Predicting Short Term Outcome of Primary Total Hip Arthroplasty: A Prospective Multivariate Regression Analysis of 12 Independent Factors

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Introduction: Total hip arthroplasty (THA) is a widely performed procedure for the treatment of osteoarthritis, osteonecrosis, rheumatoid arthritis, and hip dysplasia. However, despite the advances made in past decades, not all patients receive enhanced mobility and return to comfortable, independent living after THA. Therefore, it would be beneficial to both surgeons and patients to be able to predict short term outcomes for THA. The purpose of this study was to investigate factors affecting the short-term outcome of primary THA and then develop a multivariate regression equation that can predict the short term outcome of primary THA.

Materials and Methods: This was a prospective study of 101 patients who underwent primary THA between October, 2001 and February, 2007. All patients were followed for a minimum of 1 year. 12 independent variables, including age, gender, diagnosis, the presence of preoperative comorbidities, BMI, preoperative Physical Component (PC) score of the Western Ontario and McMaster University Osteoarthritis Index (WOMAC), type of anesthesia, type of fixation, surgical time, estimated blood loss, the use of a postoperative drain, and length of stay were analyzed using correlation and multivariate regression analyses. The predicted WOMAC PC score at a minimum of 1 year postoperatively served as the primary short term outcome in the regression analysis.

Results: Correlation analyses showed three variables significantly influence short term THA outcome. These include preoperative WOMAC PC score (PC, r = 0.4384, p<0.0001), gender (G, r = -0.2393, p = 0.0159) and the presence of preoperative comorbidities (MB, r=0.22357, p = 0.0246). By multivariate regression analysis, the following regression equation was obtained:

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\text{Outcome} = PC\times0.45 - G\times9 + MB\times8 + 62
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Least squares analysis of this regression equation resulted in an R^2 value of .253. However, the average predicted outcomes did not differ significantly from observed outcomes at a minimum of one year postoperatively (p = 0.7805).

Discussion: Our results indicate that preoperative WOMAC PC score is the most important predictor for THA outcomes. Patients with better preoperative scores have better outcomes. This suggests that THA should be performed during the early stages of hip disease, when surgical candidates still have a moderate degree of physical function. The greater improvement found in males versus females following THA is in agreement with previous studies. Many believe this is due to the fact that women are treated with THA during the more advanced stages of hip disease. However, in our study, there was no significant difference between genders in terms of their preoperative WOMAC PC scores. Therefore, gender clearly has a role in THA outcome. The observation that patients with preoperative comorbidities have poorer short term outcomes is consistent with previous studies. Careful management of certain comorbidities before surgery may help to improve short term THA outcomes. Finally, when considering the combined effect of the above factors, our regression equation can be used to predict outcomes for THA at a minimum of one year postoperatively with moderate accuracy.

Conclusion: Preoperative WOMAC PC score, gender and the presence of preoperative comorbidities are three factors which significantly affect the short term outcome of primary THA. Our multivariate regression equation can be used to predict the general short term outcome of primary THA.

![Fig 1A: WOMAC physical component score improved significantly after surgery (P<0.0001).](image)

![Fig 1B: correlation analysis showed preoperative PC score influences the outcome significantly (r=0.4384, p<0.0001).](image)

![Fig 1C: Significant differences were observed between patient with and without preoperative comorbidities (P=0.0246) and Fig 1D: between males and females (P=0.0159).](image)

Figure 2: Exhibits good correlation between actual follow up WOMAC PC score and predictive WOMAC PC score with the derived multivariate equation (series 1: real outcome, series 2: predictive outcome)