

## Fluid Abuse Following Minor to Intermediate Elective Surgeries

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### Abstract

**Background:** The restriction to the guidelines for postoperative management (as omission of routine use of nasogastric tubes, early institution of oral feeding and mobilization and clarified indications of administration of intravenous fluids) has resulted in a decrease in perioperative intravenous fluid administration in fast-track surgical programs (in particular day case surgeries). In minor to intermediate surgeries, shifting of perioperative fluids are small and organ dysfunctions are minimum.

**Objective:** To establish fluid abuse postoperatively following minor and intermediate surgeries.

**Patients and Methods:** This is a prospective study done in Iraq-Diyala-Baquba teaching hospital over a period of one year from January 2018 – January 2019. The case sheets of 640 elective surgical cases had been reviewed for the intravenous fluid prescription after surgery. The types of surgeries reviewed were those which theoretically based, do not need postoperative intravenous fluid administration or shouldn't be given for more than few hours; but should start early oral fluid. The emergency cases were excluded from this study. The data collected from the case sheets of different elective surgeries in the surgical ward. The 640 patients who underwent elective mild to intermediate surgeries.

**Results:** Of those who underwent surgeries under general anesthesia, it has been found that 288 out of 390 patients (90%) were given intravenous fluid postoperatively for a period from 8- 24 hours. Of those who underwent surgeries under spinal anesthesia, it has been found that 134 out of 174 patients (77%) patients were given intravenous fluid postoperatively for a period from 8- 12 hours. Of those who underwent surgeries under local anesthesia, it has been found that 36 out of 76 patients (47%) were given intravenous fluid postoperatively for a period from 8- 12 hours. The volume of fluid prescribed ranged from 500ml to 2 liters.

**Conclusion:** Routine prescription of intravenous fluids following minor to intermediate surgeries is theoretically unsupported and is unnecessary most of the time as far as the patient is maintained well hydrated intraoperatively.

**Keywords:** Postoperative fluid therapy, perioperative fluid management, fluid abuse in surgery.

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## Introduction

The physiological response to the stress of surgery will induce inflammatory response, catabolism and retention of fluid. All of this initiated by afferent neural stimuli together with inflammatory factors originating from the increased injured area. Fluid retention results from increased water and sodium absorption under effect of antidiuretic hormone (ADH), aldosterone and the renin-angiotensin II system; these act as the main endocrine mediators [1].

Saline infusion had been shown to decrease plasma concentration of aldosterone, ADH and renin-angiotensin II in both operated and non-operated subjects. This suggests the presence of functional feedback mechanism [2]. In addition to that, the classic stress hormones as epinephrine, glucagon and cortisol together with inflammatory mediators released in response to trauma (surgery), also induce retention of fluid by itself [3].

There is a direct relationship between the magnitude of surgical stress response and the resultant impairments of physiological functions of the body organs which also include elimination of fluid. The permeability of the vessels increase proportionally to the size of trauma. This include fluid distribution from the intravascular compartment to the interstitial space predisposing to hypovolaemia (4). At the same time, the perioperative patient has a propensity for fluid retention because the fluids administered are not excreted readily. This might predispose to fluid overload postoperatively and gaining weight caused by

accumulation of fluid in the peripheral tissues [5].

Previously, it was thought that surgery cause an obligated decrease in the functional extra cellular fluid volume (ECV), hence necessitate the need for intravenous crystalloid infusion aiming at maintaining homeostasis of body fluids . These findings were conveyed by many authors and explained by many investigators by the inadequate methodological techniques [2,3].

The distinction among minor and major surgical procedures predominantly relies on the profound stress activation and impaired permeability of the capillaries which the later cause shifting of internal fluid. The body do it's best to maintain volume homeostasis of the internal fluid compartments in such away, an infused amount of fluid (crystalloid or colloid) aims to maintain a target volume. The fluid infused then leave the occupied volume at a proportional rate to the deviation from that target volume [6]. The infused fluid which is usually crystalloid distribute in a remote and central functional body fluid space, with sizes correlating well to the plasma and interstitial compartments. The elimination of the given fluid decreased significantly during an aesthesia and surgery [7]. It is established that both fluid overload and hypovolaemia may cause insufficient cardiovascular function which the later cause organ dysfunction resulting from inadequate peripheral oxygen supply [8]. Also, fluid overload theoretically increase cardiac demand which predispose to ischaemia, arrhythmia or pulmonary oedema [9].

