

Assessment of Malnutrition in Orthopaedic Surgery

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Abstract

Original Research Article

Malnutrition was common in orthopaedic patients and can have negative effects on outcomes, as studied in the hip, femoral and tibial fractures. The objective of the study was to know the effect of major elective orthopaedic surgery on the nutritional status of patients and to analyse how the nutritional markers behave pre op, post op and at 3 months follow up in patients undergoing elective orthopaedic surgery. This study was conducted at Department of orthopaedics, Government medical college, Nizamabad, Telangana state. It includes 50 patients are of 20-60 years, with a mean age of 45.6 ± 10.25 years. Males were 27 & females were 23. Diabetes was noticed in 11 patients and hypertension in 6 patients. The number of patients with BMI less than 20 (Undernourished) was only 10, and normal BMI in 22 and BMI more than 25 (overweight) was 18. The pre albumin and transferrin at pre op, post op and follow up of the patients shows a significant difference between all three values. There was significant difference in the pattern of values in diabetics and when comparing the age groups and wound infection. Hypertension and gender did not reveal any significant difference in the pattern of values. Ten patients had wound related complications – 6 superficial wound infection and 4 deep infection. There was no association of BMI with the incidence of wound infection. Four patients had post-operative urinary tract infection. Prealbumin may be a better marker for the nutritional assessment.

Keywords: Malnutrition, Prealbumin, Transferrin, Hip fracture, femoral fracture.

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INTRODUCTION

Protein is an important structural component and low protein intake may compromise the structure and strength of bone and lead to hip fracture. Malnutrition can be further aggravated by long delay for surgery, pain, nausea and vomiting [1]. The catabolic effect of surgery together with malnutrition leads to muscle wasting, which in turn will impair rehabilitation, prolong the length of hospitalization and result in poor clinical outcome and increased mortality [2]. The poor nutritional picture in this patient profile can arise from countless factors, including: alterations in the gastrointestinal physiology, medications, chronic clinical conditions, decrease of appetite, of physical activities and of the thin mass of the body, chronic diseases in the liver and kidneys, cancer and surgery [3].

Nutritional status in elderly patients with fracture can deteriorate during hospital stay and protein energy malnutrition is a poor prognostic factor for functional recovery in hip surgery patients [4]. Energy expenditure and protein requirement are often elevated after a trauma from hip fracture and the following

surgical repair. As a result, nutritional deficiency may be further exacerbated [5]. Protein energy malnutrition following acute hip fracture is associated with increased morbidity, mortality and healthcare costs [6].

The aim of nutritional assessment is to identify patients who are malnourished or at high risk of malnutrition. With appropriate nutritional intervention, it is hoped that they will benefit [7]. Failure to diagnose hospital-based malnutrition can lead to significant cost implications independent of whether nutritional intervention care will lead to an improvement in outcome [8]. Protein energy malnutrition screening and perioperative nutritional treatment have been recommended [9]. Depending on the criteria used, the reported malnutrition rate varies from 6%–78% [10]. There is lack of universal consensus regarding the best measure for protein energy malnutrition diagnosis and documentation [11].

The nutritional state of elderly patients hospitalized with hip and femur fracture appears to affect their recovery, with the most well-nourished having better and faster clinical rehabilitation. Many

elderly individuals are lacking a follow-up that encourages them to seek healthier eating habits. In this study we evaluated the prealbumin and transferrin as nutritional status indicators in orthopaedic patients undergoing hip and femur surgeries, required longer recovery periods.

MATERIALS AND METHODS

This study was conducted at Department of orthopaedics, Government medical college, Nizambad, Telangana state after obtaining permission from hospital ethics committee. It includes 50 patients undergoing elective hip and femur surgeries. 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 nutritional assessment was done by both anthropometries (BMI) and biochemical markers like Prealbumin and Transferrin better predictors of the nutritional status were estimated. Complication like Diabetes mellitus, hyper tension and wound infections, Urinary Tract Infection (UTI) were also studied. UTI referred to in our study is defined as the bacterial infection of any part of the urinary tract, confirmed with urine culture. Females were more at risk for UTI due to the anatomical differences. Paraplegics are also more at

risk for UTI. Wound infection was of superficial 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. The statistical analysis was done using SPSS software version 16. The statistical tests used were Chi square test and repeated variable Anova test.

RESULTS

This study was conducted at Department of orthopaedics, Government medical college, Nizambad, Telangana state. It includes 50 patients undergoing elective hip and femur surgeries. The type of surgery was shown in table 1. The analysis was done on the 50 patients evaluated at the preoperative, post-operative and three months follow up. People included in this study are 20-60 years, with a mean age of 45.6 \pm 10.25 years. The patients were divided into two age groups for comparison and -age more than 40 yrs and less than 40 yrs. Males were 27 & females were 23. Diabetes was noticed in 11 patients and hypertension in 6 patients.

Table-1: Type of surgeries

| Type of surgeries | No of patients |
|----------------------|----------------|
| Hip arthroplasty | 30 |
| Interlocking femur | 14 |
| Interlocking tibia | 12 |
| Bimalleolar fracture | 4 |

The number of patients with BMI less than 20 (Undernourished) was only 10, and normal BMI in 22 and BMI more than 25 (overweight) was 18. Prealbumin and transferrin values at pre & postoperative and follow up at 3 months in patients and in other co-

morbidities were shown in table 2 & 3. Prealbumin was less than 20mg/dl observed in undernourished patients. There was no patient with transferrin value less than 200mg/dl.

