Experience with Enterocutaneous Fistula Management in a District Hospital in Nigeria.

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Background: ***Enterocutaneous fistula (ECF) is an abnormal communication between gastrointestinal tract and skin. It is a difficult condition to treat and morbidity and mortality remain high in many centers. Malnutrition and sepsis are the leading causes of death. There are no clear guidelines for optimal nutritional management. Aggressive measures to maintain positive nitrogen balance is the ultimate goal of nutritional management. Our objective was to review the practice of the nutritional management and outcome of ECF in a resource limited setting in Nigeria.***
Methods: ***A retrospective study of all patients with ECF managed between 2006 and 2015. Management included resuscitation, control of sepsis, enteral feeding, skin care and timely surgical intervention.***
Results: ***A total of 57 patients were managed. Aetiology of ECF in this study was post-operative in 96.5% of cases. Fistula closure was achieved in 51/57 patients (89.5%). Thirty-nine (68.42%) fistulae closed spontaneously on conservative management while 12 (21.05%) fistulae healed following restorative surgery. Mortality rate was 10.5%. Rate of healing was related to serum albumin level and fistula output.***
Conclusion: ***Aggressive enteral feeding allows a favorable outcome in enterocutaneous fistula after a convalescence period. High output and hypoalbuminaemia were important prognostic variables.***

Keywords: Enterocutaneous fistula,enteral feeding, outcome, resource-limited setting
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Introduction

Enterocutaneous fistula (ECF) is the abnormal communication between the intestinal tract and skin. Up to 95% of cases result from complications of abdominal surgery.[1] The incidence of this condition is difficult to estimate as proper data is not kept in peripheral centers. It is classified based on daily discharges from fistula as low output with discharges<500ml/24hours and high output with discharges>500ml/24hours. The mortality and morbidity of ECF remain high despite recent advances in techniques of metabolic and nutritional support.

Before recent advances in enteral and parenteral nutrition were introduced in the management of patients with ECF, mortality was in excess of 60%, and approached 100% in those having high output fistulae.[2] Conversely, the wide unavailability of parenteral nutrition, poor socio-economic condition and widespread antibiotic abuse and resistance in many third world countries would seem to suggest not too remarkable the outcome of ECF patients in these settings. However, mortality ranges between 10% and 30% in studies from most centers reviewed.[1] Sepsis, fluid and electrolyte imbalance and malnutrition (fistula triad) remain the leading causes of death in patients with ECF. One of the most challenging aspects of the management in poor countries is nutritional rehabilitation.

In high output fistula loss of fluid and nutrients may far outstrip rate of replacement. The fistula effluent contains large quantity of water, electrolytes, enzymes, protein, peptides, amino acids and other nutrients. Small bowel secretions may contain up to 75 g of protein, which would otherwise be reabsorbed. Such patients have shifted into a starvation mode, are in a high catabolic state and a prolonged state of negative nitrogen balance.

Following initial resuscitation and sepsis control, the most significant predictor of outcome of ECF is the quality of metabolic and nutritional support.[2] Since the 1970s parenteral nutrition (PN) has been used for initial nutritional management with the aim of inducing bowel rest and facilitating fistula closure and healing. The almost universally unchallenged notion of the benefit of Total Parenteral Nutrition (TPN) in ECF management has been carried through to the present day even though it would seem there has not been additional improvement in the mortality rate since the introduction of "nil by mouth" regimen after the 70s. There are no large studies comparing enteral and parenteral feeding on ECF patients. Many studies in which patients were managed solely with EN report outcomes comparable to those managed with TPN. Earlier researchers state that there are no experimental data for optimal routes of feeding in enterocutaneous fistula .[4]

The classification of fistula affects the route of feeding and caloric and protein requirements[5] i.e. patients with high output fistula should receive more calories and protein than those with low output fistula and may require TPN or other supplements. Basal nutritional requirement is 20 kcal/kg/d of carbohydrate and fat and 0.8 to 1 g/kg/d of protein.[6] For low-output fistulas the requirement increases to 25 to 30 kcal/kg/d and 1.5 to 2 g/kg/d respectively. High-output fistulas may require up to twice the caloric daily requirement plus 2 to 2.5 × baseline protein requirements to achieve a positive nitrogen balance.[7]

