A Method for Determining Success Following Total Hip Replacement Surgery

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Success following a total hip replacement surgery has been frequently reported. There are a number of factors that should be evaluated in the determination of a successful surgery. Some of these factors might include the absence of pain, ambulation without aids, an increased range of motion of the hip, and increased functional gains. If a method for determining success of a total hip replacement surgery could be developed, then the potential influence of various patient factors such as age, sex and personality variables could be investigated, Patient factors that adversely influence surgery could then be determined and systematically studied so that their effects might be minimized.

In a previous paper[3] a hip evaluation form similar to that described by Merle d' Aubigne and Postel[2] and Charnley[1] was evaluated which consisted of 4 measures: pain, ambulation, range of motion and function. The authors concluded that there was sufficient agreement between raters on these measures to consider the hip evaluation form statistically reliable. By using this form, or any similar form readily available to the reader, criteria for a successful surgery might then be established. The purpose of this study, therefore, is to see if through the rating of an orthopedist we can statistically differentiate between groups of total hip replacement patients that differ in terms of relative success from surgery. If so, then, we can possibly determine if there are other patient factors which may be the cause for the poor result if there are no signs of loosening or infection.

MATERIALS AND METHODS

One hundred ninety-one consecutive private patients who underwent a total hip replacement at Indiana University Medical Center provided the population for this study. Forty of these patients (21%) either did not wish to participate in the study or else they had incomplete data. This resulted in 151 midwestern patients being included in this study, of whom 53 were men and 98 were women. The hip evaluation form was initially administered at least 2 weeks prior to the surgery. The Minnesota multiphasic personality inventory (MMPI) and the hip evaluation form were then administered at least 12 months postoperatively. The presence of any postoperative complications as well as demographic variables such as age, education, marital and employment status were also recorded on each of the patients.

Of the 4 hip evaluation measures, ambulation and range of motion were felt to be influenced by variables unrelated to the success of the surgical procedure, such as non-union, muscle atrophy, ectopic ossification, or previous surgical scarring. Therefore, it was decided, prior to this

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TABLE 1. The Product-Moment Correlations for 98 Women On Hip Evaluation Form Measures One Year Following Surgery

	Pain	*Ambulation*	*Range of Motion*	*Functional Handicap*
Pain	—			
Ambulation	.44***	—		
Range of motion	.15	.42***	—	
Functional handicap	.52***	.83***	.50***	—

*** $p < 0.001$.

study, that a combination of pain and functional evaluation measures would best reflect the success of surgery. On the hip evaluation form[3] a rating of 5 for pain would indicate slight or occasional pain while a rating of 6 would indicate no significant pain. For the functional evaluation measure a rating of 5 indicates work with extensive walking and standing, most housework, but unable to do all that a patient would normally do for his or her age. A rating of 6 indicates full physical labor, heavy housework, and all those activities that the patient would normally do for his or her age. Therefore, it was decided that a "good response" to surgery would consist of a rating of 6 for both pain and function or a rating of 6 on one of these variables and a rating of no less than 5 on the other. Those patients who did not meet these requirements were designated as "not-as-good response" to surgery. The group designations were made from the hip evaluation forms given one year following surgery.

RESULTS

Before the presurgery hip evaluation form and demographic data were examined, the interrelationships among the 4 hip evaluation measures taken one year following the hip replacement surgery were assessed by means of a product–moment correlation to determine possible relationships. Table 1 contains the correlation coefficients for the women. As can be seen, the hip evaluation measures following surgery were *not* independent of each other, with the exception of the relationship between pain and range of motion. The corresponding results for the men are shown in Table 2. All 4 hip evaluation measures, following surgery, were interrelated with a positive correlation between each of the measures. In summary, a high rating on one measure following surgery was associated with high ratings on the other measures even though these measures reflected different aspects of the patients' function.

Using the criteria for the "good response" and the "not-as-good response,"

TABLE 2. The Product-Moment Correlations for 53 Men On Hip Evaluation Form Measures One Year Following Surgery

	Pain	*Ambulation*	*Range of Motion*	*Functional Handicap*
Pain	—			
Ambulation	.58***	—		
Range of motion	.40**	.35*	—	
Functional handicap	.55***	.78***	.38**	—

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

TABLE 3. The Demographic Variables for the Two Surgery Groups of Men and Women

Demographic Variables	Women		Men	
	Good Response (N = 65)	*Not as Good Response (N = 33)*	*Good Response (N = 36)*	*Not as Good Response (N = 17)*
Age	66.06	62.94	64.80	65.23
Education	12.71	12.18	11.78	9.23*
Marital status married	46%	51%	89%	82%
Employment status retired	63%	42%	44%	82%*

* $p < 0.05$.

which were determined prior to the study, 65 women were designated as being in the "good response" to surgery group, while 33 were in the "not-as-good response" group. For the men, 36 men were classified as "good response" and 17 men were classified as "not-as-good response" to surgery.

