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Range of movement poor index of hip function

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Conventional systems of assessing the hip before and after surgery use the range of movement as an indicator of functional results. We found that the range of movement, defined as the flexion arc or the total range, is a poor indicator of function as measured by ability to reach the feet. A different and more direct basis for assessing function is proposed.

The accurate assessment of patients before and after hip surgery is essential if surgical procedures are to be evaluated critically. Most established systems record pain, walking distance, often some form of functional assessment, and the range of movement at the hip (Grade 1947, Merle d'Aubigné and Postel 1954, Shepherd 1954, Larson 1963, Harris 1969). The importance of measuring pain and walking distance is self-evident, but the measurement of the range of movement is really only of value if it can be shown to correlate with function of the hip joint. Over the years, we have come to feel that this relationship is not as clear as might be expected, and we have therefore examined to what extent, if any, the range of movement measured clinically after hip surgery predicts function as measured by ability to reach the feet.

Methods

All the patients who have had their hips replaced under the senior author's care are examined clinically at The London Hospital on the anniversary of their operation. At this time a standard form is completed by an orthopedic surgeon at senior registrar or consultant level or the equivalent. The range of movement in all three arcs (flexion/extension, abduction/adduction, and internal/external rotation) is recorded. Patients are asked if they can reach their feet for the purpose of pedicure, and their replies are classified into three groups: those who can do so with ease, with difficulty, and those who are unable to do so. A note is made as to whether or not any disability noted is to be attributed to other abnormalities (e.g., stiffness in the lumbar spine or in the knee). We have subjected the results to *discriminate analysis* (Mardia et al. 1973). This technique enables a prediction to be made for each patient on the basis of the flexion/extension arc and of the total range, as to whether or not they would be expected to reach their feet with ease, with difficulty, or not at all.

From these data, we have been able to correlate the flexion/extension arc, the sum of all three arcs (the total arc), and the patient's ability to reach his ipsilateral foot.

Patients

A random sample of 100 patients who had undergone hip replacement with a minimum follow-up of 1 year were reviewed. Three patients were found to be incapacitated by factors other than their operated on hip, and they were therefore excluded from further study. Thus, there were 97 patients available for review comprising 35 men and 62 women of whom 80 had arthrosis and 17 rheumatoid arthritis. Their mean age was 61 (37–82) years.

Results

As might be expected, patients who could reach their feet had, in general, a better range of movement than those who could not do so (Table 1). This was true whether the flexion/extension range was considered in isolation or whether the total range of movement was measured. Results presented as in Table 1, however, do not demonstrate the power with which either measure-

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ment of the range of movement can predict a given individual's ability to reach his feet, because the scatter in the values for the range of movement in any one group is so wide as to make accurate prediction impossible. The flexion and the total arcs correctly predicted the patient's hip function in only 49 out of 97 hips and 42 out of 97 hips, respectively (Table 2). Thus, the flexion/extension arc formed a slightly better basis for this prediction.

Discussion

The poorly observed prediction of the patient's recorded ability to reach the foot from the measured range of movement is perhaps attributable to misunderstandings between the patient and the surgeon when enquiring about functional capacity and the well-known inaccuracies involved in measuring range of movement. It should, however, be noted that these observations were made by experienced orthopedic surgeons making the assessment with the questions and the data set out on a standard form. Both the patients and the surgeons spoke fluent English.

It appears to us pointless to base assessment of hip function on the measured range of movement. It would be easier, more accurate, and probably more relevant simply to ask the patients how easily they could reach their foot. The responses to such a question could be split into four or even six categories in the same way as is used, e.g., for pain. Thus, if a four-category method were to be employed, the responses could, for example, be split into 1) patients who could reach their foot with ease and cut their toenails; 2) patients who could reach their foot, but not with ease, and could not cut their toenails; 3) patients who could reach only to their ankle; and 4) patients who could reach only to their knee.

Table 1. Ability to reach feet and range of hip movement in 97 patients. Figures are mean (SD) degrees

Reach feet	Group	No.of hips	Range of movement	
			Flexion/extension	Total
With ease	I	37	105 (13)	172 (28)
With difficulty	II	47	96 (12)	149 (37)
Unable	III	13	84 (10)	131 (16)

Table 2. The predicted and actual number of patients in each group (see Table 1) on the basis of their flexion/extension arc

Group	Actual number	Predicted number		
		I	II	III
I	37	25	12	0
II	47	17	20	10
III	13	0	9	4

Table 3. The predicted and actual number of patients in each group (see Table 1) on the basis of their total arc of movement

Group	Actual number	Predicted number		
		I	II	III
I	37	23	12	2
II	47	18	10	19
III	13	0	4	9

It might be objected that the ability to reach the foot is not dependent purely on hip function: it obviously depends on the mobility of the knee, of the lumbar spine, and on a number of other factors. However, exactly the same objections can be raised with regard to pain (where pain in the region of the hip might, for example, originate in the lumbar spine) or the distance walked (where limitations may be due to a multitude of factors other than the hip itself). In practice only three of our hips had to be discarded because of the presence of some other factor that obviously interfered with the ability to reach the foot.

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