

Do patients in their 90th decade of life have more complications and readmissions than those in their 80th decade of life following primary total hip arthroplasty?

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INTRODUCTION:

In recent years, demographic changes have been reported with a continuing trend towards an increasingly aging population. The performance of total hip arthroplasty (THA) in elderly patients, especially nonagenarians, is challenging due to higher patient frailty and medical comorbidities. The purpose of this study was to compare 90-day postoperative complications and unplanned readmissions between nonagenarians and octogenarians undergoing elective THA.

METHODS:

We retrospectively analyzed 2,573 patients who underwent primary THA at our institution between January 2016 and December 2021. Only patients with a preoperative diagnosis of primary hip osteoarthritis between 80 and 99 years of age, with a minimum follow-up of 14 months, were included. Patients with bilateral THA, tumoral pathology, revision surgery, fractures or history of previous surgery were excluded.

One hundred and eleven patients were finally included and were divided into 2 groups. Forty-four patients were nonagenarians (Group A) and 67 patients were octogenarians (Group B). Demographic data included age, gender, body mass index (BMI), ASA score and Charlson Comorbidity Index (CCI). Frailty was defined according to the Rockwood Frailty Index. All patients underwent a thorough preoperative assessment through a specific institutional clinical pathway created for this matter.

Postoperative adverse events were grouped into major (grades III to V) or minor (grades I and II) as stated by the modified Clavien Dindo classification (C-D). A readmission was defined as an "all-cause" episode of new hospital admission within 90 days of discharge. Patient survival was evaluated up to 2 years of follow-up. A regression model was used to evaluate independent risk factors for the development of complications.

RESULTS:

Demographic variables

There were no differences in the ASA score (65.9% vs. 53.7% ASA III-IV), prevalence of frailty (1% vs. 9%) and comorbidities between both groups ($p > .05$). A significant difference was observed between both groups when comparing those patients with ADL 6/6 points, with 47 (84.1%) in group A and 37 (55.2%) in group B ($p = 0.02$), preoperative CCI (mild: 0 vs. 3%; moderate: 56.8% vs. 79%; severe: 2.3% vs. 9%; $p = 0.007$), preoperative hematocrit (38 [IQR 35-40] vs. 39 [IQR 37-42]; $p = 0.016$) and length of stay (3 [IQR 2-4] vs. 2 [IQR 2-3]; $p = 0.004$). The median follow-up of the series was 28 months (14-47).

Analysis of postoperative complications

In general, 9 in-hospital complications were recorded (8 in group A vs. 1 in group B; $p = 0.002$). Although nonagenarians had more in-hospital complications, most were minor ($p = 0.002$), none of which resulted in mortality. Postoperative complications at 90 days did not show statistically significant differences between both groups, with a total of 10 complications, 4 (9.1%) and 6 (9%) for group A and B, respectively; $p = 1$ (Table 2)

Readmissions

There were 6 unplanned readmissions, 2 (4.5%) in nonagenarians and 4 (6%) in the control group; $p = 1$. In the nonagenarian's group, 1 patient (2.3%) presented a deep infection, treated with debridement, antibiotics, irrigation, and implant retention, and a transient ischemic attack (TIA) (2.3%). In the control group, there was 1 (1.5%) deep infection treated with debridement, antibiotics, irrigation, and implant retention, 1 (1.5%) prosthetic dislocation treated with closed reduction, and 2 (3%) PPF B2 treated with osteosynthesis.

Postoperative mortality

Mortality at 90 days was 0% in both groups. At 14 months of follow-up, it was 4.5% in Group A and 5.9% in Group B. Implant survival was 100% at the end of follow-up.

Logistic regression analysis for complications

Univariate regression analysis, age over 90 years (OR 3.81 95% CI 1.31 to 11.11, $p = 0.014$), severe CHF (OR 3.23 95% CI 1.14 to 9.13, $p = 0.027$), ASA III and IV (OR 4.30 CI 95% 1.17 to 15.85, $p = 0.0280$) and preoperative Ht. (OR 0.83 CI 95% 0.71 to 0.98, $p = 0.025$) were associated with greater probability of presenting postoperative complications. However, these lost significance after adjusting for confounding factors in the multiple regression model (OR 2.48 IC 95% 0.78 a 7.90, $p = 0.125$) (Tables 3 and 4)

DISCUSSION AND CONCLUSION:

The age of 90 years old was not a barrier to perform elective THA safely. Nonagenarian patients had longer hospital stays and were more likely to develop complications during hospitalization than octogenarians after primary THA. Many of the

complications developed were minor, such as superficial infection, urinary tract infection, blood transfusion and hematoma. Despite these findings, age over 90 years was not an independent risk factor for unplanned readmissions or mortality. Multimodal protocols of perioperative care are paramount for improving outcomes after THA in very old patients.

