Original Research Article

A Hospital Based Prospective Study to Assess the Effect of Major Orthopedic Surgery on the Nutritional Status of Patients at Newly Established Tertiary Care Center

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Abstract

Background: Malnutrition is also major problem among residents in long-term care facilities. Furthermore, patients admitted to the hospital may already be malnourished or at risk of malnutrition. The aim of this study to evaluate the effect of major elective orthopaedic surgery on the nutritional status of patients at newly established tertiary care center. **Materials & Methods:** This is a prospective study done on 50 patients, those who got admitted and operated under department of Orthopaedics at Government Medical College, Dungarpur, Rajasthan, India during one year period. The nutritional assessment was done by both anthropometry (BMI) and biochemical markers (Pre-albumin and Transferrin). The patients were evaluated pre op, post op (at suture removal) and at three months follow up. The proforma was filled up for each patient which included demographic details, diagnosis, surgery done, comorbidities and the nutritional parameters. **Results:** Total number of patients assessed during the one-year time period was 50. Total number of cases followed up was 31 (62% follow up). The pre-albumin & transferrin values at pre op, post op and follow up of the humerus shaft fracture & tibia shaft fracture patients shows a significant difference between all three values ($P<0.0001$, $P<0.0001$*** respectively). The comparison of mean value in between humerus shaft fracture & lower limb surgery groups, which was pre albumin values showed a significant difference ($p<0.05$**). Transferrin values showed a difference which was not statistically significant ($p>0.05$). **Conclusion:** We concluded that the effectiveness of pre-albumin as a reliable nutritional marker. Prealbumin can be used routinely in patients at risk of malnutrition to assess and to take appropriate nutritional measures to prevent complications.

Keywords: Nutritional Status, Pre-Albumin, Transferrin, Upper Limb, Lower Limb.

Introduction

Trauma and surgery induce extensive physiological changes, commonly denominated the acute phase reaction (APR). This APR is activated by various kinds of stimuli, namely nociceptive stimulations, tissue injury, tissue ischaemia and reperfusion as well as by haemodynamic disturbances which occur commonly in such patients. APR is mainly characterized by the release of counter-regulatory hormones, complex metabolic changes and by the hepatic synthesis of numerous acute phase factors (C-reactive protein, haptoglobin, complement protein, etc). There is a resistance to the nutritional support. In patients with non complicated surgery and low or moderate severity trauma, the metabolic changes are minor and self-limited. Conversely, in patients with complicated surgery or major trauma, there is an extensive APR, which can be very prolonged.

Malnutrition results either from inadequate intake or increased energy needs during illness[1]. It causes loss of both body fat and lean body mass including muscle[2]. It is known that humans do not survive once their body cell mass (fat free portion of muscle, viscera, and immune system) drops below 60% of the normal levels of young adult[3].

Thus severe wasting results in death. However, factors such as trauma, ageing and chronic diseases that are not directly related to malnutrition also results in body wasting[2,4].

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The trauma of injury or surgery causes production of catabolic cytokines resulting in increased expenditure and break down of protein stores, including muscle[5]. These changes support the activation of inflammatory and reparative mechanisms and promote recovery[5-7]. Healthy individuals who are adequately nourished generally move through the catabolic phase in to the reparative phase and recover without serious consequences.

Protein-energy malnutrition (PEM) is a chronic or acute lean body protein loss that leads to a state of specific nutrient deficiency that produces a measurable change in body function[8]. PEM is a clinical condition characterized by depletion of muscle/body fat and visceral proteins. PEM is associated with a worse outcome during illness and may be reversed by conversion to an anabolic state. PEM is common in hospitalized patients and is associated with increased mortality[9,10]. 30%– 60% of patients hospitalized for acute illness are malnourished, and nutritional status has been shown to deteriorate during hospitalization[11]. Reasons for this high prevalence include poor recognition and monitoring of nutritional status and inadequate intake of nutrients during hospitalization[8]. Malnutrition is also major problem among residents in long-term care facilities. Furthermore, patients admitted to the hospital may already be malnourished or at risk of malnutrition[12]. The aim of this study to evaluate the effect of major elective orthopaedic surgery on the nutritional status of patients at newly established tertiary care center.

