

# Clinical outcome before and after the implementation of the ACERTO protocol

## *Resultados clínicos antes e após a implantação do protocolo ACERTO*

HARACELLI CHRISTINA BARBOSA ALVES LEITE DA COSTA<sup>1</sup>; ROGÉRIO LEITE SANTOS, ACBC-MT<sup>2</sup>; JOSÉ EDUARDO DE AGUILAR-NASCIMENTO, TCBC-MC<sup>3</sup>

### A B S T R A C T

**Objective:** To compare the postoperative clinical outcomes of patients undergoing cancer surgery in the Mato Grosso Cancer Hospital before and after implementation of the ACERTO protocol. **Methods:** We prospectively observed 271 patients during two periods: the first between April and May 2010 (n = 101) comprised patients undergoing conventional conducts (Phase 1) and the second from September to October 2010 (n = 171) formed by patients undergoing a new protocol of perioperative established by ACERTO (Phase 2). The variables examined were length of preoperative fasting, reintroduction of diet in the postoperative period, hydration volume and length of stay. **Results:** When comparing the two periods, in Phase 2 there was a decrease of approximately 50% in the time of preoperative fasting (14.7 [4-48] hours vs 7.2 [1-48] hours, p <0.001), a reduction of approximately 35% of the volume of intravenous fluids in the immediate postoperative period (p <0.001), 47% in the first postoperative day (p <0.001) and 28% at second PO (p = 0.04), with an overall reduction of 23% (p <0.001). There was no difference in length of postoperative hospital stay between the two phases (3.9 [0-51] vs. 3.2 [0-15] days, p = 0.52). However, in patients whose time of preoperative fasting was up to 5 hours, hospitalization time decreased by one day (3.8 [0-51] vs 2.5 [0-15] days, p = 0.03). **Conclusion:** The adoption of ACERTO measures is feasible and safe in cancer patients. After implementation of the ACERTO protocol, there was reduction of intravenous fluids volume and, when the preoperative fasting was reduced, hospitalization time was shorter.

**Key words:** Outcome assessment (health care). Clinical protocols. Postoperative care. Fasting. Length of stay.

### INTRODUCTION

The postoperative recovery of patients undergoing oncologic surgery remains a major challenge for the surgeon. The overall rates of postoperative complications can reach 42.9%<sup>1</sup>. Major oncologic surgeries to gastrointestinal tract are still associated with a high rate of postoperative morbidity, higher hospital costs and significant consumption of patients' health recovery<sup>2</sup>.

The traditional postoperative care has been questioned and new paradigms of evidence-based medicine have shown that, in recent years, some routines and protocols in perioperative care are useless and, in some cases, harmful<sup>3</sup>. The ERAS (Enhanced Recovery After Surgery) protocol aims at new perspectives on the use of perioperative management methods, pursuing the reduction of the organic response to trauma, surgical complications and faster recovery of patients, performing modifications to traditional care based on controlled and randomized

studies, and meta-analyses<sup>4</sup>. The ACERTO protocol (a Portuguese for "Accelerated Total Postoperative Recovery") is a program that aims to accelerate postoperative recovery of patients undergoing abdominal operations. The initial results of this protocol were quite appreciable in a university hospital, decreasing hospitalization time in two days<sup>5</sup>. The implementation of the ACERTO protocol was a pioneering experience in Brazil, and was initially used in patients undergoing abdominal operations, but was quickly incorporated by other specialties, such as head and neck, urological, thoracic, plastic, vascular and maxillofacial surgeries<sup>6</sup>, with similar results. The ACERTO protocol defines some routines of perioperative prescription, such as nutritional therapy, reduced period of preoperative fasting, early postoperative feeding, decreased intravenous hydration, among others<sup>5,6</sup>.

The results presented by other studies show that the use of ACERTO protocol can improve surgical outcomes in elderly patients<sup>7</sup>, those undergoing CABG<sup>8</sup> and

Work conducted in the Department of Surgery, Faculty of Medical Sciences, Federal University of Mato Grosso – UFMT, Mato Grosso State – MT, Brazil.

