

Evaluation Of Nutritional Status By Different Parameters And To Predict Spontaneous Closure, Morbidity And Mortality In Patients With Enterocutaneous Fistulas: A Study Of 92 Cases

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Abstract

92 patients of enterocutaneous fistula are evaluated for their nutritional status at the time of presentation by clinical, biochemical, functional evaluation and discriminant analysis.

Study reveals that serum transferrin level > 140 mg/dl correlates well with the spontaneous closure of enterocutaneous fistulas and mortality among these patients is low. ($P < 0.005$), Serum albumin 3gm/dl has good prognostic value for enterocutaneous fistulas ($P < 0.005$), Prognostic nutritional index <40 (low risk) have significantly less mortality and high fistula closure rate ($P < 0.02$), and triceps skinfold thickness and delayed cutaneous hypersensitivity seems to have good correlation with fistula closure rate and mortality but necessitate further study for proper statistical analysis. Proper evaluation of Nutritional Status in patients with enterocutaneous fistulas is an important and integral part of management of patients to select for aggressive nutritional support to decrease morbidity and mortality in these patients.

INTRODUCTION

Enterocutaneous fistula is an abnormal communication, direct or indirect between the gastrointestinal tract and the body surface.¹

Enterocutaneous fistulas may lead to severe and rapid loss of nutrition. It appears to be related to site and volume of fistula and correlates directly with increased morbidity and mortality.^(2, 3, 4)

A focused nutritional history and physical examination suggesting nutritional depletion such as weight loss of 10 %, pre existing illness, weakness, muscle wasting and edema might be helpful in obtaining a subjective assessment of nutritional status. Anthropometric assessment in the form of skin fold thickness attempts to estimate body fat reserve while mid - arm muscle circumference estimates muscle mass. A patient with triceps skinfold thickness <60 percent of the standard (12.5mm in men and 16.5 mm in women) would be considered as having abnormalities of fat reserves, while those demonstrating mid-arm muscle circumference < 60 percent of standard (25.5 cm in men and 23 cm in women) are considered as having abnormal somatic or

skeletal muscle protein stores.⁽⁵⁾

Determination of serum albumin and prealbumin levels gives an indirect estimate of visceral protein stores. Prealbumin level is more suggestive of acute changes in nutritional status.

Transferrin is the principle plasma protein for transport of iron. Its concentration correlates with total iron-binding capacity of serum.

Measurement of transferrin levels in serum and other body fluids aid in the differential diagnosis of malnutrition, acute inflammation, infection, and assessment of renal function and red blood cell disorders, such as iron deficiency anemia, and protein loss for which it is also useful in monitoring treatment.

Functional assessment aims at evaluating immune competence and muscle function. Immune function might be assessed by determination of total lymphocyte count and delayed cutaneous hypersensitivity (DCH) to a battery of intradermal antigens, however in critically ill patients a number a factor can non-specifically alter DCH thereby

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rendering it meaningless in the evaluation of nutritional status.

Immune function is therefore neither a specific indicator of mal-nutrition nor is easily assessed.(6)

A prognostic nutrition index (PNI) which permits quantitative determination of the risk of nutritionally based operative morbidity and mortality in an individual patient, is an equation which takes into consideration of four variables used for nutritional assessment namely serum albumin (gm/dl), serum transferrin (mg/dl), triceps skinfold thickness (mm) and delayed cutaneous hypersensitivity to a three antigen panel (rated as 0: non reactive, 1:<5mm in diameter, 2: ≥ 5 mm in diameter) (7)

MATERIAL AND METHODS

The study consist of 92 patients with enterocutaneous fistula admitted in the Department of Surgery, M. Y. Hospital, Indore during the period of June 2005 to June 2008.

1. With objective of evaluation of nutritional status of each patient by clinical evaluation, biochemical evaluation, functional evaluation and discriminant analysis and to evaluate role of measurement of different parameters to predict spontaneous closure of fistulas and morbidity and mortality in these patients.

2. To study the value of PNI to predict morbidity and mortality of these patients

Patients less than 14 years of age group were not included in the study.

Statistical analysis done by Chi-square test

RESULT

Figure 1

Table 1: Outcome in relation to Serum Transferrin levels

(Serum Transferrin) (mg/dl)	Patients	Spontaneous Closure	Cured by surgery	Died
<100	10	2 (20.0%)	2 (20.0%)	6 (60.00%)
101 to 140	22	4 (18.18%)	6 (27.27%)	12 (54.55%)
>140	60	50 (83.33%)	2 (3.33%)	8 (13.33%)

$\chi^2=9.60$; 1 d.f.; $p < 0.005$, Highly significant

Out of 60 patients who had serum transferrin level more than 140 mg/dl, 50 patients undergone spontaneous closure and 2 patient undergone surgical closure. Spontaneous closure rate 83%. Mortality rate 13%.

