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Factors Influencing Prognosis and Outcome in Enterocutaneous Fistula

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Abstract: *Enterocutaneous fistulas still present as a challenge to current combined surgical and medical mana gement. There is still a considerable mortality and morbidity associated with enterocutaneous fistulas and the c urrent modality of treatment even if successful mostly requires prolonged hospitalization. Major causes of morb idity and mortality are due to sepsis, malnutrition and metabolic complications. Enterocutaneous fistulas occur s predominantly post operatively than spontaneous. All patients who developed enterocutaneous fistula, either i n this hospital during the course of treatment or were referred to this hospital following development of fistula f rom to Oct 2015- Aug2017 were included in this study and was analysed. Enterocutaneous fistulas were seen be tween the age groups 11yrs to 80yrs. The commonest age group when fistula occurred were between 31-40and 51-60, 20 out of 34 fistulas occurred in this age group. The mean age occurrence of fistula was 52.64 years. Po stoperative Enterocutaneous fistulas occurred in 34patients (100 %) and no spontaneous fistula occurred in our study.Emergency surgeries (24) more commonly caused fistulas than elective (10). The primary disease for whi ch the patient was admitted to the hospital for treatment were as follows: Viscous perforation (11), malignancy (9), tuberculosis (3), sigmoid volvulus (2), post appendicectomy (4), exploratory laparotomy for pseudo obstruc tion (2),crohns disease(1),post PCNL colonic injury(1),SMA thrombosis(1). Small bowel fistulae represented 18 out of 34 (52.9%), followed by colonic fistulae 10 out of 34 (29.4%) followed by 3 at appendix (8.8%). fourteen (41.2%) fistulae were low output, five (14.7%) were medium output, high(44.1%) fistulae were high output. Hy ponatremia occurred in 17 patients (50%), hypokalemia in 17 patients (50%), and. Twenty three patients presen ted with hypoalbuminaemia which worsened in 12 patients over the period of time.The fistula closed spontaneo usly in 20 out of 34 patients (58.8%).The fistula was closed surgically in 6 patients. Conservative management s howed best results in patients with low output fistulae. Early surgical intervention along with rapid control of se psis and early management of electrolyte imbalances must be considered in patients with high output fistulae as these patients showed a higher mortality rate when they were managed conservatively.*

Keywords:*Enterocutaneous fistula, sepsis, hypoalbuminaemia*

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I. Introduction

Enterocutaneous fistula (ECF) is defined as abnormal communication between bowel lumen and skin d ue to disruption in gastro-intestinal tract which can be because of any surgery or disease or both which is most c ommonly seen in post-operative settings.Fistulas of gastrointestinal tract can be defined using many classificatio ns namely anatomic, physiologic, and etiologic[(1)]With every classification system specific implications with reg ard to likelihood of spontaneous closure, prognosis, operative timing and non-operative planning is associated. All these classification systems are by no means exclusive of one another, since the fistulas can be described by all three systems which lead to a way of understanding the enterocutaneous fistula in an integrated manner and i ts pathological impact on the patient can be achieved [(2)]Enterocutaneous fistula is a dreaded complication of abd ominal surgery. Other factors contributing to enterocutaneous fistula include inflammatory bowel disease, divert iculitis, radiotherapy, tuberculosis, trauma, ischemic bowel disease and malignancy.[(2)]Morbidity and mortality h olds considerable associations with enterocutaneous fistula compared to other surgical conditions, death percent age remains disproportionately high with enterocutaneousfistula.High fistula output, sepsis, malnutrition, fluid a nd electrolyte and metabolic disturbances are associated with increased mortality. Early control of sepsis, adeq uate nutritional support and skin protection contribute to favorable outcomes.[(1)]The management of enterocutan eous fistula continues to be a considerable challenge to surgeons, gastroenterologists and allied professionals. P

hysiological and nutritional reserves of patients undergoing several operative procedures get severely compromi sed.In the management of enterocutaneous fistula, initial focus should be oncorrection of fluid and electrolyte di sturbances,control of sepsis and fistula output. Attention should be paid to nutritional requirements, skin care an d psychological support.surgicalmanagement should be considered if fistula persists after conservative measures [(3)] Definitive surgical closure should be performed only 6 to 8 weeks after the initial event, as most fistulas close spontaneously within 4 to 6 weeks. Early operation is associated with recurrence of the fistula due to the inflam matory process. Gastrointestinal fistulas are infrequent but not a rare complication to the surgeon who performs gastro intestinal surgery [(1)]