Nutritional status assessment includes a focused clinical evaluation to identify features of nutritional depletion. Signs of nutritional deficiency may include loss of 10% body weight, weakness, anaemia, loss of muscle bulk and oedema. Mid arm circumference and triceps skin fold thickness measurements are used to determine abnormalities of muscle mass and fat reserves respectively. Determination of serum albumin and prealbumin levels gives an indirect estimate of visceral protein stores. Levels are low in malnutrition and correlate with chances of fistula closure.[8] Comprehensive nutritional assessment specific for ECF patients are mostly impractical in clinical settings and include parameters like the length of functioning bowel, citrollin and nitrogen balance .[5]

"If the gut works, use it" is a well-known surgical adage. The gastrointestinal tract remains the most desirable route of feeding because it is physiological. It enhances the body's defense mechanism and improves blood supply to the gut. Enteral nutrition is used for low output fistulae and fistulae in the distal ileum and colon. Oral feeding is relatively cheap. Where patients are too sick, however, nasogastric tube feeding, gastrostomy and jejunostomy tube feedings are possible. A feeding tube can be advanced distal to a proximally located fistula e.g. a gastric or duodenal fistula. However, in high output fistulae, and fistulae of the pancreas, stomach and duodenum there are clear benefits of TPN. Fistuloclysis (insertion of a feeding tube directly into an enterocutaneous fistula) is sometimes used for EN when a fistula is not expected to close on its own.[9] Fistula effluent may also be re-infused into another enterocutaneous fistula by fistuloclysis or into a jejunostomy tube.[3] Managing teams must be innovative in their attempts to provide adequate balance of carbohydrates, protein and fats, vitamins and trace elements to these patients. Success depends on patients' motivation, managing teams' aggression, multidisciplinary team approach and timely surgical intervention.

This study reports enteral nutritional management of patients with enterocutaneous fistula admitted to our centre (a resource-limited setting) and some factors affecting the outcome of treatment.

Patients and Methods

This retrospective study identified 77 patients with ECF managed at Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State in North-central Nigeria from 2006 to 2015. Sixty five case files were recovered from the medical records unit. Eight case files were excluded because of incomplete information regarding nutritional management or lack of basic information. Fifty-seven case files were reviewed and relevant data extracted.

Data was collected from patients' records and analyzed. These data included age, sex, weight, height, body mass index, source of referral, origin of the fistula and type of treatment (non-operative and operative), outcome, and length of hospital stay. Fistula output for each patient was calculated from the mean fistula effluent for the first 3 days, starting from the day the fistula was first diagnosed. Fistula was considered low output when mean daily effluent was<500 ml/day, and high output >500 ml/day. Each patient's nutritional status on admission and during treatment was assessed using the available data for weight, body mass index, subjective global assessment, and serum albumin level (normal 3.5mg/dl-5.5mg/dl). Nutritional management was planned individually, depending on the fistula output type and patient's nutritional status. Initial management included resuscitation which involved fluid and electrolytes therapy, blood transfusion and surgery for sepsis or intestinal obstruction. After initial resuscitation, samples were taken for full blood count (FBC), Serum electrolytes, urea and creatinine, calcium, phosphate, liver function tests including serum total protein and albumin, random blood sugar, urinalysis and hemoglobin genotype (in children). Imaging tests included plain abdominal x-rays in suspected intestinal obstruction, fistulography for multiple fistulae and abdominal ultrasound scanning for suspected intra-abdominal abscess.

Onward management was in conjunction with dieticians and medical social workers. Also involved were care-givers and the cleric where possible to encourage patients to feed. Appropriate fluid and electrolytes management continued. Antibiotics were used only in patients with sepsis. Zinc oxide paste was painted around the skin of fistula openings. Dressing over the stoma was changed frequently as required. Nutrition was administered by mouth as the preferred route of feeding. Where necessary this was by nasogastric tube.

A comprehensive catalogue of the traditional practice of nutritional management was collected from the Dietetics Department. Enteral diets consisted of carefully selected locally made high calorie high protein food items. A standardized regime of nourishment was scheduled by the hospital Dietician and mainly involved feeding with Kwash pap preparation. It consists of a combination of finger millet, ground nuts, soy beans and Cray fish made into a powder and stored in 200g packages containing 860kcal of energy. The nutrient content of Kwash pap was computed using Nigerian Food Composition Tables (Ogunmodede, 2011)[1] as shown in Table 1. Nutrients were administered three to four times daily according to each patient's requirement. This was administered orally or via nasogastric tube in very ill patients. Compliance was monitored and patients were weighed daily. Vitamin supplements and trace elements were also administered to each patient.

