

Original research article

Postoperative exploratory laparotomy and its association with serum potassium levels: a prospective study.

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Abstract

Aim: To assessment of alterations in serum potassium levels during postoperative exploratory laparotomy.

Materials and methods: This was a prospective study conducted in the Department of General Surgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India for two years. A total of 50 patients who underwent explorative laparotomy were included in this study. Collection of 2 cc of blood volume was done at preoperative time, one the day of surgery and on postoperative days of surgery. All the samples were sent to laboratory where autoanalyzer was used for assessment of serum potassium levels.

Results: In the present study, a total of 50 patients who underwent exploratory laparotomy were included. Mean age of the patients was 59.4 years. 66 percent of the patients were males while the remaining were females. Mean potassium levels at Baseline (before starting of surgery), one day after surgery, three days after surgery and seven days after surgery were found to be 4.73 mEq/L, 5.33 mEq/L, 4.52 mEq/L and 4.43 mEq/L respectively.

Conclusion: A significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively.

Keywords: laparotomy, potassium levels, post-operative

Introduction

Sodium as a major extra cellular ion is of primary importance is reflecting changes of water and electrolytes status in the body.¹ Postoperative hyponatremia and its relative complications can occur after any surgical procedure, particularly in elderly patients. The early symptoms can be mild which if not recognized on time, can progress to severe neurological manifestations and can even prove fatal to patients. The early warning is most of the time taken as normal post-operative sequelae resulting in increasing morbidity and mortality in patients with hyponatremia. The treatment is simple and in most cases, the early complications can be reversed by infusing sodium containing solutions.² Osmolar concentrations in between extracellular and intracellular compartments are regulated by movement of the solutes and/or body water. Changes in solute concentrations such as Na⁺ and glucose that do not move freely across membranes will cause water to move intraspatially from intracellular to extracellular in order to equilibrate the solute concentrations. Osmolality, thus, depends on the solute concentrations. Emergency and elective surgery, trauma, sepsis, feeding, fasting, and an anesthesia all affect the electrolyte balance.³ Stress response to surgery is characterized by

increase in the secretion of pituitary hormones and the activation of sympathetic nervous system.⁴ In order to maintain isotonicity, circulating intravascular volume, and adequate oxygen-carrying capacity, Postoperative fluid balance is important. Fluid balance involves giving fluids appropriately based on the individual patient's needs and giving enough fluids. Total fluid loss in the average adult is about 2500 mL/day. This includes 100–200 mL/day through the gastrointestinal tract, insensible fluid losses (through the lungs and skin) of about 500–1000 mL/day, and urine output of about 1000 mL/day. The fluid volume required, therefore, is generally about 2500 mL/day for a 70-kg adult, with Na⁺ of 30 mEq/L and K⁺ of 15–20 mEq/L.⁵ The fluids available are colloids, crystalloids, blood and blood products. In general, crystalloids containing electrolytes found in plasma are administered. Blood and/or blood products might be required depending on the degree of blood loss.⁵ Fluid and electrolyte imbalances may occur rapidly in the surgical patient, and can be caused by numerous factors, including preoperative fluid and food restrictions, intra-operative fluid loss, or the stress of surgery.⁶ Any type of surgical trauma, whether elective or emergency, causes various effects on the human body including a great impact on the physiology of fluid and electrolytes within the body.⁷ Post-operative potassium metabolism has long been the focus of research. Numerous studies have demonstrated that hypokalemia is an independent risk factor for post-operative complications. In clinical settings, pre-existing hypokalemia is frequently detected via initial serum potassium measurement at hospital admission, which usually results in considerable delay of elective laparotomy. Hence; the present study was conducted for assessing the alterations in serum potassium levels during post-operative exploratory laparotomy.

Materials and methods

This was a prospective study conducted in the Department of General Surgery, Indira Gandhi Institute of Medical sciences, Patna, Bihar, India for two years .

Inclusion criteria

- A total of 50 patients who underwent explorative laparotomy

Exclusion criteria

- Hypertensive patients
- Diabetic patients
- Patients with history of any other systemic illness

Methodology

Complete demographic and clinical details of all the patients were recorded. A Performa was made and all the relevant data of all the subjects was recorded. Physical and general examination of all the patients was done. Collection of 2 cc of blood volume was done at preoperative time, one the day of surgery and on postoperative days of surgery. All the samples were sent to laboratory where autoanalyzer was used for assessment of serum potassium levels. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

Results

In the present study, a total of 50 patients who underwent exploratory laparotomy were included. Mean age of the patients was 59.4 years. 66 percent of the patients were males while the remaining were females. Mean potassium levels at Baseline (before starting of surgery), One day after surgery, Three days after surgery and Seven days after surgery were found to be 4.73 mEq/L, 5.33 mEq/L, 4.52 mEq/L and 4.43 mEq/L respectively. A significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively.