The demographic data for the 2 groups of surgery patients are shown in Table 3. There were no significant differences between the 2 groups of women in regard to their age, education, marital or employment status. For the men, however, there was a significant difference on 2 of the variables. The men in the "not-as-good response" to surgery group had less education and more of these men were retired.

Next, the presurgery hip evaluation form measures were examined to evaluate whether the patient's level of functioning prior to the operation was related to the success of the surgery. These results are contained in Table 4. As can be seen, there did not seem to be much difference for the 2 groups of women in terms of their ratings on pain, ambulation, range of motion, or functional handicap prior to surgery. There was a difference for the 2 groups of men. The "not-as-good response" group was significantly poorer on 3 out of the 4 measures, suggesting that they had more pain, less ambulation, and greater functional handicaps prior to the surgery.

Each patient's chart was examined following convalescence from surgery for any indications of postoperative complication, such as phlebitis, wound problems, dislocations *etc*. For the women, 45 of the "good responders" (69%) and 17 of the "not-as-good responders" (51%) did not have any

TABLE 4. The Presurgery Hip Evaluation Form Measures for Two Surgery Groups of Men and Women

Hip Evaluation Form Variables	Women		Men	
	Good Response (N = 65)	*Not as Good Response (N = 33)*	*Good Response (N = 36)*	*Not as Good Response (N = 17)*
Pain	2.85	2.91	3.36	2.76*
Ambulation	3.45	3.27	3.89	3.35*
Range of motion	3.01	3.24	3.31	3.53
Functional handicap	3.01	2.97	3.75	3.06**

* $p < 0.05$. ** $p < 0.01$.

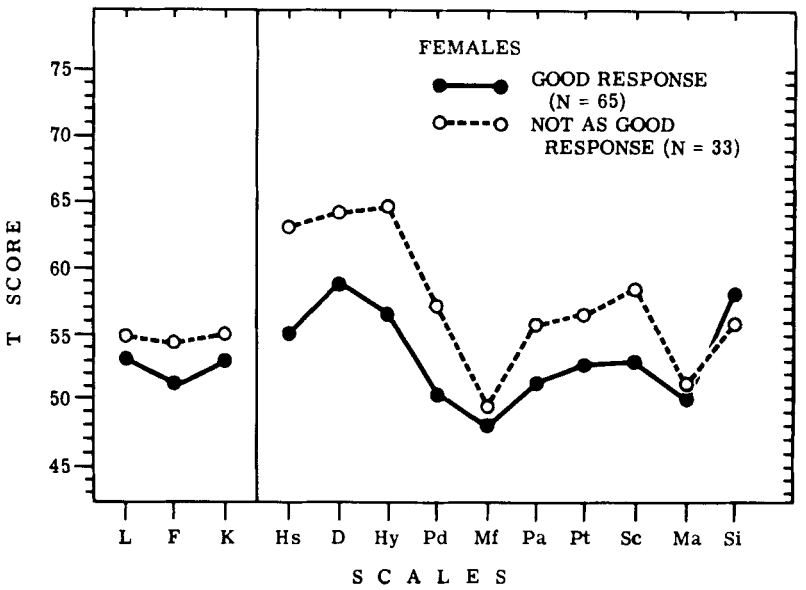

FIG. 1. The graphic results of the two female groups of total hip replacement patients. F, D, Pa and Pt: $p < 0.05$. Pd, and Sc: $p < 0.01$. Hs and Hy: $p < 0.001$. Abbreviations: lie (L), infrequency (F), correction (K), hypochondriasis (Hs), depression (D), hysteria (Hy), psychopathic deviate (Pd), masculinity - feminity (Mf), paranoia (Pa), psychasthenia (Pt), schizophrenia (Sc), hypomania (Ma), social introversion (Si).

complications ($z = 1.72$, $p < .10$). For the men, 25 of the "good responders" (69%) and 10 of the "not-as-good responders" (59%) did not have any complications ($z = 0.45$, n.s.). Thus, there were no significant differences between the 2 groups in terms of postoperative complications.

The MMPI results for the women can be seen in Figure 1. There was a difference between the 2 groups on both the vector of validity scales ($F(3,94) = 3.60$; $p < 0.05$) and the vector of clinical scales ($F(10,87) = 2.60$; $p < 0.05$). Differences were found on 8 of the 13 individual MMPI scales. The "not-as-good response" group had higher scores on Infrequency (F), Hypochondriasis (Hs), Depression (D), Hysteria (Hy), Psychopathic deviate (Pd), Paranoia (Pa), Psychasthenia (Pt), and Schizophrenia (Sc) scales. For F, D, Pa, and Pt scales the probability levels were less than 0.05. For Pd and Sc scales the probability levels were less than 0.01 and for Hs and Hy scales the probability levels were less than 0.001. The results suggest that for the women, the "not-as-good response" group had more physical symptoms, more anxiety, depression, and more difficulties in relating to other people than the "good response" group.