Out of 32 patients who have serum transferrin less than 140mg/dl, 6 patients undergone spontaneous closure and 8 patients undergone surgical closure and 18 patients died. Spontaneous closure rate 19%. Mortality rate 57%.

Figure 2

Table 2: Outcome in relation to Serum Albumin

S. Albumin (g.dl)	Patients	Spontaneous Closure	Cured by Surgery	Died
<3	30	6 (20.00%)	6 (20.00%)	18 (60.00%)
≥3	62	50 (80.64%)	4 (6.46%)	8 (13.00%)

$\chi^2 = 8.50$; 1 d.f.; $p < 0.005$, Highly significant

Patients who were malnourished (serum albumin < 3 gm/dl) had spontaneous closure rate 20% and mortality 60% as compared to well nourished group (serum albumin ≥ 3 gm/dl) had spontaneous closure rate 80% and mortality 13%

Figure 3

Table 3: Outcome in relation to Prognostic Nutritional Index (PNI)

S. Albumin (g.dl)	Patients	Spontaneous closure	Cured by Surgery	Died
<40	8	8 (100.00%)	-	-
40-49	20	18 (90.00%)	-	2 (10.00%)
≥50	64	30 (46.88%)	10 (15.62%)	24 (37.50%)

$\chi^2 = 6.40$; 1 d.f.; $p < 0.02$, Significant

Among low risk group (PNI<40), fistula closure rate is 100%

Among moderate risk group (PNI 40-49), fistula closure rate was 90% and mortality was 10%

Among high risk group (PNI ≥50) fistula closure rate was 63% and mortality 37%.

Figure 4

Table 4: Outcome in relation to Triceps Skinfold thickness (TSFT)

TSFT	Patients	Spontaneous Closure	Cured by surgery	Died
Males				
≥ 7.5	60	46 (76.67%)	2 (3.13%)	12 (20.00%)
< 7.5	12	-	2 (16.67%)	10 (83.33%)
Females				
≥ 9.9	12	8 (66.67%)	4 (33.33%)	-
< 9.9	8	2 (25.00%)	2 (25.00%)	4 (50.00%)

Patients in whom TSFT is < 60% of the standard (<7.5 mm in males and <9.9 mm in females), spontaneous closure rate was 10% and mortality rate was 70%

Figure 5

Table 5: Outcome in relation to Delayed Cutaneous Hypersensitivity (DCH)

DCH	Patients	Spontaneous Closure	Cured by Surgery	Died
0(NR)	10	2 (20.00%)	0 (0)	8 (80.00%)
1(<5mm)	52	36 (69.00)	2 (4.00%)	14 (27.00%)
2 (≥5mm)	30	20 (67.33%)	8 (26.67%)	2 (7.00%)

Anergic patients (DCH non reactive / 0) had 20% spontaneous closure rate and 80% mortality.

Intermediate reaction (<5 mm/ 1) - 69% closure rate and 27% mortality

Good reaction (>5mm/2) - 67% spontaneous closure rate and 7% mortality.

Figure 6

Table 6: Comparative Study of Good Prognostic variables

Variable	Patients	Spontaneous Closure	Cured by surgery	Died	x2	P value
Serum albumin (>3 gm%)	62	50 (80.64%)	4 (6.45%)	8 (12.91%)	8.50	<0.005
ST (>140 mg/dl)	60	52 (86.67%)	4 (7.16%)	4 (7.16%)	9.60	<0.005
TSFT (>12.5 mg/dl-M) (>16.5 mg/dl-F)	72	54 (75.00%)	6 (75.00%)	12 (16.5%)	-	-
DCH2 (>5mm)	24	18 (75.00%)	6 (25.00%)	-	-	-
PNI <40%	8	8 (100.00%)	-	-	6.40	<0.02

DISCUSSION

92 patients with enterocutaneous fistulas are evaluated for their nutritional status at the time of presentation of the fistula. Serial measurement of the different nutritional markers or parenteral nutritional index was not done because slowly changing parameters such as triceps skinfold thickness and parameters sensitive to dilutional factors such as albumin, are an insensitive measure of acute nutritional manipulation.

A study from University of Pennsylvania by Mullen JL, Buzby GP et al(7) examined the value of 16 nutritional and immunologic variables in predicting consequent morbidity and mortality in surgery patients.

