

IMPACT OF THE FASTING ABBREVIATION ON THE SURGICAL PATIENT

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INTRODUCTION

Empirically, it was thought that prolonged preoperative fasting aimed to ensure gastric emptying, in order to prevent bronchoaspiration, emesis and administration of drugs to reduce gastric acidity and volume^{4,8,9,59}. However, results from European, Canadian and American studies suggest decreasing preoperative fasting by offering clear liquids and drinks rich in carbohydrates at 12.5% up to two hours before the elective surgical procedure in a safe way^{5,8,9}. Thus, the deleterious effects of prolonged fasting can be reduced. When insulin levels decrease, there is an increase in glucagon that will lead to a decrease in glycogen levels, and an increase in insulin resistance for glycemic maintenance. As a consequence, the sympathetic nervous system and the adrenal medulla will be stimulated to release substances that trigger the inflammatory response, generating an increase in the systemic organic response and numerous stimuli will affect the hypothalamus. If these systemic stimuli are intense and/or prolonged, the inflammatory response to stress will be exacerbated and consequently increase the production of cytokines, such as interleukin 1 and 6, and tumor necrosis factor (TNF), which causes more important metabolic alterations^{5, 6,7,9,17}. To minimize this effect of prolonged preoperative fasting and such exacerbated metabolic cascades, the abbreviation of fasting with clear liquids up to two hours before surgical intervention is currently recommended. However, this preoperative offer of clear carbohydrate-enriched liquids is contraindicated in patients with significant gastroparesis or any disease that implies difficulty in gastric emptying^{2,8}.

ENHANCED RECOVERY AFTER SURGERY (ERAS)

ERAS was a 2001 initiative to develop a group of studies associated with surgical

recovery, created by European surgeons dissatisfied with the results obtained in surgeries at the time, whose main point of research is the emphasis on the quality of post-surgical recovery rather than on speed (fast-track). On this occasion, the concept of a multidisciplinary group was created, working together around the patients with a multimodal approach to solve problems that delay and cause complications; with an evidence-based approach and care protocols and change in management, using interactive and continuous auditing to assess results^{14,19,22}.

The ERAS concept consists of improving recovery by reducing complications by modifying the metabolic response to surgical insults instead of focusing only on the length of stay of the patient. The approach includes preparing the body's immune system with specific amino acids and preoperative use of a carbohydrate drink to avoid the effects of prolonged fasting^{14,19}.

ACERTO PROJECT

ACERTO (Acceleration of Total Postoperative Recovery) is a protocol based on the European study (ERAS – Enhanced Recovery After Surgery) which, in 2005, published a set of perioperative care in opposition to measures previously based on empiricism, on care in surgeries and that are based on controlled and randomized studies, and on meta-analyses¹⁴.

It all started with the results of a survey carried out at the Hospital Universitário Júlio Müller (HUJM) to which 11 of the 12 surgeons questioned about prescribing antibiotic therapy in intestinal resection surgeries positively stated that they prescribed it, but antibiotic prophylaxis was used in only 10% of the patients. This fact showed that subjectivity is a serious problem in medical conduct that can lead to risk circumstances or increased morbidity and mortality in hospital units⁴⁸.

It is known that several concepts about surgery have been passed from surgeons to surgeons without scientific basis. So, multidisciplinary protocols such as ERAS and ``ACERTO``, which are equipped with scientifically proven proposals, aimed at the well-being of surgical patients, where evidence of reduced length of stay, morbidity and mortality, reduced preoperative fasting period, early feeding, abolition of prolonged fasting and cervix preparation for most abdominal procedures, and financial savings in hospital costs point to new paths, demystifying those considered empirical and without technical-scientific foundation^{15,48,55}.

