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Assessing undernutrition of trauma patients with complex soft tissue defects treated at viet duc university hospital using prealbumin serum levels

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Abstract

Purpose: Nutrition is playing an important role in mitigating trauma wounds, especially complex wounds. Undernutrition could cause a delay in the wound healing process and prolonged hospital stay. Thus we have conducted the study aiming to evaluate the nutritional status of trauma patients with complex soft tissue defects for the further recommendation of wound care improvement.

Materials and Methodology: A prospective study of patients with complex traumatic wounds who have been treated at the Department of Septic Surgery and Wound care of Viet Duc University Hospital from 2/2020 to 2/2021. Subjects enrolled in this study include both genders, over 18 years old, with trauma wounds, are evaluated the undernutrition by pre albumin serum levels. The data was processed by software SPSS.20.0.

Results: A total of 70 patients were diagnosed the complex traumatic wounds, of them, 57 males accounted for 81.4%; 13 females accounting for 18.6%; mean age was 37.1 ± 2.3. The main cause of injuries was road traffic accidents, accounting for 78 %, and occupational accidents accounting for 22%. 21.4% of patients were reported to have soft tissue wounds only, the remaining 78.6% were with complex lesions including tendon and bone damaged. Co-morbidities accounted for 20% (Mellitus diabetes), 15.7% (heart diseases). No one in serious status of undernutrition (pre albumin serum <5.0 mg/dL), however, 5.0 to 10.9 mg/dL accounted for 28.6%, and 15.0 to 35.0 mg/dL accounted for 71.4% respectively. Healing time <1 week was 8.6%, from 1-3 weeks in 72.9%, and more than 3 weeks in 18.5%. Complications with serious necrosis requiring more debridements accounted for 8.6%.

Conclusions and Recommendations: Results from the study show that nutritional evaluation is useful in complex traumatic wounds treatment. Careful and daily check of wounds, evaluation of healing progress as well as the patient nutritional status can make the appropriate treatments which might help to improve the healing progress.

Keywords: Wound care, wound healing, malnutritional risk assessment.

Introduction

Wound care is an important part of treatment for surgical patients. Wound healing complications such as infection, delayed healing affecting the treatment process, causing prolonged hospital stay, increasing costs. According to a statistic in the US, the length of hospital stays increasing with an average of 7.4 days due to complications related to wound care cost an additional 130 million USD per year. In Vietnam, many recent studies have shown that wound care plays an important role in medical care, wound infection complications are most common among nosocomial infections, accounting for 12% in some large hospitals [1,2,3,4,].

According to the researches, many factors affect the quality of wound care and wound healing, including nutrition. For both chronic and acute wounds, appropriate nutrition is the key to accelerate the healing process. The undernutrition mostly affected wound healing and should be adjusted [1,5].

Viet Duc University Hospital is a special class surgical hospital, performs over 70,000 major operations per year in recent years, most common are related to trauma and injured wounds [6]. Despite wound care being an important issue of the hospital's professional activities, however, not so many reports related to nutrition and wound care have been done. This is a common situation in Vietnam because clinical assessment of nutritional status has yet to become part of the routine clinical history taking and physical examination. Therefore, we conducted a study to assess undernutrition of trauma patients with complex soft tissue defects which have been treated at the Wound Care Unit - Department of Septic

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Surgery, Viet Duc University Hospital aiming to make recommendations for improving the quality of care in general, and in wound care in particular.

Materials and Methodology

Subjects

Selection criteria

All patients aged from 18 years old, regardless of gender, with traumatic soft tissue wounds were treated at the Wound Care Unit - Department of Septic Surgery at Viet Duc Hospital during the period from February 2020 to February 2021.

Methods

Retrospective and prospective study.

Research variables

General characteristics of subjects: age, gender, causes of injury.

Wound characteristics: sized from 5 cm in wide and damaged to subcutaneous layer (hypodermis) in-depth.

Characteristics of nutritional status on admission and two days later based on pre-Albumin serum test. Levels of undernutrion according to Fuhrman MP [7].

<5.0 mg/dL: Severe requiring active intervention
5.0 to 10.9 mg/dL: Mild, requiring nutritional intervention
11.0 to 15.0 mg/dL: Moderate, retest every 2 weeks to adjust
15.0 to 35.0 mg/dL: No undernutrition,

Treatment outcomes

Data processing

The database was collected and processed by using SPSS 20.0 software.

Research ethics

The study protocol was approved by the hospital's Board of Directors, as well as relevant departments at the study sites.