II. Material &Methods

Study design: Descriptive study
Study location: Study was conducted in the Department of General Surgery in surgical units in Government W enlockHospital and KMC Attavar Hospital coming under KMC Mangalore
Study duration: October 2015-August 2017.
Sample size: Time bound prospective study
Study population: All patients with intra-abdominal surgeries presenting with or develop ECF in above hospita ls.
Inclusion criteria: All patients with gastric, duodenal, small bowel, colon and rectal fistulas

Exclusion criteria:
1. Fistula –in-ano
2. Fistulas established as a planned surgical procedure, such as catheter duodenostomy, gastrostomy, feeding enterostomies, ileostomy and colostomies.

Procedure methodology:

Patients who presented or developed ECF are followed. Diagnosis of ECF was made clinically based o n detection of intestinal or fecal effluent from the drain site or the site of abdominal incision. Detailed history o f the patient was taken. Parameters included for the study are demographic profile, haemoglobin, biochemical p arameters including blood sugar,urea,serum electrolytes, total proteins,albumin. Description of the fistula includ ed cause, anatomical location, fistula output, complications. Management and outcome of the patient was follow ed.

III. Results

This is a clinic-pathological study from October 2015 to August 2017. All patients who developed ente rocutaneous fistula, either in this hospital during the course of treatment or referred to this hospital following de velopment of a fistula outside this hospital were included in this study. A total of 34 cases included in the study based on inclusion and exclusion criteria**.**

Age:Enterocutaneous fistulas were seen between the age groups 11yrs to 80yrs. The commonest age gr oup when fistula occurred were between 31-40 and 51-60 years, 20 out of 30 fistulas occurred in this age group. The mean age occurrence of fistula was52.64 years. Thus in our study enterocutaneous fistulas predominantly o ccurred in middle and old age group

AGE		Frequency	Percent
	30 and below	3	8.8
	31 – 40	13	38.2
	41 – 50	5	14.7
	51 – 60	7	20.6
	Above 60	6	17.6
	Total	34	100.0

Table 1: Age distribution

SEX : In our study enterocutaneous fistulas occurred in 25males (73.5%) and 9 females (26.5%).

Sex		Frequency	Percent
	Female	9	26.5
	Male	25	73.5
	Total	34	100.0

Table 2 Sex distribution

AETIOLOGY

Enterocutaneous fistulas were either postoperative or spontaneous. The commonest cause of enterocuta neous fistulas were post operativefistulas. In our study 34 out of 34 (100%) were post operative fistulas.

POST OPERATIVE	**34**	**100%**
SPONTANEOUS	0	0

Table 3: Distribution of post-operative and spontaneous fistula

POSTOPERATIVE FISTULAS

Thirty four fistulas were the direct result of some surgical procedure. Perforation closure and resection and anastomosis of the bowel were the surgeries which commonly resulted in fistulas.

Table 4: surgeries that were followed by fistulas.

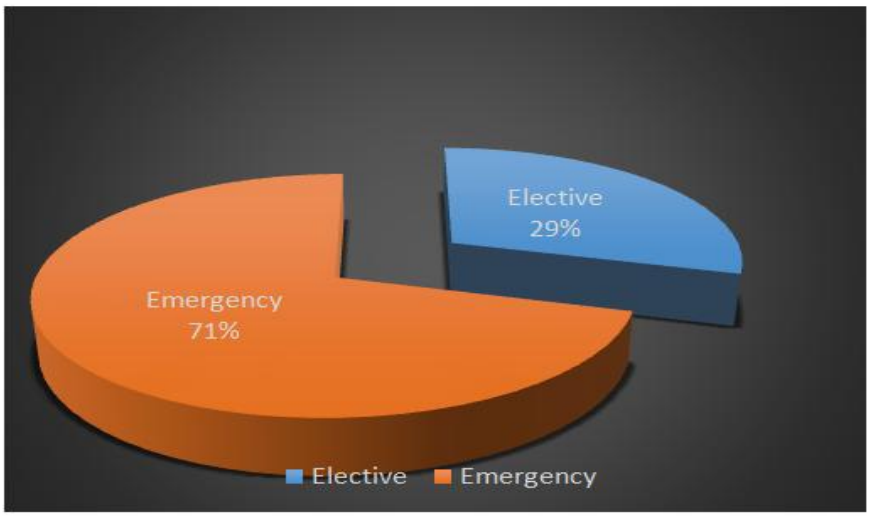
Etiology of enterocutaneous fistula	**Total**
Duodenal perforation closure	4
Ileal perforation closure	5
Jejunal perforation closure	3
Post appendicetomyfaecal fistula	4
Right hemicolectomy	4
Left hemicolectomy	2
Partial gastrectomy	1
Anterior resection	1
post adhesiolysis in TB abdomen	3
Sigmoidectomy	2
SMA thrombosis	1
Pseudo obstruction	2
Post PCNL colonic injury	1
Crohn's disease	1

