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Original Research Paper

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STUDY OF ELECTROLYTE IMBALANCE IN PREOPERATIVE CASES OF ACUTE INTESTINAL OBSTRUCTION IN ADULTS

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ABSTRACT An observational prospective study was carried out at Rajah Muthiah Medical College and Hospitals, Annamalai Nagar for the study period of October 2019 to September 2021. The aim of the study was to evaluate changes in the level of different electrolytes in the body in cases of acute intestinal obstruction from the onset of symptoms to the period of presentation. As a matter of study 50 cases were taken as sample size. Major electrolytes were taken into consideration, sodium, potassium, chloride, urea and bicarbonate. Regular blood investigations were done to check their values and it was compared with the eggleston series. It was studied that there is persistent hyponatremia which had no relation to the duration of obstruction, potassium level remained almost constant, hypochloraemia occurred ,in the early stages acidosis was noted and elevation in blood urea level was noted especially after 3rd day of obstruction.

KEYWORDS : Electrolyte imbalance, Preoperative evaluation and management

INTRODUCTION

Electrolytes are the major salts in the body that conduct electricity and are found in the body fluids, tissues and blood.[1] Examples are chloride, calcium, magnesium, sodium and potassium. Sodium is concentrated in the extra cellular fluid and potassium concentrated in ICF (more inside the cells). Proper balance is essential for muscle co-ordination, heart function, fluid absorption and excretion and nerve function. Bowel obstruction describes the failure of progression of intestinal contents. Based on nature, severity, location and etiology several terms are used to describe bowel obstruction e.g functional, mechanical etc. Simple mechanical obstruction is the compromise of lumen of bowel without compromise of its vascular supply. In simple obstruction important and progressive changes take place in the bacteriologic content of obstructed bowel, in the amount and composition of gas in the gut above the obstruction, in circulation and in the distended bowel and in the complex fluid and electrolytes fluxes that takes place across the membranes.[2,7,9]

When strangulation complicates the picture, these pathological changes are compounded by the progressive vascular changes in the affected intestine and its mesentery and eventually leads to toxaemia with actual death of gut wall. There is a persistent hyponatremia, a gradual drop in serum potassium beginning 5 days after the onset of obstruction, a progressive decrease in chloride level over first week followed by a rise in blood urea level for a week and an initial tendency towards acidosis gradually replaced by the alkalosis.[1,8] The mainstay of treatment in intestinal obstruction includes gastro duodenal suction, intravenous fluid administration and operative correction. Identify the different electrolytic changes in adults with acute intestinal obstruction this study was conducted

METHODS AND MATERIALS

Study Design:

- Prospective study

Study Population:

- The patients who were diagnosed to have acute intestinal obstruction and admitted at Rajah Muthiah Medical College Hospital, Chidambaram during the study period.

Study Period:

- October 2019 to September 2021.

Sample Size:

- 50 patients with acute intestinal obstruction were admitted in Rajah Muthiah Medical College Hospital, CHIDAMBARAM.

Inclusion Criteria:

- All patients diagnosed with Acute intestinal obstruction and were admitted in Rajah Muthiah Medical College Hospital, Chidambaram.

Exclusion Criteria:

- Paediatric age group with acute intestinal obstruction.
- Pregnant women with acute intestinal obstruction.
- Patient not willing for any study
- Patients having previous electrolyte abnormalities like CRF,

Emphasis was placed upon determining the exact duration of obstruction and previous treatment including fluid therapy received prior to admission. The onset of abdominal pain to the period of presentation was taken as criteria of onset of obstruction. Before starting the therapy, blood was taken for analysis. Initial values were taken into-consideration

OBSERVATION AND RESULTS

Total number of acute intestinal obstruction operated: During this period: 50

The data for total number of total number of acute abdomen cases admitted was approximately 2350 cases and Acute intestinal obstruction admitted are not available. The percentage of surgical admission thus reads 2.12%. There was a male pre-ponderance due to inclusion of inguinal hernias. The oldest patient was 85 years old and the youngest patient was 15 years old. The mean age of this series was 50 years.

