Interpret with Caution: Randomized Controlled Trials Comparing Cemented versus Press-Fit Hemiarthroplasty in Geriatric Patients with Intracapsular Hip Fractures are Statistically Fragile with High Loss to Follow Up

Mary Lou[1], Matthew Quinn[2], Eleanor Burstein[3], Patrick Morrissey[3], Eric Matthew Cohen[4]
[1]The Warren Alpert Medical School of Brown University, [2]Department of Orthopaedic Surgery, Brown Universit, [3]Brown University, [4]UNIVERSITY ORTHOPEDICS

INTRODUCTION: Displaced intracapsular hip fractures in the geriatric population carry a high social and medical burden for patients and institutions with estimates approaching 6 million fractures annually by 2050. Hemiarthroplasty is often the treatment of choice, but debate persists in the literature as to whether the implant should be fixed in the femur with a cemented (CHA) or press-fit (PFHA) method. As randomized control trials (RCTs) covering this topic have significant clinical importance, this study evaluates the statistical fragility of RCTs to improve interpretation of these studies in clinical decision-making.

METHODS:

RCTs published up to May 2024 comparing PFHA and CHA in the management of intracapsular hip fractures were identified systematically through the PubMed database. For each article, counts of mortality, periprosthetic fracture, dislocation, and revision within 1 year for both cemented and non-cemented groups were extracted. The fragility index (FI) was calculated as the number of event reversals needed to alter significance for a variable. FIs were obtained for both PFHA and CHA cohorts, with the lowest value used as the index for that study. The fragility quotient (FQ) was computed by dividing FI by the study sample size. Significance for each of the variables was determined using a 2x2 contingency table and Fisher's exact test, with $p < 0.05$ determined to be significant. A study was defined as statistically robust if it had an FI greater than its described loss to follow-up (LTF) of patients.

RESULTS:

A total of 11 RCTs were identified, representing a total of 2,764 patients (1,386 CHA and 1,378 PFHA). There were no significant differences in mortality, dislocation, or revision between CHA and PFHA cohorts for all studies included. Median number of LTF patients was 28 (IQR 10-194). Only 3/11 studies had cohorts with significant differences in periprosthetic fractures. For mortality, 10/11 studies were statistically fragile, with an overall median of 7 (IQR 5 – 8) and median FQ of 0.08 (IQR 0.02 – 0.12). Data on periprosthetic fractures (median FI 4.5, IQR FI 2-5; median FQ 0.04, IQR FQ 0.02 – 0.08), revisions (median FI 5, IQR 3 – 6; median FQ 0.03, IQR 0.02 – 0.06), and dislocations (median FI 5, IQR 3 – 6; median FQ 0.04, IQR 0.02 – 0.06) were also fragile in comparison to number of LTF patients. LTF numbers were noted to be high in multiple RCTs due to mortalities and the degree of cognitive impairment of patients included.

DISCUSSION AND CONCLUSION: Results from recent RCTs comparing CA versus PFHA must be interpreted with caution as differences in the mortality, periprosthetic fracture, dislocation, and revision rates are statistically fragile with loss to follow up rates that exceeded the FI.