NATURE OF SURGERY : Post operativeenterocutaneous fistulas occurred more often when the surgery was performed as an emergency 24 out of 34 (70.6%). Ten elective surgeries resulted in fistula out of 34 (29.4%).

Table 5: Distribution of elective and emergency surgeries

ELECTIVE	10	29.4%
EMERGENCY	24	70.6%

Chart 1: Distribution of elective and emergency surgeries



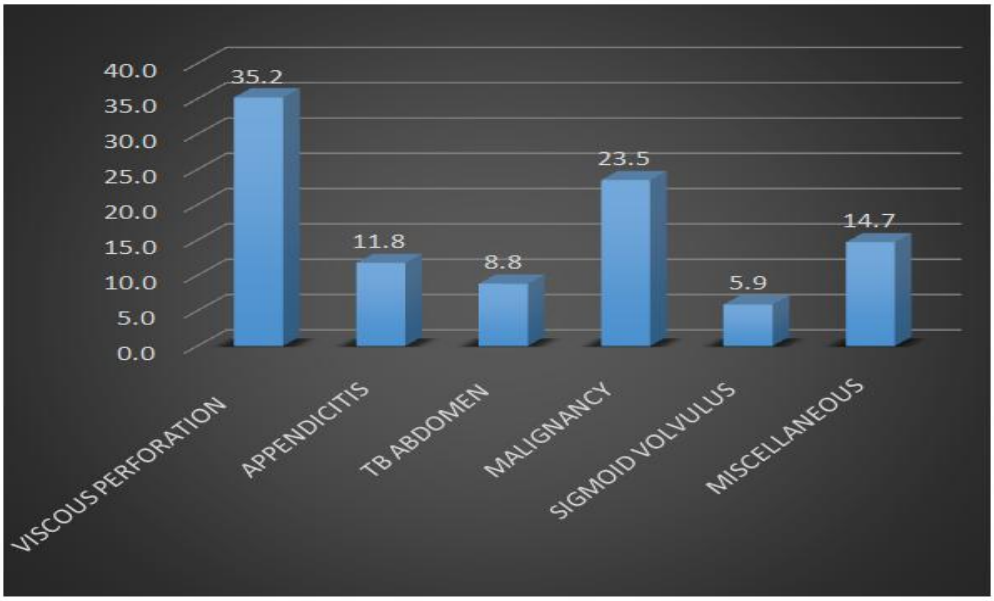
PRIMARY DISEASE

The primary disease for which the patient was admitted to the hospital for treatment were as follows: V iscous perforation (12), malignancy(8), tuberculosis (3), sigmoid volvulus (2), post appendicectomy (4),explorat ory laparotomy for pseudo obstruction (2), crohn's disease(1) , post PCNL colonic injury(1),SMA thrombosis(1)

Table 6 : Primary disease for which the patient was admitted to the hospital

PRIMARY DISEASE:	INDIVIDUAL PATHOLOGY	TOTAL
VISCOUS PERFORATION	DUODENUM	4
	JEJUNUM	3
	ILEUM	5
APPENDICITIS		4
TB ABDOMEN		**3**
MALIGNANCY	RIGHT COLON	4
	LEFT COLON	2
-	STOMACH	1
	COLO-RECTUM	1
SIGMOID VOLVULUS		2
SMA THROMBOSIS		1
CROHN'S DISEASE		1
PSEUDO OBSTRUCTION		2
RENAL CALCULI	POST PCNL OLONIC INJURY	1

