



Original Research Article

Effect of intraoperative volume status and hemodynamics on patients undergoing laparoscopic bariatric surgeries : A retrospective study

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ABSTRACT

Introduction: The increasing trend and need of bariatric surgeries has made it vital for the anaesthesiologists to spruce up their knowledge regarding peri-operative management of morbidly obese patients. Intra-operative fluid management in such patients is critical and has always been debatable.

Materials and Methods: We retrospectively assessed the influence of amount of fluid given intra-operatively and effect of hemodynamics on the renal function tests and acid-base status of 103 morbidly obese patients undergoing laparoscopic bariatric surgery between April 2017 to March 2018 in our institution. All the patients received central venous pressure guided fluids and were divided into two groups on the basis of amount of fluid thereby administered as less than 2 litres and 2 litres or more.

Results: In our study, slight metabolic acidosis was seen patients receiving less than 2 Litres of fluid while better hemodynamics were observed in patients receiving 2 litres of fluid or more intra-operatively.

Conclusion: Obese patients coming for laparoscopic bariatric surgery should receive intra-operative fluids targeting optimal hemodynamics. Central venous pressure may not be an accurate predictor of fluid responsiveness.

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1. Introduction

The increasing trend and need of bariatric surgeries, in recent years, has made it pivotal for the anaesthesiologists to spruce up their knowledge regarding peri-operative management of morbidly obese patients. Management of fluid balance in these patients has been debatable, which to some extent, can be attributed to the lack of available literature in this context. The current paradigms for fluid administration in obese population are mostly based on studies which compared liberal to restrictive approaches in a non-obese population. While the liberal intra-operative fluid administration has been shown to improve peri-operative physiologic organ function and patient recovery,¹ it can lead to hypertension, pulmonary oedema and requirement for ventilatory support. On the other hand, a restrictive approach to intra-operative fluid

administration may result in acute tubular necrosis and organ dysfunction.² Thus, peri-operative fluid therapy in morbidly obese patients has double edged implications. In our study, we evaluated the influence of intra-operative hydration on the vital parameters, renal function tests and arterial blood gas analysis of patients undergoing laparoscopic bariatric surgery, retrospectively.

2. Materials and Methods

After approval from the Institutional Ethics Committee, we did a retrospective study wherein we evaluated 103 ASA II-IV patients of either sex (age varying between 23-62 years) from a single centre who underwent laparoscopic bariatric surgery between April 2017 and March 2018. The demographic data, vital parameters and investigations were taken from the pre-anaesthesia check up records. We recorded data from the patients files also whenever necessary. In all patients standard ASA monitoring in

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the form of ECG, blood pressure, CVP (central venous pressure), urine output, temperature, pulse oximetry and end-tidal carbon dioxide (EtCO₂) were noted. Invasive arterial blood pressure monitoring was done in patients in which non-invasive blood pressure recording could not be done because of larger arm circumference.

Anaesthesia technique : After shifting the patient inside the operation theatre, they were made to lie down in a ramped position so as to make tragus in line with the sternal notch. Pre-oxygenation was done for 5 minutes. Patients were given intravenous injection fentanyl 1-2µg/kg and induced with injection propofol 2-3mg/kg iv. Difficult airway cart was kept ready for each case. Anaesthesia was maintained with oxygen/air/ desflurane at one minimum alveolar concentration, to maintain a BIS (Bispectral Index) value of 40-60 and muscle relaxation was achieved with atracurium 0.5 mg/kg. Lungs were ventilated with volume control mode of ventilation keeping the positive end-expiratory pressure between 0 and 5 mmHg. Core body temperature was maintained within normal limits with the help of Bare Hager and use of warmed intravenous fluids. Internal jugular vein catheterization was performed after the induction of anaesthesia and fluid administration was done according to CVP. The surgery was carried out in modified Lloyd Davis position (steep reverse Trendelenberg position with legs spread apart). Intra-operatively, patients received crystalloids such as 0.9% normal saline, ringer lactate and plasmalyte A solution. At the end of surgery, tracheal extubation was done and patients were shifted to the post anaesthesia care unit (PACU) postoperatively.

The data was collected from records which included patient profile, amount of intravenous fluid given intra-operatively, central venous pressure, urine output, hemodynamic variables, post-operative investigations (arterial blood gas analysis, renal function test, liver function test) and post operative complications (if any). Patients were divided into two groups on the basis of amount of fluid administered: group A (received <2 litres of fluid) and group B (received > 2 litres of fluid). Renal function tests and acid base analysis was done in all the patients 24 hours postoperatively. We also analysed data considering the effect of fluids on mean arterial pressures.

