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Sigmoid Volvulus Due Chagas Disease

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Abstract

American Trypanosomiasis, also known as Chagas disease, is a parasitic disease caused by *Trypanosoma cruzi* and transmitted by hematophagous vectors, occupies the fourth place as a cause of loss of potential years of life between infectious and parasitic diseases, and has an acute presentation form and chronic, in which it can present complications at cardiac and digestive levels, among others. The development of megacolon with subsequent development of volvulus is an important cause of acute abdomen and intestinal obstruction that requires urgent treatment, as it presents an axial rotation of the intestinal loop with obstruction in a closed loop and subsequent ischemia. According to the World Health Organization, there are between 16 and 18 million infected people in the world, of which the majority is located in Latin American territory, and it is estimated that approximately only 1% receives adequate diagnosis and complete treatment.

Keywords: Chagas disease, megacolon, intestinal occlusion, trypanosomiasis, sigmoid volvulus

1. Introduction

Infections and exposure to *Trypanosoma cruzi* occupy the fourth place due to loss of potential years of life between parasitic and infectious diseases [1]. American Trypanosomiasis, also known as Chagas disease, is a parasitic infection transmitted by hematophagous vectors [2] with acute clinical presentation and silent chronic. According to the World Health Organization (WHO), there are between 16 and 18 million infected people in the world, of which the majority is located in Latin American territory, and only 1% receives adequate diagnosis and complete treatment. For the World Health Organization and the Pan American Health Organization, Trypanosomiasis is considered the most serious parasitic disease in Latin America [1].

Transmission can also be done vertically through women infected during pregnancy, which would lead to a congenital disease with intrauterine clinical conditions and at birth.

One of the main complications of the chronic form of Chagas disease is the development of the Chagasic megacolon, which causes alterations in the neurosensory system of the colon. Colon volvulus is described as torsion of the large intestine on its mesenteric axis, thus causing a picture of intestinal obstruction and secondary ischemia.

The development of intestinal volvulations secondary to megacolon [3] is considered as the most severe complication of megacolon syndromes, regardless of

their etiology [4]; although it is relatively uncommon in western countries [3], there are records of countries where it occupies the third cause of low intestinal obstruction, only after cancer and diverticular disease [1].

2. Record

Although the vector has been known since the fourteenth century, the first reports of endemia occurred in the post-Columbian period, due to the human displacements that conditioned the direct contact of the vector with the host. In 1909, Dr. Carlos Chagas communicates the discovery of the new human Trypanosomiasis, and in 1911, he obtained the first record of congenital Chagasic disease. In the 1920s, several studies were conducted in pregnant animals that were suffering from acute and chronic stage disease as a follow-up to the theory of vertical transmission [5], and it is in 1949 when Aldao in Venezuela describes the *T. cruzi* finding in peripheral blood of a 2-day-old newborn [2].

The first description with reference to the volvulus was found in the records of Egypt in the Ebers papyrus and mentioned that the volvulus could resolve spontaneously or present a picture of intestinal necrosis; from 1500 BC, it is recognized that detortion of the intestinal loop is crucial for the definitive resolution of the picture, and there are also records made by Hippocrates where suppositories and insufflation were used by mechanical instruments introduced in the anus in order to generate decompression [6]. However, the first description coined with the term Sigmoid volvulus was made by Von Rokitansky in 1836, demonstrating a condition in which the sigmoid wraps itself and its own mesentery, causing a closed loop intestinal obstruction that, if not treated, presented complications such as intestinal ischemia, gangrene, and perforation [7].

Initially, the treatment that was suggested for intestinal torsions was nonsurgical, avoiding intestinal interventions to a greater extent due to the high mortality that occurred in patients with intestinal obstruction; however, after the introduction of aseptic techniques and antisepsis for surgical procedures, in 1883, Atherton performed the first successful surgical procedure for sigmoid volvulus detortion in the United States, and the following year, Treves recommended the colectomy for volvulus that presents vascular complications with gangrene. From 1889, the therapeutic options for volvulus were defined in detortion, pexia, and resection (with or without ostomy) [6].

3. Epidemiological aspects

More than 100 years after the discovery of the causative agent and its form of transmission, Chagas disease is considered the most serious parasitosis in Latin America and one of the 14 lag diseases according to the World Health Organization [8], considering that a minimum of 110 million individuals in 21 countries are at risk of infection. The mother-child transmission of *T. cruzi* can occur at any stage of embryonic and fetal development, without being free of infection none of the periods of development. And although the incidence of vertical transmission in humans is considered low, changes in proportion due to urbanization, migrations from endemic areas and serological controls during transfusions, favor that mother-child transmission is one of the main forms of maintenance of the endemic; however, this form of transmission does not have an exact form of be measured due to nonspecific symptoms and the possibility of going through latent stage for many years. In Argentina, a study was conducted in which it was estimated that, for each case of Vectorial Chagas disease, there would be at least 10 cases of undiagnosed congenital vertical

