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Routine Preoperative Nutritional Screening in All Primary Total Joint Arthroplasty Patients Has Little Utility

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ABSTRACT

Background: Nutritional optimization before total joint arthroplasty (TJA) may improve patient outcomes and decrease costs. However, the utility of serologic laboratory markers, including albumin, transferrin, and total lymphocyte count (TLC), as primary indicators of nutrition is unclear. We analyzed the prevalence of abnormal nutritional values before TJA and identified factors associated with them.
Methods: We retrospectively reviewed 819 primary cases of TJA performed at 1 institution from January to December 2018. Patient demographic characteristics were assessed for associations with abnormal preoperative nutritional values (albumin <3.5 g/dL, transferrin <200 mg/dL, and TLC <1.5 cells/μL^3). Associations of comorbidities, American Society of Anesthesiologists Physical Status classification, and age-adjusted Charlson Comorbidity Index (CCI) with abnormal values were assessed with logistic regression.
Results: Values were abnormal for albumin in 21 cases (2.6%), transferrin in 26 cases (5.6%), and TLC in 185 cases (25%). Thirteen cases (1.7%) had abnormal values for 2 markers. Age was associated with abnormal albumin and TLC, and race with abnormal transferrin. Congestive heart failure, chronic kidney disease, pancreatic insufficiency, gastroesophageal reflux disease, osteoporosis, dementia, and CCI were associated with abnormal albumin; Parkinson disease and American Society of Anesthesiologists Physical Status with abnormal transferrin; and dementia, body mass index, cancer history, and CCI with abnormal TLC.
Conclusion: We report low prevalence of and a low concordance rate among abnormal nutritional values before primary TJA. Our results suggest that routine testing of all healthy patients is not warranted before TJA.

Preoperative medical optimization to minimize complications and improve clinical outcomes is an important focus in total joint arthroplasty (TJA) [1,2]. Improving outcomes while decreasing costs is the hallmark of value-based care delivery [3]. As a result, areas of patient medical optimization, such as preoperative anemia correction and weight loss, have been studied and standardized at institutions across the United States [4–6].

The relationship between poor nutritional status and poor surgical outcomes is well documented [5,7–10]. Nutritional screening through laboratory tests may help identify patients with malnutrition [8,9], and some authors have advocated for routine nutritional screening before TJA using defined thresholds [10,11]. In orthopedics, nutrition has typically been assessed using serum albumin, transferrin, and total lymphocyte count (TLC) [8]. The prevalence of abnormal nutritional markers in patients undergoing primary TJA is unclear, with reported rates of 3%-50% depending on the marker [12–18]. The involvement of these nutritional markers in fluid balance, liver function, and stress has led some to suggest that they be used as markers of general health as opposed to primary measures of nutritional status [19,20]. As such, these markers

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may be more valuable for determining whether associated patient comorbidities warrant treatment than for indicating nutritional status [21].

Our institution implemented a patient screening protocol for all primary TJA candidates that assesses modifiable risk factors, such as obesity, tobacco use, blood glucose levels, and narcotic use. We screen all surgical candidates using nutritional laboratory markers. In this study, we investigate the value of routine screening for albumin, transferrin, and TLC before primary TJA. Our goals are to assess the utility of this routine screening by determining the prevalence of abnormal values for these markers and to identify the patient factors associated with them. We hypothesized that the rate of abnormal values for nutritional markers would be low and that abnormal values in one marker would not be correlated with others. Furthermore, we hypothesized that abnormal values for each of the 3 markers would be associated with higher comorbidity index values.

Methods

This study was approved by our Institutional Review Board. We performed a retrospective review of preoperative nutritional status, as measured by serologic laboratory markers, among all patients who underwent primary TJA at our institution in 2018. We excluded bilateral procedures, incorrectly coded procedures, and records lacking preoperative albumin or transferrin values.

We identified 827 cases of primary TJA. Of these, 819 cases in 772 patients met our selection criteria and were included in analyses (Table 1). Most procedures were total knee arthroplasty (451 cases, 55%). The mean (±standard deviation) age at the time of TJA was 63 ± 10 years. Mean patient body mass index (BMI) value was 31 ± 5.1, and 57% of procedures were performed for women.

Data Collection

We manually extracted the following data from patient medical records: age, gender, race, BMI value, surgical location (hip or knee), medical comorbidities (Table 1), American Society of Anesthesiologists Physical Status (ASA-PS) classification, age-adjusted Charlson Comorbidity Index (CCI) value [22], preoperative nutritional laboratory values (albumin, transferrin, and TLC), and postoperative complications, which included wound complications (surgical site infection, wound dehiscence, blistering, or drainage), cardiac complications (myocardial infarction, cardiac arrest, or acute exacerbation of congestive heart failure [CHF]), dislocations, urinary tract infection (UTI), acute kidney injury (AKI), thromboembolic complications (deep venous thrombosis, pulmonary embolism), and in-hospital delirium. The outcomes of interest were abnormal values for albumin (<3.5 g/dL), transferrin (<200 mg/dL), or TLC (<1.5 cells/μL^3) [9].

