Perioperative Albumin in TKA: Age and Baseline as Dynamic Predictors

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INTRODUCTION: Previous studies have evaluated preoperative serum albumin (SA) for predicting postoperative complications of total knee arthroplasty (TKA). This study aimed to investigate the dynamics of perioperative SA and changes in SA (ΔSA) and identify any influential patient or surgical factors.

METHODS: In total, 381 patients (483 knees) undergoing primary TKA were recruited (Table 1). SA values preoperatively (SA_0), 1 week postoperatively (SA_{1W}), and 4 weeks postoperatively (SA_{4W}) were investigated. SA values were converted to a percentage of SA_0 and differences between timepoints were calculated and expressed as follows: ΔSA_{1W-0}, ΔSA_{4W-1W}, and ΔSA_{4W-0}. Patient and surgical factors previously identified or with the potential to influence SA were evaluated.

RESULTS: The median values of SA_0, SA_{1W}, and SA_{4W} were 4.4, 3.8, and 4.2 g/dL, respectively; SA_0 was significantly different between groups (p<0.001) (Table 2). The incidence of low SA_0 (<3.5 g/dL) was less than 1%. Median ΔSA values were −13.7%, 9.6%, and −4.5% for ΔSA_{1W-0}, ΔSA_{4W-1W} and ΔSA_{4W-0}, respectively; ΔSA was significantly different between groups (p<0.001) (Table 3). SA_{4W} recovered to 95.5% of SA_0 with less than 2% of patients having low SA_{4W} (<3.5 g/dL). Multiple regression analyses showed SA concentration at each timepoint was significantly associated with the other SA timepoint values; age was significantly associated with SA_{4W} and SA_{1W} (all p<0.001).

DISCUSSION: We identified SA_0 and age as significant factors affecting SA dynamics in the perioperative period. Low SA (<3.5 g/dL) was uncommon both preoperatively and at 4 weeks postoperatively; therefore, conventional cutoff values and preventive measures for low SA may need reconsideration.

SIGNIFICANCE/CLINICAL RELEVANCE: This study highlights that preoperative serum albumin and age are crucial factors influencing perioperative albumin dynamics after TKA, suggesting a need to reconsider conventional low albumin cutoff values and their associated preventive measures due to the rarity of severe postoperative drops.

Table 1 Patient characteristics

	Variables (patients/ knees)	381/ 483
Patient Factor	Sex (Male 63/ 77, Female 318/ 406)	18 [22]/ 79 [88]
	Age (years)	74 [69, 78]
	Body weight (kg), Male/ Female	58 [53,66]
	Body height (cm)	151 [147, 155]
	Body mass index (kg/m^2), Male/ Female	26 [23, 28]
	HSS score	45 [37, 51]
	Comorbidity	
	Hypertension (Yes/No)	301/ 182
	Hyperlipidemia (Yes/No)	95/ 388
	Diabetes Mellitus (Yes/No)	59/ 424
	Smoking history (Yes/No)	24/ 459
Surgical Factor	Operative Time (min.)	55 [50, 62]
	Torniquet Time (min.)	58 [53, 65]
	Total blood loss (ml)	430 [200, 720]

Data are presented as n or median [25th, 75th percentile]. HSS, Hospital for Special Surgery.

Table 2 Distribution of patients between serum albumin concentration ranges at each time point

Serum Albumin Level (g/dL)	Number of Patients (%)		
N (%)	Pre-op*	1 week post-op*	4 weeks post-op*
Median [quasi]	4.4 [4.2, 4.6]	3.8 [3.6, 3.9]	4.2 [4.0, 4.3]
< 3.0	2 (0.4)	3 (0.6)	1 (0.2)
3.0-3.4	2 (0.4)	60 (12.4)	8 (1.7)
3.5-3.9	38 (7.9)	301 (62.3)	93 (19.3)
4.0-4.4	251 (52.0)	117 (24.2)	310 (64.2)
≥ 4.5	190 (39.3)	2 (0.4)	71 (14.7)

* p<0.001 (among three groups) using Friedman test, and each group (p<0.001) using Scheffé's method.

Table 3 Distribution of patients between serum albumin (SA) concentration change ranges expressed as a percentage of preoperative SA

Period; N (%)	ΔAlb ≤ -20 %	-20 < ΔAlb ≤ -10%	-10 < ΔAlb ≤ 0 %	0 % < ΔAlb
(Po 1W- Pre)/ Pre -13.7 (-17.7, -9.5)*	58 (12.0)	291 (60.2)	126 (26.1)	8 (1.7)
(Po4w-Po1w)/ Pre 9.6 (5.7, 13.1)*	0 (0)	1 (0.2)	33 (6.8)	449 (93.0)
(Po 4w- Pre)/ Pre -4.5 (-8.2, -0.2)*	5 (1.0)	80 (16.6)	284 (58.8)	114 (23.6)

* p<0.001 (among 3 groups) by the Friedman's test, and each group (p<0.001) with Scheffé's method