For the men the comparable results for the MMPI are shown in Figure 2. There was no significant difference between the 2 groups on the vector of validity scales ($F(3,49) = 0.40$; n.s.) and the vector of clinical scales ($F(10,42) = 0.89$; n.s.). Thus, for the men there were no differences between the 2 groups on the MMPI.

Since the "not-as-good" group may have contained some individuals who did not respond to surgery, any patient who received ratings of less than [illegible] on both pain and function following surgery was designated as having a "poor" response to surgery. There were 6 females and one male who fell into this group. When these were excluded from the analyses the previously reported results remain unchanged.

DISCUSSION

The method for determining success of surgery following total hip replacement in this study consisted of selecting values on the hip evaluation form which would be consistent with the outcome of successful surgery.

The findings, using this method of determining success, represent a different set of

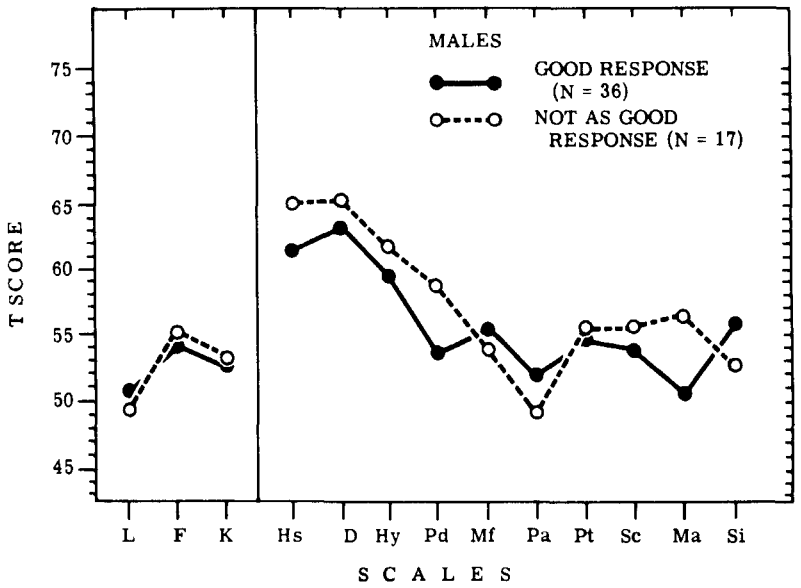

FIG. 2. The graphic results of the two male groups of total hip replacement patients. There is no significant differences between the two groups. Abbreviations: lie (L), infrequency (F), correction (K), hypochondriasis (Hs), depression (D), hysteris (Hy), psychopathic deviate (Pd), masculinity-feminity (Mf), paranoia (Pa), psychasthenia (Pt), schizophrenia (Sc), hypomania (Ma), social introversion (Si).

results as a function of the sex of the patient. For men, education and employment status as well as their hip evaluation measures, prior to surgery were associated with the outcome of the surgical procedure. For women, only the personality measures obtained following surgery discriminated between the 2 surgical groups. since the personality measures were not administered prior to surgery, it is impossible to determine whether these differences existed prior to surgery, whether they were influenced by surgery, or whether they were the response to the results of the surgery. Patients who received surgery for pain relief were compared with patients who had not received surgery by Sternbach and Timmermans.[4] They found that the surgical patients showed significantly greater reductions on the MMPI on the Hypochondriasis (Hs), Hysteria (Hy), and Hypomania (Ma) scales of the MMPI. In each case the patients who received surgery for pain relief showed the greater reduction of scores. Unfortunately they did not analyze their results as a function of the sex of the patient.

The hip evaluation form is easy to administer and provides a means of comparing different patients as well as the same patient at different times. This form provides the basis for the present method of determining surgical success, It is hoped that this method of determining surgical success will stimulate additional research in this area. At the present time an additional study is being planned to replicate the present findings with another series of total hip replacement patients who will have been administered the hip evaluation from and the MMPI prior to and one year after surgery. This design will provide a means of analyzing the impact of surgery on the personality dimensions. By delineating factors which influence the outcome of surgery, it is hoped that additional techniques may be utilized or designed which would eventually result in an increase in the number of patients which would demonstrate a "good response" to surgery.

SUMMARY

The success of a total hip replacement surgery, using the hip evaluation form, was investigated in 2 groups of surgical patients which differed in terms of relative success of surgery. For the men, the group which did not respond as well to surgery had less education and were more retired individuals;

this group also had more pain, less ambulation, and greater functional handicaps prior to surgery. For the women, there were no significant differences between the groups with regard to the demographic variables and the hip evaluation measures prior to surgery. The Minnesota multiphasic personality inventory administered following surgery suggests that the women who did not respond as well to surgery had more physical symptoms, anxiety, depression, and difficulties in relating to people.

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