Hypoxemia is a possible complication postoperatively. This hypoxemia is multifactorial which may include endocrine, metabolic stress activation, sleep disturbance and lung dysfunction [10]. Nocturnal hypoxemia is described peak on the second and third postoperative nights. This may be explained by cardiovascular and cerebral dysfunction. Both fluid overload and hypovolaemia may induce late postoperative hypoxemia by peripheral circulatory impairment followed by promotion of accumulation of extravascular fluid[11].

The unavoidable decrease in pulmonary function after surgery may amplitude by fluid overload which predispose to pneumonia and respiratory failure. This means decreased pulmonary function but it should be known that this decrease in pulmonary function may not be directly related to the occurrence of lung complications [12].

Some studies in patients underwent pneumonectomy and esophagectomy reported strong relationship between the amount of fluid administered perioperatively and postoperative pulmonary complications, in such away an increased amount of intravenous fluid administration leads to increase the rate of complications [13]. The trauma of surgery leads to impaired gastrointestinal motility [14] which amplified by hypovolaemia and fluid overload. Hypovolaemia decrease splanchnic circulation and fluid overload cause decrease motility caused by fluid accumulation in the alimentary tract wall and the tissue around [15].

Surgery with it's associated trauma induce coagulopathy in the form of hypercoagulation which may predispose to thromboembolic complications [16]. The choice of perioperative management may potentially affect coagulation. Investigators found that crystalloid administration (whatever the type) promote hypercoagulation. In contrast to crystalloids, the authors found that colloids promote decrease in coagulation[17].

Generally, there is no accepted definition of postoperative azotemia, therefore, there is no determined clinical relevance of increased creatinine level in the postoperative period [18]. Possibly, the most relevant definition of postoperative azotemia might be the need for dialysis [19]. ADH, aldosterone and angiotensin II are the main mediators of the injury (surgery) induced retention of urine, resulting in decrease urine output, which is a common indication for administrating fluid in surgical practice. Despite that, intraoperative urine output is increased in response to administration of fluid. Intraoperative diuresis by itself do not seem to predict postoperative renal failure which is defined as the need for dialysis, in patients operated on electively. However, further studies in this area are needed[20]. It is revealed that both fluid over load and hypovolemia may result in impairment in tissue oxygenation with negative implications for wound healings. And even wound complications , including leaking from the anastomotic site. In one study performed during cardiac surgery, it is revealed that

plasma volume infusion given to achieve maximum ventricular stroke volume led to improvement of perfusion of the gastrointestinal mucosa, and significant decrease in major postoperative complications as stroke, major infections, paralytic ileus, respiratory failure and death [21,22].

Tissue perfusion has been monitored perioperatively by different methods including intestinal tonometry, laser Doppler flowmetry, microdialysis, near infrared spectroscopy, transcutaneous oxygen tension and muscle PH electrodes. The clinical implications are unclear and neither administration of fluids or vasopressors according to these testing methods has led to improvements in clinical outcome [23,24].

### **Recovery**

Regarding postoperative nausea and vomiting (PONV), dizziness and drowsiness revealed to predict hospital stay following ambulatory surgery, and is influenced by administration of fluid [25]. Studies revealed impairments in the functional balance after anaesthesia, both regional and general. Fatigueness in the postoperative period may be influenced by physiological and psychological factors, contribute to delayed recovery and has been evacuated in both minor and major surgical procedures [26]. Postoperative nausea and vomiting is multifactorial including both open and laparoscopic surgeries, but increased with laparoscopy, and anaesthesia with decreased risk with propofol. The sex has its own effect

also, with increased risk of PONV in female. It is also more in smokers [27].

Fluid homeostasis and peripheral circulation may affect PONV and perioperative dysfunction also seen to be associated with PONV [28].

Common indications for intravenous fluid substitution in elective surgery.

- 1-Preoperative fluid deficits
- 2-Control hemodynamics under anesthesia
- 3-Maintain high CVP
- 4-Control hemodynamics postoperatively
- 5-No enteral nutrition postoperatively
- 6-Prevention of hypotension with regional anesthesia/analgesia

### **Intraoperative consideration**

The most common side effect encountered during epidural and spinal anesthesia is hypotension, which result from venous and arterial vasodilation requiring infusions of fluid or vasopressors administration. Such fluid administration is a common contributory factor to fluid overload postoperatively [29].