Chart 2: Primary disease for which the patient was admitted to the hospital



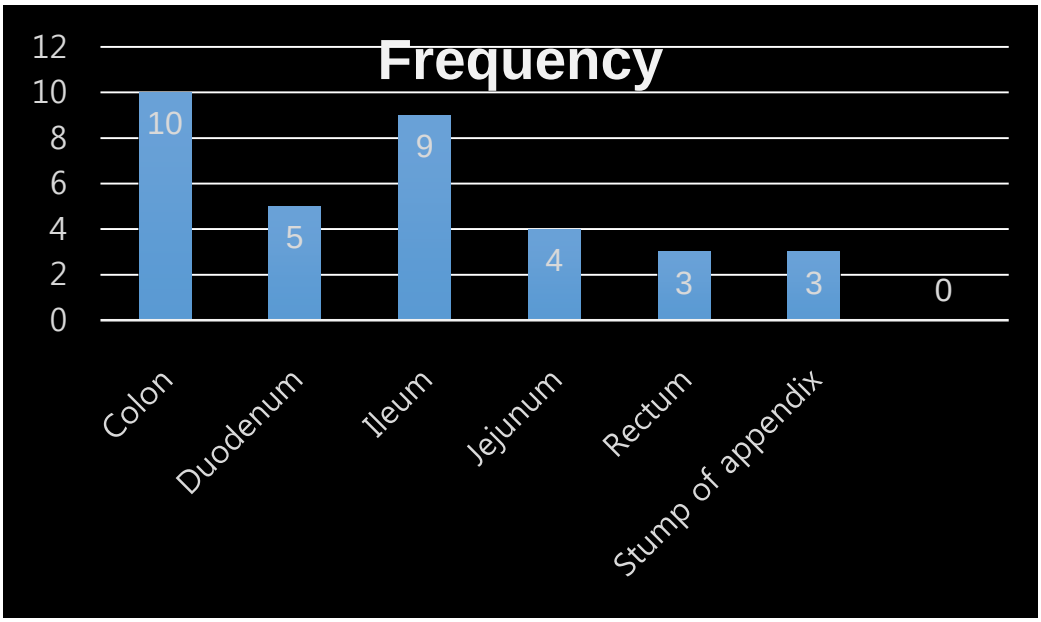
DIAGNOSIS

Various methods of diagnosis were used for identification of the location of the fistula. Fistulogramwa s used in six patients and all the sixfistulograms revealed the origin of the fistula. Location of fistula was diagn osed operatively in one patient. Clinical diagnosis of fistula was done in remaining patients.

FISTULA CHARACTERISTICS: ANATOMICAL LOCATION OF FISTULA

Small bowel fistulae represented 18 out of 34 (52.9%), followed by colonicfistulae 10 out of 34 (29.4 %) followed by 3 at appendix (8.8%).

Table 7-location of fistula
Chart 3-Location of fistula



FISTULA OUTPUT

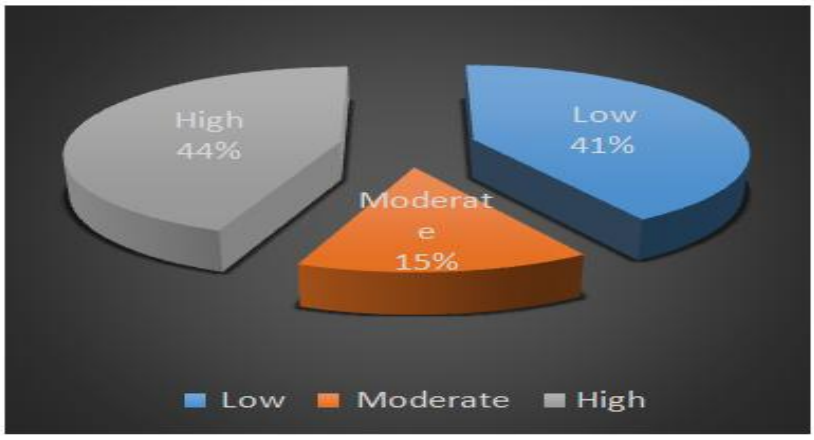
Fourteen (41.2%) fistulae were low output, five (14.7%) were medium output; fifteen (44.1%) fistulae were high output.