1. MSc Graduate, Postgraduation in Health Sciences Faculty of Medicine, UFMT; 2. Clinical Director, Mato Grosso Cancer Hospital; 3. Professor, Department of Surgery Faculty of Medicine, UFMT.

coloproctologic operations<sup>9</sup>. In this context, there was the need to expand these benefits in relation to perioperative care to surgical patients with cancer. In the national literature, we found no other work that reported results with the adoption of this protocol in Oncology. The objective of this study was to evaluate the postoperative outcomes of patients undergoing surgical treatment for cancer before and after implementation of the ACERTO protocol.

## METHODS

We prospectively studied 271 patients undergoing oncologic surgical treatment for cancer in the Service of Surgical Oncology of the Mato Grosso Cancer Hospital between April and October 2010. The observation took place in two phases: an initial one from April to May 2010, before applying ACERTO, and another from September to October 2010.

Trainings were conducted with seminars with the participation of oncologic surgeons, residents of the Service of Surgical Oncology, anesthesiologists, nurses and nutritionists. In these seminars, the following topics were addressed: 1) perioperative nutrition, 2) perioperative intravenous hydration, 3) importance of preoperative fasting abbreviation, and 4) the importance of early feeding. in order to facilitate the implementation of the

project, information was placed in the infirmary of the surgical clinic, operating room and distributed to doctors, nutritionists and nurses, who were unaware that data were being collected before and would continue to be collected after training.

The project was approved by the Ethics Committee of the Federal University of Mato Grosso under number 988.

Patients were observed and compared in two distinct periods: the first (n = 101) comprised patients undergoing conventional perioperative management (Phase 1) and the second (n = 170) comprised patients undergoing the new protocol conducts of perioperative follow-up established by ACERTO (Phase 2). Table 1 shows the set of measures established by ACERTO and conventional routines that were being applied before applying it.

The variables collected were: 1) time of preoperative fasting, 2) postoperative volume of intravenous hydration; 3) postoperative day of onset of oral or enteral nutrition and 4) length of postoperative hospital stay. In analysis of preoperative fasting time, we excluded patients with obstructive tumors of the gastrointestinal tract, morbid obesity, symptomatic gastroesophageal reflux and pyloric stenosis.

Preoperative fasting, length of stay, postoperative day for reintroduction of oral diet and volume of IV fluids infused postoperatively were evaluated for normal

**Table 1** - Conducts applied in abdominal surgery in the General Surgery Ward of HUJM before and after the implementation of the Postoperative ACERTO protocol.

Conventional Routines	Routines advocated by ACERTO
<ul style="list-style-type: none"> <li>▪ Minimum Preoperative fasting of eight hours (since the night before surgery).</li> <li>▪ Start of postoperative diet after elimination of flatus or bowel movement (after improvement of "ileus").</li> <li>▪ Postoperative intravenous hydration volume of 40ml/kg.</li> <li>▪ Signature of operation informed consent by the patient.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Long preoperative fasting not allowed. Use of liquid diet enriched with carbohydrates until the eve of the operation, intake happening until two hours before the operation. Exception: GIT obstructive cancer, morbid obesity, severe gastroesophageal reflux and pyloric stenosis.</li> <li>▪ In operations with digestive anastomosis, reintroduction of diet on the first postoperative day (liquid diet) or on the same day of the operation. In surgeries with esophageal anastomosis, diet by jejunostomy or nasoenteric tube in the first PO.</li> <li>▪ Intravenous hydration should not be prescribed in the immediate postoperative period of hernia. Intravenous hydration should be withdrawn 12 hours after cholecystectomy, with few exceptions. With some exceptions, a maximum of 30ml/Kg/day fluid resuscitation until the first postoperative day.</li> <li>▪ More detailed Consent Form and information to patients about their surgical procedures.</li> <li>▪ Inform the patient, before the operation, about details of the procedure to be performed, encouraging him/her to restart walking and feeding early in the postoperative period.</li> </ul>

distribution with the Kolmogorov-Smirnov test and for variances homogeneity with the Levene test. For parametric data we used the Student t test (data expressed as mean and standard deviation), and to compare non-parametric data, the Mann-Whitney test (data are expressed as median and range). To analyze the length of stay in Phase 2, we distributed patients according to the time of preoperative fasting being more or less than five hours. We adopted a value of  $p < 0.05$  as an index of statistical significance.

