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Impact of serum levels of sodium, potassium, and albumin for fistula formation rate after intestinal surgery

Doha Adel Noor El-Din [1*], Emad Ali Ahmed [2], and Alaa El-Din Hassan Mohammed [2]

[1] Surgery Department, Faculty of Medicine, Merit University, Sohag, Egypt.

[2] Department of General Surgery, laparoscopy and surgical oncology, Faculty of Medicine, Sohag University, Egypt.

*Corresponding author. Doha Adel Noor El-Din

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Abstract

Background:
This study aims to investigate the relationship between early postoperative feeding implementation and the serum levels of sodium, potassium, and albumin in developing intestinal fistula post-intestinal surgery. These results indicate early postoperative feeding plays a role in improving clinical outcomes and so reduces the incidence of intestinal fistula formation.

Methods: This prospective cohort study was carried out on 25 patients, both sexes, who underwent intestinal surgery with early feeding and monitoring sodium, potassium, and albumin levels.

Results: laboratory investigations (ALB, K, and Na) were insignificantly different between patients without any postoperative leakage.

Conclusions: There was an insignificant difference in sodium, potassium, and albumin levels in forming intestinal fistula post-intestinal surgery with early postoperative feeding; as these biochemical markers may not be directly associated with the occurrence of leakage following intestinal surgery. Intestinal fistula formation is likely influenced by a combination of factors such as surgical technique, local tissue healing, infection, and patient-specific variables, rather than biochemical markers.

Introduction

Intestinal surgery, while often lifesaving, carries significant risks, particularly in complex procedures such as resections and anastomoses (1,2). Among the most serious complications that can arise in the formation of intestinal fistula, a condition that can dramatically impact recovery, increase hospital stay, and elevate healthcare costs (3,4). The development of intestinal fistula is frequently associated with factors such as infection, anastomotic failure, and poor nutritional status (5,6). One of the key elements in the development of postoperative complications, including intestinal fistulas, is the imbalance in essential biochemical markers, particularly sodium, potassium, and albumin (7). Disruptions in electrolyte homeostasis and low serum albumin levels have been closely linked to delayed wound healing, increased susceptibility to infection, and impaired

immune response factors that contribute to fistula formation and poor surgical outcomes (8,9).
Early postoperative feeding has emerged as an asset of evidence-based strategies designed to optimize recovery following major surgery (10). These protocols focus on multimodal approaches that include early mobilization, adequate pain control, minimal fasting, and nutritional optimization (11,12). One of the core components of early postoperative feeding is the careful management of fluids and electrolytes, as well as early nutritional support, all of which may help stabilize critical markers like sodium, potassium, and albumin (13). Despite the well-established benefits of early postoperative feeding in reducing postoperative morbidity, length of hospital stays, and intestinal fistula through the stabilization of these biochemical markers (14,15).
This research aims to investigate the impact of early postoperative feeding on levels of sodium, potassium, and albumin in patients undergoing intestinal surgery, with a particular focus on their role in the occurrence of intestinal fistulas.

Patients and Methods:

This prospective cohort study was carried out on 25 patients, both sexes, who underwent intestinal surgery. The study was done from January 2022 to June 2022 after approval from the Ethical Committee of Sohag University Hospitals, Sohag, Egypt. Informed written consent was obtained from the patients.
All patients presented with urgent intestinal surgery included in the study.
Exclusion criteria were pediatric patients, patients associated with comorbidities such as uncontrolled DM, metastasis, and pediatric. Study with early postoperative feeding for all patients

Data Collection:
Preoperative evaluation:
All patients included in the study must be evaluated through:
Detailed history and accurate clinical examination.
Laboratory investigations, including blood group, complete blood count, albumin, creatinine, electrolytes, and coagulation profile.
Radiological investigations, including chest and abdomen X-ray, abdominal ultrasonography, and /or CT may be added.