transmission disease [5]. There are estimates that intrauterine infection is considered to be 2–5% of children born to a mother with chronic or latent Chagas disease, while this percentage increases when the infection is acquired during pregnancy and/or when it is associated with immunodeficiency diseases [9]. As mentioned above, there are two fundamental ways of infection, the one caused by vectors and the other that is propitiated vertically from mothers with latent disease, and there are variations regarding the incidence and prevalence rates according to the endemicity of the areas where it presents the disease and population characteristics, as well as the latency and silent disease factor that determines that there may be biases with underestimation or overestimation. Intestinal volvulations are one of the main complications of megacolon (regardless of its etiology), and results in an important cause of intestinal obstruction. Depending on different associated factors such as the height above sea level where patients live, hygienic-dietary habits, racial characteristics, etc., different statistics have been found. A review of the world literature found that Iran had the highest incidence of sigmoid volvulation secondary to megacolon with an average of 85%, Bolivia 74%, Ethiopia 54%, Pakistan 30%, Russia 30–50%, India 24%, Uganda 20%, Polinia 17%, and the United States 5–10% [4]. On the other hand, the incidence of intestinal volvulus, regardless of the cause and origin, represents variable ranges according to the statistics available; it is reported as 4% of all cases of intestinal obstruction in developed countries and up to 50% of developing countries. Regarding gender distribution, it has been proposed that the predisposition of men to sigmoid colon volvulations is secondary to the fact that the female pelvis has more space for spontaneous reduction of volvulations [7]. A study conducted in the endemic population of Peru showed that fluctuations in temporary rains condition variations in the chances of infection in domestic and human animals [10].

4. Pathophysiology

The vector transmission cycle of Chagas disease begins with the suction of blood from infected mammals by hematophagous vectors, in which the Trypanosome develops until it reaches the infectious phase that is excreted through feces, with which inoculation occurs when feeding on other mammals again by means of mucous membranes or skin lesions that are produced during scratching or bites of the same insects [11]. According to the form of infection and the age at which the infection develops, Chagas disease can present at the level of intrauterine development (10% of positive serologies in childhood and adolescence), having a significant variation in prevalence according to the area and country studied, where up to 81% of pregnant women with Chagas disease have been reported in rural areas of South American countries [12] with varying degrees of morbidity in fetal development and birth, such as abortion, prematurity, low birth weight, and clinical picture ranging from asymptomatic patients to those who develop sepsis, as well as hepatosplenomegaly, meningoencephalitis, hepatitis, myocarditis, and hemolytic anemia [9], although there are also reports of pregnant patients with an acute period of the disease in whom there is no transmission of the parasite to the embryo nonfetus, with which it is determined that the condition can be placental without affecting the fetus, or the fetus without affecting the placenta or generating no affection to either of them despite having an acute period of the disease in the pregnant woman [5].

T. cruzi reaches fetal circulation by hematogenous route as a result of placental inflammation, causing acute or chronic inflammatory foci with parasitism in trophoblastic and macrophage cells, without having a direct correlation between parasitism and fetal infection, since approximately 70–80% of cases despite infection at birth no specific symptoms are found.

When the infection is acquired by vector, it has an incubation period of approximately 5–14 days after direct contact of the parasite with the host when it is by direct inoculation and 20–40 days when it is carried out through blood transfusions [11]. But regardless of the route of infection, Chagas disease has three well-defined stages of development:

- Acute phase: it is usually asymptomatic and presentation in young people, when signs and symptoms occur they are usually transient and coincide with periods of high parasitemia that normally lasts for 2–4 months [1], 1–2% of cases in patients are determined at this stage. When symptoms occur, these are usually frequent and irregular fever that usually extends from 2 to 4 weeks, edema, satellite lymph nodes, hepatomegaly (approximately 40% of cases), splenomegaly, anorexia, asthenia, myalgia, headache, and occasionally arthralgia, [12] and to a lesser extent, data of acute myocarditis (weak pulse, tachycardia, hypotension, cyanosis, edema, and anasarca) [1].

During this period, you can find signs of entry, also known as “inoculation chagomas,” which consist of skin lesions in sites exposed to the vector that have an average duration of 15 days. The most characteristic sign of this period is the so-called “Sign of Romagna—Mazza,” which consists of unilateral eyelid edema, pink-light violet, painless, and hard (**Figure 1**) [12] that disappear in an average of 30–60 days [1]. In general, the acute stage develops with a benign evolution, being only fatal between 2 and 7% of cases [12], when it occurs in children under 6 years of age where virulence is greater and they develop lethal meningoencephalitis in 50% of cases [1].

- Chronic indeterminate or latent period represents 50–70% of patients with Chagas disease and is characterized by specific symptoms at the cardiac or digestive level; patients have positive serology and immunoglobulin G for Chagas; however, the rest of the paraclinical studies are negative. About 30% of patients persist with this indeterminate form during the rest of their lives, and the rest evolves to the determined phase in a period of 10–30 years [11]. During this period, you can find indeterminate electrocardiographic manifestations (arrhythmias or tachycardia) and may cause sudden death in sporadic cases.
- Chronic period determined: the parasites have caused damage mainly in tissues of the autonomic nervous system and striated muscles [1]; for this reason, patients have specific organic conditions at the cardiac, esophageal, and colonic levels (among others), in which organomegalies with functional conditions are present, there may be involvement of several organs in the same period. At this stage of the disease, there is a high parasitemia and antibodies. At this point, specific organic conditions allow the use of specific imaging and laboratory studies that favor diagnostic suspicion [12]. Cardiac injuries condition the establishment of chronic Chagasic cardiomyopathy and esophageal symptoms such as dysphagia, odynophagia, hypersalivation, belching, heartburn, and regurgitation, while at the colonic level, they present constipation, meteorism [1], elongations, mesenteritis retractable, and in more advanced cases, intestinal occlusion secondary to intestinal volvulations.