Statistical Analysis

Using Student's *t*-tests with unequal variances, we compared demographic and clinical characteristics, as well as postoperative complication rates between cases with normal vs those with abnormal values for albumin, transferrin, and TLC. Chi-squared and Fisher's exact tests were used for continuous and categorical variables, respectively. ASA-PS class (further categorized as a binary variable, ASA-PS class ≤ 2 or >2) and CCI values were similarly compared between groups. Unadjusted logistic regression with robust standard errors to account for multiple procedures within individuals was used to evaluate associations between each selected comorbidity, ASA-PS class, and CCI value and the odds of abnormal albumin, transferrin, or TLC. Results of the regression analyses are reported as odds ratios (ORs) with 95% confidence intervals (CIs). *P*-values <0.05 were considered significant, and no adjustments were made for multiple comparisons. All analyses were conducted using Stata, version 15, software (StataCorp LLC, College Station, TX).

Results

Prevalence of Abnormal Values

Preoperative albumin, transferrin, and TLC values were available for 795 (98%), 465 (56%), and 733 (89%) cases, respectively. Abnormal albumin was identified in 21 (2.6%), abnormal transferrin in 26 (5.6%), and abnormal TLC in 185 (25%) cases. For the 461 cases (56%) with both albumin and transferrin values available, only 1 case (<1%) had abnormal values for both (Fig. 1). For the 715 cases (86%) with both albumin values and TLC available, 7 (1%) had abnormal values for both. For the 427 cases (52%) with both transferrin values and TLC available, 5 (1%) had abnormal values for both. Of the 423 cases (51%) with all 3 markers available, none had abnormal values for all 3.

Patient Characteristics

Patient characteristics were similar between cases with normal and abnormal nutritional markers, with the exceptions of age for

Table 1
Patient Characteristics Stratified by Preoperative Nutritional Laboratory Markers From 819 Primary Total Joint Arthroplasty Procedures Performed in 2018[a].

Parameter	Overall, n (%) (n = 819)	Albumin, n (%)		*P* Value	Transferrin, n (%)		*P* Value	TLC, n (%)		*P* Value
		Abnormal (n = 21)	Normal (n = 774)		Abnormal (n = 26)	Normal (n = 439)		Abnormal (n = 185)	Normal (n = 548)	
Age (y)	63 ± 10[b]	69 ± 8.4[b]	63 ± 10[b]	<.01	64 ± 10[b]	64 ± 11[b]	.92	66 ± 10[b]	62 ± 10[b]	<.01
Gender										
Male	354 (43)	5 (24)	337 (44)	.07	12 (46)	187 (43)	.72	87 (28)	228 (72)	.20
Female	465 (57)	16 (76)	437 (56)		14 (54)	252 (57)		98 (23)	320 (77)	
Race										
White	589 (72)	17 (81)	554 (72)	.63	9 (35)	313 (71)	<.01	137 (74)	391 (71)	.63
Black	162 (20)	3 (14)	155 (20)		13 (50)	91 (21)		36 (19)	110 (20)	
Other	66 (8)	1 (5)	65 (8)		4 (15)	35 (8)		12 (6)	47 (9)	
BMI (kg/m^2)	31 ± 5.1[b]	31 ± 6.1[b]	31 ± 5.1[b]	.83	31 ± 5.4[b]	31 ± 5.1[b]	.84	30 ± 5.2[b]	32 ± 5.1[b]	<.01
Surgical location										
Hip	368 (45)	12 (3)	352 (97)	.29	11 (5)	205 (95)	.66	90 (49)	238 (43)	.22
Knee	451 (55)	9 (2)	422 (98)		15 (6)	234 (94)		95 (51)	310 (57)	
CCI	2.9 ± 1.9[b]	4.3 ± 2.5[b]	2.8 ± 1.8[b]	.01	3.3 ± 2.3[b]	3.0 ± 1.9[b]	.58	3.4 ± 2.0[b]	2.7 ± 1.8[b]	<.01

BMI, body mass index; CCI, Charlson Comorbidity Index; TLC, total lymphocyte count.
[a] Abnormal values were defined as follows: albumin <3.5 g/dL; transferrin <200 mg/dL; TLC <1.5 cells/μL^3.
[b] Reported as mean ± standard deviation.

albumin and TLC, race for transferrin, and BMI for TLC. Mean age was higher for cases with abnormal albumin (69 ± 8.4 years) compared with those with normal albumin (63 ± 10 years) ($P < .01$). The proportion of non-white patients was larger among those with abnormal transferrin (65%) compared with those with normal transferrin (29%) ($P < .01$). The mean age of cases with abnormal TLC (66 ± 10 years) was older than that of cases with normal TLC (62 ± 10 years) ($P < .01$). Similarly, mean BMI value was lower in cases with abnormal TLC (30 ± 5.2) compared with those with normal TLC (32 ± 5.1) ($P < .01$).

