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Observational Study

Effectiveness of Ferric Carboxymaltose for Iron Deficiency Anemia in Crohn's Disease Patients at a Tertiary Center in Brazil – A retrospective observational cohort study

Ferric carboxymaltose for Crohn's Disease

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Abstract

BACKGROUND

Although the gastrointestinal tract is the most affected by Crohn's disease, the condition triggers other consequent manifestations, and iron deficiency anemia is one of the most common. Intravenous iron replacement is currently available through several drugs such as ferric hydroxide sucrose and ferric carboxymaltose. However, the clinical management of these conditions can be challenging.

AIM

Thus, the present study analyzed, through medical records, the clinical and epidemiological data of a cohort of patients with active Crohn's disease who received intravenous ferric carboxymaltose in the treatment of iron deficiency anemia to elucidate the effectiveness of the drug.

METHODS

In this retrospective, observational study, 25 patients with active Crohn's disease, severe anemia, and refractory to previous conventional treatments were included. Patients were evaluated two times: during previous treatment with ferric hydroxide sucrose and treatment with ferric carboxymaltose.

RESULTS

After treatment with ferric carboxymaltose, parameters of iron deficiency anemia assessment significantly improved, serum hemoglobin levels increased in 93% of patients ($p < 0.0001$), and in 44% there was an increase of ≥ 2g/dL in a single application. In addition, 86% of the patients showed an increase in serum iron ($p < 0.0001$) and ferritin ($P = 0.0008$) and 50% in transferrin saturation ($P = 0.01$). The serum iron levels at baseline showed a negative association with the ileal and colonic CD and use of biologics and a positive association with patients who developed CD later in life after the age of 40 (A3) and with a stenosing (B2) and fistulizing (B3) phenotype. The values of hemoglobin and hematocrit after ferric hydroxide sucrose treatment remained similar to those found before treatment.

CONCLUSION

This study demonstrated that ferric carboxymaltose is an important therapeutic strategy for the treatment of iron deficiency anemia in Crohn's disease patients, achieving satisfactory results in refractory cases.

Key Words: Ferric Carboxymaltose; Iron Deficiency Anemia; Crohn's Disease; Inflammatory Bowel Disease; Anemia; Clinical Management

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Core Tip: In this observational cohort study, treatment with a single dose of ferric carboxymaltose demonstrated a significant improvement in the hematological parameters evaluated for the treatment of iron deficiency anemia in Crohn's disease patients at a tertiary center of a developing country. These results may contribute to guiding clinical treatment of this condition, mainly in cases of refractoriness to ferric hydroxide sucrose.

INTRODUCTION

Crohn's disease (CD) is an inflammatory bowel disease (IBD) characterized by a chronic inflammatory disorder of the gastrointestinal tract (1, 2). Although the gastrointestinal tract is the most affected section in CD, the affection may occur under other manifestations (3,4), such as anemia, which is among the most common in IBD (5-7). This condition is commonly defined by the World Health Organization as when hemoglobin is below normal values (less than 12 g/dL in women and 13 g/dL in men) (8). Its prevalence varies widely, depending on the evaluated CD patients (hospitalized or outpatients).

Iron deficiency anemia (IDA) is usually determined by a negative balance in serum iron levels, where more iron is lost than is consumed in the diet (9). In CD patients, chronic blood loss from the ulcerated intestinal mucosa associated with diarrhea decreased iron intake due to dietary restriction, and/or deficiency in transluminal iron absorption during the period of disease activity plays an important role in causing iron deficiency (10). Erythropoiesis and iron metabolism may also be affected by increased serum hepcidin levels in high systemic inflammation, impairing dietary iron absorption and resulting in low serum iron levels (11).

