

Effect of serum albumin in wound healing and its related complications in surgical patients

Vikram Sindgikar, Basavaraj Narasanagi^{*}, Tejasvini V, Anand Ragate and Faraz Ahmed Patel

Department of Surgery, BLDE University's Shri B.M. Patil Medical College, Solapur Road, Vijayapur-586103 Karnataka, India

Abstract: *Introduction:* Surgery by itself will add a lot of stress to the patients. It is associated with a lot of morbidity, the problems related to the wound healing and its complications and mortality at times. There are battery of factors that can predict the problems related to the complications. It will be invaluable to have the predictors that can assess the complications before the operative procedures so that the deficit factors can be corrected in order to reduce the morbidity associated with the surgical procedures. This study is taken up to assess one of such important factors that is the effect serum albumin on the surgical out come. *Aim:* To study effect of protein (s.albumin) levels and the wound healing and related complications like wound infection, wound dehiscence and anastomotic leak. *Materials & Methods:* The study is conducted in the department of Surgery Shri. B.M. Patil Medical College. A total of 130 patients were studied over period of 2 years and were evaluated for serum albumin and the wound related complications. *Results:* Significant wound related complications were noted in hypoalbuminemic patients as compared to the patients with normal albumin levels. *Conclusions:* Serum albumin levels can be considered to be one of best predictors for the wound related complications.

Keywords: Hypoalbuminemia, Wound Healing, Post Operative Complications.

Introduction

The adverse effects of malnutrition on the morbidity and mortality of patients was first recognised by Hippocrates many centuries ago. Nutrition plays a vital role in the care of patients on a surgical service. Between 30% and 50% of hospitalized patients are malnourished and malnutrition is clearly associated with increased morbidity and mortality. In the presence of malnutrition, surgical wounds and anastomoses are less likely to heal, resulting in an increased risk of wound complication and anastomotic dehiscence [1].

Nutritional assessment is essential for identifying patients who are at risk of developing complications. Although a variety of nutritional indices have been found to be valuable in predicting patient outcome when used alone, there is no consensus on the best method for assessing the nutritional status. The serum albumin level is the most readily available and clinically useful parameter. A serum albumin level greater than 3.5 g/dl suggests adequate protein stores and it

confers a protective effect through several biological mechanisms. Serum albumin is a better prognostic indicator than anthropometric markers of nutritional status because its ability to detect protein-energy malnutrition, which is not necessarily accompanied by lower body weight and may not be clinically recognizable, but is associated with significantly increased morbidity and mortality [2]. Protein energy malnutrition results from increased protein or energy requirements associated with the stress of illness, injury or infections. If the increased needs are not met from dietary or therapeutic sources, visceral protein stores are depleted, leading to abnormal function in organ systems, including gastrointestinal malabsorption, impaired immunologic response, impaired production of albumin and other proteins in the liver [3].

Aims and Objective: To study effect of protein levels and the wound healing and related complications like wound infection, wound dehiscence and anastomotic leak.

Material and Methods

Source of data: Patients admitted in B.L.D.E.A’s Shri B.M. Patil Medical College Hospital for any major elective or emergency surgery, between Sep 2012 and Aug 2015.

Calculated sample size n=130

Inclusion Criteria: Patients who were admitted for any major elective or emergency surgery under the department of Surgery in B.L.D.E.A’s Shri B.M. Patil Medical College Hospital and Research Centre, Bijapur.

Exclusion Criteria: Patients who had jaundice, severe anaemia <7 g/dl, chronic renal disease and patients on steroids or chemotherapy.

Method of collection of data:

- Details of cases were recorded including history and clinical examination
- Investigations: serum albumin was estimated on the day of admission and on 5th 10th and 15th post operative days.
- Wound related complications were monitored with respect to infection (SSI), wound dehiscence, anastomotic leak, mortality if any.

Statistical analysed: The data was analyzed by Z test. P value of <0.05 was considered statistically significant.