Once the parasite comes into contact with a host cell, it adheres to the specific receptors of the cell membrane and subsequently conditions a

restructuring of the microfilaments of the wall, also causing an abnormal mobilization in the calcium channels [1].

In those known as mega syndromes, the megaesophagus and the Chagasic megacolon stand out (**Figures 2 and 3**). The first usually occurs before age 40 and

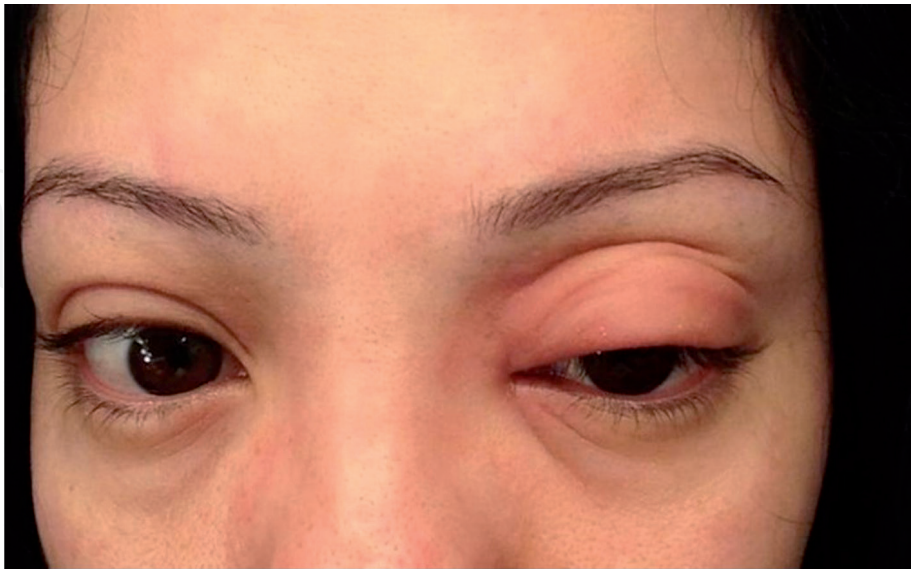


Figure 1.
“Sign of Romagna—Mazza”, unilateral eyelid edema, pink-light violet, painless and hard.



Figure 2.
Contrasted radiography of Chagasic megaesophagus.

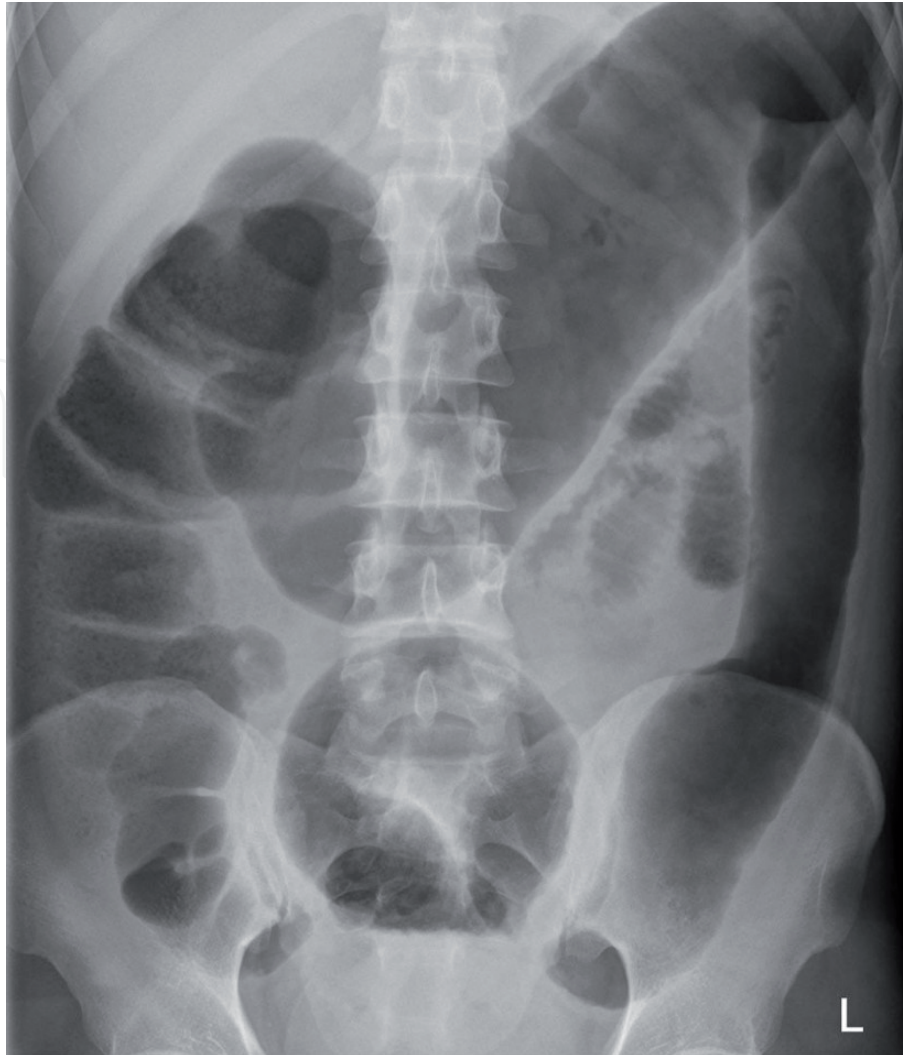


Figure 3.
Simple radiography with dilated colon due megacolon.