Adult patients received between 1800kcal in low output and 3000kcal in high out-put fistula per day. For children, calorie intake was a minimum of 30kcal/day and twice this value in high out-put fistula. Adequacy of feeding was adjudged based on patients' continuous weight gain. Feeding was thus adjusted accordingly. Where necessary feeding was supplemented with intravenous amino acid solution (Astymin).

Results

Of the 57 patients studied, 30 were males and 27 were females (M: F ratio = 1.1:1) studied, the median age (Table 2) was 29years (range 7-64 years). Thirty-two (56.14%) patients had fluid and electrolytes abnormality and 12 (21.1%) had anaemia. Patients were resuscitated in the acute setting. All patients received oral feeding following resuscitation. During the course of management, 17 patients (30.9%) required nasogastric tube feeding with or without amino acid (Astymin) supplement (syrup or intravenous preparation) in patients not capable of taking adequately or to augment oral nutrient intake (Table 3). Tables 4 and 5 illustrate outcome in 57 patients with ECF. Fistula closure was achieved in 51 patients (89.5%). Thirty-nine (68.42%) fistulae closed spontaneously on conservative management. On the other hand, twelve patients (21.05%) had successful surgical closure and four had failed restorative surgery. There were four recurrences that were subsequently and successfully managed conservatively. There were 39 (68.42%) low output fistulas of which 30 (76.92%) closed spontaneously while 12 (30.77%) required surgical closure and five died (Table 6).

Table 1: Nutrient content of Kwash Pap (100 g).[1]

Nutrient	Content
Moisture (%)	6.0
Energy(Kcal)	430.0
Protein (g)	33.2
Fat (g)	17.5
CHO (g)	35.0
Fiber (g)	3.5
Ash (g)	4.8

Table 2. Age and sex Distribution

Age in Years	Male	Female	Number
1-10	3	3	6
11-20	12	9	21
21-30	5	7	12
31-40	5	5	10
41-50	4	2	6
51-60	0	1	1
61-70	1	0	1
TOTAL	**30**	**27**	**57**

Table 3. Distribution of the Routes of Feeding

Feeding Modalities	Number
Nasogastric (NG)	9
Oral	56
Astymin Supplement	10
Fistuloclysis	0
Parenteral Nutrition (PTN)	0
Combinations	
NG, then Oral	6
Oral+ *Astymin Supplement	7
NG + *Astymin Supplement, then oral	4