Comorbidities

On logistic regression analyses, the following comorbidities were associated with greater odds of abnormal albumin: CHF (OR 3.9, 95% CI 1.1-14), chronic kidney disease (OR 7.2, 95% CI 2.3-22), pancreatic insufficiency (OR 13, 95% CI 1.1-156), gastroesophageal reflux disease (OR 2.7, 95% CI 1.0-7.0), osteoporosis (OR 7.0, 95% CI 2.5-20), and dementia (OR 13, 95% CI 1.3-130) (Table 2). Only Parkinson disease (OR 5.8, 95% CI 1.1-30) was associated with greater odds of abnormal transferrin. Cancer history (OR 2.2, 95% CI 1.3-3.7) and dementia (OR could not be calculated because all patients with dementia had abnormal TLC) were associated with greater odds of abnormal TLC.

American Society of Anesthesiologists Physical Status Class/Charlson Comorbidity Index Value Associations With Abnormal Laboratory Values

American Society of Anesthesiologists Physical Status Class

Among all cases, most (65%) had an ASA-PS class of 2 (Table 3). Distributions of ASA-PS classifications were not significantly different between the abnormal and normal albumin groups ($P = .16$), abnormal and normal transferrin groups ($P = .72$), or abnormal and normal TLC groups ($P = .85$).

Charlson Comorbidity Index Value

The distribution of CCI values by albumin, transferrin, and TLC values are presented in Figure 2. CCI values were significantly higher in cases with abnormal albumin (mean 4.3 ± 2.5) compared with those with normal values (mean 2.8 ± 1.8) ($P = .01$). Similarly, CCI values were significantly higher in cases with abnormal TLC (mean 3.4 ± 2.0) compared with those with normal values (mean 2.7 ± 1.8) ($P < .01$). No such differences were observed for transferrin values ($P = .58$; Table 1).

Factors Associated With Abnormal Laboratory Values

On logistic regression analyses, higher ASA-PS class was associated with greater odds of abnormal albumin (OR 2.4, 95% CI 1.0-5.8) but not abnormal transferrin (OR 1.4, 95% CI 0.71-2.9) or TLC (OR 1.1, 95% CI 0.77-1.6). However, a 1-point increase in CCI value was associated with greater odds of abnormal albumin (OR 1.4, 95% CI 1.1-1.6) and TLC (OR 1.2, 95% CI 1.1-1.3) but not transferrin (OR 1.1, 95% CI 0.86-1.3). The probability of abnormal albumin, transferrin, and TLC values over the range of CCI values is presented in Figure 3.

Postoperative Complications

Thirty-three of the 819 cases in this study (4%) involved wound complications, which occurred at the highest rate of any postoperative complication. Six cases (0.7%) involved cardiac complications, 3 (0.4%) involved dislocations, 11 (1.3%) involved UTI, 14 (1.7%) involved AKIs, 5 (0.6%) involved thromboembolic complications, and 6 (0.7%) involved in-hospital delirium. Abnormal albumin value was associated with a higher rate of in-hospital delirium

Table 2
Associations Between Comorbidities and Abnormal Preoperative Nutritional Laboratory Markers for 819 Primary Total Joint Arthroplasty Procedures Performed in 2018[a].