is related to the progressive destruction of parasympathetic neurons, which cause dilation in different degrees and subsequent elongation, with hypertrophy of the muscular layers and mucous parakeratosis, with areas of chronic inflammation, which progresses to the progressive loss of motor coordination and contractile capacity, producing dysphagia as the main symptom.

The megacolon usually presents with motor dysfunction of different segments of the colon, being greater in sigmoid and rectum, conditioned by intramural parasympathetic denervation, progressively leading to dilation, presenting as the main complication of it, the development of intestinal volvulations with secondary intestinal obstruction [12]. Another of the factors that are considered associated is the retractable mesocolitis, which predisposes the retraction of the distal and proximal segment of the sigmoid loop favoring its torsion, the copious intake of fermentable and high cellulose foods is also considered a trigger for intestinal volvulations, because with this the elastogenesis is reduced, with elongation of muscle fibers that favors the development of greater volume and length of the handles, since they condition the elongation of the axes in formation of new fibers, it is also considered that the altitude in the inhabited areas could condition a progressive elongation of the intestinal handles according to the physical law of Boyle and Mariotte favoring the expansion of intraluminal gases at a lower atmospheric pressure [4], which is demonstrated from multiple studies in those found

that altitude conditioned a significant increase in colonic length in patients living in mountain areas of different countries, proposing the added classification of megacolon height.

From the genesis of the megacolon, it has been classified as congenital megacolon (as an example Hirschsprung's disease) and the acquired megacolon (which includes that caused by American trypanosomiasis) [3], indicating that the volvulations they have are within their etiological factors, the deficit of vitamins, intoxications, and adherent syndromes by chronic or recurrent inflammatory processes [2].

Some authors mention that, in general terms, it can be considered that two essential factors are required for the development of sigmoid volvulus:

1. Redundant segment of colon with a short mesentery.
2. A fixation segment with short proximity to the intestinal loop [3].

The colonic loop conditions the gas and fluid distention of the proximal segment, resulting in a progressive increase in intraluminal pressure that leads to the obstruction of venous return with a congestive picture and finally compromised blood flow of the affected segment, which in If not resolved, conditions ischemia, necrosis and subsequent intestinal perforation.

It is estimated that approximately 40–60% of patients who present with acute abdominal symptoms have previously presented occlusive and distention conditions [13]. In any case, the pathophysiological understanding of intestinal volvulations continues to be poor [14], due in part to the large percentage that is presented urgently with acute abdomen, which is complex, determining the factors prior to such presentation.

5. Clinical presentation

Clinically, sigmoid volvulus may present acutely with surgical resolution, which may present a high rate of complications with morbidity and added mortality in cases where gangrene occurs or when the patient has significant systemic comorbidities [15], or chronic with intermittent and isolated periods of constipation or occlusion that remits spontaneously, many times without reaching the diagnosis of megacolon or volvulation by resolution without treatment [7].

The clinical picture of Chagas disease will depend, as mentioned above, on the clinical phase or stage that is being studied in the patient at the time of the appearance of symptoms. However, making an approach to the development of megacolon (normally observed between 40 and 50 years of age), which leads to intestinal obstruction, by progressive and chronic intramural denervation of the parasympathetic system, it can be mentioned that in a large part of the cases it presents with nonspecific symptoms such as progressive constipation and inability to evacuate, developing intermittent symptoms of generalized abdominal distention, which is usually treated by the patients themselves with laxatives and enemas, which delays medical evaluation and timely diagnosis [12].

The acute clinical picture occurs in approximately 80% of patients [7] and is characterized by sudden abdominal pain and inability to channel gas and stool deposition, conditioning a progressive distention of the abdomen, which in some cases can be asymmetric [10] secondary to the accumulation of gas, fluid, and inflammatory bowel process due to occlusion [3], which increases

morbidity [7] and mortality, which can be estimated at 33–80% in cases where intestinal ischemia occurs [16], which can lead to necrosis in three areas mainly in the neck of the volvulus, at any location of the occluded closed loop, and in the portions adjacent to the volvulated area (distal descending colon or proximal rectum by venous thrombosis backward) [6]. Mortality also rises considerably in those with decompensated systemic comorbidities [17]. In a study conducted in India, with a sample of 128 cases of patients with sigmoid volvulus, it was found that 93.75% presented what was considered a classic clinical triad that included abdominal pain, distention, and constipation [7]. According to the time of evolution, the patient may have aggregate symptoms such as nausea and vomiting of gastrointestinal characteristics [18], as well as tachycardia, hypotension, and polypnea, due to the development of systemic inflammatory response syndrome.

Volvulations, unlike fecal impaction, condition an empty rectal ampulla, and the distention is usually more intense than obstructions at higher levels of the gastrointestinal tract [6]. If the picture is not resolved, the patient will present data from peritonitis secondary to necrosis of the intestinal walls, which can lead to perforation of the hollow viscera with the intestinal contents leaving the peritoneal cavity.

