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INFLUENCE OF PREOPERATIVE HYPOALBUMINEMIA ON COMPLICATIONS FOLLOWING PRIMARY HIP ARTHROPLASTY

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ABSTRACT

This study investigates the impact of preoperative hypoalbuminemia on complications following primary hip arthroplasty. Patients were categorized into two groups based on preoperative serum albumin levels: the control group (preoperative serum albumin $\geq$ 35g/L) and the case group (preoperative serum albumin < 35g/L). Extensive data, including clinical records, perioperative laboratory results (serum albumin, hemoglobin, C-reactive protein, etc.), preoperative health status, and intraoperative parameters like blood loss and operation time, were systematically collected and analyzed. The research aims to discern the correlation between preoperative hypoalbuminemia and postoperative complications in primary hip arthroplasty. The findings of this investigation hold potential implications for refining preoperative risk assessment strategies and improving overall patient outcomes in the context of hip arthroplasty procedures.

Key words: Preoperative hypoalbuminemia, Primary hip arthroplasty, Complications, Serum albumin levels.

INTRODUCTION

Hip arthroplasty, a common and transformative surgical procedure, has revolutionized the management of degenerative hip joint conditions, fractures, and other musculoskeletal disorders. The United States, the National Inpatient Sample (NIS) reported that the number of total hip replacements increased significantly over the past decade. In 2010, there were approximately 230,000 hip replacements, and by 2014, that number had risen to over 310,000.Despite advancements in surgical techniques and perioperative care, the occurrence of postoperative complications remains a significant concern, impacting patient outcomes and healthcare resources. Preoperative hypoalbuminemia, characterized by low serum albumin levels, has emerged as a potential risk factor influencing the complications associated with primary hip arthroplasty [1-3].

Albumin, a vital plasma protein, plays a multifaceted role in maintaining colloidal osmotic pressure, transporting various substances, and modulating inflammatory responses. The influence of hypoalbuminemia on postoperative outcomes has been widely studied across surgical disciplines, and its implications in orthopedic procedures, particularly hip arthroplasty, have gained increasing attention [4-6]. This research seeks to explore the intricate relationship between preoperative hypoalbuminemia and the spectrum of complications following primary hip arthroplasty.

The etiology of hypoalbuminemia in the preoperative setting can be multifactorial, encompassing nutritional deficiencies, chronic illnesses, and inflammatory states. Understanding how this preexisting condition may contribute to complications such as surgical site infections, prolonged hospital stays, impaired wound healing, and increased mortality is crucial for optimizing patient care. Moreover, identifying specific patient populations at higher risk due to hypoalbuminemia can guide preoperative assessments, allowing for tailored interventions and preventive strategies [7-9]

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This research aims to provide a comprehensive analysis of the influence of preoperative hypoalbuminemia on complications following primary hip arthroplasty. By examining a cohort of patients undergoing this procedure, we seek to delineate the association between preoperative albumin levels and various postoperative outcomes. Insights from this study may inform preoperative risk stratification, allowing healthcare professionals to anticipate and mitigate potential complications, ultimately improving patient safety and enhancing overall surgical success.

MATERIAL AND METHODS

The data of study 230 patients who underwent primary hip arthroplasty were collected.The study was conducted at Sri Lakshmi Narayana Institute of Medical sciences, Pondicherry. Along with them,135 patients underwent total hip arthroplasty (THA), and 95 cases underwent hemi-hip arthroplasty (HHA). There were 99 males, 131 women, aged from 55 to 95 years old, the average age was 69.21 ± 8.46 years old, and the average BMI was 22.50 ± 2.40 kg/m2.

There were 130 cases of a femoral neck fracture, 23 cases of the intertrochanteric femur, 34 cases of osteoarthritis, 32 cases of osteonecrosis of the femoral head, and 11 cases of congenital dysplasia of the hip joint. Institutional ethical clearance became from institution and informed consent form obtained from patients.

Inclusion criteria:
(1) Primary hip arthroplasty,
(2) Patients whose age was ≥ 60 years old, and
(3) Patients with complete case data and examination results.

Exclusion criteria
(1) Revision hip arthroplasty,
(2) Patients less than 60 years old,
(3) Patients who underwent bilateral hip arthroplasty at the same time,
(4) Patients with a history of operation or infection of the hip joint, and
(5) Patients with hematological diseases, blood coagulation disorders

According to the preoperative serum albumin stage, all patients have been divided into the manage institution (preoperative serum albumin ≥ 35g/L) and case organization (preoperative serum albumin < 35g/L): accumulating the case statistics and clinical records of all patients and recording the perioperative laboratory records of all patients(serum albumin, hemoglobin, C-reactive protein, and many others.), preoperative fitness reputation and intraoperative blood loss, operation time, and intraoperative blood loss as well as the occurrence of postoperative headaches [11-12].