### **Postoperative consideration**

The combination of improved postoperative ileus and the restriction to guidelines for postoperative management as removal of nasogastric tubes, early oral feeding, mobilization and administration of intravenous fluids only when indicated, all these resulted in reduced perioperative intravenous fluid administration [30].

### **Fluid management in elective surgeries Minor surgeries**

In minor surgeries, the perioperative fluid shift is small and organ dysfunction is minor.

The dehydration which is caused by preoperative fasting accounts for the majority of fluid deficits in these procedures. It is well established that fluid infusion aiming to correct this preoperative dehydration. It is revealed by authors that giving 1-2 liters as a crystalloid may improve drowsiness, dizziness and PONV[31].

### **Intermediate (moderately complex): Surgery**

Intermediate surgeries cover procedures as laparoscopic fundoplication, laparoscopic cholecystectomy, hysterectomy, knee and hip arthroplasty and peripheral vascular surgery. Laparoscopic cholecystectomy is one of the most commonly performed surgical procedures. In a double blind randomized, clinical trial 48 patients undergoing laparoscopic cholecystectomy, it is found that intraoperative administration of 40 ml/kg (~3 liters) vs 15 ml/kg (~1.5 liters) ringer lactate led to significant improvement in pulmonary dysfunction, ambulation, balance function and subjective recovery measures as nausea, general wellbeing, thirst, dizziness, drowsiness and fatigue[32].

### **Patients and Methods**

This is a cross sectional, comparative study. This is a prospective study done in Baquba teaching hospital over a period of one year from the 1st of January 2018 – the 1st of

January 2019. The case sheets of 640 elective surgical cases had been reviewed for the intravenous fluid prescription after surgery. The types of surgeries reviewed were those which theoretically based, do not need postoperative intravenous fluid administration or shouldn't be given for more than few hours; but should start early oral fluid intake depending on the proved base that the bowel function return back to normal within less than 6 hours in minor to intermediate surgeries.

The emergency cases were excluded from this study. The data collected from the case sheets of different elective surgeries in the surgical ward.

The 640 patients who underwent elective surgeries include the following (the study focused on minor to intermediate surgeries): Haemorrhoid, testicular hydrocele, testicular varicocele, inguinal hernias, umbilical hernias, paraumbilical hernias, epigastric hernias, sebaceous cyst, lipoma, excisional biopsy of lymph nodes, excisional biopsy of breast mass, undescended testicle, gynaecomastia, small haemangioma, abscess anywhere, fissure in ano, fistula in ano, removal of a scar, removal of tattoo, pilonidal sinus, thyroglossal duct cyst, thyroid nodule, secondary suturing, and ingrown toe nail.

**Table (1):** The forma used in the study.

Type of surgery	Age	Type of anesthesia	
		GA	LA

### Statistical analysis

The data results are obtained through calculating the number and the percentage using Microsoft office excel 2017.

### Results

The case sheets of 640 elective surgeries (minor to intermediate surgeries) had been

reviewed for the intravenous fluid prescription after surgery.

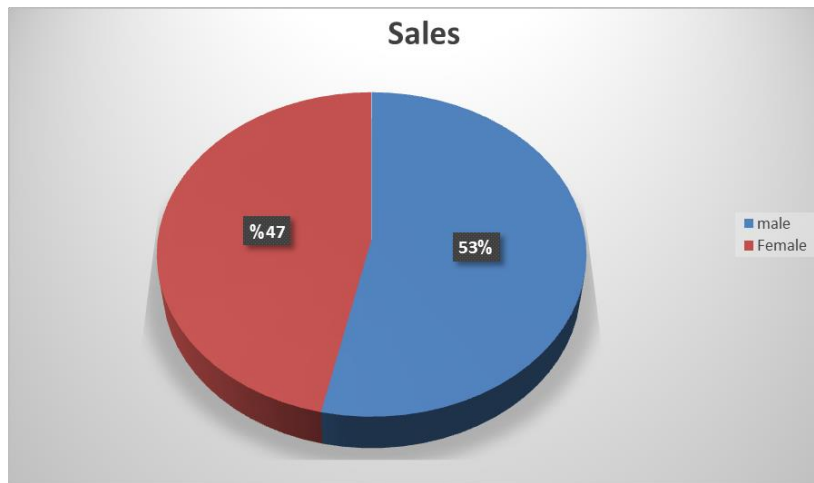
It has been found that 390 patients underwent surgeries under general anesthesia, 174 patients underwent surgeries under spinal anesthesia and 76 patients under local anesthesia.

