

Ultra-early postoperative feeding and its impact on reducing endovenous fluids.

Uso da realimentação pós-operatória ultra precoce e seu impacto na redução de fluidos endovenosos.

ANNA CAROLINA FRANCO¹; ALBERTO BICUDO-SALOMÃO^{1,2}, TCBC-MT; JOSÉ EDUARDO AGUILAR-NASCIMENTO^{1,3}, TCBC-MT; TALISSA BANDEIRA SANTOS¹; RENAN VICENTE SOHN¹

A B S T R A C T

Objective: To investigate the use of “ultra-early” postoperative feeding (oral liquid diet offered in the post-anesthetic recovery room) in patients undergoing common general surgical procedures and to assess the volume of intravenous fluids, as well as the rate of complications and the length of hospital stay. **Methods:** Prospective, observational study, which assessed the compliance with the “ultra-early” feeding, the reduction of preoperative fasting time, the perioperative venous hydration volume, the length of stay and the operative morbidity. **Results:** 154 patients with a mean age of 46 ± 15 years were followed. “Ultra-early” feeding was performed in 144 cases (93.5%). Patients who did not receive the “ultra-early” feeding received a significantly greater volume of postoperative intravenous fluids (500mL versus 200mL, $p = 0.018$). The length of stay was 2.4 ± 2.79 days (conventional feeding) versus 1.45 ± 1.83 days (“ultra-early” feeding), with no statistical difference ($p = 0.133$). There was no difference in the percentage of general complications ($p = 0.291$), vomiting ($p = 0.696$) or surgical infection ($p = 0.534$). **Conclusion:** “Ultra-early” feeding had a high adherence by patients undergoing common general surgical procedures, and it was related to decreased infusion of postoperative fluids. Complication rates and the length of stay were similar between groups.

Headings: Perioperative Period. Perioperative Care. Fasting. Postoperative Complications. Hospitalization.

INTRODUCTION

Multimodal perioperative care protocols have been used by several surgical services aiming to reduce operative morbidity, length hospital stay and, consequently, accelerate the recovery of surgical patients^{1,2}. The ACERTO protocol (Acceleration of Total Recovery in the postoperative period), initially implemented in Brazil in 2005³, has been the motto for the publication of several studies in the last decade. Good results have been demonstrated when adhering to all the protocol steps. However, three topics should be highlighted: the reduction of preoperative fasting, the perioperative venous hydration and the early postoperative feeding,

all of which have a high impact on reducing the response to trauma and the length of hospital stay⁴⁻⁸.

At the Júlio Müller University Hospital (Cuiabá, Mato Grosso, Brazil), where the ACERTO protocol was created, “ultra-early” postoperative feeding has been proposed since 2015, for patients undergoing standard general surgical procedures, while still in the post-surgery recovery unit. After the operation, the patient remains in post-anesthetic recovery unit (PAR) until his/her complete stabilization and, immediately after he/she is discharged by the responsible anesthesiologist, he/she is offered 400mL of clear liquids, enriched with 12.5% of maltodextrin (50g).

1 - Universidade Federal do Mato Grosso, Hospital Universitário Júlio Müller - Cuiabá - MT - Brasil. 2 - Universidade de Cuiabá, Faculdade de Medicina - Cuiabá - MT - Brasil. 3 - Centro Universitário de Várzea Grande, Faculdade de Medicina - Várzea Grande - MT - Brasil.

To date, no authors have specifically evaluated patients undergoing this protocol. Empirically, the majority of patients undergoing “ultra-early” feeding do not need any type of parenteral fluid therapy in the postoperative period. They will be able to orally reach their water requirements, as soon as they are discharged from the post-anesthetic recovery unit. However, the proof of concept of this hypothesis has not yet been demonstrated. Based on this, the present study aims to investigate the use of “ultra-early” postoperative feeding (oral liquids offered in the post-anesthetic recovery) in patients undergoing common general operations, and to evaluate the volume of intravenous fluids, as well as the occurrence of complications and length of hospital stay.

METHODS

Data were collected after approval by the Research Ethics Committee UFMT- Júlio Müller University Hospital - CEP under the number 2,191,113 (CAAE: 71694117.5.0000.5541). None of the authors declares any conflict of interest.