## RESULTS

Oncologic resections were performed in 271 patients; there were six (5.9%) deaths in Phase 1 and five (2.9%) in Phase 2 (a global mortality rate of 4.1%) ( $p = 0.33$ ). There were no cases of aspiration of gastric contents into the respiratory tree during induction of anesthesia, nor postoperatively, in Phase 2. Patients' demographics are shown in table 2. There was no difference in the type of operation, time of operation, gender and age in the two study phases.

We found an average 14.7 hours of fasting, therefore much more than the recommended eight hours

of preoperative fasting prior to the project implementation (Table 3). When comparing the two periods, in Phase 2 there was a drop of approximately 50% of the time of preoperative fasting (median [range]: 14.7 [4-48] hours vs 7.2 [1-48] hours,  $p < 0.001$ ). Adherence to protocol in Phase 2 was not total and only 81 (47.6%) of patients were operated with less than a 5 hour fasting.

There was a significant reduction in the volume of intravenous fluid infused per patients in the postoperative period in Phase 2 in relation to Phase 1. There was a reduction of approximately 35% in the volume in the immediate postoperative period ( $p < 0.001$ ), 47% in the first postoperative day ( $p < 0.001$ ), and 28% in the second postoperative day ( $p = .04$ ). During hospitalization overall reduction was 23% ( $p < 0.001$ ) (Figure 1).

The postoperative time of reintroduction of diet was similar between the two phases (Table 3). There was loss of one case record for lack of annotation, so 270 cases were analyzed. The majority of patients were fed back till 24 hours after surgery, with no difference ( $p = 0.50$ ) between Phase 1 (95/101 cases, 94%) and Phase 2 (162/169 cases, 95.8% .)

There was no difference in length of postoperative hospital stay between the two phases (3.9 [0-51] vs. 3.2

**Table 2** - Demographics of patients in Phase 1 (pre-ACERTO) and Phase 2 (post-ACERTO).

	Phase 1 (n=101)	Phase 2 (n=170)	p
Gender (n. %)			
Male	59 (58%)	88 (52%)	0.33
Female	42 (42%)	82 (48%)	
Age (average and DP. years)	57 ± 15	54 ± 16	0.21
Types of Operations (n. %)			
Gastrointestinal tract	28 (28.3)	46 (27.1)	0.71
Urologic	32 (32.3)	47 (27.6)	
Others locations*	41 (40.4)	77 (45.3)	
Operative time (average and DP. minutes)	70 ± 56	66 ± 44	0.53

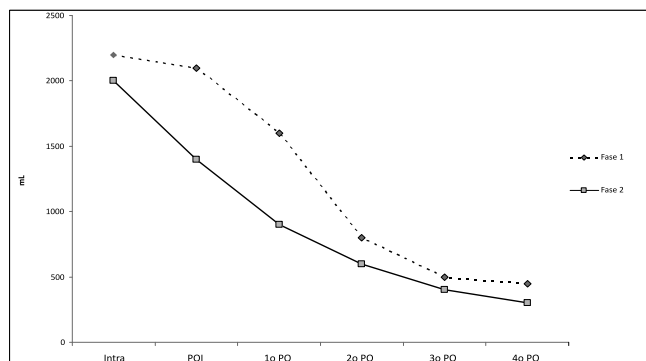
\* Hysterectomies, lymphadenectomy, excision of skin tumors, mastectomies

**Table 3** - Perioperative nutritional approach in the periods before and after the implementation of the ACERTO protocol.

	Phase 1	Phase 2	p
Time of preoperative fasting (mean and variance; hours)	14.7 [4-48]	7.2 [1-48]	<0.001
Day of feeding (mean and variance; OP)	POI [POI-7° PO]	POI [POI-3° PO]	0.44
IV Fluids (liters)			
POI	2.0 ± 1.0	1.3 ± 0.9	<0.001
1 <sup>st</sup> PO	1.5 ± 1.4	0.8 ± 1.1	<0.001
2 <sup>nd</sup> PO	0.7 ± 1.2	0.5 ± 0.9	0.04
Total	7.5 ± 5.4	5.4 ± 4.3	<0.001

POI: Immediate postoperative period

PO: Postoperative day



**Figure 1** - Evolution of the volume of intravenous fluids in the two phases of the study according to the perioperative date ( $p < 0.001$  in POI – Immediate postoperative period;  $p < 0.001$  in the 1<sup>st</sup> PO and  $p = 0.04$  in the 2<sup>nd</sup> PO).