*Astymin: commercial preparation of amino acid, vitamins and trace elements

Table 4A. Summary of the Cases According to Selected Variables

S/N	Age	Sex	Anatomic Level	Aetiology	Output Type	Albumin (mg/dl)	Spontaneous Healing	Length of Stay	Mortality
1	15	F	Ileum	Postoperative	LOP	2.3	-	42	+
2	20	F	Ileum	Postoperative	HOP	2.9	No	67	-
3	12	M	Ileum	Postoperative	HOP	3.0	No	58	-
4	15	M	Ileum	Postoperative	LOP	3.8	Yes	27	-
5	8	F	Ileum	Postoperative	LOP	2.9	No	60	-
6	39	M	Ascending Colon	Postoperative	LOP	4.3	Yes	27	-
7	13	M	Ileum	Postoperative	LOP	3.8	Yes	48	-
8	15	F	Ileum	Postoperative	LOP	2.9	Yes	42	-
9	40	F	Ileum	Postoperative	HOP	2.8	-	57	+
10	21	M	Caecum	Postoperative	LOP	3.2	No	51	-
11	30	F	Jejunum	PAT	HOP	2.4	No	96	-
12	13	F	Ileum	Postoperative	LOP	3.4	Yes	32	-
13	19	F	Ileum	Postoperative	LOP	4.2	Yes	23	-
14	41	M	Jejunum	Postoperative	HOP	2.8	Yes	108	-
15	26	F	Ileum	Postoperative	HOP	2.7	No	76	-
16	17	F	Ileum	Postoperative	HOP	2.9	Yes	38	-
17	16	M	Ileum	Postoperative	LOP	5.3	Yes	23	-
18	11	M	Ileum	Postoperative	LOP	3.3	Yes	40	-
19	31	M	Ileum	Postoperative	HOP	3.8	Yes	18	-
20	23	M	Ileum	Postoperative	HOP	3.7	Yes	35	-
21	30	F	Ileum	Postoperative	LOP	3.9	Yes	43	-
22	10	F	Ileum	Postoperative	LOP	3.6	Yes	20	-
23	13	F	Ileum	Postoperative	LOP	3.7	Yes	32	-
24	45	F	Descending Colon	Postoperative	LOP	4.8	Yes	17	-
25	14	M	Ileum	Postoperative	LOP	3.9	Yes	29	-
26	35	M	Ileum	Postoperative	LOP	3.6	No	53	-
27	43	F	Ileum	Postoperative	LOP	4.0	Yes	42	-
28	34	F	Ileum	Postoperative	HOP	3.7	Yes	26	-
29	34	M	Ileum	PAT	LOP	2.9	No	84	-
30	17	F	Ileum	Postoperative	LOP	4.1	Yes	26	-
31	5	F	Ileum	Postoperative	LOP	2.6	Yes	57	-
32	22	F	Descending Colon	Postoperative	LOP	4.1	Yes	38	-
33	25	M	Ileum	PAT	LOP	2.9	Yes	57	-
34	35	F	Ileum	Postoperative	LOP	5.0	Yes	19	-
35	4	M	Ileum	Postoperative	LOP	3.9	Yes	15	-
36	29	M	Duodenum	Postoperative	HOP	2.2	-	105	+
37	35	F	Ileum	Hernia Incision	LOP	4.5	Yes	15	-
38	70	M	Ileum	Postoperative	LOP	3.9	No	60	-
39	7	M	Jejunum	Postoperative	HOP	2.3	-	29	+

Table 4B. Summary of the Cases According to Selected Variables

S/N	Age	Sex	Anatomic Level	Aetiology	Output Type	Albumin (mg/dl)	Spontaneous Healing	Length of Stay	Mortality
40	11	M	Jejunum	Postoperative	HOP	2.7	Yes	44	-
41	22	F	Caecum	Postoperative	HOP	3.0	Yes	51	-
42	55	F	Descending Colon	Malignancy	LOP	2.8	-	76	+
43	15	M	Ileum	Postoperative	LOP	3.4	Yes	40	-
44	12	M	Ileum	Postoperative	LOP	3.2	Yes	44	-
45	9	M	Ileum	Postoperative	LOP	2.6	No	49	-
46	16	F	Ileum	Postoperative	LOP	3.4	Yes	33	-
47	33	M	Jejunum	Postoperative	HOP	2.7	No	54	-
48	12	M	Ileum	STF	HOP	2.4	-	2	+
49	42	M	Sigmoid	PAT	LOP	4.8	Yes	18	-
50	24	F	Ileum	Post-abortion	LOP	4.4	Yes	92	-
51	28	M	Ascending Colon	Postoperative	LOP	3.6	Yes	18	-
52	14	F	Ileum	Postoperative	LOP	3.4	Yes	16	-
53	26	M	Caecum	Postoperative	LOP	3.9	Yes	19	-
54	44	M	Ileum	TB	HOP	2.7	Yes	227	-
55	32	F	Ileum	Postoperative	HOP	2.6	No	52	-
56	11	M	Ileum	Postoperative	LOP	3.8	Yes	26	-
57	12	M	Ileum	Postoperative	LOP	3.6	Yes	24	-

*PAT: Penetrating abdominal injury, †TSF: Typhoid spontaneous fistula,

‡LOP: Low output, §HOP: High output

Table 5. Enterocutaneous Fistula Outcomes in 57 Patients According to Location of the Fistula

Site of Origin	**No. of pts**	**Physiology**		**Serum Albumin (mg/dl)**		**Fistula Closure**		**Deaths**
		LOP	***HOP***	***<3***	***≥3***	***Sponta-neous***	***Operative***	
Duodenum	1	0	1	1	0	-	-	1
Jejunum	5	0	5	5	0	2	2	1
Ileum	42	31	11	14	28	30	9	3
Colon	9	8	1	1	8	7	1	1
Total	57	39	18	21	36	39	12	6