This was a prospective, observational study of adult patients (over 18 years old), sequentially admitted at the General Surgery Unit, at Júlio Müller University Hospital (Cuiabá-MT, Brazil), to undergo general common surgical procedures. The type of the operation was defined according to the criteria adopted by the Brazilian public system (Sistema Único de Saúde), by the standardization of its operating procedures (Ordinance No. 2848 of November, 2007)¹⁰. In this sample, all evaluated patients completed the operative procedure and were admitted to the post-anesthetic recovery unit as candidates for

“ultra-early” feeding. The choice of using it or not was up to the responsible doctors (surgeons and anesthetists).

The observation period took place between July 2016 and February 2017. Patients were followed from the moment of their hospitalization until their discharge. Data from patients who could not be followed for this entire period (loss of follow-up) were discarded. Patients with a malignant neoplastic disease (suspected or confirmed) were not included.

Oral intake of clear liquids (1 glass of 400mL) enriched with 12.5% of maltodextrin (50g) was considered as the “ultra-early” feeding. This was offered in the post-anesthetic recovery (PAR) unit under the nursing and anesthesiology supervision teams. These patients were also allowed water intake after discharge. The total intravenous hydration in the pre, intra and postoperative period (only crystalloid infusion, regardless of the type of solution used) was assessed (data in milliliters). The Clavien-Dindo classification was used to classify postoperative complications by using a translated and tested version for Brazilian Portuguese¹¹.

Continuous variables were evaluated for normal distribution using the Kolmogorov-Smirnov test (KS) and homogeneity of variances using the Levene test. Data were expressed as mean and standard deviation (variables with normal distribution and with homoscedasticity), or median and maximum and minimum interval (non-parametric distribution variables). Categorical variables were expressed as absolute numbers, percentages and 95% confidence intervals (95 CI). When comparing the results between continuous variables, Student’s t-test was used for data with normal distribution and which presented homoscedasticity. For the other data, the Mann-

Whitney non-parametric test was used. The analysis between categorical variables was performed using the chi-square test or Fisher's exact test when the expected data in any of the cells were less than 5. $P < 0.05$ was adopted as the statistical significance index. For analysis, we used the statistical package SPSS (*Statistical Package for Social Sciences*), version 20.0 for Microsoft® Windows®.

RESULT(S)

A total of 154 consecutive patients were analyzed, and the operative procedures they underwent are described in Table 1.

The mean age of the patients was 46 ± 15 years old (95% CI 44-49 years old), with 62 (36.1%) men and 92 (63.9%) women. According to the classification of the American Society of Anesthesiologists (ASA), most patients were classified as ASA I (73; 47.4%) or II (47.4%). 8 patients (5.2%) were classified preoperatively as ASA III. Regarding the Apfel predictive score for the risk of vomiting in the postoperative period,

49 patients (31.6%) were considered low risk and 68.2% had moderate to high risk [63 (40.9%) moderate risk and 43 (27.7%) high risk].

Adherence to the pre-operative short period fasting protocol was seen in 134 patients (87%) who used carbohydrate-rich clear liquids (with or without proteins). The average preoperative fasting time was 4.77 ± 3.93 h (95% CI 4.15-5.40h). One hundred forty-four patients (93.5%) received "ultra-early" feeding in the post-anesthetic recovery unit. These patients were discharged to other units (ward) with orally administrated fluids, and they received their second meal (solid diet in 52/36.1%, soft diet in 88/61.1% and or liquids in 4/2.7% of the cases) on average 2.81 ± 1.2 hours later (95% CI 2.60-3.01h; range 1 to 8h). As indicated in Figure 1, patients for whom the "ultra-early" feeding was not allowed, oral diets were offered later - a median of 6h (range from 3 to 24h) after discharge from the PAR unit ($p < 0.001$), and they were allowed solid diets in 27.2%, soft diet in 54.5% and liquids in 18.1%.

Table 1. Common general surgical procedures - 154 patients.