[0-15] days,  $p = 0,52$ ). However, it was observed that the time of postoperative hospital stay was reduced by one day among patients who had fasting period of up to five hours when compared to those with fasting periods longer than five hours (3.8 [0-51] vs 2.5 [0 -15] days,  $p = 0.03$ ).

## DISCUSSION

This study showed that the use of a multimodal protocol, such as ACERTO, which is based on evidence, is safe. There was no increase in mortality rates or length of stay. The reduction of preoperative fasting also did not result in respiratory complications, such as aspiration of gastric contents nor chemical pneumonia. Although adherence to protocol fasting abbreviation was not high, the results showed that, when the shorter fasting was prescribed, length of stay decreased. This association between reduced fasting and accelerated postoperative recovery has been reported by several authors<sup>6,8,10,11</sup>. This change of routine fasting is safe and is recommended by anesthesia societies<sup>12,13</sup>, and revisions made on the subject<sup>14</sup>.

The practice of fasting was initiated when the anesthetic techniques were rudimentary and were based on a retrospective study in pregnant women and not in patients undergoing elective operations<sup>14</sup>. The risk of aspiration during anesthesia was feared and thus the practice of fasting was imposed, without proper evidence, since the night before the operation. In the 1980s and 1990s this requirement was challenged in randomized prospective studies that have shown that the adoption of uniform periods of fasting for two / three hours after ingestion of clear liquids or drinks with carbohydrates was safe<sup>15</sup>. In addition, preoperative fasting, besides quite uncomfortable and unnecessary, can be harmful by enhancing or perpetuating the organic response to trauma<sup>14</sup>. In 2007 Aguilar-Nascimento et al. studied 54 female patients undergoing cholecystectomy who received 200 ml of a drink containing 12.5% carbohydrates (CHO) two hours before

the operation and concluded that the preoperative intake of that drink reduced the incidence of postoperative gastrointestinal manifestations (nausea and vomiting) and length of hospital stay<sup>16</sup>.

The protocol established in our service advocates the use of the drink enriched with 12.5% carbohydrate two hours before the operation, but the patients remained on average about seven hours without ingesting liquids. This also occurred in the implementation of the ACERTO protocol in Julio Muller Hospital, when the prescription was two hours, but the average reported was four hours<sup>5</sup>. This is due, most of the time, to delays in operations. In any case, our prior average was of about 15 hours, there being a significant improvement. The adjustment to the ideal was important in that it was only noted an improvement in hospital stay in patients who fasted on average five hours awaiting the procedure.

Conventionally, the return of the diet for patients undergoing intestinal anastomosis has been prescribed only after the return of peristalsis, clinically characterized by the appearance of bowel sounds and elimination of flatus. However, recent literature has discussed and countered that kind of conduct. The early feeding after operations involving intestinal resection and anastomosis can be conducted without risks and potential benefits to patients, as it provides earlier discharge, lower incidence of infectious complications and reduced costs<sup>17,18</sup>. In a previous study it was shown that it is possible to start feeding patients earlier after colonic anastomosis, without risk. Lewis *et al.*<sup>17</sup> confirmed that the old idea of “risk” from an early postoperative feeding lacked evidence. In our study, we observed no change in relation to the results presented for early postoperative reintroduction of feeding between the two phases; therefore, this practice has become quite consolidated within the routine protocols of the institution’s surgeons.

There is evidence that restricted intravenous fluid replacement accelerates postoperative recovery. Brandstrup *et al.*<sup>19</sup> coordinated a multi-center study that compared two regimens of perioperative fluid replacement. They concluded that with the use of restricted fluid resuscitation there was significant reduction of postoperative and cardiopulmonary complications, and of those related to wound healing, and they did not observe any possible adverse effect of the restriction system. Recently, a study from our group showed that oral replacement entails much less electrolyte changes than the intravenous one in healthy volunteers<sup>20</sup>. This study showed that it is possible to safely reduce fluid load administered postoperatively in oncological operations, thus reducing hospital costs. It is noteworthy, in addition to the points already discussed, the possibility of early mobilization, because without fluid replacement catheters the patient feels better able to move around and with the stimulus (thirst) to return to oral feeding.