Treatment of IDA aims to increase levels of hemoglobin (Hb), serum ferritin (s-ferritin), and transferrin saturation (TSAT) levels above the lower threshold of normal, to restore iron stocks to prevent recurrent anemia and not just to restore the short-term hematopoietic state (10). Oral iron supplementation is usually the first choice for treatment, but intestinal absorption in CD patients can be compromised by the activity of the inflammatory process, which limits the effectiveness of treatment (3, 12). In addition, unabsorbed iron results in increased clinical activity in IBD patients due to gastrointestinal side effects, decreasing treatment adherence (13, 14). On the other hand, the administration of intravenous (IV) iron has helped in the correction of IDA of these patients, and in the maintenance of iron stocks in a faster and more prolonged response to treatment. Moreover, IV iron administration avoids gastrointestinal side effects, which positively influences treatment adherence and consequently improves the quality of life (15, 16).

Currently, IV iron replacement for the treatment of IDA is available through several drugs that are distinguished by their complex chemistry such as iron hydroxide sucrose, and iron dextran (17). Recent pharmacology progress has led to ferric carboxymaltose (FCM), to correct the IDA through its pharmacokinetic characteristics (18, 19). FCM has a vigorous molecular structure containing stable iron in the form of a non-dextran iron complex with an iron hydroxide core (III), with a carbohydrate ligand. The structure is similar to that of ferritin, allowing for the absorption of iron without releasing free iron in the body. Therefore, administration can be performed in high doses (with a maximum dose of up to 1000 mg), in a safe and clinically well-tolerated manner (20, 21). Given the above, this study was designed to evaluate the effectiveness of FCM in the treatment of iron deficiency anemia in CD patients in a tertiary center in Brazil, where IBD has become increasingly frequent mainly in the last two decades (22).

MATERIALS AND METHODS

Study design and Study population

In this observational retrospective cohort study, 25 patients with active CD who were followed at the IBD Unit of the Clinical Hospital of the University of Campinas (Unicamp), were included sequentially from October 2014 to November 2021. The patient's clinical information was evaluated through outpatient database electronic records. Disease activity was determined by Crohn's Disease Activity Index (CDAI), Crohn's Disease Endoscopic Index of Severity (CDEIS), magnetic resonance imaging enterography (enteroMRI), and clinical and laboratory exams.

All patients presented severe anemia (hemoglobin ≤ 10 g/dL and hematocrit <41% for men and <36% for women), according to the World Health Organization (8), and they were refractory to previous conventional treatments. Iron deficiency was determined by transferrin saturation (TSAT) <20%, ferritin ≤ 100 ng/mL, and serum iron < 60 µg/dL.

Clinical characteristics and laboratory results were collected twice from the patient's past clinical history: during the previous treatment with ferric hydroxide sucrose (a subgroup of the total cohort) and the treatment with ferric carboxymaltose.

Analysis of the treatment effect after ferric carboxymaltose and ferric hydroxide sucrose

All laboratory parameters were evaluated before and after treatment with a single intravenous administration of ferric carboxymaltose and after treatment with intravenous ferric hydroxide sucrose, to elucidate the effectiveness of medication in this group of patients. The parameters of the primary analysis for anemia correction were hemoglobin ≥12 g/dL in a woman and ≥13 g/dL in men or an increase that Hb ≥ 1 g/dL. Secondary analyses included increases in serum levels of iron, serum ferritin [s-ferritin], and transferrin saturation [TSAT].

Statistical analysis

All results are reported as the median ± SEM. The D'Agostino & Pearson test and Shapiro-Wilk test were used to investigate whether the data followed a

normal *Gaussian* distribution (p>0.1). The data were analyzed using Person's chi-squared test and paired t-test, Wilcoxon matched pair test or Mann-Whitney Test. Data were analyzed using GraphPad Prism® 8, with a critical p-value of 5%. Finally, univariate and multiple regression analyses using generalized linear models were performed to investigate the association of the hematological parameters with the clinical and demographic characteristics of the patients. For this performance, the significant variables or the ones that adjusted other variables <0.20 were maintained in multiple models, and data were analyzed using Stata® 14, with a critical value of 5%.