Table 1: Distribution Based on Etiology

S.no	Etiology	No of cases	Percentage
1	Adhesions	26	51.4
2	External hernias	14	25.7
3	Strictures	4	8.5
4	Intussuception	4	8.5
5	Malignancy	1	2.8
6	Internal hernias	1	2.8

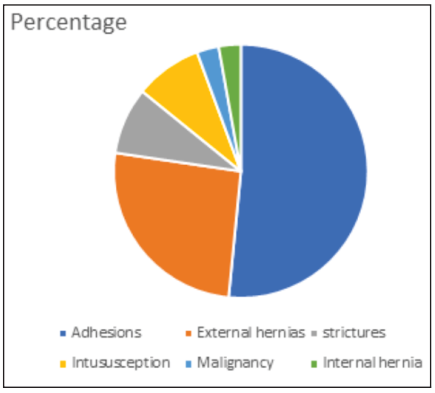

Fig-1: Distribution of Percentage by Etiology

Based on the study of above pie chart the most common cause was adhesive intestinal obstruction in 26 (51.4%) patients, next comes the obstructed hernias in 14 (25.7 %) patients.

Over previous two decades intestinal obstruction due to adhesive obstruction is on increasing number. This is because of increasing number of laparotomies being performed.

Similarly obstructed hernias in decreasing incidence because of more number of elective early surgeries being performed for hernias

In this study more number of obstructed hernia patients belong to old age above 61 years. Most of these patients neglected their hernias initially and later presented with obstruction.

Adhesions have become more and more common cause of intestinal obstruction over the years as shown in Table 1.

Over the years numerous techniques have been devised to prevent adhesion formation. However, these techniques were not evaluated in the present study.

Volvulus and intussusception occupies the third important place as a cause of intestinal obstruction in the present series and is seen in 4 (8.5 %) patients. All of them are sigmoid volvulus. It is reported to be the commonest cause of acute intestinal obstruction in the elderly. Average age of the patients who suffered from sigmoid colon volvulus in this study is 50 years.

Intussusception is seen in 8.4% of cases in this study. Its incidence has been reported to be 1% by Nelson and Ellis and 7.4% by Ram chandran.

Malignancy is the next common cause of intestinal obstruction in this study and is seen in 1 case (2.8%).

Table 2: Serum sodium levels

S. No	Days	Present series	Eggleton series
1	First day	129	131
2	Second day	129	135
3	Third day	133	132
4	Fourth day	128	130
5	Fifth day	124	134
6	Sixth day	121	130
7	>= Seven day	129	138

Serum sodium changes of patients based on the interval between the onset of symptoms to the period of presentation

Individual serum sodium levels in this series ranged from 121 mEq/L to 133mEq/L. In Eggleston series the values ranged from 130 to138 mEq/L. The named serum sodium levels are 135-145 mEq/L.

Table 3: Serum Potassium Levels

S.no	Days	Present series	Eggleston series
1	First day	4.15	4.40
2	Second day	4.2	4.3
3	Third day	4.9	4.41
4	Fourth day	3.9	4.3
5	Fifth day	4.26	4.2
6	Sixth day	4.5	4.17
7	>/=Seven days	4.7	4.01

Serum potassium levels of patients from the onset of symptoms to the period of presentation.

Table 4: Serum Chloride Levels

S.no	Days	Present series	Eggleston series
1	First day	88.3	98.3
2	Second day	96.5	98
3	Third day	92.6	95.2
4	Fourth day	92.1	90.4
5	Fifth day	92.2	91.2
6	Sixth day	87	90.2
7	>/=Seven days	90	97.0

Serum chloride levels of patients from the onset of symptoms to the period of presentation.

Serum chloride ranged from 87- 96.5 mEq/L. In eggleston series values ranged from 90.4 to 98.3 mEq/L.

Table 5: Serum Bicarbonate Levels

S.no	Days	Present series	Eggleston series
1	First day	20.5	22.6
2	Second day	20.6	25.5
3	Third day	20.5	25.4
4	Fourth day	19.7	25.3
5	Fifth day	21.5	26.4
6	Sixth day	18.4	24.2
7	>/=Seven days	21.8	27

Serum bicarbonate levels of patients from the onset of symptoms to the period of presentation.

Normal bicarbonate levels in this series varied from 20.5 to 21.8 mEq/L, in eggleston series 22.6 to 27 mEq/L .

Table 6: Blood Urea Levels

S.no	Days	Present series	Eggleston series
1	First day	52	73
2	Second day	35.4	60.8
3	Third day	42.5	93
4	Fourth day	51.5	100
5	Fifth day	58.1	96
6	Sixth day	68.0	110
7	>/=Seven days	43.6	69.4

Blood urea levels of patients from the onset of symptoms to the period of presentation.