Comorbidity	Albumin (n = 795)			Transferrin (n = 465)			Total Lymphocyte Count (n = 733)		
	N (%)	% Abnormal	OR (95% CI)	N (%)	% Abnormal	OR (95% CI)	N (%)	% Abnormal	OR (95% CI)
Alcoholism	17 (2.1)	5.9	2.4 (0.29-19)	11 (2.5)	0	NA	16 (2.2)	25	0.99 (0.30-3.2)
Cancer history	75 (9.4)	6.7	3.1 (0.96-10)	49 (11)	4.0	0.68 (0.16-2.9)	69 (9.4)	41	2.2 (1.3-3.7)
CKD	47 (5.9)	12.8	7.2 (2.3-22)	31 (6.7)	6.5	1.2 (0.26-5.3)	45 (6.1)	33	1.5 (0.78-3.0)
CHF	35 (4.4)	8.6	3.9 (1.1-14)	16 (3.4)	0	NA	34 (4.6)	35	1.7 (0.80-3.4)
CTD	40 (5.0)	2.5	0.94 (0.12-7.3)	24 (5.2)	8.3	1.7 (0.37-7.5)	38 (5.2)	34	1.6 (0.79-3.2)
COPD	111 (14)	5.4	2.5 (0.86-7.6)	68 (15)	5.8	1.1 (0.36-3.3)	92 (13)	21	0.74 (0.43-1.3)
CAD/MI history	79 (9.9)	0	NA	44 (9.5)	3.9	0.37 (0.05-2.8)	72 (9.8)	10	1.1 (0.61-1.9)
Dementia	4 (0.50)	25	13 (1.3-130)	3 (0.65)	0	NA	4 (0.55)	100	NA
Depression	138 (17)	2.7	0.79 (0.22-2.8)	75 (16)	2.7	0.42 (0.10-1.8)	123 (17)	22	0.80 (0.50-1.3)
Diabetes mellitus	129 (16)	1.6	0.54 (0.12-2.4)	68 (15)	5.9	1.1 (0.35-3.2)	122 (17)	24	0.91 (0.57-1.4)
Dysphagia	15 (1.9)	0	NA	12 (2.6)	0	NA	15 (2.0)	33	1.5 (0.50-4.4)
GERD	269 (34)	4.5	2.7 (1.0-7.0)	160 (34)	3.7	0.54 (0.21-1.4)	244 (33)	28	1.2 (0.86-1.7)
Hepatitis C	18 (2.3)	5.6	2.2 (0.27-18)	8 (1.7)	13	2.5 (0.28-22)	18 (2.5)	11	0.36 (0.08-1.6)
HIV/AIDS	9 (1.1)	0	NA	7 (1.5)	14	2.9 (0.32-26)	7 (0.96)	29	1.0 (0.77-1.4)
Hyperlipidemia	397 (50)	2.8	1.1 (0.43-2.8)	237 (51)	6.3	1.3 (0.60-3.0)	371 (51)	24	0.90 (0.64-1.3)
Hypertension	485 (61)	2.9	1.3 (0.49-3.4)	283 (61)	6.4	1.5 (0.64-3.5)	446 (61)	27	1.3 (0.88-1.8)
Hyperthyroidism	6 (0.75)	0	NA	4 (0.86)	25	5.8 (0.49-69)	5 (0.68)	20	0.74 (0.07-7.4)
IBD	9 (1.1)	11	4.8 (0.55-42)	7 (1.5)	17	3.5 (0.36-33)	9 (1.2)	44	2.4 (0.57-10)
Osteoporosis	38 (4.8)	13	7.0 (2.5-20)	23 (4.9)	14	2.9 (0.79-10)	39 (5.3)	33	1.5 (0.76-3.0)
PI	4 (0.50)	25	13 (1.1-156)	2 (0.43)	0	NA	4 (0.55)	0	NA
Parkinson disease	5 (0.63)	0	NA	4 (0.86)	25	5.8 (1.1-30)	5 (0.68)	40	2.0 (0.49-8.0)
PUD	16 (2.0)	0	NA	9 (1.9)	0	NA	14 (1.9)	29	1.2 (0.37-3.8)
PVD	26 (3.3)	3.9	1.5 (0.19-12)	19 (4.1)	10	1.9 (0.43-8.9)	24 (3.3)	25	0.99 (0.39-2.5)
Stroke history	39 (4.9)	2.6	0.97 (0.12-7.5)	25 (5.4)	8.0	1.5 (0.34-6.8)	37 (5.0)	38	1.9 (0.93-3.8)
Vitamin D deficiency	129 (16)	3.1	1.2 (0.39-3.8)	76 (16)	4.0	0.65 (0.19-2.2)	116 (16)	22	0.83 (0.52-1.3)
None of the above comorbidities	96 (12)	1.1	0.37 (0.05-2.8)	45 (9.7)	4.4	0.77 (0.18-3.4)	90 (12)	19	0.66 (0.38-1.1)

CAD, coronary artery disease; CHF, congestive heart failure; CI, confidence interval; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CTD, connective tissue disease; GERD, gastroesophageal reflux disease; HIV/AIDS, human immunodeficiency virus/acquired immunodeficiency syndrome; IBD, inflammatory bowel disease; MI, myocardial infarction; NA, not applicable; OR, odds ratio; PI, pancreatic insufficiency; PUD, peptic ulcer disease; PVD, peripheral vascular disease.

[a] Abnormal values were defined as follows: albumin <3.5 g/dL; transferrin <200 mg/dL; or total lymphocyte count <1.5 cells/μL.[3].