RESULTS

Patient characteristics and clinical outcomes

The clinical and demographic characteristics of the entire cohort are reported in Table 1. A total of 25 CD patients were included in the study, 12 males (48%) and 13 females (52%) with a median age of 37 (20-67) years. The median duration of CD was 144 (6-312) months, and according to the Montreal classification, one patient was diagnosed before the age of 16 years (A1, 4%), 22 patients between 17 and 40 years (A2, 88%), and 2 patients over 40 years old (A3, 8%). Five patients had terminal ileal location (L1, 20%), 4 colonic location (L2, 16%), and 16 ileal and colonic locations (L3, 64%). Regarding the behavior of CD, 8 patients had a non-penetrating pattern (B1, 32%), 13 had stenosing disease (B2, 52%), and the remaining 4 patients had a penetrating disease (B3,16%). Eleven patients had the concomitant perianal disease (44%) and 20 underwent previous surgeries because of CD complications, such as abscess, stenosis, and fistula.

Almost all recruited patients were under biological therapy (23 patients - 92%) and 14 were using immunosuppressive therapy (56%). Regarding the treatment of IDA, all patients had previously used other medications and 10 (40%) had a history of blood transfusion because of severe anemia.

Of the total patients, a subgroup of 16 used ferric hydroxide sucrose previously for the treatment of IDA; 9 males (56.3%) and 7 females (43.7%), with a median age of 37 (25-67) years. The median duration of CD was 144 (24-312) months and, according to

the Montreal classification, one patient was diagnosed before the age of 16 years (A1, 6.25%), 14 patients between 17 and 40 years (A2, 87.5%), and one patient over 40 years old (A3, 6.25%). Four patients had ileal location (L1, 25%), 3 colonic location (L2, 18.7%), and 9 ileal and colonic location (L3, 56.3%). Regarding the CD behavior, 4 patients had a non-penetrating pattern (B1, 25%), 8 stenotic disease (B2, 50%), and the remaining 4 patients had penetrating disease (B3, 25%). Eight patients had the concomitant perianal disease (50%) and 15 had undergone previous surgeries for CD complications.

All recruited patients with a history of ferric hydroxide sucrose injection for the ADF treatment were under treatment for CD: 15 patients were under biological therapy (93.7%) and 13 were under immunosuppressive therapy (81.3%). Eight patients (50%) of this subgroup needed a blood transfusion because of severe anemia.

Table 1

Disease Activity

Patients with CD who received iron replacement therapy with FCM had their disease activity determined by nuclear magnetic resonance (presence of ulcers, mucosal enhancement of contrast, or alteration of mesentery associated with the affected intestinal area), colonoscopy with median Crohn's Disease Endoscopic Index of Severity (CDEIS) of 16.9 (5.6 – 26) and/or fecal calprotectin 1000 (104 – 1000) µg/g at baseline.

The median Crohn's Disease Activity Index (CDAI) at baseline was 303.5 (128 – 537.6) and at the end of treatment, it decreased in most patients (61%), 235.8 (13.5 – 470), but without statistical significance (P = 0.21). Regarding other inflammatory biomarkers, most patients included in the study (64%) had serum CRP levels > 3mg/L (reference value lower than 3 mg/L), with a median of 5.91 (0.16-114) mg/L; and the ERS median was 30 (3-120) mm/h.

Evaluation of laboratory parameters before and after treatment with ferric carboxymaltose

Hemoglobin levels increased in 93% of patients after treatment with FCM. The median hemoglobin concentration increased from 8.5 g/dL (5.8 – 10) to 10.1g/dL (7.8 – 13.7) ($p < 0.0001$) (Figure 1a). In addition, correction of anemia and/or Hb increase ≥ 1 g/dL was achieved in 84% of patients with just one dose of medication. Eleven patients (44%) had an increase in Hb ≥ 2 g/dL. Hematocrit values were within normal parameters in 16% of patients after treatment with FCM and there was a significant increase in 88% of patients with a median concentration from 27.8% (19.7 – 32.29) to 33% (25.9 – 42.8) ($p < 0.0001$) (Figure 1b). (Table 2)