Table 8: Fistula output

	Frequency	Percent
Low	14	41.2
Moderate	5	14.7
High	15	44.1
Total	34	100.0

Chart 4: Fistula output

Location of Fistula	Frequency	Percent
Colon	10	29.4
Duodenum	5	14.7
Ileum	9	26.4
Jejunum	4	11.8
Rectum	3	8.8
Stump of Appendix	3	8.8
Total	34	100.0



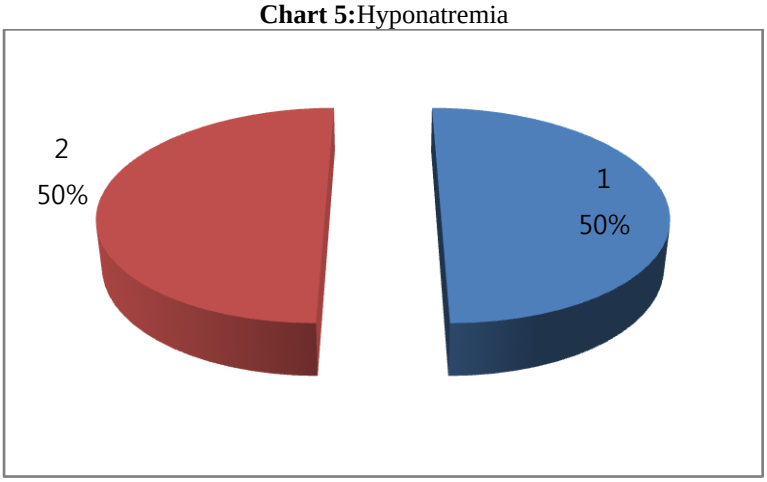
METABOLIC COMPLICATIONS:

Hyponatremia – Hyponatremia occurred in 17 patients (50%)

Table 9: Hyponatremia

Hyponatremia		Frequency	Percent
	Absent	17	50.0
	present	17	50.0
	Total	34	100.0

Chart 5: Hyponatremia

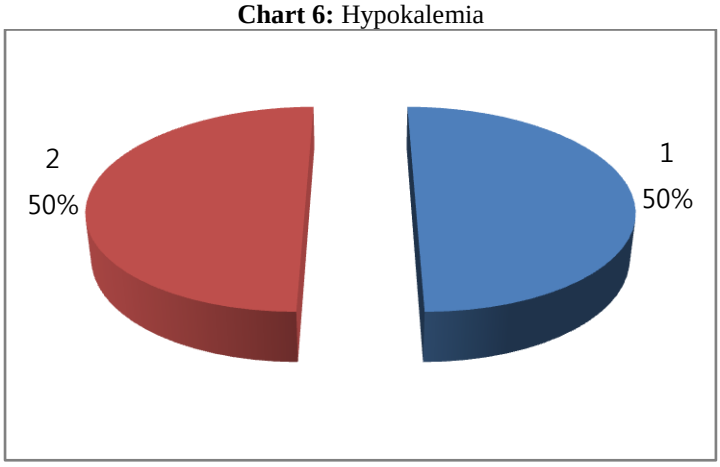


HYPOKALEMIA –Hypokalemia occurred in 17 patients (50%)

Hypokalemia		Frequency	Percent
	Absent	17	50.0
	Present	17	50.0
	Total	34	100.0

Table 10: Hypokalemia

Chart 6: Hypokalemia



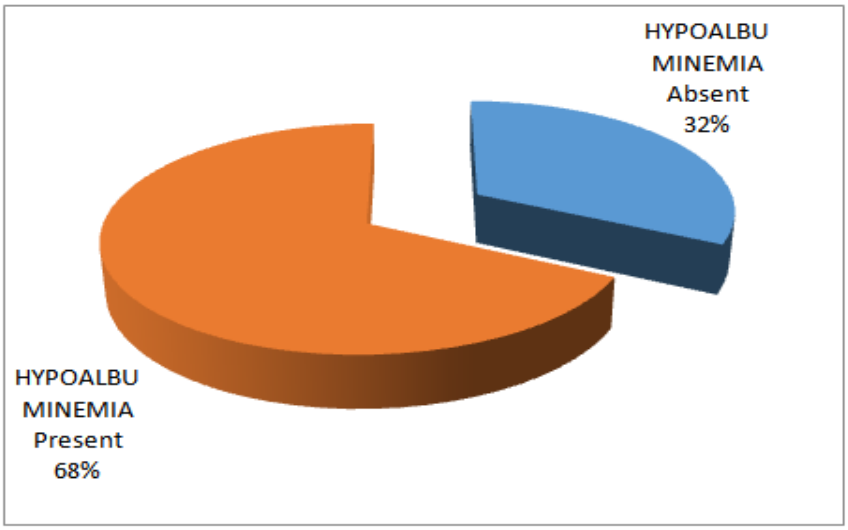
HYPOALBUMINEMIA

23 patients presented with Hypoalbuminemia which worsened in 12 patients over the period of time.