Results

The study was conducted on 130 patients, aged between 2-86 years, who underwent any major elective or emergency surgery in Sri B.M. Patil Medical College Hospital and Research Centre Bijapur, from September 2012 to August 2015. Among the 130 patients, 47 patients were having serum albumin levels more than 3.5g/dl and 83 patients were having serum albumin less than 3.5g/dl.

Sex	Number	Percentage (%)
Male(M)	98	75.4
Female(F)	32	24.6

Of the 130 patients studied, 75.4% were male and 24.6% were female.

Age (yrs)	Total no.
<10	2
11-20	17
21-30	15
31-40	28
41-50	20
51-60	28
61-70	14
>70	6

Of the 130 patients, the age varied from 2-86years. The number of patients were more in the 21-30 years group was highest.

	<3.5g/dl	>3.5g/dl
Post op complications	33	4
No complications	50	43
Total	83	47

Of 83 patients with hypoalbuminemia 33 patients developed wound related complications and 4 patients with normal albumin levels developed wound related complications. The p value is 0.000318

The various complications were wound infection in 24 patients (72.7%), wound dehiscence in 9 cases (27.28%), anastomotic leak in 5 cases (15.15%) in hypoalbuminemic group. Whereas 3 patients developed wound infection (75%) and one patient developed anastomotic leak (25%) in the other group.

S. albumin g/dl (patients)	Wound infection	Wound dehiscence	Anastomosis leak
<3.5(83)	24	9	5
>3.5(47)	03	-	1

It was observed that the rate of complications were more in patients with s.albumin levels less than 3.5 g/dl. However in this study there were no mortalities.

Discussion

Nutritional assessment is essential for identifying patients who are at increased risk of developing post operative complications. A variety of nutritional indices have been found to be valuable in predicting patient outcome. In our study preoperative serum albumin level was used for nutritional assessment. Serum Albumin level less than 3 g/dl was associated with increased postoperative morbidity and mortality according to studies done by Vincent et al [4], Golub et al [5], Wojtsiak et al [6], Brown et al [7] and Mullen et al [8].

Our study shows similar results (P <0.005), patients with Serum Albumin less than 3 g/dl had more postoperative complications. Gibbs [2] et al observed that a decrease in serum albumin from concentration greater than 4.6 g/dl to less than 2.1 g/dl (P < 0.001) was associated with an exponential increase in morbidity and mortality and that it was a good prognostic indicator. Nagachinta et al [9] also found an association between s.albumin less than 3.9 g/dl and wound infection. According to Foley et al [10] postoperative complication rate was higher when albumin was lower than 2.5 g/dl (P<0.001).

Table-5: Significance of S.albumin levels in predicting postoperative outcome		
Study name	S.albumin g/dl associated with increased complications	p-value
Vincent et al [4]	<3	<0.005
Golub et al [5]	<3	<0.05
Brown et al [7]	<3	<0.05
Foley et al [10]	<2.5	<0.001
Nagachinta et al [9]	<3.9	<0.001
Present study	<3.5	<0.05

In our study of 130 patients, 47 patients had serum albumin of more than 3.5grams/dl. In this group the complications rates were significantly low. Only 4 patients developed complications, of which 3 had wound infection and one patient had suffered anastomotic leak. Where as in the other

group 33 patients developed wound related complications. 24 patients had wound infection, 9 patients had wound dehiscence and 5 patients had anastomtic leak. The infection rate further increases as the protein levels decreases. Of 33 patients with complications, 20 patients had serum albumin levels were less than 3 gram /dl. Further the in hospital stay, the cost of the treatment and morbidity, absence from work were high.

In contrast to the above mentioned studies and our study, Ryan JA [11] reported that there was no significant difference in wound infection rates with serum albumin greater than 3.4, 2.8-3.4 or less than 2.8 g/dl. Gherini et al [12] showed that serum albumin values could not predict postoperative complications.

Engelman [13] et al observed that albumin less than 2.5 g/dl (p < 0.001) and BMI less than 20 kg/m² (p <0.005) and greater than 30 kg/m² (p <0.005) was associated with increased post operative complications. Joshi [14] et al reported that post operative mortality was higher when serum albumin was less than 3.2g/dl and BMI less 20 kg/m²(p<0.05).