Operations	n	%
Videolaparoscopic cholecystectomy	52	33,8
Inguinal/crural hernioplasty	22	14,3
Ventral hernioplasty	18	11,7
Hemorrhoidectomy / Fistulectomy	16	10,4
Non-aesthetic female breast plastic surgery (mammoplasty)	9	5,8
Surgical treatment of varicose veins	8	5,2
Thyroidectomy	6	3,9
Abdominal Dermolipectomy	3	1,9
Ureteroscopic treatment of urinary tract lithiasis	3	1,9
Surgical treatment of gastroesophageal reflux disease	2	1,3
Hepatectomy with for cyst removal	2	1,3
Miscellaneous	13	8,4
Total	154	

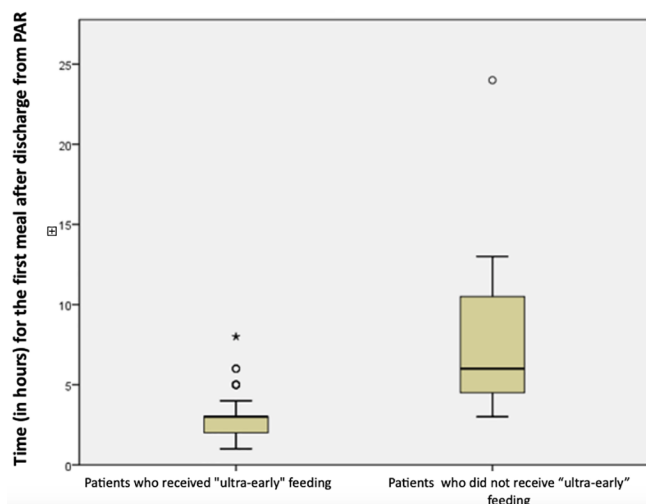


Figure 1. Time (in hours) for the first meal after discharge from PAR unit (ward feeding) in patients who had been fed in PAR and in those where this was not done (* $p < 0.001$).

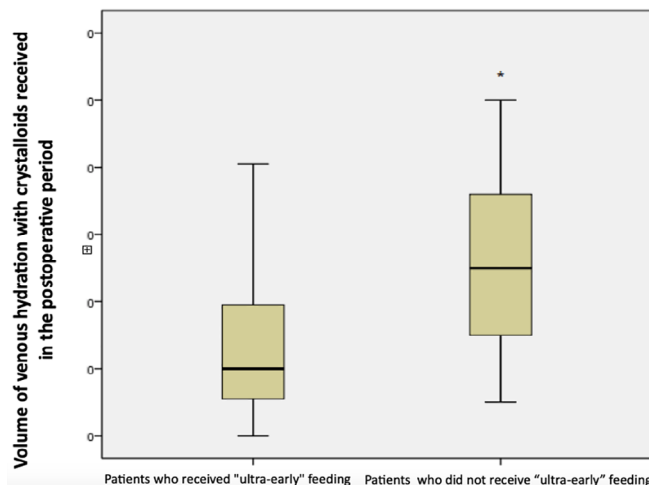


Figure 2. Volume of venous hydration with crystalloids received in the postoperative period, stratified by patients who received or not "ultra-early" feeding (* $p = 0.018$).

No patient had intravenous hydration in the preoperative period. The median infused intraoperative volume was 600mL (ranging from 500 to 2000mL), and the postoperative was 200mL (ranging from 100 to 5300mL). As seen in figure 2, patients who did not receive the "ultra-early" feeding (median 500mL, ranging from 100 to 2000mL) received significantly higher volumes of intravenous fluids than "ultra-early" feeding patients (median of 200mL, ranging from 100 to 5,300mL; $p = 0.018$).

The average length of stay was 1.5 ± 1.9 days (95% CI 1.2 - 1.8 days). Although patients without the "ultra-early" feeding had a higher average postoperative length of stay than those with "ultra-early" feeding (2.4 ± 2.79 days *versus* 1.45 ± 1.83 days), this was not significantly different ($p = 0.133$).

Postoperative complications (major and minor) occurred in 41 patients (26.6%). Most of the complications were minor, according to the Clavien-Dindo classification: were grades I (16.2%) or II (7.8%).

There was no difference in the percentage of complications between patients who received or did not receive the "ultra-early" feeding ($p = 0.291$). Vomiting in the postoperative period was seen in 11% (17) of the patients. 11.1% of the patients in the "ultra-early" feeding vomited while 10% of patients without the "ultra-early" feeding did not (with no statistically significant difference between groups ($p = 0.696$)). There were 10 cases of surgical infections, which corresponds to 6.5% of the total operated patients. Most of these infection cases were related to ventral hernias operations (30%). Only one surgical-site infection (SSI) was diagnosed during the hospital stay (this was also the most severe case, requiring the patient to remain in the hospital for fifteen days), the others (90% of SSI cases), were diagnosed and resolved in the outpatient clinic. There were no cases of readmissions. There were no differences between patients who underwent the "ultra-early" feeding with those who did not follow such protocol, regarding complications ($p = 0.5345$).