In Brazil, a recent study showed that the adoption of evidence-based practices reduced the length of stay of

uncomplicated patients<sup>21</sup>. Nevertheless, there were no reports from centers specialized in oncology. This is a new trend that gradually emerges and we believe that, being sedimented on sound scientific knowledge, will soon be part of the routine of the surgery wards of public and private institutions. Our results should be viewed with caution, as

this was not a randomized study, had heterogeneous cases, with different cancer diagnoses, and did not measure postoperative complications. Nonetheless, the findings show that the adoption of a multidisciplinary perioperative measures such as the ones of ACERTO, is feasible, is safe and can reduce the length of stay in oncologic surgeries.

## R E S U M O

**Objetivo:** Comparar os resultados clínicos pós-operatórios de pacientes submetidos à cirurgia oncológica no Hospital de Câncer de Mato Grosso antes e após a implantação do protocolo ACERTO. **Métodos:** Foram prospectivamente observados 271 pacientes durante dois períodos: o primeiro, entre abril e maio de 2010 (n=101) formado por pacientes submetidos a condutas convencionais (Fase 1) e o segundo, entre setembro a outubro de 2010 (n=171), formado por pacientes submetidos a um novo protocolo de condutas peri-operatórias estabelecidas pelo projeto ACERTO (Fase 2). As variáveis observadas foram: tempo de jejum pré-operatório, reintrodução da dieta no período pós-operatório, volume de hidratação e tempo de internação. **Resultados:** Na comparação entre os dois períodos, na Fase 2 houve uma queda de aproximadamente 50% do tempo de jejum pré-operatório (14,7 [4-48] horas vs 7,2 [1-48] horas,  $p < 0,001$ ), houve redução de aproximadamente 35% do volume de fluidos intravenosos no pós-operatório imediato ( $p < 0,001$ ), de 47% no 1º PO ( $p < 0,001$ ) e de 28% no 2º PO ( $p = 0,04$ ), sendo a redução global de 23% ( $p < 0,001$ ). Não houve diferença no tempo de internação pós-operatória entre as duas fases (3,9 [0-51] vs. 3,2 [0-15] dias;  $p = 0,52$ ). Entretanto, nos pacientes cujo tempo de jejum pré-operatório foi de até 5 horas houve redução de um dia de internação (3,8 [0-51] vs 2,5 [0-15] dias,  $p = 0,03$ ). **Conclusão:** A adoção das medidas do projeto ACERTO é factível e segura em doentes oncológicos. Após a implantação do protocolo ACERTO reduziu-se o volume de fluidos intravenosos e quando o jejum pré-operatório foi reduzido o tempo de internação foi menor.

**Descritores:** Avaliação de resultados (cuidados de saúde). Protocolos clínicos. Cuidados pós-operatórios. Jejum. Tempo de internação.