6. Diagnostic methods

Depending on the clinical stage of Chagas disease, the level of blood parasitemia, detection, and isolation of *T. cruzi* may be relatively easy; in the neonatal period, for patients who are at risk of vertical transmission from an infected mother, obtaining umbilical cord blood is the method of choice [1].

Direct methods for the isolation of the causative agent can be performed with fresh examination, thick drop, Strout's concentration method (blood collection without anticoagulant for centrifugation of red blood cells and leukocytes not trapped in the clot), triple centrifugation, and microhematocrit [2]. Indirect methods are based on the study of the patient's immune response and are mainly used in chronic phases when the number of parasites in the blood is less than the acute phase; it is considered that there must be two positive tests taken in the same blood sample and include at least one of the tests considered to be the most sensitive (ELISA or indirect immunofluorescence), in case of discrepancies, a third test or referral to a laboratory would be performed specialized [19].

For the specific case of the Chagasic megacolon and the sigmoid volvulus, the diagnosis is initially based on extensive history, including housing history, work areas, chronic digestive symptoms, and the time of establishment of acute intestinal occlusion symptoms [7]. On physical examination, data related to intestinal obstruction will be revealed, including generalized abdominal distension, peristaltic noise fighting with metallic sounds [17], generalized tympanism, and abdominal pain that may or may not have frank data of diffuse peritonitis.

The clinical picture of intestinal obstruction, vomiting, distention, abdominal pain, and chronic constipation accompanied by X-rays constitutes the basic pillars for diagnosis [14]. Simple abdominal radiography reaches diagnostic percentages greater than 90% [20], where you can find the classic sign of volvulations with coffee bean or omega image [18] (**Figure 4**), which is observed in approximately 30% of the cases [14], as well as classic signs of secondary occlusive conditions and

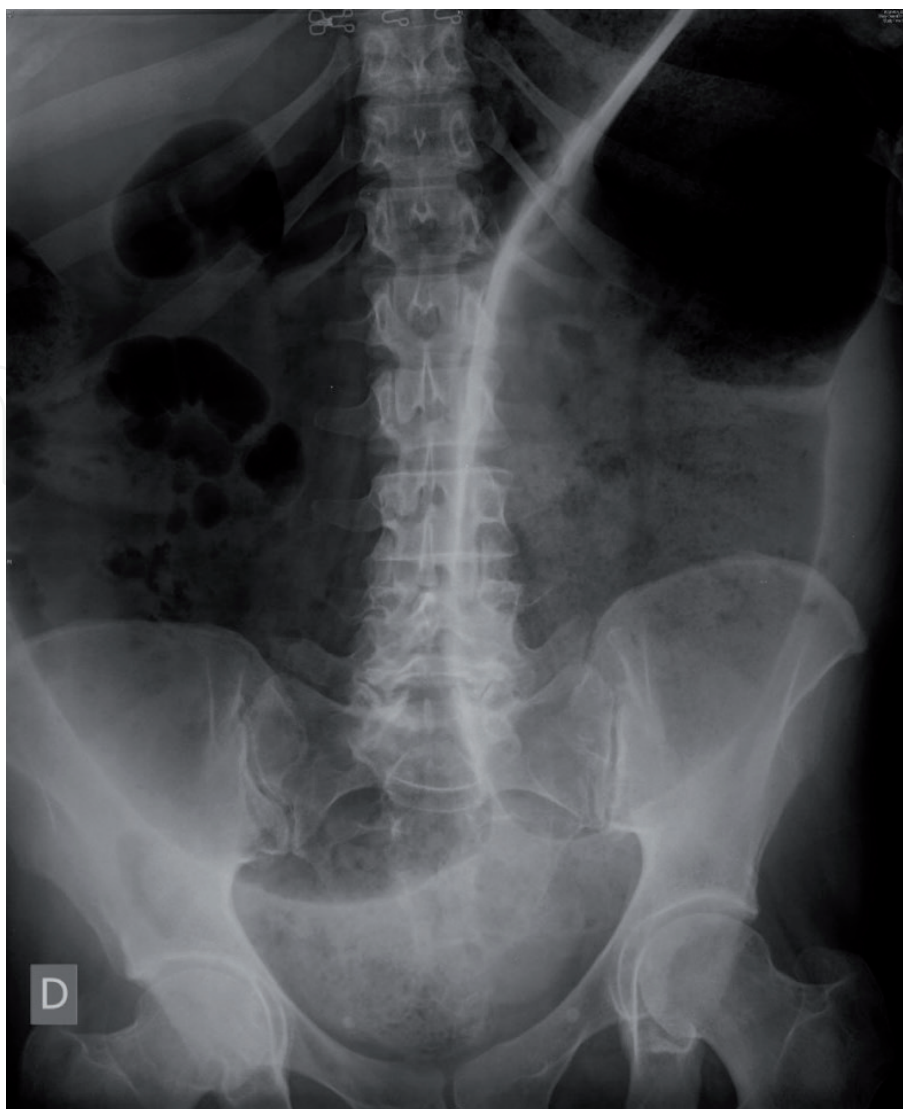


Figure 4.
Coffee bean imagen in simple radiography due sigmoid volvulus.

other pathologies such as coin stack, hydro levels, inverted “u”, etc. [20] (**Figure 5**). In cases where the diagnosis is not established with the aforementioned, the use of studies contrasted with barium by enema may show obstruction at the level of the rectosigmoid junction with a bird’s beak image, so that the diagnostic method can approach the 100% [6]; it is also considered that this type of studies can have a therapeutic purpose generated a detortion in many cases [14]; however, its use is limited due to the risks of peritonitis perforation and development, in which it is contraindicated [18]. The tomographic study can reveal the classic image of swirl sign due to the rotation of the mesocolic vessels turned (**Figure 6**), also having the advantage of ruling out other abdominal pathologies that occur with similar symptoms [16].