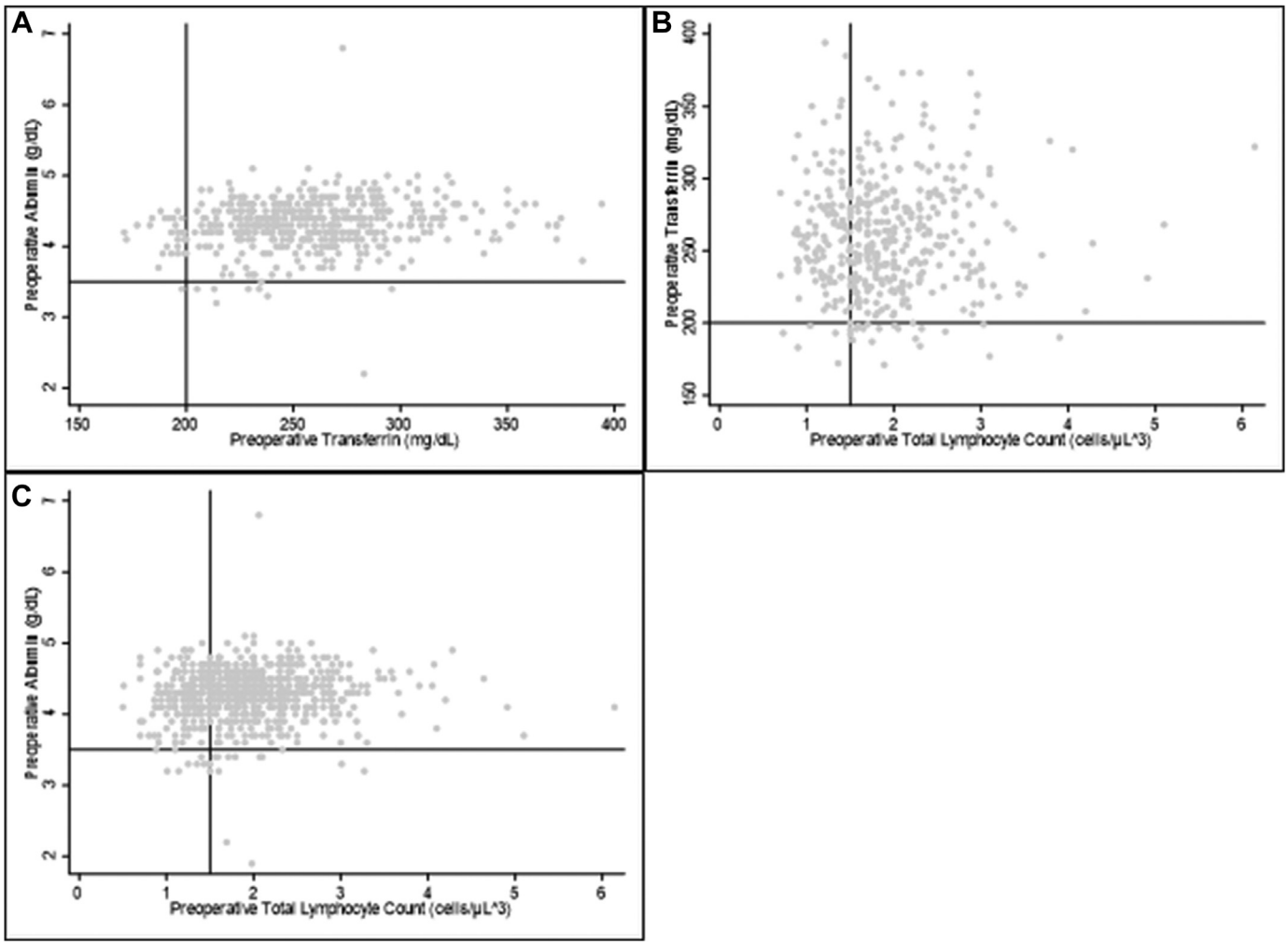

Fig. 1. Scatterplot showing the following comparisons: (A) albumin and transferrin, (B) transferrin and total lymphocyte count, and (C) albumin and total lymphocyte count. Bottom left quadrant of plots indicates cases with abnormal values for both laboratory markers.

($P < .01$); abnormal transferrin with a higher rate of AKI ($P = .03$); and abnormal TLC with a higher rate of UTI ($P = .02$). No other associations between postoperative complications and abnormal nutritional markers were observed.

Discussion

Serologic laboratory testing of markers such as albumin, transferrin, and TLC has been recommended as a surrogate for assessing a patient's nutritional status before undergoing TJA [5,8]. We report a low prevalence of abnormal albumin (2.6%) and transferrin (5.6%) levels before primary TJA and a higher prevalence of abnormal TLC (25%). We also report a low concordance rate among markers, with only 13 cases involving more than 1 abnormal marker. Age, dementia, and CCI value were associated with abnormal albumin, as well as abnormal TLC. Albumin was normal in 97% of cases and transferrin in 95%.