*LOP: Low output
†Hop: High output

On the other hand, 18 (31.58%) were high output fistulas with nine (50%) closing spontaneously, six (33.33%) cured surgically and three dying. Thirteen (72%) high output fistulae and only eight (21%) low output fistulae were associated with moderate to severe hypoalbuminaemia (Figure 1). Of 21 (36.84%) patients with serum albumin of less than 3mg/dl, only nine (42.86%) had spontaneous closure, seven (33.33%) had surgical closure and five (23.81%) died. Thirty-six (63.16%) patients had serum albumin >3mg/dl at presentation of which 30 (83.33%) had spontaneous fistula healing, five (13.8%) needed an operation for cure and one (2.76%) patient died shortly after presentation (Table 7). Average stay on admission was 46 days (15-227 days) from fistula onset. Overall mortality was 10.53%.

Table 6. Relationship between Fistula Out-put and Fistula Healing and Mortality

Type	Number of Patients	Spontaneous Closure	Operative Closure	Deaths
Low Out-put	39	30	6	3
High Out-put	18	9	6	3
Total	57	39	12	6

Table 7. Relationship Between Serum Albumin and Fistula Healing and Mortality

Serum albumin	No. of Patients (n=57)	Spontaneous Closure (n=39)	Operative Closure (n=12)	Deaths (n=6)
<3mg/dl	21	9(52.38%)	7 (33.33%)	5
≥3mg/dl	36	30(83.33%)	5 (13.89%)	1

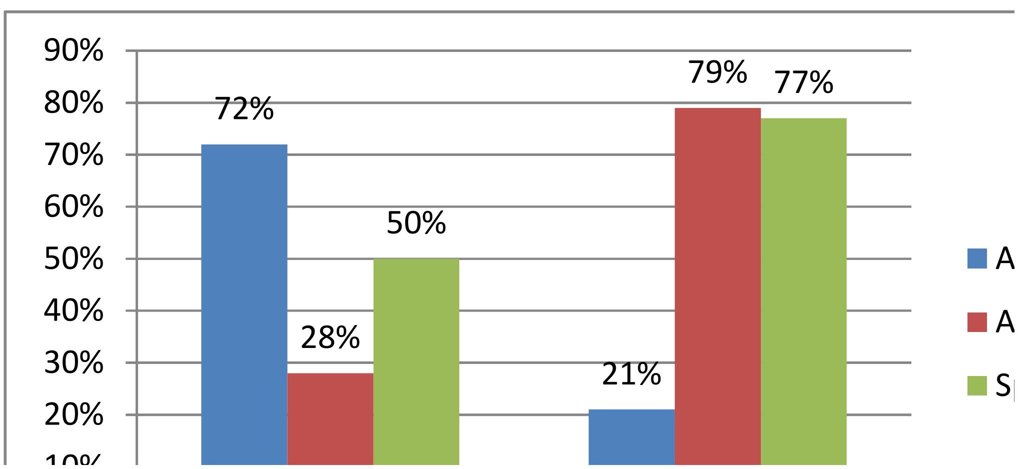

Figure 1. Relationship of output, serum albumin and spontaneous healing

Discussion

Enterocutaneous fistula may lead to rapid and profound loss of nutrients. Site of origin of fistula plays an important role in fluid, electrolytes and nutrient loss. Proximal fistulae have higher output and are more difficult to treat. Probability and timing of closure is also adversely affected in more proximal fistulae. [10] In the present study, there were one duodenal and five jejunal fistulae. All produced high output effluent and were associated with severe hypoalbuminaemia (albumin <3mg/dl) (Table 5). Thirteen of 18 cases (72%) of high output fistulae resulted in low serum albumin and were associate with 50% chance of spontaneous closure and longer periods of convalescence. Overall, small bowel fistulae had a lower chance of spontaneous closure and required longer duration of nutritional treatment before spontaneous closure compared to colonic fistulae (Table 3).