Mullen [15] et al reported that in the postoperative period being underweight was associated with increased mortality and obese individuals had more wound complications.

Conclusion

Our study shows that serum albumin is a good indicator of post operative complications. The rate of complications were significantly high in patients with serum albumin less than 3.5g/dl and significant difference was found as compared to the patients with serum albumin levels more than 3.5g/dl.

Thus serum albumin is a good prognostic indicator because of its ability to detect protein-energy malnutrition, which is not necessarily accompanied by lower body weight and may not be clinically recognizable, but is associated with significantly increased risk of morbidity and mortality.

References

1. Heys SD, Simpson WG, Eremin O. Surgical nutrition. In: Paterson-Brown S, editor. *Emergency surgery and critical care*. 7th ed. London: *WB Saunders*, 1997; 55.
2. Gibbs J, Cull W, Henderson W, Daley J, Hur K, Khuri SF. Preoperative Serum Albumin level as a predictor of operative mortality and morbidity. *Arch Surg* 1999; 134:36-42.
3. Williams JZ, Barbul A. Nutrition and wound healing. *Surg Clin North Am* 2003; 83:571.
4. Vincent JL, Dubois MJ, Navicks RJ, Wilkes MM. Hypoalbuminemia in acute illness: is there a rationale for intervention? *Ann Surg*, 2003; 237:319-334.
5. Golub R, Sorrento JJ Jr, Cantu R Jr. Efficacy of albumin supplementation in the surgical intensive care unit: a prospective, randomized study. *Crit Care Med* 1997; 25: 249-252.
6. Wojtsjak SL, Brown RO, Roberson D. Effect of Hypoalbuminemia and parenteral nutrition on free water excretion and electrolyte-free water resorption. *Crit Care Med* 1992; 20:164-169.
7. Brown RO, Bradley JE, Bekemeyer WB. Effect of albumin supplementation during parenteral nutrition on hospital morbidity. *Crit Care Med* 1988; 16:1177-1182.
8. Mullen JL, Buzby GP, Waldman MT, Gertner MH, Hobbs CL, Rosato EF. Prediction of operative morbidity and mortality by preoperative nutritional assessment. *Surg Forum* 1979; 30:80-82.
9. Nagachinta T, Stephens M, Reitz B. Risk factors for surgical wound infection following cardiac surgery. *J Infect Dis* 1957; 156: 967.
10. Foley EF, Borlase BC, Dzik WH. Albumin supplementation in the critically ill. A prospective, randomized trial. *Arch Surg*. 1990; 125:739-742.
11. Ryan JA, Taft DA. Preoperative nutritional assessment does not predict morbidity and mortality in abdominal operations. *Surg Forum* 1980; 31:96-98.
12. Gherini S, Vaughn BK, Lombardi AV Jr, Mallory TH. Delayed wound healing and nutritional deficiencies after total hip arthroplasty. *Clin Orthop Relat Res*, 1993; 293:188-195.
13. Engleman DT, Adams DH, Byrne JG, Avanki SF, Collins JJ, Couper GS et al. Impact of BMI and Serum Albumin on morbidity and mortality after cardiac surgery. *J Thorac Cardiovas Surg*, 1999; 118: 866-873.
14. Joshi J, Shvkumaran S, Bhargav Y, Kansare B, Sharma RS. Perioperative management of the Geriatric patient. *J Ind Aca Geri*, 2006; 2:28-33.
15. Mullen JT, Davenport DL, Hutter MM, Hosokawa PW, Henderson WG, Khuri SF et al. Impact of BMI on perioperative outcome in patients undergoing major intra abdominal cancer surgery. *Ann Surg Onco*, 2008; 15:2164-2172.

*All correspondences to: Dr. Basavraj Narasangi, Associate Professor, Department of Surgery, BLDE University's Shri B.M. Patil Medical College, Solapur Road, Vijayapur-586103 Karnataka, India. Email: nbasavaraj2001@hotmail.com