In studies of nutritional markers in TJA, reported rates of abnormal values range from 2% to 12% for albumin, 1.4% to 39% for transferrin, and 16% to 56% for TLC [13,16,23–28]. Other studies have shown little correlation between these markers [10,28]. In a retrospective review of more than 3100 cases of primary total knee arthroplasty at a single institution, Morey et al [28] reported preoperative rates of 7% for abnormal albumin and 16% for abnormal

Table 3
ASA-PS Classification Stratified by Preoperative Nutritional Laboratory Markers From 819 Cases of Primary Total Joint Arthroplasty Performed in 2018[a].

ASA-PS Class[b]	No. of Cases	Albumin			*P* Value	Transferrin			*P* Value	Total Lymphocyte Count			*P* Value
		N	Abnormal, n (%) (n = 21)	Normal, n (%) (n = 773)		N	Abnormal, n (%) (n = 26)	Normal, n (%) (n = 438)		N	Abnormal, n (%) (n = 185)	Normal, n (%) (n = 547)	
1	28	28	0 (0)	28 (3.8)	.16	14	0 (0)	14 (3.2)	.72	28	7 (3.8)	21 (3.8)	.85
2	529	511	10 (48)	501 (65)		317	17 (65)	300 (68)		463	114 (62)	349 (64)	
3	261	255	11 (52)	244 (32)		133	9 (35)	124 (28)		241	64 (35)	177 (32)	

ASA-PS, American Society of Anesthesiologists Physical Status; TLC, total lymphocyte count.
[a] Abnormal values were defined as follows: albumin <3.5 g/dL; transferrin <200 mg/dL; or TLC <1.5 cells/μL^3.
[b] No case had an ASA-PS class of 4.