DISCUSSION

The present study demonstrates that patients undergoing common general surgical procedures, who follow the ACERTO multimodal protocol and who were treated by the “ultra-early” postoperative feeding, while still in the PAR unit, receive decrease intravenous hydration in the postoperative period. These patients received less than 1 unit (500mL) of crystalloid solutions, since admission to the post-anesthetic recovery unit until discharge. They did not receive additional intravenous crystalloids other than those, and they were discharged to the wards with oral fluids prescribed.

Hernioplasties and cholecystectomies were, respectively, the second and third most performed operations in the Brazilian health system, between the years 1995 and 2007⁹. Data presented in this study indicate the same, since 92 (59.8%) patients underwent laparoscopic cholecystectomy or ventral and crural hernioplasty.

According to the ACERTO multimodal protocol and the ACERTO guidelines on the nutritional interventions in the perioperative period for elective general surgical patients, published in 2017 in association with the Brazilian College of Surgeons (CBC) and with the Brazilian Society of Parenteral and Enteral Nutrition (BRASPEN), it is highly recommended early oral or enteral feeding, after elective abdominal procedures (within 24 hours in the postoperative period) as long as the patient is hemodynamically stable (even for patients undergoing gastrointestinal anastomosis).

For patients undergoing Laparoscopic Cholecystectomy, hernioplasties and anorectal procedures, it is recommended to start early oral diets and hydration, without the prescription of intravenous hydration¹³.

We have used, in the present study, the denomination of “ultra-early” feeding, since the first oral intake still occurs in the post-anesthetic recovery unit. The patient drinks, at least, 400mL of clear liquids, with 12.5% of maltodextrin, in the PAR, when well awoken, and under the supervision of the nursing and anesthesia team. This type of postoperative feeding was feasible in 93.5% of the patients. After the PAR discharge, the first meal was offered on average after 3.2 ± 2.45 h (95% CI 2.81-3.59h), in relation to the end of the operation, being, in most cases, a soft hospital diet. In our series, patients who did not follow the “ultra-early” feeding were allowed later oral diets (median 6 hours).

In the postoperative period, the median crystalloid infusion was 200mL (ranging from 100 to 5300mL). The median postoperative infused volume for patients receiving the “ultra-early” feeding was 200mL, while the median for patients who did not follow this protocol was 500mL [ranging from 100 to 2000mL ($p = 0.018$)]. Crystalloid solutions are provided in 500 mL bags, and we compared patients regarding the number of infused bags. We observed that 78.5% of the ultra-fed individuals received less than 1 bag (500mL) in the postoperative period, whereas this was only seen in 36.36% of the patients who did not follow this protocol ($p = 0.005$).

This implies that the patients fed in the PAR unit were discharged to the ward without intravenous fluids.

In addition to the benefits of accelerating the patient's postoperative recovery, it is important to highlight the financial savings that the non-administration of improper intravenous fluids can generate to the public or private health system. A recent Brazilian randomized clinical trial evaluated the results and the average cost for venous hydration in patients undergoing video-laparoscopic cholecystectomies with conventional venous hydration regimen versus no postoperative hydration. In the control group (free intravenous hydration), the average cost was 23.41 ± 3.63 reais per patient, whereas, for the study group (restrictive hydration), it was 13.35 ± 2.73 reais ($p < 0.05$). In addition to the clinical safety of this regimen, this study considered potential savings to the public system of approximately 559,466 reais/year (considering the number of operations of this type performed in the public health system in Brazil)¹⁴.

Among the postoperative complications (27%), according to the Clavien-Dindo Classification, type I (16.2%) stands out. However, these patients did not require any specific approach and did not need pharmacological or surgical treatment, or endoscopic and radiology interventions. In this study, postoperative complications that required some type of intervention occurred in only 2.5% of patients. The incidence of postoperative vomiting, in the current study, was 11%, lower than the reported incidence in surgical patients of about 20 to 40%, reaching up to 80% in high-risk patients¹⁵.