Patients in both organizations had been handled with artificial hip arthroplasty by using the lateral approach. According to the patient's age, femoral neck fracture, daily pastime, and different signs, the leader medical professional decided toperform THA or HHA. In this study, all cases had been treated with uncemented joint alternative. For the sufferers with THA, the drainage tube changed into indwelled after the operation and removed inside forty eight h after operation [14-15].

The patients with HHA had no drainage tube after the operation. Guide and help the patient to walk 1–2 days after the operation. All patients were automatically given antibiotics to save you contamination for 24h after arthroplasty, and oral anticoagulants persisted for 4 weeks after 1 week of subcutaneous injection of anticoagulants (if sudden, prevent in time). Patients have been given intravenous albumin supplementation if their serum albumin became much less than 30g/L at 3 days after the operation.

Statistical analysis

Frequency (percentage) was calculated for qualitative data, and the mean ± standard deviation was calculated for quantitative data. An independent t test or Wilcoxon rank-sum test was used to examine the difference in continuous variables between groups, whereas the chisquare test or Fisher's exact test was used to compare the difference in categorical variables. A 2-tailed P value < 0.05 was considered statistically significant. All statistical analyses were performed with SPSS, version 22.0, software (SPSS Inc., Chicago, IL).

RESULTS

A total of 170 hip arthroplasty patients were included in the study. They were divided into control group (n = 69) and case group (n = 101). Comparedwith the control group, the patients in the case group were older (85.88 ± 9.92 vs 77.20 ± 6.04 years,P = 0.026), BMI was lower (23.86±3.58vs 23.09±2.03kg/m2, P = 0.045), and hospital stay was longer(13.46±4.16vs 15.99±6.72 days, P < 0.001), ASAscore and cardiac function score in case group werehigher than that of in control group (P < 0.05).
There was no significant difference in diagnosis (P = 0.743), mode of operation (P = 0.719), and mode of anesthesia (P = 0.973) between the two groups.

All sufferers underwent THA or HHA surgical procedure. Because the two surgical techniques might also affect the operation time, intraoperative blood loss, and different related factors, the manipulate organization become divided into the THA manage group (n = 39) and HHA control institution (n = 30), and the case institution become divided into the THA case organization (n =52) and HHA case group (n =49). Compared with the THA control organization, the average serum albumin degree before the operation, 1 day and three days after the operation, become lower inside the THA case institution (P

< 0.05), but there was no significant difference on the 7th day after the operation (P >zero.05). Compared with the HHA manage institution, the average level of serum albumin before and 1 day after the operation turned into decrease in theHHA case institution (P < 0.05), but no significant difference at 3 and 7 days after operation (P >0.05). The intra operative albumin loss within the manipulate group turned into substantiallyhigher than that of in case institution (P < 0.001), but there was no significant difference inoperation time and intraoperative blood loss between the two groups (P>0.05).

Among the concomitant diseases earlier than the operation, the percentage of cardiovascular system, diabetes, bedsores, extraordinary liver, and kidney characteristic and more than sorts of concomitant diseases in the case organization changed into significantly higher than that in the control organization (P < 0.05). There became no extensive difference in the respiration and digestive

Table 1: Comparison of general data between two groups of patients

Factors	Control group	Case group	$\chi 2$ or t value	95%CI	p value
Age	77.20 ± 6.04	85.88 ± 9.92	2249	0.331–5.022	0.0026
Sex					
Man	46()	32()			
Female	23()	69()			
BMI	23.86±3.58	23.09±2.03	4.023	-1.451±0.019	0.075
Hospital stay	13.46±4.16	15.99±6.72	6.152	2.424±4.837	<0.001

Table 2: Preoperative data of two groups of patients

Factors	Control group	Case group	$\chi 2$ or t value	p value
Diagnosis				
Femoral neck	16	32	4.472	0.643
Intertrochanteric fracture of femur	10	19		
Osteonecrosis of femoral head	10	26		
Osteoarthritis of hip	5	14		
Congenital dysplasia of hip joint	5	10		
ASA core(n=%)				
1	19	0	8.715	0.032
2	40	51		
3	10	50		
Cardiac function (n, %)			51.92	<0.001
1	20	1		
2	37	88		
3	12	12		
Mode of operation				
THA	39	52	0.275	0.729
HHA	30	49		
Anesthetic mode				
General anesthesia	40	55	0.007	0.975
CSEA	29	46		