Despite the fact that the clinical picture and imaging tests allow the diagnosis to be elucidated in most cases, there are still variable percentages in which the diagnosis is established intraoperatively after starting the procedure under the approach of the acute abdomen or intestinal occlusion (**Figure 7**) [17].

Endoscopic studies such as rectosigmoidoscopy and colonoscopy make it possible to have a diagnostic-therapeutic possibility in patients with sigmoid volvulations while providing the ease of making an internal evaluation that helps predict the possibility of intestinal ischemia [20].



Figure 5.
Simple radiography with coin stack, hydro levels and inverted “u” imagen.

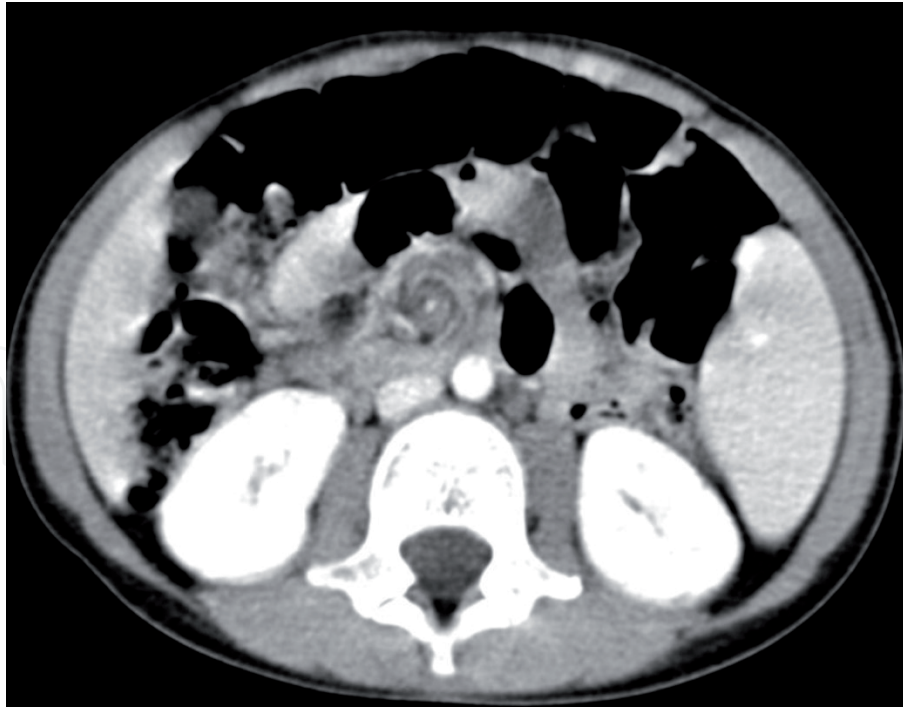


Figure 6.
Swirl sign due to the rotation of the mesocolic vessels.

Among the differential diagnoses that should be ruled out are stenosing colon neoplasms, diverticular disease, pseudo colonic obstruction (Ogilvie syndrome), megacolon due to Hirschsprung’s disease, and other intestinal tract volvulations [13].



Figure 7.
Intraoperatively finding of sigmoid volvulus.

7. Treatment

The specific treatment of Chagas disease continues to be a challenge and health concern in countries that are considered endemic [1], and throughout history, different drugs have been used for their management, finding useful specific Nifurtimox and Benznidazol, which act on the circulating form of *T. cruzi*, so the best healing results are obtained when administered in the acute phase of the disease [2]; however, its use in pregnant patients is restricted by the risk of teratogenicity [1]. In case of patients who have acquired the disease vertically, the efficacy of the etiological treatment is estimated to be close to 100% in the first year of life, demonstrating elimination of parasitemia and negativization of serological tests within a few months of starting the treatment [21]. Approved treatments for etiological management are not commercialized on a daily basis, and their use depends on the national health agencies of each country. The recommended intake duration for treatment is 60 days, although in cases where there are adverse reactions that cause intolerance, a shortened therapy of 30 days can be considered, subsequently completing the other 30 days with the unused medicine once adverse effects have been controlled [19].

Different treatment schemes have been proposed according to the patient's age, but in general terms, the doses proposed and analyzed as effective in parasite eradication are follows:

- Benznidazole: 5–10 mg/kg/day divided into two daily doses for 60 days and may vary up to 7 mg/kg/day with the recommendation to be administered after food to reduce the risk of adverse reactions, which include dermal hypersensitivity, generalized edema, fever, myalgia, arthralgia, nausea, vomiting, hyporexia, anorexia, epigastralgia, leukopenia, thrombocytopenia, agranulocytosis, and purpura.