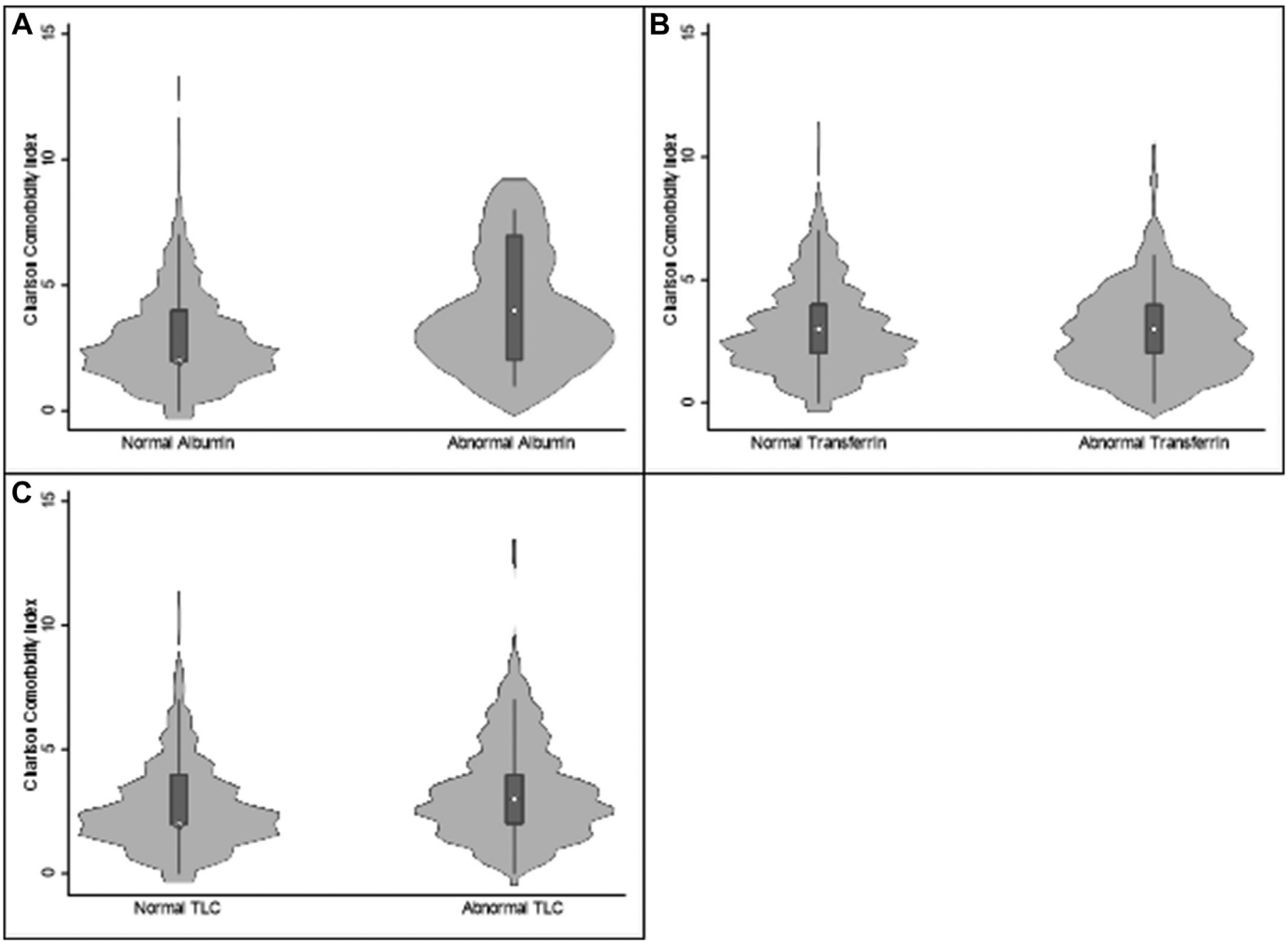

Fig. 2. Violin plots displaying the distribution of Charlson Comorbidity Index, by preoperative (A) albumin, (B) TLC, and (C) transferrin status. White dot represents median; dark gray rectangle represents IQR; and the error bars represent the upper- and lower-adjacent values. Upper-adjacent value is the largest observation that is less than or equal to the upper inner fence (third quartile +1.5 × IQR). Lower-adjacent value is the smallest observation greater than or equal to the lower inner fence (first quartile −1.5 × IQR). IQR, interquartile range; TLC, total lymphocyte count.

TLC, but only 1.6% of patients had abnormal values for both. In a study of more than 2100 cases of elective primary or revision arthroplasty, Huang et al [10] reported abnormal values for 2.3% of albumin tests and 6.6% of transferrin tests, with both abnormal in only 0.4% of cases. Our findings, along with previous reports, suggest that the yield of preoperative nutritional testing of all patients is low and unlikely to be cost effective.

Others have also attempted to identify risk factors associated with abnormal nutritional markers in TJA. Rudasill et al [17] reported on age, gender, comorbidities, and other risk factors associated with greater odds of hypoalbuminemia. Similarly, Ryan et al [18] queried the National Surgical Quality Improvement Program database and found that comorbidities, such as diabetes, smoking, chronic obstructive pulmonary disease, and others, were associated with hypoalbuminemia. However, only 38% of the cases had available albumin data. Additionally, these studies did not assess transferrin values. In their retrospective study, Huang et al [10] found that malnourished TJA patients, defined by abnormal albumin or transferrin, had higher CCI values but no significant differences in age or BMI. We identified age, dementia, and CCI as being associated with more than 1 abnormal serologic marker.

These 3 laboratory values have been proposed as surrogates for nutritional status. It is rare that all 3 values are abnormal in a single patient. Defining poor nutritional status on the basis of an abnormal value for albumin, transferrin, or TLC, as several studies have done, may not reflect nutritional status because various comorbidities may be the cause of abnormal values. For example, hematologic differences between ethnic groups can lead to lower transferrin values [29], and fluid balance, CHF, and chronic kidney disease can affect albumin levels [30]. The research surrounding each of the 3 markers varies considerably. Ten of 20 studies in a systematic review of nutritional laboratory markers and postoperative wound complications [31] examined TLC, and 4 of these found it to be associated with poor outcomes [7,16,23,24,26–28,31–35]. However, 2 of these 4 studies defined malnutrition as an abnormal value for albumin, transferrin, or TLC [34,35]. We found a much higher prevalence of abnormal TLC than of the other 2 markers, but our results, along with previous research, suggest that TLC is an ineffective screening tool for nutritional status. Finally, in our assessment of postoperative complications, we found no significant difference in wound complication rates for any of the 3 nutritional markers. Although we reported associations between abnormal albumin and in-hospital delirium, abnormal transferrin and AKI, and abnormal TLC and UTI, because of the low numbers of complications in the study cohort, we were unable to adjust for covariates such as age.