Table 1: Demographics of the series.

Variable	Group A (n=90)	Group B (n=97)	P-Value
Median Age ± (QR)	90 (90-92)	82 (81-82)	<0.001
Female sex § (%)	36 (40.0)	40 (41.2)	0.12
BMI* (kg/m ² ±SD)	27.32 (4.57)	28.06 (3.98)	0.367
ASA III and IV † (%)	29 (32.2)	36 (35.7)	0.203
ADL‡ § (%)	37 (41.1)	37 (35.2)	0.002
Fragility Scale § (%)			0.30
Non-Fragile	21 (23.3)	17 (16.2)	
Pre-Fragile	21 (23.3)	24 (23.8)	
Fragile	4 (4.4)	6 (5.9)	
CCI † (%)			0.007
Mild	0 (0)	2 (2)	
Moderate	25 (27.8)	53 (51.9)	
Severe	19 (21.1)	12 (11.7)	
Hemostasis †			0.016
Preoperative	18 (20.0)	19 (17.4)	
Postoperative	23 (25.6)	23 (22.7)	
Pre-Post Difference	5 (5.6)	4 (3.9)	
Median Length of stay (days, IQR)§	1 (2-4)	2 (2-3)	0.004
Median Surgical Time †	60 (60-73)	60 (60-70)	0.988
Comorbidities § (%)			
Hypertension	38 (42.2)	59 (58.1)	0.792
Diabetes	4 (4.4)	8 (7.9)	0.636
Cardiovascular	19 (21.1)	17 (16.4)	0.550
Respiratory	7 (7.8)	6 (5.9)	0.265
Neurological	2 (2.2)	1 (1.0)	0.561
Smoking	4 (4.4)	8 (7.9)	0.636
Oncological	0 (0)	0 (0)	0.528

*Values are expressed as a mean along with the standard deviation in parentheses. † Values are described as median and the interquartile range in parentheses. § Values are presented as frequency and percentage in parentheses.

Table 2: Description of in-hospital and 90-day complications in both groups

Complications	Group A	Modified C-D	Group B	Modified C-D	P-Value
Intraoperative § (%)					
PPF (A2)	1 (2.3)		1 (1.5)		1
In-hospital events § (%)	8 (18.2)		1 (1.5)		0.002
Superficial Infection	1 (8.9)	2 (Minor)			
UTI	1 (8.9)	2 (Minor)			
Transfusion	2 (5.4)	2 (Minor)			
Hematoma	1 (8.9)	1 (Minor)			
90-day Postoperative § (%)	4 (9.1)		6 (9)		1
Superficial Infection	2 (4.5)	2 (Minor)	2 (3)	2 (Minor)	
Deep Infection	1 (2.3)	30 (Major)	1 (1.5)	30 (Major)	
FFP (B2)			2 (3)	30 (Major)	
Dislocation			1 (1.5)	1A (Major)	
TIA	1 (2.3)	4 (Major)			

§ The values are presented as the number of patients, and percentage in parentheses. PPF=Periprosthetic fracture, according to the Vancouver classification (ira and postoperative TIA=Transient ischemic attack C-D=Clavien-Dindo

Table 3: Simple logistic regression analysis for complications (raw odds ratio)

Variable	B	Odds Ratio	95% Confidence Interval	P-Value
Nonagenarians	1.34	3.81	1.31 - 11.11	0.014
CCI (Severe)	1.17	3.23	1.14 - 9.13	0.027
ASA III and IV	1.46	4.30	1.17 - 15.83	0.028
Preoperative Hemostasis	-0.18	0.83	0.71 - 0.98	0.025

CCI= Charlson comorbidity index

Table 4: Multiple logistic regression analysis for complications (raw odds ratio)

Variable	B	Odds Ratio	95% Confidence Interval	P-Value
Nonagenarians	0.91	2.48	0.78 - 7.90	0.125
CCI (Severe)	0.68	1.98	0.63 - 6.24	0.244
ASA III and IV	1.1	3.02	0.76 - 12.02	0.117
Preoperative Hemostasis	-0.13	0.88	0.71 - 1.04	0.125

CCI= Charlson comorbidity index