Moreover, serum iron levels increased in 18 patients (86%) after FCM injection. The median serum iron improved from 15 µg/dL (4 – 43) up to 26 µg/dL (10 – 64.52), demonstrating the satisfactory effect of the medication in only one application ($p < 0.0001$) (Figure 1c). Ferritin increased in 86% of patients after FCM: 23.79 ng/mL (0,5 – 475.4) at baseline and 100.38 ng/mL (4,26 – 826,1) after treatment, 77% of patients showed normalization of this parameter after treatment ($P = 0.0008$) (Figure 1d). Concerning the transferrin saturation, it increased under treatment with FCM, from 3.5 at the beginning of treatment (1 – 21) up to 9 (2 – 26.3) after injection ($P = 0.01$) (Figure 1e). (Table 2)

Figure 1

Table 2

After a single application with iron carboxymaltose, all patients had an increase in mean corpuscular volume (MCV) levels and most reached normalization in the parameter (59%) after treatment ($P = 0.05$) (Table 2). No statistical significance was

found regarding the levels of HCM, MCHC e platelets analyzed after treatment (Table 2).

Concerning the hematimetric parameters and profile of iron, ferritin, and STAT, we analyzed the associations with the clinical variables under investigation. As observed in Table 3, although all patients included in the study had baseline serum iron levels below the normal range, the baseline serum iron levels were negatively associated with patients with an ileal and colonic CD (L3) who took biologics, but positively associated with patients who developed CD later in life after the age of 40 (A3) and with a stenosing (B2) and fistulizing (B3) phenotype. The highest level of ferritin after the application of ferric carboxymaltose occurred in patients who presented colonic location (L2) and fistulizing phenotype (B3). The baseline serum STAT levels were associated with patients with stenosing (B2) and fistulizing (B3) phenotypes and perianal disease.

Table 3

Results of previous ferric hydroxide sucrose injections in this cohort

Finally, the study aimed to assess the effects of ferric carboxymaltose in CD patients, taking into account the previous treatment of ferric hydroxide sucrose in these patients. For this analysis, a subgroup of patients from the total cohort was included, and hemoglobin and hematocrit levels were obtained from the medical charts. The median duration of the treatment with ferric hydroxide sucrose was 5.5 mo (1-30) and the number of applications was 12 (4-32).

The median hemoglobin concentration increased from 8.9 g/dL (6.5-11.8) to 9.7 g/dL (7.5-13.2) and the median hematocrit levels increased from 30.4 (22.2-37.8) to 34,54 (24.8-39.29) after treatment with ferric hydroxide sucrose. However, with no statistically significant difference ($p < 0.05$), as expected, this cohort comprises refractory patients to traditional iron replacement. When these same patients were treated with ferric

carboxymaltose, we observed an increase in hemoglobin (P = 0.0005) and hematocrit (P = 0.0001) when compared to the values obtained before treatment. (Figure 2a and b)

Figure 2

DISCUSSION

IDA is the most frequent clinical condition in CD patients and usually, it is accompanied by the clinical and endoscopic activity of the disease, but at other times it can be the first manifestation that precedes the intestinal and abdominal symptoms and is one of the main causes of fatigue and poor quality of life. Our data demonstrated a significant improvement in hemoglobin, iron, ferritin, and transferrin saturation levels after treatment with FCM. Although these findings have been previously proven in a few studies (10, 20) our data showed significant improvement in the hematological parameters with just a single dose of the medication.

Our results from the clinical practice confirmed the findings obtained by Sobrado *et al*, who evaluated FCM for the treatment of anemia in CD patients at a Brazilian center (23). Although they performed a quite similar study, we included a larger number of patients treated at a tertiary center in selective and strictly defined criteria of disease activity (endoscopic and/or radiological imaging). Furthermore, we compared the effects of FCM with previous ferric hydroxide sucrose treatment.