Table 11: Hypoalbuminemia

Hypoalbuminemia		Frequency	Percent
	Absent	11	32.4
	Present	23	67.6
	Total	34	100.0

Chart 7: Hypoalbuminemia



ANAEMIA

Anaemia occurred in 29 out of 34 patients. There was no anaemia in fivepatients.

Table 12: Anemia

Anaemia		**Frequency**	**Percent**
	Absent	5	14.7
	Present	29	85.3
	Total	34	100.0

MANAGEMENT:

Patients were managed either conservatively or surgically. Twenty eight patients (82.4%) were manage d conservatively with intravenous fluids, nutritional supplementation, electrolyte correction, skin care. Six patie nts (17.6%) were managed surgically.

CONSERVATIVEGROUP

The fistula closed spontaneously in 20 out of 34 patients (58.8%), eightfistulas failed to close with con servative treatment and all the eight patients expired.

In the patients in whom fistula closure occurred spontaneously, there were four high output and four moderate o utput and twelve low output fistulae.

OPERATIVE GROUP

The fistulae were closed in six patients, closure was achieved in twopatients. Two high output fistula cl osed and three high output fistula and one moderate output fistula failed to close by surgical management. Patie nts were taken up for surgery when the fistula failed to close after a period of conservative management in six p atients.

Surgeries done for fistula closure

Fistula excision and end to end anastomosis done in one patients and fistula exclusion and anastomosis in one patients and fistula closure in four patients.

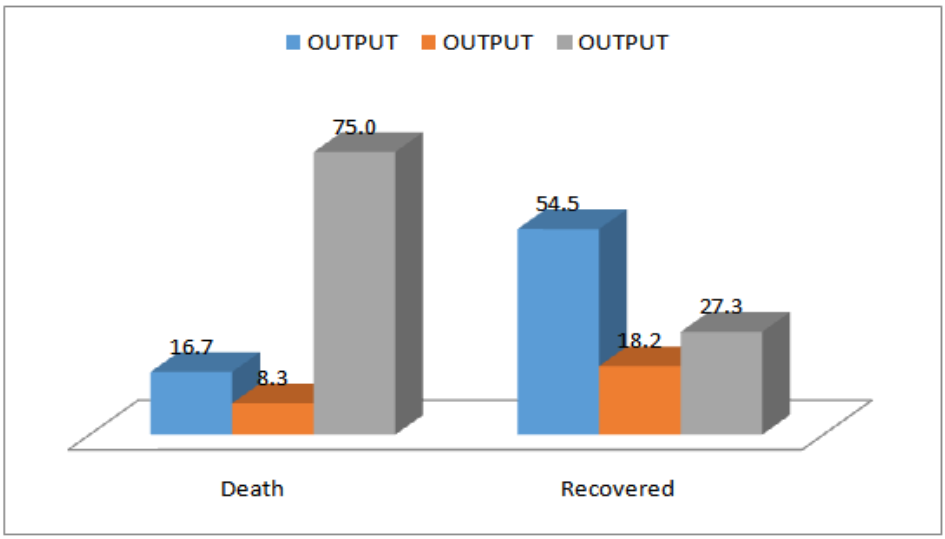
FISTULA NON CLOSURE

Twelve fistulae failed to close with either conservative (8) or surgical (4) management. All Twelve pati ents expired. Nine patients had high output fistula and one patient had medium output fistula and two low outpu t fistulas.

Causes for non closure of fistula:

Reason for non closure of fistula are malignancy (4), tuberculosis (2), sigmoid volvulus- anastomotic l eak(1), traumatic jejunal perforation with intra-abdominal abscess(2),crohns disease(1),GJ anastamotic leak(1) ,SMA thrombosis(1)

Chart 8: Overall outcome



TOTAL PARENTERAL NUTRITION

Total parenteral nutrition was instituted in two patients. Fistula closure occurred in one patient . T.P.N was discontinued in other patient due to financial problems.

COMPLICATIONS OF TREATMENT

Pleural effusion was seen in seven patients, acute renal failure in three patients, and deep vein thrombo sis in one patient.

Complications of treatment

COMPLICATION	NO OF PATIENTS
Pleural effusion	7
Deep vein thrombosis	1
Acute renal failure	3

MORTALITY

There were 12 deaths in 34 patients, that is a mortality rate of 35.3% was observed. The cause of death was septicemia in 7 patients and multiorgandysfunction syndrome (MODS) in four patients and severe abdomin al bleeding in one patient. There were nine high output fistulas, one medium output fistula and two low output fi stulas.