**Table (2):** Distribution of patients according to the type of surgery.

Anal surgery	Hydrocele	Varicocele	Inguinal hernia	Paraumbilical hernia	Epigastric hernia	Sebaceous cyst	Lipoma	Lymph node biopsy	Breast mass	Undescended testicle	Gynaecomastia	Haemangioma	Abscess	Scar removal	Pilonidal sinus	Thyroglossal cyst	Secondary suturing	Ingrown toe nail	Total
62	51	34	56	81	46	30	46	38	45	36	8	6	35	6	25	11	15	9	640

**Table (3):** Distribution of patients according to the age group (yrs).

1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	Total
97	112	127	115	75	54	40	20	640



**Figure (1):** Distribution of males and females.

**Table (4):** Distribution of the patients according to the type of anesthesia given.

Type of anesthesia			
General anesthesia	Spinal anesthesia	Local anesthesia	Total
390	174	76	640

Of those who underwent surgeries under general anesthesia (390 patients), it has been found that 288 out of 390 patients (90%) were given intravenous fluid postoperatively for a period from 8-24 hours.

Of those who underwent surgeries under spinal anesthesia, it has been found that 134 out of 174 patients (77%) were given intravenous fluid postoperatively for a period from 8- 12 hours.

Of those who underwent surgeries under local anesthesia, it has been found that 36 out of 76 patients (47%) were given intravenous

fluid postoperatively for a period from 8- 12 hours. The volume of fluid prescribed ranged from 500ml to 2 liters. All of the patients who underwent surgeries under local anesthesia or under spinal anesthesia were ordered to start oral intake at least in the form of water and juices within the first hour postoperatively Table( 4).

Ninety percentage (351 Patients) of patients who underwent surgeries under general anesthesia were ordered to start oral within a period of 1-6 hours. The remaining 10% started oral within 6-10 hours Table (4).



**Table (5):** Distribution of patients according to the timing of starting oral intake.

No. of patients(%) underwent surgeries under general anesthesia Ordered to start oral intake within 1-6 hours	No. of patients(%) underwent surgeries under spinal anesthesia Ordered to start oral intake Ordered to start oral intake within the first hour postoperatively	No. of patients(%) underwent surgeries under general anesthesia Ordered to start oral intake within the first hour postoperatively
351 (90%)	174 (100%)	76 (100%)

Six hundreds and one patient (93.9%) out of 640 patients prescribed intravenous fluids in an abused way, either by infusing fluids when they are not needed at all as in those underwent surgeries under local or spinal anesthesia or even surgeries lasting less than 30 minutes performed under general anesthesia, or in an amount larger than needed putting in mind that preoperative dehydration is corrected by the anesthetist intraoperatively and oral intake in day case surgeries can be started within less than 6 hours in most cases.

### Discussion

In Most of minor to intermediate surgeries are day case surgeries and not less than half of the day case surgeries now a days are performed under local and spinal anesthesia. Therefore they can start oral fluid in the immediate postoperative period [33].

The peristaltic movement of the bowel return back to normal within 4-6 hours. But studies revealed that the bowel can function even in the absence of peristaltic movements, and hence the patients can start having fluids before the bowel sounds being heard by stethoscope[34].

In addition all of the patients receive intravenous fluid intra-operatively, so that the patient discharged from the theater well

hydrated. Depending on the above facts, it is logic that routine prescription of intravenous fluid for such patients is wrong and unsupported scientifically. Also; many studies proved that unnecessary postoperative IV fluid prescription is not devoid of complications [35].

Distinction should be made (a) for replacement of abnormal losses and (b). between fluid and electrolytes required for normal daily requirement No intravenous fluid should be given just because it is a “routine” part of clinical care. Fluid and foods should be provided orally or enterally and intravenous infusions should be discontinued as soon as possible [36].

### Conclusions

Routine prescription of intravenous fluids following minor to intermediate surgeries is theoretically unsupported and is unnecessary most of the time as far as the patient is maintained well hydrated intraoperatively.

### Recommendations

Surgeons should be careful with prescribing intravenous fluid postoperatively as there was an abuse of fluid infusion in the current study which have both negative economic impact on the hospital and adverse health impact on the patient.



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