## REFERENCES

- Melani AGF, Fregnani JHTG, Matos D. Tratamento cirúrgico do adenocarcinoma de reto por laparoscopia e por acesso convencional: estudo comparativo de tempo cirúrgico, complicações pós-operatórias, radicalidade oncológica e sobrevida. *Rev Col Bras Cir.* 2011;38(4):245-52.
- Gianotti L, Braga M, Frei A, Greiner R, Di Carlo V. Health care resources consumed to treat postoperative infections: cost saving by perioperative immunonutrition. *Shock.* 2000;14(3):325-30.
- Nygren J, Hausel J, Kehlet H, Revhaug A, Lassen K, Dejong C, et al. A comparison in five European Centers of case mix, clinical management and outcomes following either conventional or fast-track perioperative care in colorectal surgery. *Clin Nutr.* 2005;24(3):455-61.
- Teeuwen PH, Bleichrodt RP, Strik C, Groenewoud JJ, Brinkert W, van Laarhoven CJ, et al. Enhanced recovery after surgery (ERAS) versus conventional postoperative care in colorectal surgery. *J Gastrointest Surg.* 2010;14(1):88-95.
- Aguilar-Nascimento JE, Bicudo-Salomão A, Caporossi C, Silva RM, Cardoso EA, Santos TP. Acerto pós-operatório: avaliação dos resultados da implantação de um protocolo multidisciplinar de cuidados peri-operatórios em Cirurgia Geral. *Rev Col Bras Cir.* 2006;33(3):181-8.
- Bicudo-Salomão A, Meireles MB, Caporossi C, Crotti PLR, Aguilar-Nascimento JE. Impacto do projeto acerto na morbimortalidade pós-operatória em um hospital universitário. *Rev Col Bras Cir.* 2011;38(1):3-10.
- Aguilar-Nascimento JE, Salomão AB, Caporossi C, Diniz BN. Clinical benefits after the implementation of a multimodal perioperative protocol in elderly patients. *Arq gastroenterol.* 2010;47(2):178-83.
- Feguri GR, Lima PRL, Lopes AM, Roledo A, Marchese M, Trevisan M, et al. Resultados clínicos e metabólicos da abreviação do jejum com carboidratos na revascularização cirúrgica do miocárdio. *Rev bras cir cardiovasc.* 2012;27(1):7-17.
- Aguilar-Nascimento JE, Bicudo-Salomão A, Caporossi C, Silva RM, Cardoso EA, Santos TP, et al. Abordagem multimodal em cirurgia colorretal sem preparo mecânico de cólon. *Rev Col Bras Cir.* 2009;36(3):204-9.
- Kehlet H, Wilmore DW. Multimodal strategies to improve surgical outcome. *Am J Surg.* 2002;183(6):630-41.
- Basse L, Hjort Jakobsen D, Billesbølle P, Werner M, Kehlet H. A clinical pathway to accelerate recovery after colonic resection. *Ann Surg.* 2000;232(1):51-7.
- Smith I, Kranke P, Murat I, Smith A, O'Sullivan G, Søreide E, et al. Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol.* 2011;28(8):556-69.
- American Society of Anesthesiologists Committee. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. *Anesthesiology.* 2011;114(3):495-511.
- Aguilar-Nascimento JE, Perrone F, Assunção Prado LI. Jejum pré-operatório de 8 horas ou de 2 horas: o que revela a evidência? *Rev Col Bras Cir.* 2009; 36(4):350-2.
- Stuart PC. The evidence base behind modern fasting guidelines. *Best Pract Res Clin Anaesthesiol.* 2006;20(3):457-69.
- Aguilar-Nascimento JE, Dock-Nascimento DB, Faria MSM, Maria EV, Yonamine F, Silva MR, et al. Ingestão pré-operatória de carboidratos diminui a ocorrência de sintomas gastrointestinais

- pós-operatórios em pacientes submetidos à colecistectomia. ABCD, arq bras cir dig. 2007;20(2):77-80.
17. Lewis SJ, Andersen HK, Thomas S. Early enteral nutrition within 24 h of intestinal surgery versus later commencement of feeding: a systematic review and meta-analysis. *J Gastrointest Surg.* 2009;13(3):569-75.
  18. Aguilar-Nascimento JE, Goelzer J. Alimentação precoce após anastomoses intestinais: riscos ou benefícios? *Rev Assoc Med Bras.* 2002;48(4):348-52.
  19. Brandstrup B, Tønnesen H, Beier-Holgersen R, Hjortø E, Ørding H, Lindorff-Larsen K, 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(5):641-8.
  20. de Aguilar-Nascimento JE, Valente AC, Oliveira SS, Hartmann A, Slhessarenko N. Changes in body composition, hematologic parameters, and serum biochemistry after rapid intravenous infusion or oral intake of 2 liters of 0.9% saline solution in young healthy volunteers: randomized crossover study. *World J Surg.* 2012;36(12):2776-81.
  21. Walczewski MRM, Justino AZ, Walczewski EA, Coan T. Avaliação dos resultados de intervenção após mudanças realizadas nos cuidados peri-operatórios em pacientes submetidos à operações abdominais eletivas. *Rev Col Bras Cir.* 2012;39(2):119-25.

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**Address correspondence to:**

José Eduardo de Aguilar-Nascimento

E-mail: [je.nascimentocba@gmail.com](mailto:je.nascimentocba@gmail.com)