This reinforces the benefits of the multimodal protocol associated with the "ultra-early" feeding and decreased intravenous hydration.

In this study, we found 6.5% (10 cases) of surgical infection. Only one severe infection was seen during hospitalization. In Brazil, data on the incidence of SSI in general and specific operations vary between 1.4% to 38.8%¹⁶. Several risk factors are known as predisposing to SSI, and are classified as the risk of surgical infection index of the National Nosocomial Infection Surveillance System (NISS): the ASA index, the Operative Wound Contamination Potential (PCFO) and the duration of the operation. Our data are in accordance with the literature; however, there was a high rate of infections in operations classified as clean (3.89%), possibly due to the high number of complex hernioplasties in this series. However, only 1.94% of SSIs occurred in potentially contaminated operations, probably due to the use of video laparoscopy to treat most cases. The decreased trauma and exposure of tissues, as well as the duration of the procedure under the laparoscopic approach can influence the occurrence of SSI, but do not exclude it.

It is important to highlight that this is an observational study which may impact results, in particular, since the adherence to the "ultra-early" postoperative feeding protocol was high (93.5%). Thus, in order to better assess the impact of this protocol, especially in terms of postoperative morbidity, it is important to carry out further studies, with a more homogeneous sample and an equal number of cases among the groups.

Multimodal protocols must be continuously updated. They are based on evidence, and evidence is dynamic. This dynamism is healthy, and an inseparable part of thinking in search of the best strategies for the management of surgical patients. There is still a lot to be investigated when we talk about strategies to improve surgical recovery in its various perspectives. The “ultra-early” feeding and the consequent decrease in the volume of intravenous fluids seem to be a simple, safe and potentially cost-effective approach. This is still a non-routine protocol in most services in Brazil.

CONCLUSION

The “ultra-early” postoperative feeding was feasible in a group of patients undergoing common general surgical procedures. Patients undergoing this protocol received minimal volumes of postoperative intravenous fluids, which was significantly lower than those who were fed on a routine protocol. The “ultra-early” feeding patients had similar complication rates in comparison to those undergoing the routine protocols, which is consistent with the literature. This may potentially be a useful clinical protocol in order to improve the postoperative recovery of the surgical patient.

R E S U M O

Objetivo: investigar em uma série de casos de pacientes submetidos a operações de médio porte em cirurgia geral, o uso da conduta de realimentação pós-operatória “ultra precoce” (dieta oral líquida oferecida na recuperação pós-anestésica), avaliando-se o volume de fluidos endovenosos recebidos no pós-operatório por estes pacientes, assim como a ocorrência de complicações e o tempo de internação hospitalar. **Métodos:** estudo prospectivo, observacional. Avaliou-se a aderência à rotina de realimentação “ultra precoce”, abreviação do jejum pré-operatório, volume de hidratação venosa perioperatório, tempo de internação e morbidade operatória. **Resultados:** um total de 154 pacientes com média da idade de 46 ± 15 anos, foram acompanhados. Realimentação “ultra precoce” foi realizada em 144 casos (93,5%). Pacientes que não receberam realimentação “ultra precoce” receberam volume significativamente maior de fluidos endovenosos no pós-operatório do que pacientes realimentados de maneira “ultra precoce” (500ml versus 200ml, $p=0,018$). O tempo de internação foi de $2,4 \pm 2,79$ dias (realimentação convencional) versus $1,45 \pm 1,83$ dias (realimentação “ultra precoce”), sem diferença estatística ($p=0,133$). Não houve diferença no percentual de complicações gerais ($p=0,291$), vômitos ($p=0,696$) ou infecção do sítio cirúrgico ($p=0,534$). **Conclusão:** a realimentação “ultra precoce” apresentou-se como uma conduta de elevada aderência em operações de médio porte em Cirurgia Geral nesta série de casos e, esteve relacionada a infusão de volume significativamente menor de fluidos endovenosos no pós-operatório, com índices baixos de complicações e sem impacto no tempo de internação.

Descritores: Período Perioperatório. Assistência Perioperatória. Jejum. Complicações Pós-Operatórias. Hospitalização. Terapia Combinada.

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Mailing address:

Anna Carolina Franco

E-mail: annacarolinafranco@hotmail.com

albertobsalomao@gmail.com