Results

Some demographics of subjects

Age-gender characteristics: 70 patients who met with criteria, were predominantly male: 57 males (81.4%) and 13 female (18.6%). The average age was 37.1 ± 2.3, in which age group between 20 to 60 years old accounts for the vast majority,

Discussions

Nutrition is essential for patients, affecting the quality of care and treatment in general. Many studies have shown that patients have nutritional problems (at risk of malnutrition or severe malnutrition) which range between 20 to 50% [7,9,10]. Malnutrition, especially undernutrition causes postoperative complications, prolonged hospital stay, and increases treatment costs. Despite the interest and advances in interventions, the undernutrition of patients is still not fully concerned. For surgical or trauma patients, nutrition plays an even more important role. Undernutrition increases the risk of postoperative complications such as surgical site infection, anastomotic leaks, delayed wound healing, etc. Besides, undernutrition is also associated with other nosocomial infections such as pneumonia, sepsis. Trauma patients with undernutrition are not being except with complications and mortality, prolonged hospital stay. In the studies conducted by Xin Chen in China in a large number of trauma patients in the plastic surgery department of Xinqiao Hospital, Chongqing [10], by Nguyen Tien Dung of the National Institute of Burns [4] in patients with wounds have shown the role of nutrition in wound healing. In the report of NV Pham [11] and colleagues on 438 surgical patients at some hospitals in the Mekong Delta region of Vietnam, the malnourished group had a higher rate of complications than the group without malnutrition problems, especially postoperative infectious complications.

According to dietetic experts, nutrients enhance the ability to rebuild connective tissue, promoting wound healing. Wound healing is a complicated process through three stages: Inflammatory phase - Proliferative phase - Remodelling phase, protein deficiency prolongs the inflammatory phase because protein contains nitrogen, stores amino acids, plays an important role in tissue reconstruction [12,13,14,15].

The causes of undernutrition are divided into 3 groups [14,15]: *Decreased nutrient tolerance due to anorexia:* elderly, psychological, pathological patients; Decreased ability to digest and absorb: mainly related to gastrointestinal diseases such as short bowel, intestinal tuberculosis, cancer, sub-obstruction, drug side effects, after surgery ... Loss of nutrients: gastrointestinal fistula, burns, injury…

Increase metabolism due to trauma, burns, surgery

Administered ways: oral (enteral) or intravenous (parenteral). It can be said that undernutrition has many combined causes, especially for trauma patients, the result of an imbalance between nutrient supply and nutrient consumption over a while, causing functional impairment body.

To improve nutritional status which helps to treatment outcomes, and to prevent the risk of complications, patients should be evaluated for nutritional status as soon as they are admitted to the hospital for adjustment nutrition regimen, it includes:

Rapid assessment of overall nutritional status: based on anthropometry such as BMI (Body Mass Index), NRS-2002 (Nutrition Risk Screening-2002), subjective nutritional assessment (SGA).

Assessment of adipose muscle and tests: Determination of

body composition through muscle mass, fat by clinical or ultrasound check or muscle strength by assessment of hand force, biochemical tests by serum albumin/prealbumin levels. [16,17,18]

In which, the risk of undernutrition is assessed through easy-to-implement and valuable laboratory indicators, which is the measurement of serum prealbumin (transthyretin). It is a tryptophan-rich protein and, similar to albumin, it is synthesized in the hepatocytes of the liver and released in the blood [8,18]. It helps to carry certain hormones that regulate how the body uses energy and other substances through blood circulation. When prealbumin levels are lower than normal, it might be a sign of undernutrition and doctors will adjust protein supplements or fluids accordingly. For trauma and injured patients, assessment by weight, squeeze force, and fat muscle mass cannot be done because of many soft tissues already damaged and the patients should be immobilized on beds, therefore based on biochemical tests, it will be an easy way to perform. According to Albina JE (1994) [8], blood tests for albumin and prealbumin are also a way to assess nutrition for hospitalized patients when other measures are not possible to conduct. On the other hand, these two test indicators are also used to evaluate the effectiveness of post nutritional intervention for patients. Although no method of assessment is perfect, the application of the assessment of malnutrition will provide appropriate intervention and assist the physician in the wound care process. Besides, because the length of stay of trauma patients is not as long as the patients with chronic wounds, the assessment needs to be early and timely. The prealbumin's short half-life of 2 days, is suitable for evaluation.

Prealbumin is a misnomer; the correct name is transthyretin [3]. As it has a short half-life (2 days) and a relatively small pool, it might be a better indicator to assess nutritional status than the widely used albumin serum level [4].

In our series, males accounted for the vast majority of patients with 81.4%, females accounted for only 18.6% (Figure 1), most of the trauma patients were young and the average age was 37.1 ± 2.3, which related to traffic accidents accounted for the majority of 84% (Figure 2). The location of injury in the lower limb accounts for 78.6%, the upper limb is 15.7%, only 5.7% affects other parts of the body (Table 1). In our series, the characteristics of wounds were in Table 2 shown that complex wounds accounted for 78.6%, sized more than 10cm for 58.6%, and over 15cm was 10%. Risk factors were exudate for 75.3%.

Table 3 relates to co-morbidities diseases, the combined causes of delayed healing. This is similar to other reports showing that healing factors are strongly influenced by co-morbidities diseases such as Mellitus diabetes and cardiovascular disease [4,9,10,19].