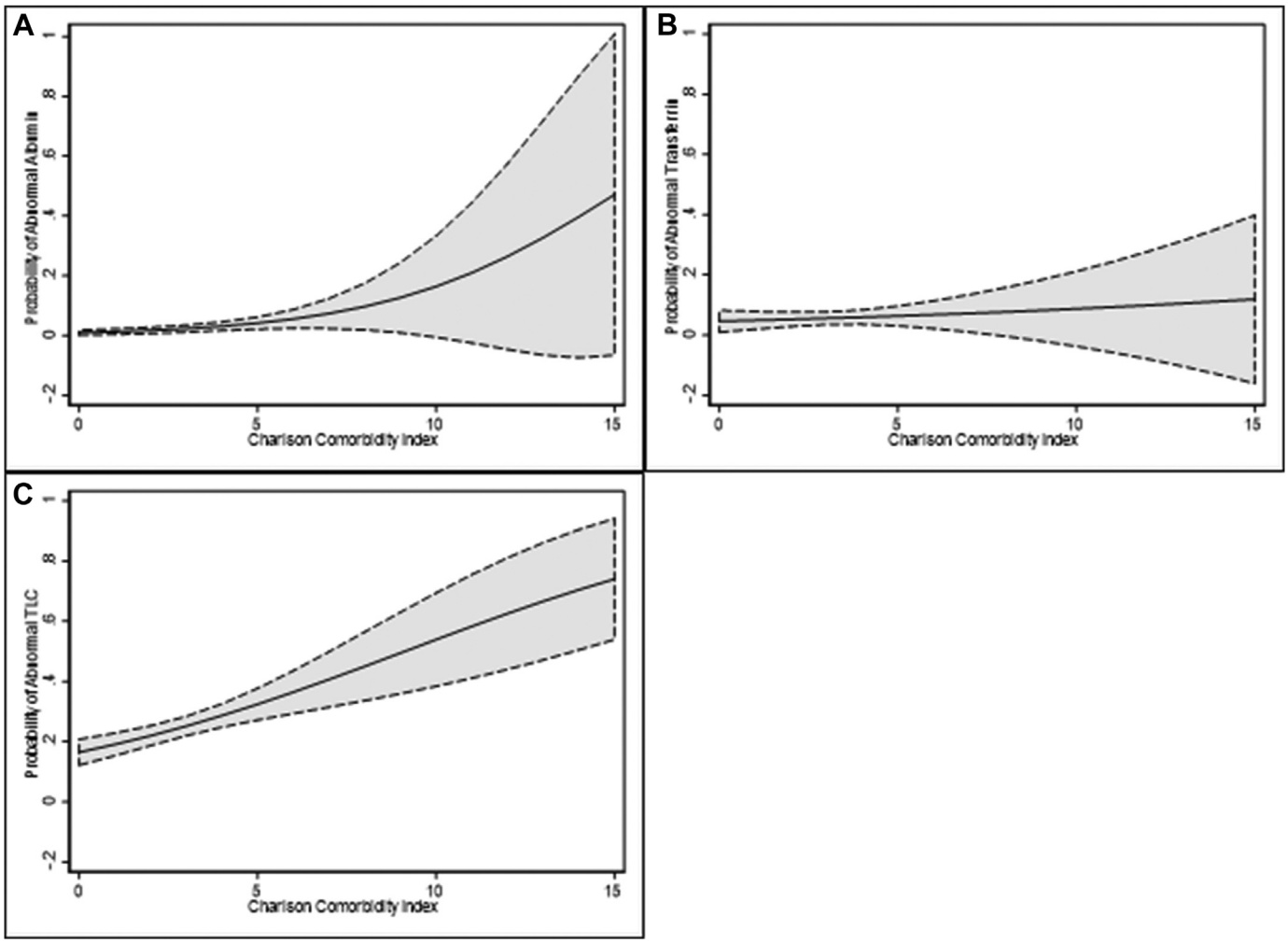

Fig. 3. Predicted probability of (A) abnormal albumin, (B) transferrin, and (C) TLC as a function of Charlson Comorbidity Index. TLC, total lymphocyte count.

There has been a move in primary TJA to identify malnourished patients in an attempt to correct their nutritional status before surgery. Several specialty societies suggest that the physical examination is a stronger diagnostic tool for malnutrition than are laboratory markers [19,20]. Additionally, nutritional interventions based on abnormal laboratory values have not been associated with clear improvement in outcomes [36]. These laboratory values may be more useful as markers of underlying comorbidities as opposed to malnutrition [37]. Our data suggest there is little value in routine nutritional testing. There is an opportunity for cost savings on these tests, which are not otherwise obtained for elective TJA [38,39]. Patient history and clinical judgment should determine whether an individual's nutritional status should be further assessed. Further understanding and investigation is warranted.

Limitations of our study include the retrospective collection of data. Additionally, our assessment of the relationship between certain comorbidities and abnormal nutritional values was limited because of sample size. Therefore, some of our findings, such as the association between abnormal albumin and dementia or pancreatic insufficiency, as well as between Parkinson disease and abnormal transferrin, may warrant further investigation. Additionally, the low prevalence of abnormal laboratory marker results prevented us from using multivariate regression to identify independent relationships between comorbidities and abnormal nutritional values. A strength of our study is the use of clinical records, which allow more accurate assessment of patient comorbidities compared with administrative data [40,41].

Conclusions

The prevalence of abnormal nutritional markers in primary TJA is low, as is the concordance among values. Patient age, dementia, and CCI were associated with abnormal values for more than 1 nutritional marker. Although we were unable to determine which patients should undergo preoperative nutritional evaluation in the form of serologic laboratory tests, our results suggest that universal implementation of nutritional laboratory screening in all patients does not appear to be warranted to ensure preoperative medical optimization in primary TJA patients.

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