Surgical procedure:
Under general anesthesia, a mid-line incision followed by abdominal exploration will be performed. Once the decision is made for intestinal anastomosis or repair, adequate intestinal preparation will be conducted.
Jejuno-jejunal, jejuno-ileal, ileo-ileal, ileo-colic, or coleo-colic anastomosis will be performed after resecting of the affected segment. The anastomosis or repair technique will be conducted in two layers. The seromuscular layers will be anastomosed by polyglactin 910 (*Vicryl*) 3/0 on around needle. While using polydioxanone (PDS) suture 3/0 on a round needle for the full-thickness inner layers. Intraoperative testing of the intestinal anastomosis or repair will be conducted for fluid and air leakage, routinely.
Peritoneal toilet followed by inserting abdominal drains and closure will performed.
All procedures will be performed by a senior staff surgeon in the same institution and followed by the same team.

Postoperative follow up:
Patients admitted with early postoperative feeding protocol. Routine laboratory tests of NA, K, and ALB will be conducted every other day. C-reactive protein will be requested if signs of infection are recognized. After the discharge, the patients will be followed by weekly visits at the outpatient clinic during the first month then monthly until the first postoperative six months. The follow-up protocol will include clinical assessment and identification of signs of infection or intestinal obstruction. Patients will be subjected to radiological assessment (plain X-ray and/or abdominal ultrasonography/computed tomography) if needed. The following outcomes will be evaluated: type of the identified pathology, procedure type, operative time, length of the resected intestine, blood loss, and the need for blood transfusion. In addition, the postoperative events will be analyzed, including the intestinal leakage (fistula) rate, sepsis, Los, intensive care unit (ICU) admission, nausea and vomiting, 1st bowel opening, restoration of oral fluid and normal diet, morbidity and mortality rates, pain score, wound infection or dehiscence, reoperation or readmission rate. The primary outcomes of this analysis will be the intestinal leakage rate while the other postoperative events will be considered as secondary outcomes.

Statistical analysis

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Quantitative variables were presented as mean and standard deviation (SD), compared preoperative and postoperative by paired T-test and were analyzed between two groups by unpaired student T-test. Qualitative variables were presented as frequency and percentage (%) and were compared by Chi-square test. A two-tailed P value < 0.05 was considered statistically significant.

Results

There were 25 cases that underwent our study with urgent intestinal intervention without preparation according to eligibility criteria.

The mean value (± SD) of age was 35.7 (±24.1) years. There were 19 (76%) male and 6 (24%) female. Regarding diagnosis, trauma occurred in 11 (44%) patients, inflammation in 2 (8%) patients, benign lesions in 6 (24%) patients, and malignant lesions in 6 (24%) patients. The mean value (± SD) of operative time was 4.6 (±1.12) hr (table 1).

The item		(n=25)
Age (years)		35.7 ± 24.1
Sex	**Male**	19 (76%)
	Female	6 (24%)
Diagnosis	**Trauma**	11 (44%)
	Inflammatory	2 (8%)
	Benign lesion	6 (24%)
	Malignant lesion	6 (24%)

Table 1: Demographic data of the studied patients
Data are presented as mean ± SD or frequency (%).

The intervention was RESECT\ANAST in 14 (56%) patients, repair in 2 (8%) patients, repair small intestine in 8 (32%) patients, and repair large intestine in 1 (4%) patient. The mean value (± SD) of blood loss was 378 (± 103.16) c.c., ENTERO-ENTERIC in 6 (24%) patients, ENTERO-COLIC in 7 (28%) patients and COLO-COLIC in 1 (4%) patient. 16 (64%) patients needed a blood transfusion (table 2).

The item		(n=25)
Intervention	**RESECT\ANAST**	14 (56%)
	Repair	10 (44%)
Blood loss (c.c)		378 ± 103.16
Technique	**ENTERO-ENTERIC**	6 (24%)
	ENTERO-COLIC	7 (28%)
	COLO-COLIC	1 (4%)
Blood transfusion		16 (64%)

Table 2: Intraoperative data of the studied patients
Data are presented as mean ± SD or frequency (%). RESECT\ANAST: Resection and anastomosis.

The mean value (± SD) of postoperative K was 3.5 (±0.44) mmol/L. The mean value (± SD) of postoperative Na was 133.1 (±2.75) mEq/L. The mean value (± SD) of postoperative ALB was 3 (+_0.35) g/dL (Table 3).