Only three nutritional factors examined individually were shown to correlate with outcome. Serum transferrin, serum albumin and delayed hypersensitivity reaction. Kaminski et al(8) recently correlated mortality with serum transferrin levels on admission. Harvey et al(9) demonstrated a correlation between mortality and serum transferrin, serum albumin and delayed hypertensive reactivity.

Nutritional assessment has been done by four main nutritional parameters and finally by discrimination analysis by Prognostic Nutritional Index.

Four main nutritional parameters are:

A. Serum Transferrin (ST): According to Kuvshinoff BW, Brodish RJ, Mcfadden DW, et al(10), if at the time of presentation of enterocutaneous fistulas or after 3 weeks of therapy, the serum transferrin level is >200 mg /dl, spontaneous closure is more likely. Kaminski et al JPEN 1977; recently correlated hospital mortality with serum transferrin levels on admission. Patients whose serum trasferrin levels was < 170 mg/dl had a 2.5 fold increase in

mortality.

In my study patients whose serum transferrin was < 140 mg/dl (19% spontaneous closure rate and 56% mortality rate) had a 4.3 fold increase in mortality and spontaneous closure is more likely is at the time of presentation serum transferrin level is >140 mg/dl (83% spontaneous closure rate and 13% mortality rate), (p<0.005)

B. Serum albumin: According to Blackburn GL, Smith MF et al⁽¹¹⁾ in 1977, a study of nutritional and metabolic assessment of the hospitalized patient, serum albumin along with other nutritional factors is a traditional measure of nutritional status. Serum albumin level <3 gm% is related with increased morbidity and mortality and less chance of spontaneous closure of fistulas. Coutsoftides T, Fazio VW et al 1979 and Soeters PB, fischer JF et al⁽²⁾ in a review of 404 patients with gastrointestinal fistulas mentioned that malnutrition as defined by loss of > 15% of usual body weight and /or hypoalbuminemia of <3.5 gm/dl occurs in majority of patients (about 70%) with enterocutaneous fistulas which appears to be related to the site and volume output of fistulas and correlates directly with increased morbidity and mortality in this group of patients

In my study 33% patients having serum albumin <3 gm/dl at the time of presentation in whom spontaneous closure rate was 20% and mortality rate was 60% and patients in whom serum albumin was ≥ 3 gm/dl spontaneous closure rate was 80% and mortality rate was 13%, (p <0.005).

C. Triceps Skinfold Thickness (TSFT): According to McCarthy MC et al⁽³⁾ (1991) a patient with triceps skinfold thickness <60% of the standard (12.5 mm in men and 16.5 mm in women) would be considered as having abnormalities of fat reserves. Buzby GP, Muller JP et al 1980 demonstrated triceps skinfold thickness as an important component of prognostic nutritional index to predict operative risk regarding mortality and morbidity

Hall et al⁽¹²⁾ found considerable inconsistencies when anthropometric measurements were performed by three different observers. The coefficient variation was 22.6% for triceps skinfold thickness and 4.7% for arm circumference. These considerations in particular apply to patients in an intensive care unit and those with liver and renal disease, in which edema is a major problem in assessing skinfold and arm circumference.

In my study I found that patients in whom triceps skinfold

thickness is less than 60% of the standard (n = 10) (12.5 mm in men and 16.5 in female) closure rate was 30% and mortality rate was 70% while patients in whom triceps skinfold thickness was > 60% of the standard (n=36) closure rate was 83% and mortality rate was 17% but whether this difference is statistically significant needs further study as sample size is insufficient

D. Delayed Cutaneous hypersensitivity is one of the four component in the prognostic nutritional index described by Buzby et al. Meakins et al⁽¹³⁾ have shown that simply draining an abscess can reverse anergy, immunity, therefore, neither it is a specific indicator of malnutrition nor easily studied. He reported a large series of surgical patients; demonstrated a greater mortality in anergic patients than in reactive patients (74% versus 5%)

Harvey et al demonstrated a correlation between mortality and delayed cutaneous hypersensitivity. In that study mortality was greater (31%) in patients with serial skin tests that remained abnormal despite adequate nutritional support than in patients with skin tests that remained normal or improved (8%) . There is substantial evidence that skin test anergy is closely correlated with an erosion of body cell mass as demonstrated by Shizal, Spanier et al Reconstitution of the body cell mass by total parenteral nutrition is frequently followed by restoration of skin test reactivity. Failure to restore the body cell mass despite adequate nutrition is associated with persistent skin test anergy and poor prognosis.