There were tensmall bowel fistulas and twocolonic fistulas. All the patients who expired had multiple e lectrolyte imbalance and were hypoalbuminemic.Mortality occurred in all patients in whom fistulas did not clos e.

IV. DISCUSSION

This is a clinico pathological study of enterocutaneous fistulas occurring in our institution. The patients studied consist of those patients who developed fistula either in this hospital during the course of treatment or were referred to this hospital following development of fistula.

Aetiology:

Postoperative enterocutaneous fistulas occurred in 34 patients (100%) and no spontaneous fistula occur red in our study. Berry and Fischer reported that spontaneous causes comprise 15 to 25% and post-operative co mprise 75 to 85%[4]. Edmunds and Welch reported that 67% of 157 patients with external fistulas were the direc t result of surgical complications[5]. Emergency surgeries (24) caused fistulas more commonly as compared to el ective (10) surgeries.

Surgeries that caused fistula:

Perforation closure, resection and anastomosis of the bowel were the surgeries which commonly result ed in fistulas.

Table 13: Various studies regarding the types of fistulas encountered and their aetiology[1]

STUDY	TYPE	AETIOLOGY	%
Aguirre	All intestinal	IBD	20
		Surgical	77
Reber	All GI	IBD	6
		Surgical	94
Soeters	All GI	Peptic ulcer	3
		IBD	9
		Cancer	10
		Surgical	72
Tarazi	Gastroduodenal	Surgical	98
Rose	All GI	Peptic ulcer	3
		Pancreatitis	3
		Cancer	6
		IBD	10
		Surgical	51
Present ststudy	All All	Cancer Cancer	23.5 26.5
Study	Gastrointestinal	Tuberculosis	8.8
		Viscous	35.2
		Perforation	

PRIMARY DISEASE

The primary disease for which the patient was admitted to the hospital for treatment were as follows: V iscous perforation (12) , malignancy (8), tuberculosis (3), sigmoid volvulus (2), post appendicectomy (4), explor atory laparotomy for pseudo obstruction(2),crohn's disease(1),post PCNL colonic injury(1),SMA thrombosis(1) .In a study by Edmunds et al in their classic paper in which external fistulas from stomach, small intestine and c olon were studied, cancer(6),appendicitis (9),diverticulitis(3) and tuberculosis(2) were among the major primary disease[5]. In a study by soeters et al(1979), the primary disease were cancer(43), Inflammatory bowel disease(2 6),appendicitis (2),diverticulitis(14)[6].

FISTULA CHARACTERISTICS

Fistula location

Small bowel fistulae were noted in18 out of 34(52.9%), followed by colonic fistulae 10 out of 34(29.4 %) followed by 3 at appendix (8.8 %) .Edmunds et al reported 55 out of 157 fistulas originated from stomach, d uodenum and gastrojejunal anastomosis, 46 out of 157 fistulas were from the jejunum or ileum and 57 out of 15 7 fistulas were from the colon[5]. Hollington et al (2004) reported that small intestine was the most common site of fistula; duodenum or jejunum in 53, ileum in128 patients, unclassified small bowel in 33, stomach in one an d colon in 47, site of fistula not known in 15 patients[7].

Fistula output

Based on fistulous output, fourteen low output fistulae (41.1%), five medium output fistulae (14.7%) , fifteen high output fistulae (44.1%) were observed.Among the patients with low output fistulae, 85.7% of patien ts recovered and 14.3% expired. Among moderate output fistula, 80% recovered and 20% expired. Among thos e with high output fistulae, 40% recovered and 60% expired.Accurate measurement was not possible in many p atients due to non-availability of appropriate collection bags and ostomy appliances as these were expensive and could not be afforded by the patients.Mcintyre et al reported 93 low output fistulas, 29 high output fistulas and output unknown in 10 patients, in a total of 132 patients[8].

COMPLICATIONS OF FISTULAS:

A) METABOLIC COMPLICATIONS:

In this study hyponatremia occurred in 17 patients (50%). Among the patients without hyponatremia,8 8.2% of patients recovered and 11.8%of patients expired,where as among the patients with hyponatremia, 41.2 % of patients recovered and 58.8 % of patients expired.

Hypokalemiaoccured in 17 patients (50%). Among the patients without hypokalemia 88.2% of patients recovere d and 11.8% of them expired, whereas among the patients with hypokalemia, 41.2% of them recovered and 58.8 % expired.