Materials & methods

This is a prospective study done on 50 patients, those who got admitted and operated under department of Orthopaedics at Government Medical College, Dungarpur, Rajasthan, India during one year period.

Exclusion Criteria

1. Polytrauma patients.
2. Patients admitted for tumor surgeries.

Methods

The nutritional assessment was done by both anthropometry (BMI) and biochemical markers (Pre-albumin and Transferrin). Similarly, since pre-albumin and transferrin were better predictors of the nutritional status, other biochemical markers (albumin and total lymphocyte count) were not analyzed. The patients were evaluated pre op, post op (at suture removal) and at three months follow up. The proforma was filled up for each patient which included demographic details, diagnosis, surgery done, comorbidities and the nutritional parameters.

The wound related complications in our study are described as eithersuperficial wound infection or deep wound infection. Superficial wound infection is defined as the wound infection in which infection has not breached the deep fascia and when no surgical intervention is needed for the control of infection. It responds to dressings and antibiotic therapy. Deep infection is defined as the wound infection in which the infection has breached the deep fascia and when surgical intervention (wash out and drainage) along with antibiotic therapy is needed for the control of infection.

Statistical Analysis

The statistical analysis was done using SPSS software version 22. The statistical tests used were Chi square test and repeated variable annova test.

Results

Total number of patients assessed during the one-year time period was 50. Total number of cases followed up was 31 (62% follow up) (table 1).

Table 1: Patients distribution and follow-up at three months according to surgery

Type of surgery	No. of patients	Patients follow-up at three months
Humerus shaft fracture	38 (76%)	23 (60.52%)
Tibia shaft fracture	12 (24%)	8 (66.66%)
Total	50 (100%)	31 (62%)

The analysis was done on the 31 patients evaluated at the three months follow up (table 2).

Table 2: Demographic profile of patients evaluate at three month follow-up

Demographic profile		Humerus shaft fracture (N=23)	Tibia shaft fracture (N=8)	P-value
Age (yrs)		49.52±5.83	52.58±5.29	<0.05*
Gender	**Male**	11	3	>0.05
	Female	11	5	
Comorbidity	**Diabetes mellitus**	4	2	>0.05
	Hypertension	3	3	
BMI	**<20kg/m2**	1	0	>0.05
	>25 kg/m2	9	1	
Complications	**Superficial infection**	1	2	>0.05
	Deep infection	0	1	

The pre-albumin & transferrin values at pre op, post op and follow up of the humerus shaft fracture & lower limb surgery patients shows a significant difference between all three values (P<0.0001, P<0.0001*** respectively) (table 3 & graph 1-4).

Table 3: Analysis of pre-albumin & transferrin in humerus shaft fracture& tibia shaft fracture groups

Type of surgery	Pre-op	Post-op	After 3 month follow-up	P-value
Humerus shaft fracture				
Pre-albumin	28.8±2.35	25.7±2.12	27.63±1.99	<0.0001***
Transferrin	288±10.23	256±15.87	272±13.56	<0.0001***
Tibia shaft fracture				
Pre-albumin	26.72±3.56	23.18±2.92	25.80±3.12	<0.0001***
Transferrin	274±16.23	240±15.66	268±14.88	<0.0001***