In particular, the study showed that the nutritional status of patients through assessment of prealbumin index that was different from studies related to chronic wounds. In our series, there were no patients who had severe undernutrition (Table 4: serum prealbumin level <5.0 mg/dL), however, mild undernutrition with serum prealbumin levels from 5.0 to 10.9 mg/

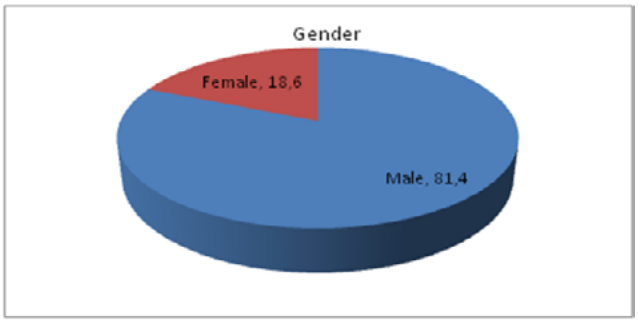

Figure 1: *Male and female ratio.*

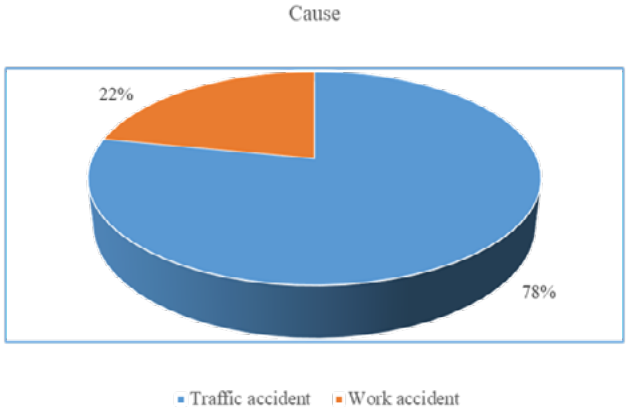

Figure 2: *Causes of wound injuries.*

Table 1: *Location of wounds (n=70).*

Description	n	%
Upper limb	11	15.7
Lower limb	55	78.6
Body part	4	5.7

Table 2: *Wound characteristics (n=70).*

Description	Size	Wound criteria
Soft tissue only : 21.4%	5-10cm: 31.4%	exudate wound: 74.3%
Associated with tendon and bone lesions : 78.6%	>10cm: 58.6%	necrotic tissue: 24.3%
	>15cm: 10%	

Table 3: *Co-morbidities.*

Description		n	%
Diseases	Heart diseases Mellitus diabetes Vascular diseases at lower limbs Other *	11 14 4 6	15,7 20 5,7 8,6

Table 4: *Serum pre-albumin levels (n=70).*

Description	n	%
<5.0 mg/dL (serious undernutrition)	n = 0	%
5.0 to 10.9 mg/dL (mild undernutrition)	n= 20	28,6
11.0 to 15.0 mg/dL (moderate undernutrition)	n= 0	0
15.0 to 35.0 mg/dL (normal range)	n= 50	71,4

dL accounted for 28.6%, and normal range with serum prealbumin from 15.0 to 35.0 mg/dL accounted for 71.4% respectively. In the study of AM Moghazy [18], prealbumin level was normal in 68% of those with normal albumin levels and 60% of those with hypoalbuminemia.

Features of laboratory tests

After appraising the serum prealbumin level in fifty burned patients undergoing graft in the Suez Canal University Hospital Burn Unit, AM Moghazy [18] concluded that this index was more valuable in assessing nutritional status than albumin. The author assessed the patient's serum prealbumin status before and after surgery on the 4th day of the patient having plastic surgery at the burn department. In young patients, the serum prealbumin concentration was higher in acute wounds, which was related to the healing process. If the patient's condition is stable, serum prealbumin is considered a predictor of scar healing with high sensitivity. According to Albina JE [8], serum albumin below 30mg/dl will delay the healing process

Table 5: *Complications (n=8)*.*

Descriptions	n	%
Bleeding	2	2,9
Serious extension of nercosis	6	8,6

**Complications rate accounted for 11,4%. They are all undernutrition on admission.*

Table 6: *Healing time.*

Time	n	%
1 week	6	8.6
From 1 to 3 weeks	51	72.9
More than 3 weeks	13	18.5

**Healing time more than 3 weeks was also in a group of patients with undernutrition*

as well as increase the risk of surgical site infection.

Healing time < 1 week accounted for 8.6%, from 1 to 3 weeks accounted for 72.9%, over 3 weeks only 18.5%. The main complication was the extension of necrotic tissue requiring multiple excisions, accounting for 8.6% (tables 5 and 6). The patients who healed the wounds in more than three weeks or complicated were all undernutrition.

Conclusions

Undernutrition caused by increase metabolism in patients having trauma, burns, surgery affects treatment results, especially for patients with traumatic wounds, which delayed the healing process. For promoting wound healing, the patients need to be assessed earlier the undernutrition risk for timely intervention. Among the assessments of malnutrition status, serum prealbumin levels are effective, simple, and suitable for trauma patients. The combination of nutrition assessment and daily check of wound healing progress becomes one part of wound care procedures to improve the quality of treatment. However, further studies with a large sample size are recommended for developing the protocol of wound care, including the malnutrition assessment.

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