Table 1: Demographic distribution of patients

Sex	No. of patients = 50	Percentage
Male	33	66
Female	17	34
Age year		
Below 40	5	10
40-50	10	20
50-60	16	32
Above 60	19	38
Area		
Rural	31	62
Urban	19	38

Table 2: Mean potassium levels

Parameter	Mean potassium levels
Baseline (before starting of surgery)	4.73 mEq/L
One day after surgery	5.33 mEq/L
Three day after surgery	4.52 mEq/L
Seven day after surgery	4.43 mEq/L

Table 3: Comparison of potassium levels

Group Versus Group	t-value	p-value	
Baseline	One day after surgery	-1.789	0.00*
	Three days after surgery	-1.496	0.01*
	Seven days after surgery	-2.656	0.03*
One day after surgery	Three days after surgery	-3.128	0.04*
	Seven days after surgery	-1.453	0.00*
Three days after surgery	Seven days after surgery	2.788	0.72

Discussion

Patients undergoing abdominal surgery develop episodes of impaired gastrointestinal motility and even postoperative ileus. Prolonged gastrointestinal paralysis after surgery may result in longer hospital stays and increased medical costs. Electrolyte homeostasis, particularly the blood potassium level, is very important for postoperative recovery of gastrointestinal function. Several studies suggested that hypokalemia was an independent risk factor for postoperative complications, including delayed recovery of gastrointestinal motility, while sufficient potassium supplementation might accelerate recovery of gastrointestinal function.^{8,9} Hence; the present study was conducted for assessing the alterations in serum potassium levels during post op exploratory laparotomy. In the present study, a total of 50 patients who underwent exploratory laparotomy were include. Mean age of the patients was 59.4 years. 66 percent of the patients were males while the remaining were females. Mean potassium levels at Baseline (before starting of surgery), One day after surgery, Three days after surgery and Seven days after surgery were found to be 4.73 mEq/L, 5.33 mEq/L, 4.52 mEq/L and 4.43 mEq/L respectively. A significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively. Variable results have been reported in past literature in this context. Guanzhen Lu et al. evaluated the significance of pre-hospital and post-operative serum potassium level monitoring and hypokalemia intervention in laparotomy patients with hypokalemia. A total of

118 laparotomy patients with hypokalemia were randomly divided into an intervention group (N = 60) and a control group (N = 58). Average serum potassium levels at admission, time period of drinking, and time of first bowel sound after laparotomy differed significantly ($p < 0.001$) between the two groups. Average serum potassium levels, first time of defecation, urination, and ambulation at 24 h and 48 h post-operation differed significantly ($p < 0.05$) between the two groups. An optimal pathway of serum potassium monitoring not only saves limited ward space but also allows for early correction of hypokalemia in patients undergoing laparotomy.¹⁰ There was no significant difference observed in the serum electrolyte levels by Maria valadao et al. (2015), and Keshab et al. (2014), whereas the studies of Shenqi et al. (2013), and Kumkum et al. (2010), Krishnamoorthy & Shobha (2002) reported an increase in the serum potassium levels post operatively.^{8,9,11-13} Blood potassium levels could differ slightly among individuals and were very important during perioperative management of patients undergoing abdominal surgery. Abdominal surgery is a main category of general surgery, and, furthermore, the effects of postoperative potassium metabolism in patients are always a concern for physicians. The first measurement of the serum potassium level after admission to the hospital shows that many patients had had hypokalemia before, which could not be explained by common causes such as inadequate intake or excessive loss of potassium. With the development of economy, improvement of living standards, increase in work pressure, and changes in lifestyle, the primary disease spectrum has altered greatly, resulting in hypertension and diabetes mellitus (DM) becoming very common conditions.¹⁴⁻¹⁷ In the present study, a significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively. Our results were in concordance with the results obtained by previous authors. Nausheen N et al. studied serum electrolyte changes in post-operative cases (patients undergoing Explorative Laparotomy) and to study which serum electrolyte is markedly changed in post-operative patients. Their study showed significant changes in serum electrolyte in postoperative period.¹⁸

Conclusion

We concluded that the significant rise in the potassium levels occur after exploratory laparotomy, followed by restoration to normal values by the end of first postoperative week.

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