and the trochanter united. The modification of the cable grip system seems to be a more reliable method of fixation.

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REFERENCES

Clarke RP Jr, Shea WD, Bierbaum BE. Trochanteric osteotomy: analysis of pattern of wire fixation failure and complications. *Clin Orthop* 1979; 141:102-10.

Dall DM, Miles AW. Re-attachment of the greater trochanter: the use of the trochanter cable-grip system. *J Bone Joint Surg [Br]* 1983; 65-B:55-9.

Ritter MA, Gioe TJ, Stringer EA. Functional significance of nonunion of the greater trochanter. *Clin Orthop* 1981; 159:177-82.

Schutzer SF, Harris WH. Trochanteric osteotomy for revision total hip arthroplasty: 97% union rate using a comprehensive approach. *Clin Orthop* 1988; 227:172-83.