2.1. Statistical analysis

Data were described in terms of range; mean ± standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square (χ²) test was performed and exact test was used when the expected frequency is less than 5. A probability value (p value) less than 0.05 was considered statistically

significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

3. Results

The demographic profile of patients in both groups was comparable. The mean age of patients in Group A (receiving <2 litres fluid) was 44.45 years (+ 10.21) and that in Group B (receiving > 2 litres fluid) was 41.49 (+ 9.34). The mean weight and BMI of patients in group A was 121.74kg & 44.39 kg/m² respectively while that of Group B was 124.25kg and 45.30kg/m² respectively.

Out of 103 patients, 59.6% had OSA, 30.8% suffered from diabetes mellitus, 51.9% had hypertension and 9.6% had bronchial asthma. Mean CVP (Figure 1) in Group A was 12.8 cmNS (+ 1.4) while that in Group B was 11.2 cmNS (+ 1.2). This difference in CVP between both the groups was statistically significant (p value 0.001). Arterial blood gas analysis (Figure 2) revealed statistically significant difference in pH, pCO₂ and HCO₃ levels where mild metabolic acidosis was seen in Group A (pH 7.30, pCO₂ 39.8, HCO₃ 18.4) when compared to Group B (pH 7.36, pCO₂ 37.8, HCO₃ 22.2). Intra-operatively, mean arterial pressure (MAP) was statistically significantly (p value= 0.037) higher in group A with value of 135 + 9.7 mmHg as compared to group B where MAP was 131.7 + 10.8 mmHg. The mean serum lactate values were lower in the group B as compared to group A but this difference was not statistically significant. Post operatively, low albumin levels 3.8 + 0.66g/dl were seen in group A while that in Group B were 4.15 + 0.79 g/dl (p value= 0.000). No statistically significant difference was seen in urine output, blood urea, serum creatinine, serum electrolytes (Na, K, Cl), hematocrit and total serum protein.

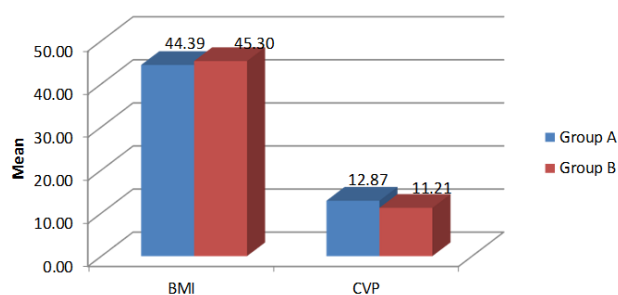


Fig. 1: Mean BMI (kg/m²) and CVP (cm NS) in Group A (receiving <2 litres fluid) and Group B (receiving > 2 litres fluid).

4. Discussion

The incidence of perioperative morbidity is increased in morbidly obese patients who are kept excessively fluid restricted. Hypovolemia leads to organ dysfunction and death.^{3,4} In an inadequately resuscitated patient,

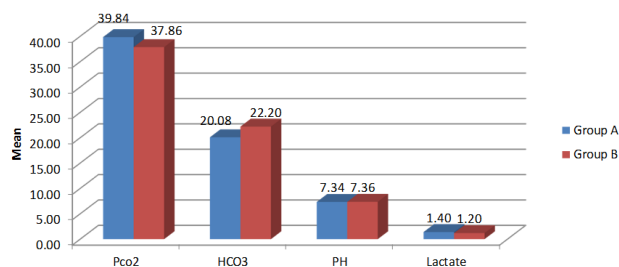


Fig. 2: Arterial blood gas analysis (post operative).