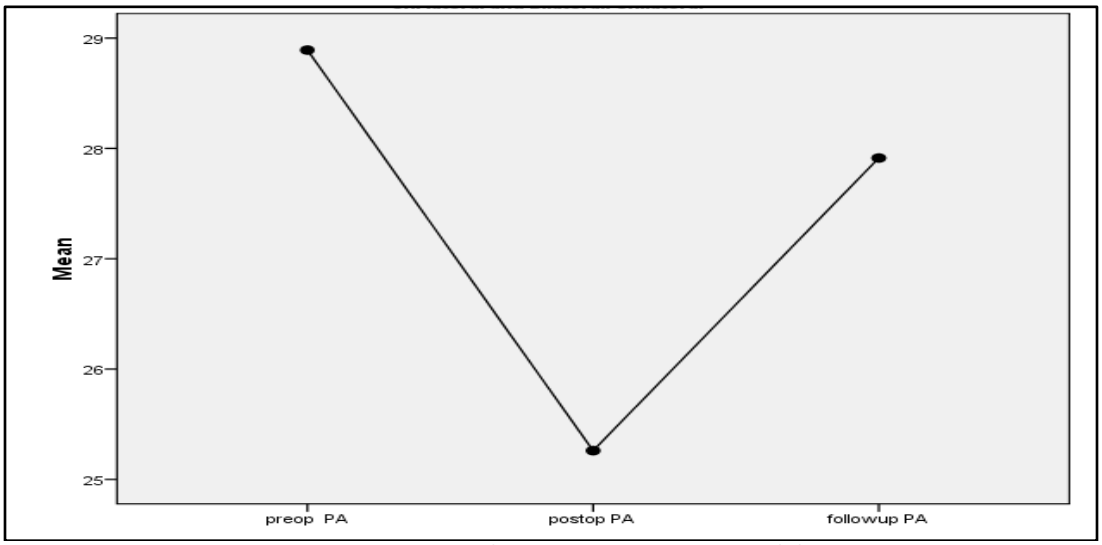

Fig. 1: Analysis of pre-albumin in Humerous shaft fracture

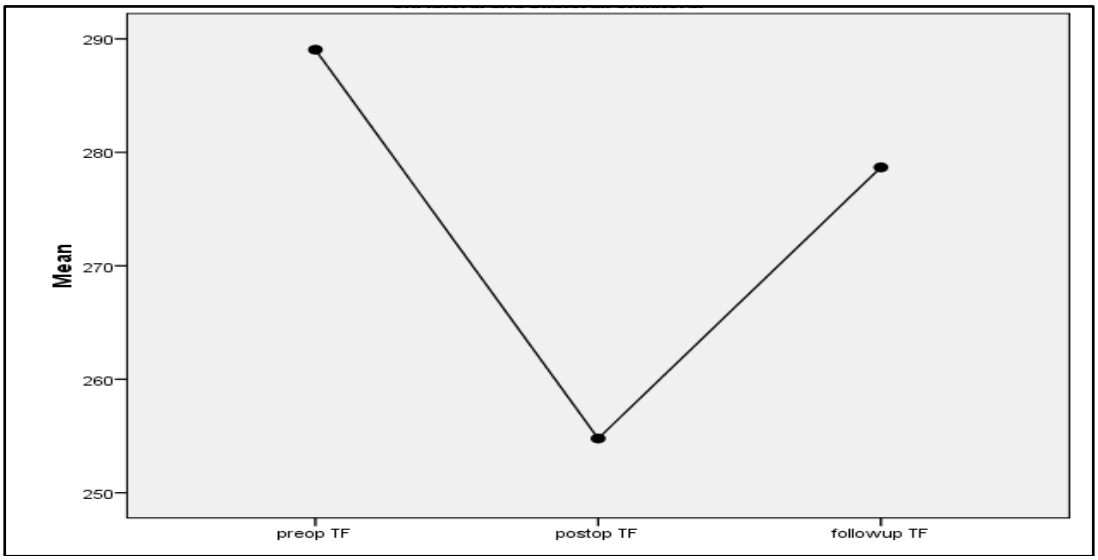

Fig. 2: Analysis of transferrin in Humerous shaft fracture

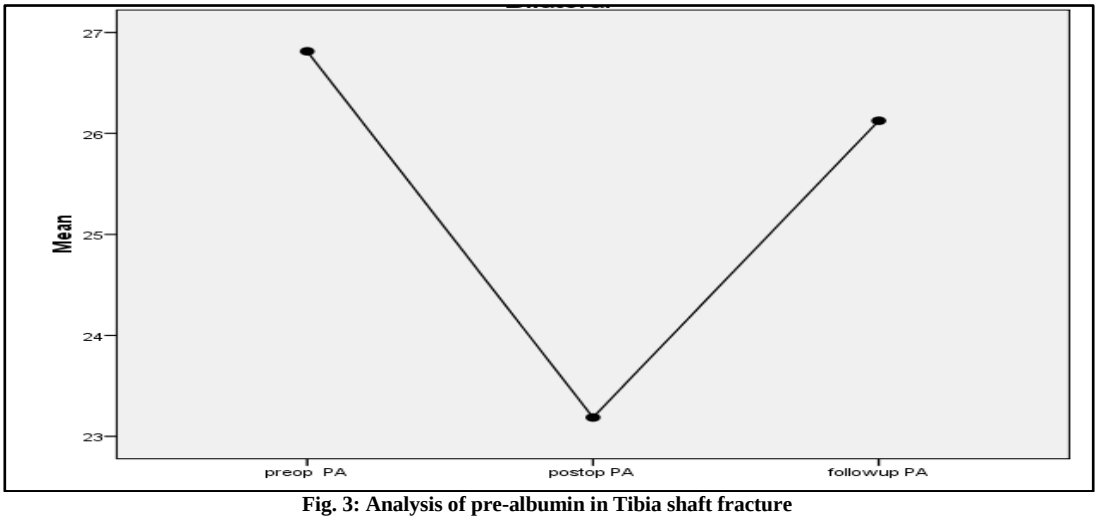

Fig. 3: Analysis of pre-albumin in Tibia shaft fracture

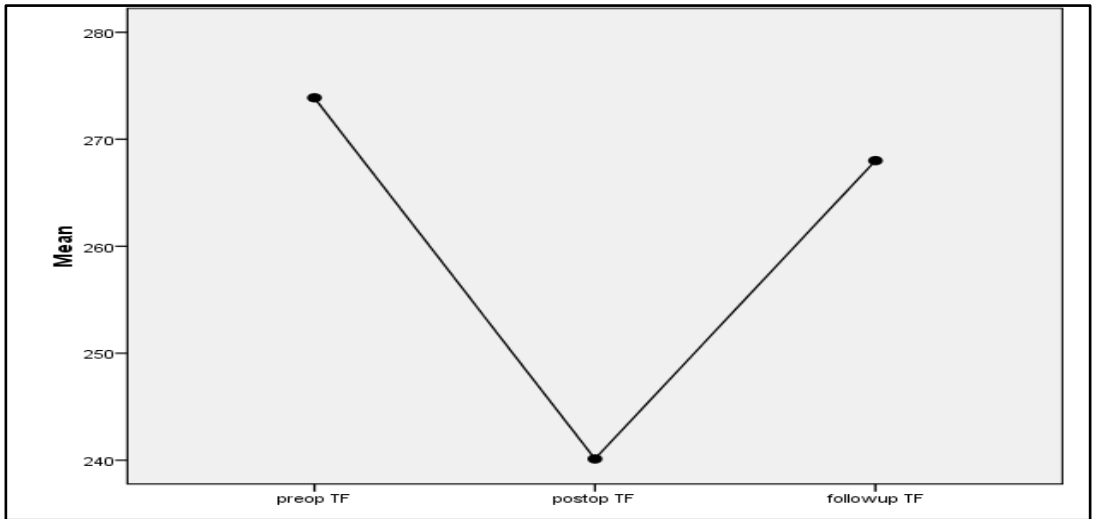

Fig. 4: Analysis of transferrin in Tibia shaft fracture

The comparison of mean value in between humerus shaft fracture & tibia shaft fracture groups, which was pre albumin values showed a significant difference (p<0.05**). Transferrin values showed a difference which was not statistically significant (p>0.05) (figure 5).