The item	(n=25)
Postoperative K (mmol/L)	3.5 ± 0.44
Postoperative Na (mEq/L)	133.1 ± 2.75
Postoperative albumin (g/dl)	3_+0.35

Table 3: Postoperative K, Na, and albumin of the studied Patients
Data are presented as mean ± SD or frequency (%). K: Potassium, Na: Sodium.

Early feeding in 24 (96%) patients. Postoperative leakage occurred in 1 (4%) patient, the leakage type was minor and occurred at POD 4 and leakage treatment was conservative. Bowel opening occurred at POD 1 in 3 (12%) patients, at POD 2 in 22 (88%) patients, and at POD 3 in 1 (4%) patients. Post wound infection occurred in 2 (8%) patients. Nausea and vomiting occurred in 1 (4%) patient. Wound dehiscence didn't happen in any patient. The mean value (± SD) of the length of stay was 10.9 (± 1.41) days (table 4)

The item			(n=25)
Early feeding			24 (96%)
Postoperative leakage	**Occurrence**		1 (4%)
	Type	**Minor**	1 (4%)
	Time	**POD 4**	1 (4%)
	Treatment	**Conservative**	1 (4%)
Bowel opening		**POD 1**	3 (12%)
		POD 2	22 (88%)
		POD 3	1 (4%)
Post wound infection			2 (8%)
Nausea and vomiting			1 (4%)
Post wound dehiscence			0 (0%)
Length of stay (days)			10.9 ± 1.41

Table 4: Postoperative data of the studied patients
Data are presented as mean ± SD or frequency (%). POD: Postoperative day.

Postoperative laboratory investigations (ALB, K, and Na) were insignificantly different between patients who had postoperative leakage and patients who didn't have postoperative leakage (table 5).

The item	Postoperative leakage (n=1)	No leakage (n=24)	P value
ALB (g/dL)	3.2±0.0	2.99±0.35	0.570
K (mmol/L)	3 ± 0.0	3.49 ± 0.44	0.283
Na (mEq/L)	137 ± 0.0	132.92 ± 2.69	0.150

Table 5: Relation between postoperative laboratory investigation and bowel leakage
Data presented as mean ± SD, ALB: Albumin, K: Potassium, Na: Sodium.

Discussion

The finding there were no significant differences in sodium, potassium, and albumin levels between patients who have intestinal fistula postoperative, in this context of early postoperative feeding offers important insights into the role of early postoperative feeding in managing postoperative biochemical markers and preventing complications. Early postoperative feeding is designed to optimize fluid balance, nutritional support, and overall recovery.
Intestinal fistula occurs due to abnormal connections formed between the intestine and another organ or the skin, often following complications like infection or poor anastomotic healing.

The results suggest that abnormalities in sodium and potassium levels aren't linked to the development of these fistulas. This might indicate that the factors leading to fistula formation such as poor wound healing, infection, or anastomotic failure are independent of the electrolyte disturbances.

Although low albumin levels could theoretically impair wound healing, the result suggests no significant role of albumin in intestinal fistula formation, other factors as surgical technique, infection, or anastomotic integrity play a more dominant role in intestinal fistula formation. It might reflect that even if patients have low albumin levels, the presence of a fistula may be more directly influenced by mechanical or technical aspects of surgery rather than systemic nutrition alone.

The development of intestinal fistula is more often associated with technical factors during surgery as anastomotic leak, poor tissue perfusion, and surgical technique (anastomotic quality, use of prophylactic antibiotics, and tension-free anastomosis) rather than biochemical parameters.

Conclusions:

The findings of this study, which show no significant differences in sodium, potassium, and albumin levels between patients with postoperative leakage and those without, in the context of early postoperative feeding suggest that these biochemical markers may not be directly associated with the occurrence of leakage following intestinal surgery. Although early postoperative feeding is designed to optimize fluid balance, nutritional support, and overall recovery, it appears that its influence on electrolyte and protein levels may not be sufficient to prevent or predict the development of postoperative leakage. These results highlight the complex nature of intestinal fistula formation, which is likely influenced by a combination of factors such as surgical technique, local tissue healing, infection, and patient-specific variables, rather than biochemical markers.

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Corresponding author**:** Doha Adel Noor El din

Department of Surgery, Faculty of Medicine, Merit University, Sohag, Egypt.

E-mail: dadel4797@gmail.com

Phone: 01002375194