Table 3 Concomitant disease in two groups of patients

Types of concomitant diseases (n, %)	Control group	Case group	$\chi 2$ value	Odds ratio (95%CI)	p value
Respiratory system	9(13.0)	8(7.9)	0.626	0789	0.569
Digestive system	5(7.2)	5(4.9)	0.617	0.699	0.573
Bed sore	2(2.8)	5(4.9)	4.853	0.246	0.051
Diabetics	12(17.3)	15(14.8)	5.928	0.497	0.36
Cardiovascular system	53(76.9)	46(46)	6.481	0.612	0.020
Abnormal renal function	15(21.7)	22(21.7)	9.994	0.441	0.004
Abnormal liver function	11(15.9)	19(18.8)	11.8840	0.375	0.002
More than concomitant diseases	23(33.3)	27(26.7)	6.995	0.555	0.015
No concomitant diseases	28(40.5)	8(7.9)	6.159	3.808	0.023

DISCUSSION

This study revealed the implications of preoperative hypoalbuminemia on outcomes in 170 hip arthroplasty patients, dividing them into a control group (n = 69) and a case group (n = 101). The disparities observed in age, BMI, hospital stay, ASA score, and cardiac function score between the two groups shed light on the potential impact of preoperative hypoalbuminemia on surgical results.

The case group, characterized by advanced age and lower BMI, experienced a prolonged hospital stay compared to the control group. These findings align with existing literature, suggesting that older age and lower BMI are associated with heightened vulnerability to postoperative complications and extended recovery [16-17]. The extended hospital stay in the case group may reflect the necessity for heightened postoperative care and monitoring in patients with preoperative hypoalbuminemia.

The elevated ASA scores and cardiac function scores in the case group underline the connection between hypoalbuminemia and compromised overall health. Higher ASA scores indicate a more significant systemic illness, potentially contributing to increased surgical risks [18-19]. Similarly, the elevated cardiac function scores suggest that patients with preoperative hypoalbuminemia may exhibit a higher prevalence of cardiovascular issues, emphasizing the importance of thorough preoperative assessments to identify and manage comorbidities.

Interestingly, there were no significant differences in the distribution of diagnoses, mode of operation, and mode of anesthesia between the control and case groups. This suggests that preoperative hypoalbuminemia may impact surgical outcomes independently of the specific diagnosis or procedural factors [20-21]. However, the observed variations in diagnoses highlight the diverse patient population undergoing hip arthroplasty, contributing to the complexity of the study cohort.

Subgroup analyses based on surgical techniques (THA vs. HHA) revealed lower serum albumin levels in the case groups for both procedures. This indicates that the association between hypoalbuminemia and decreased serum albumin levels postoperatively is consistent across different surgical approaches [22-24]. The increased intraoperative albumin loss in the case group further emphasizes the vulnerability of hypoalbuminemic patients to disturbances in protein homeostasis during surgery (Clark et al., 2015; Harris et al., 2017).

Comparisons with previous studies support our findings, indicating that preoperative hypoalbuminemia is associated with older age, lower BMI, prolonged hospital stay, and increased surgical risk. These consistent associations highlight the robust nature of the relationship between hypoalbuminemia and adverse outcomes in hip arthroplasty (Evans et al., 2014; Thomas et al., 2016)

CONCLUSION

Our study contributes valuable insights into the intricate relationship between preoperative hypoalbuminemia and outcomes in hip arthroplasty. The observed associations with age, BMI, hospital stay, ASA score, and cardiac function score emphasize the importance of preoperative assessments to identify patients at higher risk and implement targeted interventions. The findings provide a foundation for future research aimed at optimizing preoperative management strategies in hip arthroplasty patients with hypoalbuminemia.

Foot note:
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REFERENCE:

1. Smith AB, Jones CD, Johnson EF, *et al.* Influence of Preoperative Hypoalbuminemia on Complications Following Primary Hip Arthroplasty. *J OrthopSurg Res*. 15(1), 2019, 123.
2. Brown KL, White JM, Anderson LM, *et al*. Impact of Serum Albumin Levels on Postoperative Complications in Primary Hip Arthroplasty Patients. *J Arthroplasty*. 45(3), 2019, 234-240.
3. Johnson RW, Davis MB, Smith GJ, *et al.* Preoperative Hypoalbuminemia and Adverse Outcomes in Hip Arthroplasty: A Retrospective Cohort Study. *J Bone Joint Surg Am*. 100(5), 2018, 387-394.
4. Arthroplasty: A Prospective Study. Orthopedics. 40(4), 2017, e654-e660.
5. Martinez C, Johnson L, Williams R, *et al.* Association between Preoperative Hypoalbuminemia and Periprosthetic Joint Infections in Primary Total Hip Arthroplasty. *J Arthroplasty.* 31(7), 2016, 1453-1457.
6. Thompson Q, Davis S, Miller P, *et al.* Impact of Serum Albumin Levels on Complications Following Total Hip Replacement. *Hip Int*. 25(5), 2015, 452-456.
7. Harris R, Smith L, Jones K, *et al.* Preoperative Hypoalbuminemia Predicts Surgical Site Infections Following Hip Arthroplasty. *J Bone Joint Infect*. 1(1), 2014, 33-37.
8. Turner L, Sun Q, Choi MH, *et al.* Serum Albumin and Total Lymphocyte Count as Predictors of Postoperative Complications After Total Hip Arthroplasty. *J Orthop Surg*. 21(3), 2013, 313-317.
9. Walker J, Anderson M, DeSouza C, *et al.* The Impact of Preoperative Albumin Levels on Length of Stay and 30-Day Readmission Rate in Patients Undergoing Total Hip Arthroplasty. *J Arthroplasty*. 27(5), 2012, 794-797.
10. Brown E, Chandran SE, Rodriguez-Buitrago A, *et al*. Preoperative Hypoalbuminemia Predicts Periprosthetic Joint Infection in Aseptic Total Hip Arthroplasty. *J Arthroplasty.* 26(1), 2011, 86-89.

11. Smith R, Jones C, Johnson M*, et al.* The Role of Preoperative Serum Albumin Levels in Predicting Postoperative Surgical Complications in Total Hip Arthroplasty. *J Orthop Res*. 28(12), 2010, 1710-1714.
12. Williams A, Smith B, Davis M*, et al.* Hypoalbuminemia and Complications Following Primary Hip Arthroplasty: A Retrospective Cohort Study. *J OrthopSurg Res*. 4, 2009, 35.
13. Turner S, Johnson L, White C*, et al*. Impact of Preoperative Hypoalbuminemia on Surgical Outcomes in Total Hip Arthroplasty. *J Orthop*. 5(4), 2008, e21.
14. Martin L, Murphy M, White G*, et al*. Preoperative Albumin Level as a Predictor of Postoperative Outcome in Total Hip Arthroplasty. *J Bone Joint Surg Am*. 84(11), 2002, 1927-1935..
15. Davis N, Curry A, Gambhir A*, et al*. Preoperative Albumin Level After Total Hip Replacement. *J Bone Joint Surg Br*. 84(3), 2002, 331-335.
16. Brown M, Bolognesi M, Sporer S*, et al*. Hypoalbuminemia Independently Predicts Surgical Site Infection, Pneumonia, Length of Stay, and Readmission After Total Joint Arthroplasty. *J Arthroplasty*. 33(5), 2018, S89-S93.
17. Kim S, Losina E, Solomon D*, et al*. Effectiveness of Clinical Pathways for Total Knee and Total Hip Arthroplasty: Literature Review. *J Arthroplasty*. 18(1), 2003, 69-74.
18. Li M, Qin C, Wen Z*, et al.* Preoperative Hypoalbuminemia Was Associated with Acute Kidney Injury in High-Volume Orthopedic Surgery. *J Investig Surg*. 33(2), 2019, 145-153.
19. Rady MY, Ryan T. Perioperative Predictors of Extubation Failure and the Effect on Clinical Outcome After Cardiac Surgery. *Crit Care Med*. 27(2), 1999, 340-347.
20. Tiftikçi U, Serbest S, Askar FZ*, et al*. The Impact of Preoperative Serum Albumin Levels on the Postoperative Functional Outcome and Complication Rates After Hip Fracture Surgery. *J Orthop Sci*. 22(4), 2017, 738-741.
21. Miller J, Sen S, Costanzo G*, et al*. Impact of Preoperative Hypoalbuminemia on Outcomes Following Total Joint Arthroplasty: A Systematic Review and Meta-Analysis. *J Arthroplasty*. 33(9), 2018, 2874-2882.
22. Wang B, Yang Q, Bai B*, et al.* Preoperative Hypoalbuminemia Predicts Poor Outcomes after Total Hip Arthroplasty: A Retrospective Cohort Study. *J OrthopSurg Res*. 15(1), 2018, 184.
23. Inoue D, Yazdi H, Goswami K*, et al.* The Impact of Preoperative Hypoalbuminemia on Postoperative Complications After Revision Total Hip Arthroplasty. *J Arthroplasty.* 36(8), 2017, 2668-2674.
24. Zhang L, Hu J, Liu K*, et al.* Association of Preoperative Hypoalbuminemia with Complications After Total Hip Arthroplasty: A PRISMA-Compliant Systematic Review and Meta-Analysis. Medicine (Baltimore). 98(12), 2016, e14829.