ABBREVIATION OF FASTING

The term fasting abbreviation (from the English: carbohydrate loading) is used when we offer clear liquids containing carbohydrates and, sometimes with added protein, to surgical patients in order to reduce the pre-surgery fasting time. With this, it is intended to confer a series of benefits to clients, such as faster recovery of intestinal function, less muscle weakness caused by hunger, decrease in insulin resistance (through modulation of the metabolic and inflammatory response to surgical trauma by glucose), optimize postprandial glycemic control through improved insulin sensitivity and reduced length of stay. Previously, different carbohydrate solutions were tested to obtain the expected results, until reaching a concentration of 12.5% the base that complex carbohydrates that are ideal for better gastric emptying and change the fasting state to a fed state^{24,46,47,53,57}.

MAIN GOAL

- To analyze the effects of fasting abbreviation in surgical patients.

SPECIFIC OBJECTIVES

- To verify the impact on hospital costs of patients who had an abbreviated fast;
- To verify if there are changes in the length of hospital stay when the fasting of surgical patients is shortened.

MATERIALS AND METHODS

ELABORATION OF THE FASTING ABBREVIATION PROTOCOL

This protocol was assembled based on the literature review on the ERAS/ACERTO concepts and chosen, among the pillars of these protocols, the abbreviation of fasting and results audit for implementation in the hospital unit. At first, the focus was on involving the hospital board in order to obtain support for the subsequent involvement of physicians and other teams. So, a project was developed and classes were given to the general and medical directors, presenting the protocol and methods for its execution.

RECRUITING PROFESSIONALS

With the endorsement of the board, the next phase of project implementation involved the coordinators of the anesthesia team to present the project, disclosure of the methodology that would be used to carry out the work and cooperation of the team to close this project and later present it to the surgical teams.

Classes were held in the surgical center and tasting of supplements that would be used in the fasting abbreviation protocol for all anesthesiologists to know and show how all stages of the process would be performed, thus defining the means of implementing the protocol.

DISCLOSURE OF FASTING ABBREVIATION PROTOCOL

The board secretary, after the protocol was

set up, sent out information (ATTACHMENTS 1-4) to all surgical teams about the protocol and studies on the subject for four weeks, via corporate mailing, to present the project that would begin to the surgeons.

After the last week of disclosure, we returned to the operating room to guide surgeons about the protocol and how it will be conducted.

With the medical teams and directors involved in the process, we began to disseminate the protocol to the multidisciplinary team (nursing, physiotherapy, hospitalization and nutrition staff). Each week, for four weeks, informational materials about the protocol (ANNEXES 5-8), its importance and the role that each collaborator has in the success of this protocol. In addition, classes were given in loco (in the operating room, medical outpatient clinic, hospitalization units) on the care and management of surgical patients, on the institutional protocol for fasting abbreviation and its importance in the clinical outcome.

IDENTIFICATION OF SURGICAL PATIENTS AND ELIGIBILITY FOR THE PROTOCOL

The surgical center of the hospital unit works with a surgical map where information such as patient name, service number, age, type of surgery, surgeon's name, surgery time is available for consultation in the hospital management system. The nutritionist, together with a nurse, daily removes a surgical map from the system to verify which patients and surgeries will take place on the day and plan which of the patients will have the abbreviated fasting.

If patients are eligible for fasting abbreviation (because the type of surgery and/or procedure is first filtered), nutritionists/nurses make contact with the surgeon responsible for that patient, requesting authorization to shorten

fasting, with authorization granted the patient will be visited by the nutritionist.

Once the surgical patients are identified, the nutritionist conducts the protocol admissibility interview, where the patient is asked about weight, height to define BMI, past history, food allergies, bowel habits, and an explanation and the benefits of the protocol are given (in eligible cases) and the informed consent form (TCLE) is handed over to be acknowledged and signed by the patient or guardian.

DISPENSATION OF THE FASTING ABBREVIATION AND BILLING FLOW IN THE PATIENT'S ACCOUNT

A liquid diet with carbohydrate and protein was sent to the patients at two moments: when the surgery took place in the morning, a fat-free supplement (Fresubin Jucy) - kit 01 - was delivered at 11 pm the day before. Those who underwent surgery in the afternoon received a diet up to four hours before surgery containing a fat-free supplement (Fresubin Jucy) and tea with sweetener (as suggested by the anesthesia team). Grade II and III obese patients, with significant gastroesophageal disorders, pyloric stenosis syndrome, GIT obstructive cancer, diabetic patients with blood glucose above 180 mg/dL and who were hospitalized less than four hours before surgery were excluded from the process, as per SBNPE indication.