Popular recommendation for nutritional management of ECF by Bleier and Hedrick is an initial trial of complete bowel rest with TPN used during the period of sepsis control and postoperative resuscitation. Enteral feeds are then administered as soon as the gut is capable of tolerating it. [6] Advocates of bowel rest and TPN postulate that enteral feeding increases fistula output and prolongs healing time. There is data to support the fact that TPN does decrease fistula volume, but no class I data exists to show that TPN increases the rate of fistula closure.[3] Enteral feeding is effective in uncomplicated cases where patient tolerate feeds. There are clear benefits to enteral nutrition, including increased mucosal integrity and reduced infection rates. Enteral feeding usually causes increased fistula output but also passage of larger quantities of nutrients into the segment distal to the fistula where it is absorbed. Dudrick states that with at least 4 feet of functioning small bowel between the ligament of Treitz and fistula, adequate nutritive absorption may be possible.[11]

In spite of unavailability of TPN the surgeon often uses innovation to provide adequate energy and nutrients for survival and healing. Several studies have recommended individualizing nutritional management plan and feeding routes to provide calorie and protein.[12] We attempted to provide 3000kcal to many patients enterally though it was not possible in all patients. We found that 31% required, in addition, nasogastric intubation and other supplements in the form of amino acid preparation to boost nutrition (Table 3). Chapman and other workers reported a reduction in mortality from 58% to 16% when patients with ECF received 1500kcal/day. The majority of these patients received enteral feedings. Those who had more than 3000kcal/day had a 90% fistula closure rate and mortality rate of 12%. [11, 13]

The spontaneous healing rate in this study was 68% and the total healing rate was 89%. Eni et al in Northern Nigeria reported a healing rate of 59.3%.[14] Ugochukwu at Enugu (74.2%)[15] and Dodiyi-Manuel et al (75%)[16] in Southern Nigeria, and Chalya et al (65.6%)[17] in Tanzania, also reported a similar high spontaneous healing rate following enteral feeding. Gupta et al (67%) [18] and Visschers et al (87%)[19] reported similar high healing rates with use of enteral and parenteral feeding. However, some workers have reported lower healing rates. Okoli et al (10%) [1] Badrasawi et al (14%) [20] and Njeze et al (31.7%) [21] all reported low healing rates. The difference in healing rate is related to the experience and skill of the surgeon or the patients' condition.[3] Therefore, a multidisciplinary team should be involved in designing and performing the management plan.[22]

Nutritional assessment status was based on serum albumin level at presentation due to limited data in the patients' records. Spontaneous healing was common with low output and a normal serum albumin at presentation. The significant relationship between serum albumin and spontaneous healing was in accordance with similar studies. R Sing in his series of 92 cases found a spontaneous healing rate of 80% in patients with serum albumin of >3mg/dl. He also found a strong relationship between serum prealbumin ($p<0.005$), transferring ($p<0.005$), anthropometric parameters and spontaneous healing of fistula. Malnutrition was also significantly related to mortality. Low serum albumin <3mg/dl was associated with a mortality of 24%. A mortality rate of 60% was found by R Sing in patients with albumin of <3mg/dl.[7]

Readily available sources of nutrients in this environment were used judiciously. Pap (also called akamu, koko or ogi) is a common and cheap source of carbohydrate and energy in this environment. Pap is most frequently based on cereals (rice, millet, sorghum, maize), roots (manioc) or tubers (yams) depending on the region. Rich in carbohydrates, poor in proteins and fats, the energy content in pap is notoriously inadequate. For instance, a millet pap contains only 40-75kcal per 100g. Hence, the need fr pap to be fortified. Kwashpap is a modification of the traditional starchy "pap". Kwash pap preparation is a grounded mixture of millet, peanuts, Cray fish and soybeans. Kwash pap is a high energy therapeutic food preparation originally developed for treatment of children with Kwashiorkor in Nigeria. A little sugar may be added to sweeten and make it palatable. Standard Kwash pap preparation contains about 430kcal of energy per 100g (Table1). Eggs and a little palm oil may also be added in some instances to increase the nutritional value if necessary. Other supplements used include oral ad intravenous amino acid predations (Astymin) to increase protein synthesis.

Chances of dying were higher in patients with sepsis, fluid and electrolytes derangement. Source control and elimination of sepsis are essential to promote spontaneous closure when nutrition is optimal.[10] The use of octreotide and H2 receptor antagonist to reduce discharge from high output fistulae was not a part of our practice.

Conclusion

All controlled fistulae should be managed non-operatively after resuscitation and control of sepsis. Aggressive enteral feeding can yield a favorable outcome. Nutritional status at presentation has a significant impact on healing and clinical outcome. Hypoalbuminaemia and high output were important negative prognostic variables.

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