anaesthesiologists start the use of inotropes at an earlier stage. This leads to tachycardia and hence increase in myocardial oxygen demand. Such patients are at increased risk of arrhythmias and cardiovascular compromise. Many studies have compared volume replacement by comparing CVP values and they aimed to keep the CVP between 8 and 15 mm Hg.^{5,6} In our study, the mean central venous pressure in group receiving less than two litres of fluid intra-operatively was 12.8 cmNS while that in group receiving > 2 litres was 11.2cmNS; difference being statistically significant. A systematic review of 24 studies showed that the central venous pressure (CVP) is a poor predictor of blood volume and changes in CVP do not predict response to fluid administration in an obese patients.⁷ Hence, the use of CVP to predict fluid responsiveness has been challenged.⁸ We also studied serum lactate levels in our study to know the adequacy of tissue perfusion in the intra-operative period. Although the mean serum lactate values were lower in the group receiving > 2 litres of fluid intra-operatively (1.2 vs. 1.4), this was not statistically significant. Since the lactate levels in both groups were within the normal range despite the long duration of surgery and anticipated large volume shifts, it indicates the overall beneficial effects of adequate fluid replacements during bariatric surgeries. This corroborates to the findings of the study done by Hasanin A et al, who highlighted serum lactate level as one of the central indices and surrogate marker of tissue perfusion.⁹ Patients in both groups maintained urine output of >0.5 ml/kg/h intra-operatively which is in accordance with the study done by Matot I et al, who demonstrated that during laparoscopic bariatric surgery, urine output does not correlate with the rate of intra-operative fluid administration.¹⁰ In our study, better biochemical outcome in terms of arterial pH and intraoperative hemodynamics was seen in patients who received > 2 litres of intravenous fluids intraoperatively. However, postoperative acute kidney injury did not develop in any of the groups, postoperatively, as reflected by a normal and comparable creatinine values. The incidence of postoperative complications was not significantly different between the two groups in our study. Contradictory to our findings, Brandstrup et al.¹¹ observed that patients managed with a restrictive intraoperative fluid regimen had

fewer complications and a shorter postoperative stay in the ICU. This was also reported by Lobo et al.¹² who showed that a restrictive fluid strategy while targeting oxygenation indices in high-risk surgery reduced the complications after surgery. Our study had limitations in the fact that it was a retrospective study from hospital records and did not take any dynamic predictors of fluid responsiveness into account (since none were used in our hospital).

5. Conclusion

An ideal volume of fluid replacement during a bariatric surgery or any other major abdominal surgery for an obese patient still remains elusive. Different altercations in opinions exist as to the choice of perioperative fluid strategies (restrictive v/s liberal) in laparoscopic bariatric surgeries. We recommend goal-directed fluid therapy as a measure of volume responsiveness with targets as optimal hemodynamic parameters and oxygenation indices for patients undergoing laparoscopic bariatric surgery as it has been shown to be associated with improved clinical outcomes and reduction in hospital stay.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

- Chappell D, Jacob M, Hofmann-Keifer K, Conzen P, Rehm M. A rational approach to perioperative fluid management. *Anaesthesiology*. 2008;109:723–763.
- Leykin Y, Pellis T, E DM, Fanti G, Marzano B. Perioperative management of 195 consecutive bariatric patients. *Eur J Anaesthesiol*. 2008;25:168–170.
- Boyd O, Bennett ED. Achieving the goal. *Crit Care Med*. 1999;27:2298–2299.
- Mythen MG, Webb AR. Intra-operative gut mucosal hypoperfusion is associated with increased post-operative complications and cost. *Intensive Care Med*. 1994;20:99–104.
- Wakeling HG, Mcfall MR, Jenkins CS, Woods WG, Miles WF, et al. Intraoperative oesophageal Doppler guided fluid management shortens postoperative hospital stay after major bowel surgery. *Br J Anaesth*. 2005;95:634–642.
- Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N Engl J Med*. 2001;345:1368–1377.
- Marik PE, Baram M, Vahid B. Does central venous pressure predict fluid responsiveness. A systematic review of the literature and the tale of seven mares? *Chest*. 2008;134:172–180.
- Osman D, Ridel C, Ray P, Monnet X, Anguel N, et al. Cardiac filling pressures are not appropriate to predict hemodynamic response to volume challenge. *Crit Care Med*. 2007;35:64–68.
- Hasanin A, Mukhtar A, Nassar H. Perfusion indices revisited. *J Int Care*. 2017;5:24.
- Matot I, Paskaleva R, Eid L, Cohen K, Khalilah A, et al. Effect of the volume of fluids administered on intraoperative oliguria in laparoscopic bariatric surgery: a randomized controlled trial. *Arch Surg*. 2012;147(3):228–834.

11. Brandstrup B, Tonnesen H, Beier-Holgersen R, Hjortso E, Ording H, et al. Effects of intravenous fluid restriction on postoperative complications: Comparison of two perioperative fluid regimens. A randomized assessor-blinded multicenter trial. *Ann Surg.* 2003;238:641–648.
12. Lobo SM, Ronchi SL, Oliviera NG, Brandao PG, Froes A, et al. Restrictive strategy of intraoperative fluid maintenance during optimization of oxygen delivery decreases major complications after high-risk surgery. *Crit Care.* 2011;15(5):226.

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