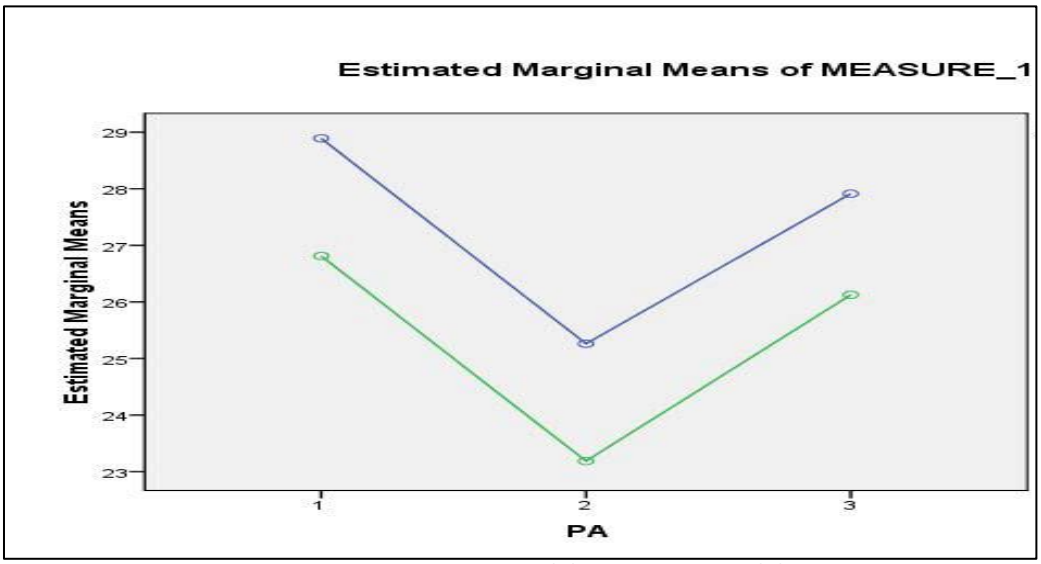

Fig. 5: The comparison between Humerous shaft fracture & Tibia shaft fracture groups

Discussion

The results of the study shows significant difference in the pre op, post op and the follow up values of biochemical marker – Pre-albumin and transferrin, in all groups of patients. This indicate that the nutritional status of the trauma patients affect the duration of hospitalization, surgery and anaesthesia, as described in various other studies.[5-7,13,14]

The incidence of undernutrition in this study was found to be 3.22%, where as the literature quotes values around 40% in orthopaedic in patients.[15]This may be due to the patient selection criteria. We included only those patients who were undergoing planned elective major orthopaedic surgery.

The biochemical parameters, even though are much better at follow up compared to the post op level, do not come back to the pre op level even at 3 months. This indicate that these patients need to be followed up further to know when actually the parameters come back to the pre op level.

There was no difference in the behavior of nutritional parameters between humerus shaft fracture & tibia shaft fracture patients. There was no difference in the behavior of nutritional parameters between humerus shaft fracture & lower limb surgery patients. In tibia shaft fracture patients, over weight patients were predisposed to wound infection.

Only in upper limb patients, hypertension gains significance as a factor affecting the pattern of changes in the nutritional marker levels. A presumed cause offered can be related to the blood loss during surgery.

The wound infections in the patients in our study did not correlate with their nutritional status even though literature quotes positive correlation between the two.[16,17] This may be due to the fact that undernutrition was detected only in 3.22% of the study population.

In our study pre-albumin correlate with the nutritional status better than transferrin. Even though studies have shown the effectiveness of transferrin as a nutritional marker[18], Pre-albumin may be a better marker for the nutritional assessment.

Conclusion

We concluded that the effectiveness of pre-albumin as a reliable nutritional marker. Pre-albumin can be used routinely in patients at risk of malnutrition to assess and to take appropriate nutritional measures to prevent complications.

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