After sending the liquid diet, the anesthesiologists were informed about which patients the fasting was shortened and the hospitalist physician called to prescribe the supplement on the patient's account. And finally, the nursing staff checked whether the patient had ingested the diet and recorded it in an electronic medical record. In flowchart 2, it is possible to observe the fasting abbreviation protocol routine after the surgical patient's eligibility.

REVISIT THE PATIENT

Soon after returning from surgery, after the anesthetic effects had passed, the patients were approached by nutritionists who asked about the presence of hunger, thirst, nausea and vomiting in the postoperative period, and satisfaction with the abbreviation of fasting, according to the routine established by the nutrition department and dietetics.

DATA CAPTURE AND CODE OF ETHICS

The number of days surgical patients remained hospitalized after surgery were measured, in order to account for and define the length of stay in this population to correlate with a reduction in hospital costs.

Data such as weight, height, BMI (when not obtained during a visit to a nutritionist), length of stay and hospital costs were obtained through the Tasy hospital management program.

This study was submitted and approved by the research ethics board under protocol n° 2,576,891

NEW PERSPECTIVES AND SAMPLE CALCULATION

Patients who were instructed by some medical teams to shorten their fasting at home (also with previous consumption of clear liquids) were included in the group of patients with abbreviated fasting.

Sample calculation was performed with a population of 1627 patients with a significance level of 95%.

INCLUSION CRITERIA

Patients undergoing elective surgeries at the hospital unit, who have been hospitalized for at least four hours prior to the surgery, have an intact GIT, satisfactory conditions to receive oral diet and be aged between 10 and 95 years.

EXCLUSION CRITERIA

Obese patients grades II and III, with important gastroesophageal disorders, pyloric stenosis syndrome, obstructive GIT cancer, diabetic patients with blood glucose above 180 mg/dL and who are hospitalized less than four hours before surgery.

STATISTICAL ANALYSIS

The GraphPad Prism 5 program was used to statistically analyze the results of the study. For the length of stay, presence or absence of signs and symptoms such as nausea and vomiting, patient who shortened the fasting and did not, and its relationship with the length of stay, the Mann-Whitney t test was used, since the data did not pass through the normality test to determine its significance. A ROC curve test was performed to determine the relationship between the sensitivity and specificity of the statistical tests on the variables presence or absence of nausea and vomiting versus fasting time, and BMI versus length of stay. The chi-square test was used to quantitatively assess the relationship between the variables mentioned above. All results were evaluated with a significance level of 95%.

RESULTS AND DISCUSSION

TOTAL STUDY PATIENTS

We evaluated 1633 patients hospitalized for elective surgery in our hospital unit of all surgical specialties (orthopedics, urology, general surgery, vascular, gynecology, neurology, plastic, otorhinolaryngology) between the months of March and May 2018. We shortened the fasting of 161 patients (10% of all surgical patients), as our abbreviation protocol consists of delivering clear liquids four hours prior to surgery and about 75% of patients in the study are hospitalized less than four hours later, making them ineligible for the protocol, 10% met the exclusion criteria and

5% of the patients could not have previously contacted a doctor or the surgeon did not authorize performing the fasting abbreviation protocol.

GENDER OF STUDY PATIENTS

Most patients in this study are female $n=950$ (58% - mean 46.66 ± 17.08 years), while men are $n=683$ (42% mean 44.78 ± 16.72 years).

LENGHT OF STAY

The total hospitalization time of patients whose fasting was not shortened ($n=1271$) was 3937 against 2708 days for those ($n=161$) whose protocol was applied with a statistically significant difference ($P<0.0001$). We obtained with statistical difference the patients who consumed the fasting abbreviation four hours before surgery and those who did not consume it and its relationship with the length of stay, observing the respective standard deviations and confidence intervals.