Table-2: Prealbumin levels in patients

| Prealbumin (mg/dL) | | Pre op | Post op | Follow up (3 months) |
|--------------------|-----------|--------|---------|----------------------|
| Group Average | | 28.5 | 23.0 | 27.1 |
| Age | <40 years | 31.2 | 27.5 | 30.2 |
| | >40 year | 27.2 | 23.4 | 25.4 |
| Gender | Male | 28.5 | 24.3 | 26.4 |
| | Female | 28.2 | 24.1 | 26.3 |
| Diabetes | No | 29.0 | 25.2 | 27.7 |
| | Yes | 25.6 | 20.4 | 23.5 |
| Hypertension | No | 28.5 | 24.3 | 27.1 |
| | Yes | 26.5 | 22.0 | 25.6 |
| Wound infection | No | 27.6 | 24.2 | 27.2 |
| | Yes | 24.5 | 21.5 | 23.8 |

Table-3: Transferrin levels in patients

| Transferrin (mg/dL) | | Pre op | Post op | Follow up (3 months) |
|---------------------|-----------|--------|---------|----------------------|
| Group Average | | 278.5 | 256.3 | 275.9 |
| Age | <40 years | 315.6 | 286.5 | 302.2 |
| | >40 year | 278.3 | 252.6 | 276.5 |
| Gender | Male | 282.6 | 256.3 | 274.5 |
| | Female | 278.3 | 254.4 | 270.9 |
| Diabetes | No | 284.5 | 264.3 | 278.7 |
| | Yes | 278.4 | 224.5 | 245.6 |
| Hepertension | No | 281.5 | 254.8 | 278.3 |
| | Yes | 272.0 | 252.0 | 275.8 |
| Wound infection | No | 283.3 | 261.2 | 272.6 |
| | Yes | 242.3 | 224.5 | 250.3 |

The pre albumin values at pre op, post op and follow up of the patients shows a significant difference between all three values. There was significant difference in the pattern of values in diabetics and when comparing the age groups and wound infection. Hypertension and gender did not reveal any significant difference in the pattern of values.

Transferrin values at pre op, post op and follow up of the patients shows a significant difference between all three values. There was significant difference in the pattern of values in diabetics, when comparing between the age groups and in patients with wound infection. Hypertension and gender did not reveal any significant difference in the pattern of values.

Complications

Ten patients had wound related complications – 6 superficial wound infection and 4 deep infection. There was no association of BMI with the incidence of wound infection. Four patients had post-operative urinary tract infection.

DISCUSSION

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 function¹. PEM is common in hospitalized patients and is associated with increased mortality. 30%– 60% of patients hospitalized for acute illness are malnourished, and nutritional status has been shown to deteriorate during hospitalization [12]. Reasons for this high prevalence include poor recognition and monitoring of nutritional status and inadequate intake of nutrients during hospitalization.

The catabolic state and the inflammatory reaction that occur in response to the trauma of both the fracture and surgery are particularly severe in hip fracture patients. It persists for several months and is dramatically higher than in nonsurgical elderly patients [13]. Hospitalized hip fracture patients have lower nutrient intake than the elderly control population [14].

Thus the prolonged inflammatory response may be related to the state of malnutrition in these patients. It results in loss of skeletal muscle mass, visceral protein and immune competence. It could induce a downward frailty cycle that may lead to dysfunction or death in certain patients [15].

Among a plethora of biochemical markers available, serum albumin remains the protein of choice in assessing protein depletion [16]. A level of 3.5 g/dl or higher is widely accepted as normal. In fact, some authors have used albumin levels alone as a laboratory indicator for malnutrition in orthopaedic patients [17]. However, no single nutritional index is considered reliable in identifying malnutrition in the elderly. It has been demonstrated that the discriminatory value of any single variable is relatively weak [8]. The combination of albumin levels with total lymphocyte count has the advantage of adding an immunological factor to the assessment [19]. Commonly used markers for malnutrition in hip fracture studies include albumin level, body mass index (BMI), Mini Nutritional Assessment (MNA) or its short form (MNA-SF) [20].

Koval *et al.* [21] studied the effects of malnutrition on a hip fracture population; albumin level and total lymphocyte count were used alone as indices for protein depletion in hip fracture patients. With regard to length of hospital stay, they found low albumin and total lymphocyte count levels to be predictive ($p = 0.03$) of a longer hospitalisation, using duration of two weeks as a threshold.

This prospective study was designed to analyze the effect of major orthopaedic surgery on the nutritional status of the patients. The results of the study shows significant difference in the pre op, post op and the follow up values of biochemical marker–Prealbumin and transferrin, in all groups of patients. This indicate that the trauma of hospitalisation, surgery and anaesthesia does affect the nutritional status of the patient, as described in various other studies [22].The incidence of undernutrition in this study was found to be 20%, whereas the literature quotes values around 40% in orthopaedic inpatients[23]. More over many of

them were over nourished. Most of the literature on malnutrition in orthopaedics are on trauma, especially hip trauma in the elderly [24, 25]. 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 indicates that these patients need to be followed up further to know when actually the parameters come back to the pre op level.

The relationship between age and the nutritional status in orthopaedic patients have been extensively studied especially in hip fractures in elderly [24, 25]. The wound infections in the patients in our study correlate with their nutritional status [26]. In our study, Prealbumin and transferrin correlate with the nutritional status, better one is prealbumin. Even though studies have shown the effectiveness of transferrin as a nutritional marker [27].

CONCLUSION

This prospective study clearly shows the effects of major elective orthopaedic surgery on the nutritional status of the patients. The pre albumin and transferrin at pre op, post op and follow up of the patients shows a significant difference between all three values. There was significant difference in the pattern of values in diabetics and when comparing the age groups and wound infection. Hypertension and gender did not reveal any significant difference in the pattern of values. Possibly prealbumin is a better indicator of nutritional status than. Transferring and prealbumin was most significant. Prealbumin 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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