23 patients (67.6%) presented with hypoalbuminaemia which worsened in 12 patients over the period o f time.Among the patients who presented without hypoalbuminaemia, 90.9% of patients recovered and 9.1% ex pired, whereas among those with hypoalbuminaemia, 52.2% recovered and 47.8% expired.Hypoalbuminaemia was one of the eight risk factors analysed by altomare et al, which adversely affects fistula closure[9]. Electrolyte imbalance was noted in 35 of 128 patients with all forms of gastro intestinal fistulas reported by soeters and ass ociates[6].

In the present series all patients (12) who expired had multiple electrolyte imbalance and were hypoalbuminemi c

MANAGEMENT

Twenty eight patients (82.4%) were managed conservatively with intravenous fluids, nutritional supple mentation, electrolyte correction, skin care. six(17.6%) patients were managed surgically.

CONSERVATIVE MANAGEMENT AND OUTCOME

28 out of 34 patients (that is 82.3%)were managed conservatively. Among these, fistula closed sponta neously in 20 patients (71.4%) and eight fistulae (28.6%) failed to close with conservative treatment and all eig ht patients expired . Out of the 20 patients who survived with conservative management, 42.8% of patients wer e found to have low output fistulae ,11.7% were found to have high output fistulae and 11.7 % were found to ha ve moderate output fistulae.

There is a wide variation in the spontaneous closure of fistulas from 15.6 to 80%. Mcintyre and associa tes reported 24.3% spontaneous closure rate[8].

Hollington et al (2004) reported 19.9% spontaneous closure rate[7]. Reber and associates found that onc e sepsis was controlled, in more than 90% of patients fistula closed within a month. Fewer than 10% of fistulas closed after 2 months and none closed spontaneously after 3 months[10]. In the present study 20 out of 34 patients closed spontaneously with a closure rate of 58.8%.

OPERATIVE MANAGEMENT AND OUTCOME:

Six patients (17.6%) underwent surgical treatment. Operative closure was achieved in two out of six p atients(33.3%) and was not achieved in four patients (66.7%). Two high output fistulae closed and three high ou tput fistulae and one moderate output fistula failed to close by surgical management. All the six patients were ta ken up for surgery when the fistula failed to close after a period of conservative management.

In Mcintyre's study, of the 117 initial fistulas 77 underwent major surgery and 66 healed after this oper ation. Eleven patients developed a recurrent fistula but four of these healed spontaneously. Of the remaining 7 p atients, three healed after one further operation and three fistulas persisted and one fistula healed after three further operations.[8]Hollington reported that 82% fistulas closed after definitive surgical treatment.[7]

TOTAL PARENTERAL NUTRITION

Total parenteral nutrition was instituted in two patients. Fistula closure occurred in one patient.T.P.N w as discontinued in other patient due to financial problems.

In the present study no conclusions can be drawn regarding TPN and outcome due to the small number of patien ts.

MORTALITY

There were twelve deaths among thirty four patients, that is a mortality rate of 35.3% was observed. Th e cause of death was septicemia in 7 patients, multiorgan dysfunction syndrome (MODS) in four patients and se vere abdominal bleeding in one patient.There were nine high output fistulas and one medium output fistula and t wo low output fistulas. There were ten small bowel fistulas and two colonic fistulas. All the patients who expire d had multiple electrolyte abnormality, and were hypoalbuminemic.

The review of literature for mortality rates for enterocutaneous fistulas shows data ranging from 6.25% to 48%. Edmunds and associates reported mortality rates of 62%, 54% and 16% respectively for gastric and du odenal, small bowel and large bowel. Mcintyre et al reported a mortality rate of 5.3% in his series[8] .

HOSPITAL STAY

The number of days spent in the hospital by the patients ranged from 7 days to 85 days. hospital stay of 52 days in the patients who expired and 73 days in those who survived[11]. In the present study mean hospital st ay was 35.5 days in the patients who expired and 40.29 days in those who survived.

V. Conclusion

In this studyit was found that when the fistula is placed more proximally, it's output will be high which will thus lead to high electrolyte imbalances causing a significant impact on the morbidity and mortality rates o f the patients. Conservative management showed best results in patients with low output fistulae. Early surgical intervention along with rapid control of sepsis and early management of electrolyte imbalances must be be consi dered in patients with high output fistulae as these patients showed a higher mortality rate when they were mana ged conservatively.

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