Normal urea levels vary from 15-40 mg/100 ml. In this series the mean values ranged from 35.4 – 67.5 mg%. In Eggleston series mean values ranged from 60.8 to 110mg/100 ml.

Table 7: Presentation of patients according to days

S. No	Days	No of patients
1	First day	1
2	Second day	18
3	Third day	9
4	Fourth day	8
5	Fifth day	7
6	Sixth day	5
7	>seven days	2
	Total	50

Based on the study of above table most of the patients presented during 2nd day from the onset of symptoms. Most of the patients presented during 2nd and 5th day from the onset of symptoms.

To summarize the results of study of the electrolyte imbalance of patients from the onset of symptoms to the period of presentation showed the following features:

1. Persistent hyponatremia but with no relation to duration of obstruction.
2. Serum potassium levels remained remarkably constant.
3. Chloride levels were also low.
4. Acidosis was noted in early stages of obstruction.
5. Elevation of blood urea levels especially after 3rdday of obstruction.

Comparing with Eggleston Series:

1. Persistent hyponatremia.
2. A gradual drop in serum potassium level beginning 5 days after onset of obstruction.
3. A progressive decrease in serum chloride level over the 1st week followed by a rise.

An initial tendency towards acidosis gradually replaced by alkalosis.

DISCUSSION

Most of patients has presented between 2nd and 5th day. The longest duration of presentation was beyond 10 days. There were one death in the group (2%). With delayed presentation the mortality and morbidity is expected to be high.[4,5] This is not so in the case, since patients who presented late in our hospital had already received treatment from outside and hence were relatively in stable conditions. The prognosis of the intestinal obstruction was considerably improved when the extent of associated water and electrolyte loss and need for intravenous replacement were recognized. It is also realized that the composition and quantity of infused fluid must be carefully controlled. The increased intestinal loss, an obviously undesirable side effect is not always appreciated. The objective of this study is mainly to highlight the importance of knowing the fluid and electrolyte disturbances in patients with intestinal obstruction and correction of these deficits by intravenous infusion so that deficits are not only corrected but the replaced fluid is distributed correctly between body compartments, thus improving the prognosis of that patient. Individual serum sodium levels in this series ranged from 121 mEq/L to 133.3 mEq/L. (Normal 135-145 mEq/L). In Eggleston series (1972) the values ranged from 130 to 138.7 mEq/L. Thus a persistent hyponatremia with no relation to duration of obstruction was noted in both series. A gradual drop in the serum potassium level beginning 5 days after obstruction was noted in Eggleston series.[3] No such changes were noticed in the present series. Mean values ranged from 4.01-4.9 (normal 3.5 - 5.5 mEq/L). Normal serum chloride ranges from 96-107 mEq/L. In this series sodium chloride ranged from 87 to 96.5 mEq/L, hypochloremia was thus persistent. Eggleston noted a rise of serum chloride levels after 1 week. Elevation of blood urea levels especially after 3days of obstruction was noted in this series reflecting progressive dehydration. Early obstruction tended to be associated with acidosis, where as late obstruction leads to alkalosis. In present series acidosis was noted (normal bicarbonate values 21-27.5).The firstphase-acidosis would be due to dehydration. While this dehydration continues to increase, its effect on acid base status is superseded by constant loss of acid and chloride through vomiting. This lead to alkalosis. The biochemical changes thus noted are persistent hyponatremia, constant serum potassium, low chloride levels, acidosis and elevated brood Urea level.

CONCLUSIONS

1. A review of 50 cases of intestinal obstruction in adults operated during October 2019 and September 2021 presented with emphasis on electrolyte imbalance. Emphasis was placed on determining the exact duration of obstruction and previous treatment including fluid therapy received prior to admission.
2. Intestinal obstruction formed 2.12% of surgical admission.
3. Treatment received prior to admission was greatly of significance with relation to the prognosis and decrease in the mortality rates (2% in this study).
4. The improved mortality and morbidity rates could be attributed to early diagnosis and treatment inspite of presenting late to hospital.
5. A persistent hyponatremia, constantserum potassium hypochloraemia, a rise in urealevels and acidosis were noted. Comparisons have been made with the available series.
6. Shock, dehydration, electrolyte changes and septicaemia are important causes of death. Better prognosis is attributed mainly to good anaesthetic techniques, adequate knowledge of fluid and electrolytes replacement, efficient blood transfusion services and introduction of adequate antibiotics and gastroduodenal suction.

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