CD patients are at greater risk of developing anemia, especially with active disease (24, 25). To analyze the safety and efficacy of FCM for the anemia treatment of IBD patients, Stein *et al* performed a prospective study. However, not only patients with severe CD activity were included, but also patients in remission, and the disease activity was based on rather unspecific criteria such as serum C-reactive protein (CRP), Crohn's Disease Activity Index (CDAI) for patients diagnosed with CD, and Colitis Activity Index (CAI) for patients with ulcerative colitis (11). All patients included in our study had severe disease activity determined by more specific criteria. 40% of our patients had severe activity determined by magnetic resonance enterography. The other 60% had CD

activity determined by colonoscopy and fecal calprotectin. Furthermore, the median baseline CD activity assessed by the IADC was 303.5 and CRP levels had a median of 5.91 before treatment with FCM.

Usually, assistant physicians who take care of these chronic patients neglect the importance of IDA and accept it as a consequence of CD, so they proceed without having an established protocol based on gathering information and assessing alternative resolutions that could assist the decision-making and treatment in their clinical practice. Christopher Coe *et al* performed a retrospective study and concluded that gastroenterologists should consider treating patients with IBD and IDA with intravenous iron as it is safe and effective (9). Our study confirms that intravenous medication has proved to be an important therapeutic strategy, which can help quickly and safely in the treatment of IDA when prescribed by physicians accompanying this group of patients. A suggested approach to managing patients with CD and IDA is illustrated in Figure 3.

Figure 3

It is important to point out that, although other studies have resulted in an increase in hemoglobin levels of ≥ 2 g/dL, the assessment was not done with just a single dose of medication (10, 20, 23). Our study showed that 44% of patients had an increase of ≥ 2 g/dL with a single dose of 50mg/mL, which demonstrates that FCM can be an important therapeutic strategy when a significant increase in parameters is needed in a short period of follow-up, either to relieve symptoms or to prepare CD patients for surgical procedures and post-surgical recovering.

Iron and ferritin serum levels increased in 86% of patients, and transferrin saturation levels increased in 50% after treatment. This early response is in agreement with previous studies that performed this assessment. However, these studies evaluated a complete response between 4 to 8 wk of treatment. Our data point to this response in most patients 15 days after treatment (20, 26).

The effect of biological therapy on anemia in patients with IBD is seldom discussed in the literature. Demonstrated evidence showed a significantly improving in anemia in patients using biological therapy for other chronic inflammatory diseases such as arthritis and ankylosing spondylitis (27). Due to chronic inflammation, anemia is usually characterized as anemia of chronic disease (ACD) in these conditions. However, although ACD is associated with IBD, the most prominent impact is due to iron deficiency and patients have recurrent anemia even after treatment with immunomodulators (28).

A recent pediatric study showed no statistical difference in hemoglobin levels between IBD patients who responded or did not respond to ant-TNF treatment (29). A study of adult patients with IBD demonstrated that although biological therapy had significant beneficial effects on disease activity, the research found no significant change in the prevalence of anemia. Furthermore, one-fifth of patients without anemia at baseline developed anemia after one year of therapy (30). Our results are in agreement with these recent studies. We demonstrated that although patients had iron levels below normal at baseline, the use of biological therapy had a negative correlation with baseline serum iron levels, which demonstrates that these patients had more severe anemia.

A study evaluating anemia in Korean patients with IBD found no significant association between patients' clinical characteristics and anemia (31). Bergamaschi *et al*, in 2010, did not relate anemia in Crohn's disease to the location or behavior of the disease (32). In 2020, a study analyzed the prevalence and risk factors of anemia and iron deficiency in patients with IBD in Brazil and concluded that patients with the penetrating disease phenotype in CD were associated with a lower risk of anemia (33). Our study demonstrates that patients with an ileal and colonic location have a negative correlation with basal serum iron levels, demonstrating more severe anemia. Patients with stenosing and fistulizing phenotypes demonstrated a positive correlation with baseline serum iron levels and transferrin saturation.

