

EDITORIAL

# THE NEED TO ACCOUNT FOR PATIENT ACTIVITY WHEN EVALUATING THE RESULTS OF TOTAL HIP ARTHROPLASTY WITH SURVIVORSHIP ANALYSIS

In 1980, Dobbs<sup>1</sup> introduced the statistical technique of survivorship analysis in the setting of total hip arthroplasty. We expanded upon the need for survivorship analysis in this setting in 1986<sup>2</sup>, and today survivorship analysis is the standard technique for any long-term statistical analysis of the results of total hip arthroplasty. As with any statistical technique, however, a proper evaluation can only be performed after accounting for all of the factors that may have contributed to implant failure.

This issue of *The Journal* contains an article by Dr. Crowther and Dr. Lachiewicz that discusses the excellent survival of a porous-coated acetabular component in patients who were less than fifty years old at the time of surgery. The results of total hip arthroplasty in younger patients are important because, in the literature published both prior to and following the use of survivorship analysis, patient age at the time of surgery has always been one of the most important prognostic factors in the prediction of early revision of the prosthesis. The question still remains, however, as to why patient age is so important. As there has never been a convincing biological explanation for this association, the assumption has always been that patient activity was the real variable that accounted for most of the effect of age on the durability of the prosthesis.

This supposed relationship between patient activity and prosthetic survival is further supported by the fact that the duration of prosthetic survival can vary widely among patients of the same age. Thus, an evaluation of patient activity, even in younger populations, should be considered a crucial step when comparing prostheses. A very inactive patient might well have a prosthesis that lasts more than twenty years, whereas a very

active patient with the same prosthesis might need a revision within the first ten years. Thus, measurements of patient activity are crucial for a proper understanding and evaluation of the results of any long-term study of total hip arthroplasty.

Even though all of the patients in the study by Crowther and Lachiewicz were young, they clearly had different activity levels. Twelve (27%) of the forty-four patients had a bilateral implant, twenty-seven (61%) were female, and seven (16%) had undergone additional procedures for reasons other than acetabular loosening. The activity levels of these patients were undoubtedly heterogeneous. How could the results of this study be compared with those of a hypothetical study of unilateral total hip arthroplasty in which 70% of the patients were male and 20% participated in some type of sports activity?

One of the major problems in the comparison of observational studies today is that there is no good existing measure of activity that can be easily used to evaluate patients over time. Since the early 1980s, surgeons at the University of California at Los Angeles have routinely estimated patient activity at every clinical follow-up visit with use of a 10-point scale<sup>3</sup>. Unfortunately, although this scale is helpful, it has not proven to be precise enough to account for the relationship between age and revision. Kilgus et al.<sup>4</sup> evaluated the effect of sports activity following total hip arthroplasty and found that there was some correlation between participation in impact sports and early revision, but the subdivision of patients clearly was not refined enough. Other authors who have evaluated the relationship between activity and revision have reported varying results<sup>5,6</sup>. Recently, Zahiri and colleagues<sup>7</sup> found a strong correlation between the number of steps per day as recorded with use of a pedometer and the level of patient activity as assessed with other methods. However, since patient activity is not static, any attempt to incorporate patient activity into an analysis of total hip arthroplasty must be flexible enough to allow for multiple readings over time. Future evaluation of new



bearing materials and existing or new implant designs will be easier and more efficient if there is an assessment of both loading cycles and impact.

Thus, it is clear that a more precise and formal method of evaluating patient activity will be needed in order for investigators to make fair comparisons between the results of procedures performed with different prostheses or under different surgical conditions. In order for investigators to more objectively evaluate patient activity over time, some type of validated patient questionnaire will be needed to more accurately adjust for patient activity in any statistical analysis. If such an evaluation of patient activity were available at several time-points, that variable could be used in a time-dependent way when comparing different prostheses, especially with reference to different patient populations.

The quantification of patient activity is a challenging goal that involves at least two steps: (1) collection of relevant data regarding all aspects of patient activity (including the nature of the activity and the frequency, duration, and intensity of participation) and (2) a summary score that reflects the relative weight of all of the different aspects of activity.

In the development of such a questionnaire, the various aspects of activity must be considered. Besides professional and social activities, recreational activities (including sports)

seem to account for an increasingly important part of patient activity following total hip arthroplasty. In 1994, Wright et al.<sup>8</sup> found that patients rated the resumption of such activities as their highest priority after the elimination of daytime pain and the return to normal walking function.

The development of a validated questionnaire will allow for more frequent patient input regarding their activity level. Today, the use of such questionnaires is facilitated by modern means of communication such as the Internet. The availability of the Internet allows for an easier data-collection process, which will be necessary if we are to obtain patient data over time as will be required. Without these tools, we will continue to compare apples and oranges in the observational studies that are the norm of the orthopaedic literature.

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