- Nifurtimox: 10–15 mg/kg/day in two daily doses for 60 days with the recommendation of being administered after food and performing a weight control at each assessment to identify the need to adjust the dose. Among the side effects or adverse reactions that have been reported are abdominal pain, epigastralgia, anorexia, weight loss, vomiting, instability in balance, confusion, seizures, chills, memory disorders, mood swings, insomnia, nervousness, rashes, generalized edema, and pruritus [1].

This medication is contraindicated in patients with moderate to severe hepatic, renal, or neurological conditions with immunocompromise.

So far there are no comparative clinical trials between the two drugs approved for etiological treatment, so the use will depend on the availability of the drug and the patient's tolerance to it [21]. The cure criterion is the obtaining of two negative samples for parasitological and serological study consecutively at intervals of 6 months after the end of the pharmacological treatment [1]. In cases where the patient is in the intermediate and chronic stages, the treatment is mainly based on resolving the symptoms according to the specific organic conditions that occur (heart disease, megaesophagus, megacolon, etc.), [11] such as diuretics, beta blockers, angiotensin converting enzyme inhibitors [19], possibility of pacemakers, or even considering the requirement of heart transplantation. The management in case of esophageal conditions is based on the use of endoscopic dilations, [11] application of botulinum toxin, and so on.

As mentioned earlier, sigmoid volvulus is considered an emergency for management; however, the pathophysiological characteristics of those that are secondary to Chagasic megacolon have percentages with spontaneous resolution before vascular complications develop in the mesentery of the affected loop. There is no general consensus about the surgical treatment of the Chagasic megacolon, since in some cases, the expectant or conservative management is reserved for patients in whom the symptoms are mild and intermittent and have a functionality compensated with dietary management or with judicious use of laxatives, as well as in those patients in whom comorbidities result in a surgical contraindication. It is important to mention that the surgical management of the Chagasic megacolon does not lead to the cure of Chagas disease, since at the time of presentation of these complications, patients usually present organic dysfunctions at different levels, so they are out of etiological treatment; however, megacolon management favors the resolution of constipation symptoms and reduces the risk of acute complications such as sigmoid volvulus or fecalomas [22].

Among the most frequently used elective procedures are:

- Rectosigmoidectomy: used since 1955, it can be performed with primary anastomosis or colostomy bypass and subsequent anastomosis; however, high rates of stenosis and fistulas have been reported.
- Anterior rectosigmoidectomy: it does not imply perineal affection; allows a variable resection of the affected segments; allows to manage a single surgical time with less morbidity, thanks to the use of mechanical sutures; and does not generate manipulation of the sphincter complex.
- Duhamel Haddad technique: it consists of resection of the affected segment with proximal colostomy and preservation of the native rectum, and it is used by surgeons with experience in colorectal approaches, so its use by surgeons with little experience leads to a higher rate of complications.

- Habr-Gama and Reis Neto procedure: allows a surgical time with mechanical sutures in which adequate morphological results are obtained, functional while maintaining the observation of the patient [22].

When the presentation of the megacolon is performed with intestinal volvulations, the treatment must be aimed at the resolution of the obstruction and prevention of recurrent episodes [13]; however, the treatment remains controversial, and the procedure of choice is based on the general condition of the patient, the suspicion of peritonitis, the viability of the volvulated segment, and the experience of the surgical team [14]. Therefore, the treatment can be divided into two main branches: emergency surgical management and conservative (nonsurgical) management [16].

- Conservative management: in many places, the initial procedure of choice is considered, since it allows decompression and resolves the acute problem, which allows planning a definitive procedure electively reducing the risks of urgent surgery [23]. This approach in deferred times has been widely accepted as the standard management [7]. Conservative procedures include the following:
 - Endoscopic unwrapping: it is indicated in the initial stages, when there are still no vascular damages in the volvulated loop. The basis of this treatment is the decompression by evacuation of the proximal intraluminal content and elimination of pathological rotation of the colonic mesentery [3]. The importance of endoscopic evaluation is based on the intrinsic observation of the volvulated handle and consists of the insertion of a rigid or flexible rectosigmoidoscope that allows the application of air and resolution of volvulus with a success rate ranging from 70 to 90% [13]; however, these procedures have a high risk of perforation. In any case, laparotomy should be performed in all cases where endoscopic findings show necrosis, mucosal ulceration, or inadvertent intestinal damage [17].
 - Sigmoidopexy and mesosigmoidoplasty have a low morbidity and mortality rate; however, they have a high incidence of recurrences [7] (**Figure 8**).