We also compared the effects of treatment with FCM and previous treatment with ferric hydroxide sucrose. We observed no statistical difference in hemoglobin and hematocrit levels after treatment with ferric hydroxide sucrose, while with a single dose of FCM, those levels showed a significant increase. Although other studies evaluated the efficacy of the two medications (9, 34), our study compared the efficacy of the treatment in the same group of patients, demonstrating that FCM is an important therapeutic strategy in refractory patients who received ferric hydroxide sucrose.

The present study reported a median of 12 applications (4-35) with previous treatment with ferric hydroxide sucrose. However, when the same patients were treated with FCM, a single infusion guaranteed a significant increase in the hematological parameters. Evstratied R, *et al* reported in their study treatment with 1 to 3 infusions with FCM, while the ferric hydroxide sucrose treatment lasted 11 infusions (34). Onken *et al* also showed a similar result, patients treated with ferric sucrose received an average of 5 infusions while patients treated with ferric carboxymaltose underwent two infusions (36).

Thus, CD patients can be exposed to fewer interventions since FCM has better efficacy with a significant increase in hematological parameters, as well as iron, ferritin, and transferrin saturation levels with usually a single dose. The consequence is a decreased number of patients' visits to hospitals or private clinics, contributing to the quality of life and emotional well-being.

Currently, the value of an ampoule of FCM (+/- R$ 641.90 – Brazilian currency) is approximately 10 times more expensive than an ampoule of ferric hydroxide sucrose (+/- R$ 64.70 - Brazilian currency), which restricts patient adherence to treatment since this medication is not available by the Unified Health System (UHS) through State Public Pharmacies in Brazil. However, studies indicate that as a final result of the treatment, FCM has a lower cost when compared to ferric sucrose. Vicente *et al* concluded that the overall cost of FCM treatment is significantly advantageous when compared to ferric hydroxide sucrose, such as the relatively lower number of infusions of FCM and the quick increase of serum hemoglobin levels after iron replacement (37).

Toblli *et al* in 2015, evaluated the economic impact of oral iron replacement treatment *vs* FCM in patients with chronic kidney disease. As a result, the study demonstrated that the cumulative cost during the 6 mo study period with ferric carboxymaltose was US$ 3.070 per patient, whereas compared to oral iron administration over the same period, the cost was US$ 17.670. The study also found that the use of FCM for the treatment of iron deficiency anemia resulted in savings of US$ 14.600 (82.6%) per patient (24).

Another study published in 2020 by Aksan *et al* analyzed and compared the cost-effectiveness of IV and oral iron treatment in patients with IDA associated with IBD and concluded that FCM is designed to be the most cost-effective IV iron therapy in Switzerland and with better clinical response to treatment (35). Basha *et al* in 2021 evaluated the efficacy and cost-effectiveness of ferric carboxymaltose *vs* iron sucrose. The retrospective study evaluated patients who were followed up for 12 mo in a tertiary center, and as a result, although the cost of the medication ferric carboxymaltose is 6.5 times higher than iron sucrose, at the end of the period the treatment with ferric carboxymaltose, has a lower cost in bed or nursing (25). Table 4 shows the main characteristics that differentiate FCM from iron sucrose.

Table 4

The literature demonstrates the effectiveness of ferric carboxymaltose in many diseases. Several studies have demonstrated the important role that medication performs in cardiovascular diseases (38, 39). However, in the gastrointestinal tract, few studies have analyzed the effectiveness of FCM, especially in Crohn's disease. Thus, our study contributed to a greater understanding of the use of medication in this disease, helping clinical practice.