In my study anergic patients had 80% mortality and patients with reactivity <5 mm had 27% mortality and reactivity >5 mm had 7 % mortality rates.

E Prognostic Nutritional Index (PNI): Gordon P, Buzby, David C, Matthews, Philadelphia, Pennsylvania, carried out a study in two distinct phase, in Phase I - Development of Linear Predictive Model was done in which Nutritional Assessment was performed on admission in 161 patients before major elective general surgical procedures. Comparison of means values for the variables measured in complicated and uncomplicated patients was used to identify variables; serum albumin, serum transferrin, triceps skinfold thickness and delayed cutaneous hypersensitivity. A discriminant analysis was then performed and a linear prediction model was developed providing a “PNI” relating the risk of operative morbidity and mortality or both to baseline nutritional status as reflected by the four predictive

variables.

In Phase II validation of the predictive model was done by evaluating prospectively 100 patients undergoing elective gastrointestinal surgery. The accuracy of the model in prospectively predicting the occurrence of complications was assessed by comparing the predicted risk of complications with their actual occurrence in 100 GI surgical patients. Patients who were subjectively considered to be at risk of significant malnutrition, 38% were classified as low risk by the index and had a 7.9% complication rate and a 2.6% mortality rate; 23% were classified as intermediate risk with a 30% complication rate and a 4% mortality rate; and 39% were high risk with a 46% complication rate and a 33% mortality rate.

In my study I studied the fistula closure rate and mortality in different group of different PNI value.

9% of the patients were classified as PNI <40 (low risk) had 100% fistula closure rate and no mortality; 22% patients with classified an intermediate risk with a fistula closure rate 90% and mortality rate 10%; 69% were high risk a 63% FCR and 37% mortality rate. Statistical calculation by Chi-square analysis found that this difference is highly significant ($p < 0.02$).

CONCLUSION

Most enterocutaneous fistulas develops as a catastrophic postoperative complication of almost every intra-abdominal surgical procedure. In the present era, mortality is largely determined by uncontrolled sepsis and sepsis associated malnutrition. The loss of gastrointestinal contents including digestive juices, water, electrolytes and nutrients through the fistula may precipitate dehydration, dyselectrolytemia, acid base imbalance and malnutrition.

Evaluation of nutritional status in these patients as soon as fistula is diagnosed by different nutritional markers, provide a useful means to predict spontaneous closure of the fistula and, morbidity and mortality of these patients. So that we can select the patient for aggressive nutritional support from the beginning.

Study demonstrated that:

1. 65% of patient have been serum transferrin level more than 140 mg/dl have spontaneous closure rate of 83% and 13% mortality rates and in patients in whom serum transferrin level less than 140 mg/dl, have 19% spontaneous

closure rate and 56% mortality rate. ($p < 0.005$). Thus Serum transferrin levels > 140 mg/dl correlates well with the spontaneous closure of enterocutaneous fistulas and mortality among these patients is low ($p < 0.005$)

2. 33% patients having serum albumin < 3 gm/dl at the time of presentation in whom spontaneous closure rate was 20% and mortality rate was 60% and patient in whom serum albumin was ≥ 3 gm/dl spontaneous closure rate was 80% and mortality rate was 13% ($p < 0.005$). Thus Serum albumin ≥ 3 gm/dl has good prognostic value for enterocutaneous fistulas ($p < 0.005$)

3. Patient in whom triceps skinfold thickness is less than 60% of the standard, closure rate was 30% and mortality rate was 70% against patients in whom triceps skinfold thickness was $> 60\%$ of the standard, closure rate was 83% and mortality rate was 17%. Thus Prognostic Nutritional Index < 40 (low risk) have significantly less mortality and high fistula closure rate ($p < 0.02$)

4. In this study anergic patients had 80% mortality and patients with reactivity < 5 mm had 27% mortality and reactivity > 5 mm had 7% mortality rates. Triceps Skinfold Thickness and Delayed Cutaneous Hypersensitivity seems to have good correlation with fistula closure rate and mortality.

5. In this study I studied the fistula closure rate and mortality in different groups of different PNI value.

9% of the patients were classified as PNI < 40 (low risk) had 100% fistula closure rate and no mortality; 22% patients with an intermediated risk have a fistula closure rate of 90% and mortality rate of 10%; 69% patients were high risk with a 63% of fistula closure rate and 37% mortality rate.

With this I conclude that proper evaluation of Nutritional status in patients with enterocutaneous fistula is an important and integral part of management of these patients to select the patients for aggressive nutritional support to decrease mortality in these patients.

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