Costa, Santos and Aguilar-Nascimento (2012) studied 271 patients and obtained a result similar to that presented in our study. Patients who fasted for five hours before surgery stayed in the hospital one day less than those who fasted for more than five hours¹⁰. Another study from 2011 also showed that it is possible to reduce the length of hospital stay by one day³.

When we separated the patients by age group, we proved that younger patients (adults: 18 to 59 years) spend much less time in hospital (2,737 days), than older ones: >60 years (8,315 days), a statistically significant result ($P < 0.0001$) by the Mann-Whitney test with their respective standard deviations, number of patients in each group and confidence interval.

It is still possible to observe that for both groups (adults and elderly), when fasting is abbreviated, patients have a reduced hospitalization time (2,484 days and 3,485

days, respectively) when compared to adults and elderly that fasting was not abbreviated (2,741 days and 8,741 days, respectively) with statistically significant difference ($P<0.0001$) for Mann-Whitney test and Welch's t test correction.

When we analyze the hospitalization time of surgical patients by specialty, we can see that it is also possible to reduce the hospitalization time when we compare the patients whose fasting was abbreviated with those who did not participate in the protocol, but without statistically significant difference, except in the specialty of general surgery and in the total number of patients (statistical difference $P<0.0001$). It is noted that for general surgery we had a decrease of one day in the length of hospital stay between the groups and when we add the total times (ie, all surgeries) it is also possible to observe a reduction of one day in the length of stay.

It is also observed that the institution of the ERAS protocol in major surgeries also reduces hospital costs by protecting against postoperative complications and by reducing the length of hospital stay²⁶. In our study, we were able to corroborate the thesis that the less time the patient remains hospitalized, the lower the hospital costs.

As for two types of specific surgeries: cholecystectomy and fracture, it is possible to observe statistically significant differences when using the t test with Welch's correction.

For the other types of surgery, no statistically significant difference was found between the groups of patients with abbreviated fasting and those whose fasting was not abbreviated.

HOSPITAL COSTS

We also analyzed hospital costs for the two groups studied (with and without abbreviation) and, as Lee and Feldman (2018) describe in their article, we found in our study a significant association between shorter

hospital stay (mean time of 3.816 ± 0.1857 N1633 CI95% 3,451-4,180) and lower hospital costs (mean R\$ 23,603.00 \pm 1581 CI95% 20,502-26,703) by Spearman's correlation ($P < 0.0001$)⁵⁸.

Note that the mean hospital costs among the group of patients with abbreviated fasting was $16,386.00 \pm 1,221$ reais (95%CI 13,975-18,798) and mean length of stay of $2,708 \pm 0.1254$ days (95%CI 2,460-2,956) against $24,392.00 \pm 1,747$ reais (95%CI 20,964-27,820) and length of stay of $3,937 \pm 0.2053$ days (95%CI 3,534-4,340) of patients whose fasting was not shortened, showing a reduction of approximately 13% in total surgery costs and one day of hospitalization.

Rinninella et al (2018) conducted a study with 219 patients applying the ERAS protocol in colorectal surgery. They followed up and performed pre-, intra- and postoperative interventions and obtained results similar to those of this study (although our work encompassed more surgeries). The average length of stay was reduced by one day, approximately, and there was a 20% reduction in costs.

When we followed the patients who underwent cholecystectomy surgery, we identified that those who shortened the fast did not have any type of complication. It is possible to notice that when the patient presents some type of complication in the postoperative period, the length of stay increases by an average of 450%. And the difference in hospital costs can reach 358%. It is worth remembering that the abbreviation of fasting seems to provide protection against the appearance of complications, but further studies must be carried out to corroborate this thesis.

CONCLUSION

- Fasting abbreviation is safe for patients undergoing elective surgeries;

- It is possible to prevent the onset of postoperative nausea and vomiting when we take patients out of the prolonged fasting state;
- Reduction of the length of stay by one day;
- Reduction of hospital costs by approximately 13%;
- Surgeries with a higher degree of complexity (such as cholecystectomy, for example), whose fasting was shortened, did not present complications. When we compare the patients in this surgery who had complications with those who did not, the reduction in length of stay was greater and the reduction in hospital costs rose to 72%.

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