The limitations of our study lay in the retrospective character of the research, as data collected through electronic medical records or outpatient databases may be scarce. As described above, we were only able to analyze the serum levels of

hemoglobin and hematocrit in the comparison between the two medications. Another limitation is that despite being larger than other Brazilian studies, the study evaluated a small number of patients. In addition, it was neither possible to correlate the degree of CD activity through the Crohn's Disease Activity Index (IADC), C- reactive protein (CRP), and erythrocyte sedimentation rate (ESR) values with the severity of anemia nor to determine if the increase of the hematological parameters after FCM treatment correlates with an improvement in quality of life assessed by validated questionnaires, such as Inflammatory Bowel Disease Questionnaire (IBDQ) (29).

CONCLUSION

From the analysis performed in this retrospective study, a better understanding of the effects of FCM in the treatment of IDA in CD patients has emerged. The study also showed that FCM is an important therapeutic strategy, as it achieves superior results when compared to the administration of iron hydroxide sucrose in patients with refractory IDA. However, there are still many gaps to be addressed in future studies about the molecular mechanism of IDA in CD. We do not yet know if IV iron replacement, besides improving the patient's quality of life and well-being, can affect the activity of the disease and help the patient to enter clinical and endoscopic remission. Our findings support FCM as an important therapeutic strategy to treat anemia and to improve the clinical status of CD patients.

ARTICLE HIGHLIGHTS

Research background

Crohn's disease (CD) is a chronic inflammatory disorder of the gastrointestinal tract, and anemia is one of the clinical manifestations. Iron deficiency anemia (IDA) in CD chronic is due to blood loss from the ulcerated intestinal mucosa associated with diarrhea, decreased iron intake due to dietary restriction, and/or deficiency in transluminal iron absorption during the period of disease activity. Currently, intravenous iron replacement is the best option for the treatment of IDA in CD. Recent

pharmacology progress has led to ferric carboxymaltose (FCM), to correct the IDA through its pharmacokinetic characteristics.

Research motivation

The administration of FCM can be performed in high doses safely and well-tolerated. Given that, this study was designed to evaluate the effectiveness of FCM in the treatment of iron deficiency anemia in CD patients in a tertiary center in Brazil, where inflammatory bowel disease has become increasingly frequent. This clinical approach can make the quality of life of CD patients better.

Research objectives

The objective of this study was to analyze, through medical records, the clinical and epidemiological data of a cohort of patients with active CD who received intravenous ferric carboxymaltose in the treatment of iron deficiency anemia to elucidate the effectiveness of the drug and compare it to iron hydroxide sucrose treatment.

Research methods

It is a retrospective, observational study, which included 25 patients with active CD, severe anemia, and refractory to previous conventional treatments. Patients were evaluated two times: during previous treatment with ferric hydroxide sucrose and treatment with FCM. Epidemiological and clinical data were analyzed, besides hematimetric parameters.

Research results

The parameters of iron deficiency anemia assessment significantly improve after treatment with FCM. Serum hemoglobin levels increased in 93% of patients, and in 44% there was an increase of ≥ 2g/dL in a single application. Moreover, 86% of the patients showed an increase in serum iron and ferritin and 50% in transferrin saturation. The serum iron levels at baseline showed a negative association with the ileal and colonic

CD and use of biologics and a positive association with patients who developed CD later in life after the age of 40 (A3) and with a stenosing (B2) and fistulizing (B3) phenotype. The hemoglobin and hematocrit values after ferric hydroxide sucrose treatment remained similar to those found before treatment.

Research conclusions

FCM is an important therapeutic strategy for the treatment of iron deficiency anemia in CD patients, achieving satisfactory results in refractory cases.

Research perspectives

The study showed that FCM is an important therapeutic strategy to treat IDA in CD patients. However, there are still many gaps to be addressed in future studies about the molecular mechanism of IDA in CD. We do not yet know if IV iron replacement, besides improving the patient's quality of life and well-being, can affect the activity of the disease and help the patient to enter clinical and endoscopic remission. Our findings support FCM as an important therapeutic strategy to treat anemia and improve the clinical status of CD patients.

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