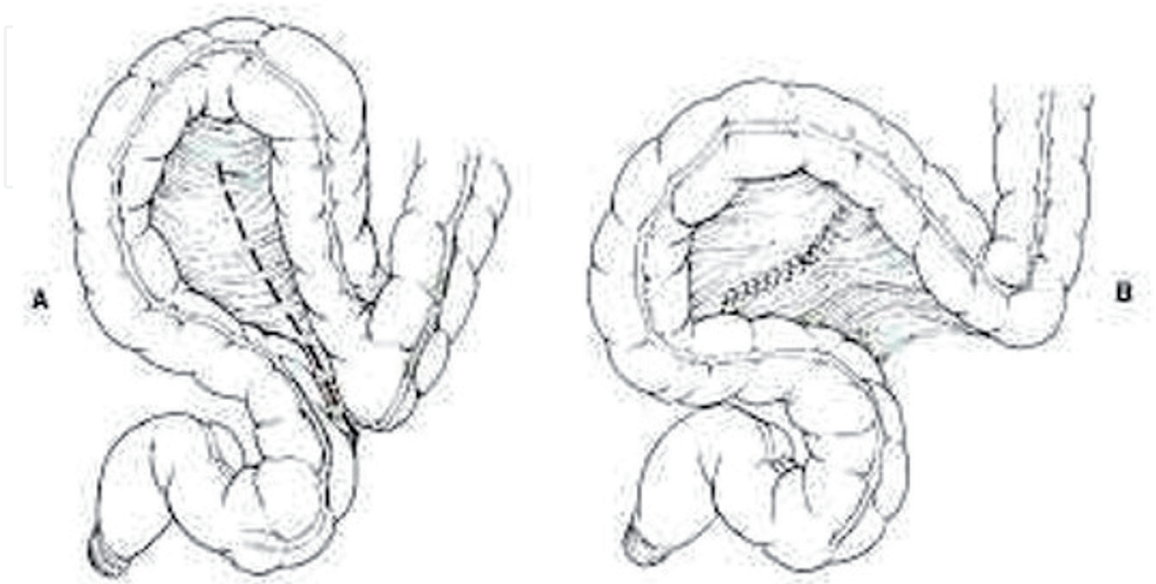


Figure 8.
Mesosigmoidoplasty technique. (A) Incision of relaxation on the longitudinal mesentery. (B) Transverse mesentery closure.

- The colon by enema has shown a success rate close to 5% of patients, with a lower recurrence rate in pediatric patients [13], while providing a diagnostic confirmation; however, it is contraindicated in patients in whom ischemia or intestinal necrosis is suspected due to the risk of perforation.

Conservative procedures are considered an effective measure for the resolution of the emergency; however, they must be completed with elective surgery given the high rates of recurrence they present, in addition to many of the patients in which they are performed, do not return to units for surgical complementation until they have an acute condition again [20].

- Surgical management: emergency laparotomy is indicated in those patients in whom clinical signs suggest ischemia, necrosis, or intestinal gangrene (leukocytosis, fever, vomiting, severe abdominal pain, data of peritoneal irritation, hypotension, free air in abdominal cavity, acidosis, or frank sepsis data) [16]. The patient's clinical status, transoperative findings, the presence or absence of peritonitis, and the preference of the surgical team are what will determine the management of the volvulus [18]. Among the therapeutic options are in the following:

- Colopexia: it is performed in cases where the surgical examination shows intestinal viability, without data of ischemia or necrosis, and consists in the reduction of the volvulate loop and subsequently fixing it to the abdominal wall in order to reduce the risk of recurrence, with a lower mortality rate [24].
- Intestinal resection with primary anastomosis: the surgical procedure of choice is currently considered in patients in whom ischemia of the proximal and distal areas is not observed, after resection [7]; however, this procedure is even in controversy due to the lack of preparation of the colon in emergency surgery and the risk of dehiscence of the anastomosis [13], which is estimated at an approximate percentage of 5.5% [18].
- Intestinal resection with Paul-Mickulicz technique: it consists of resection of the volvulated segment that includes the mesenteric neck, which in many cases requires a wide mobilization of the rectum to perform externalization of the proximal and distal loop, which is complex to perform in patients undergoing emergency surgery [7].
- Intestinal resection with Hartmann technique: resection of the volvulated segment with closure of the distal loop and externalization of proximal colostomy is indicated in those patients in whom ischemia of the proximal and/or distal intestinal segments is observed, or intestinal gangrene with data of peritonitis, as well as in those in whom the primary anastomosis is considered at high risk of leakage due to the preoperative state of the patient [7].

8. Conclusion

Megacolon, as a complication in the chronic stage of American Trypanosomiasis or Chagas disease, is a frequent cause of intestinal obstruction secondary to dilated loop volvulation in countries where the disease is considered endemic.

In countries that are not considered endemic, consensus has been proposed for early detection in primary health systems, since a lack of information has been detected in professionals at this level of care [25]. The detection of biochemical markers allows to generate a long-term correlation of the risk of cardiomyopathy and mega syndromes associated with parasitemia levels [26]. Treatment in the acute stage of the disease leads to a high cure rate; however, many of the patients do not receive timely treatment due to nonspecific symptoms in this period. The treatment of the volvulations will depend on the clinical state of the patient, being able to opt for management with or without intestinal resection of the first instance, through endoscopic approaches or emergency surgery. For patients with any sign of peritoneal irritation who are judged as already suffering bowel gangrene, emergency operation must be attempted. Because urgent approaches under general anesthesia have shown a higher rate of postoperative complications, models of minilaparotomy under regional anesthesia are positioned as another therapeutic option in high-risk patients for emergency surgery [27]. By contrast, for clinically stable patients, that is, those with no signs of peritoneal irritation, endoscopic reduction is the first acute care option of choice and has been widely accepted with a high success rate and low morbidity and mortality rates [28]. However, this is only a temporizing procedure, and a high recurrence rate has been reported. Therefore, it is strongly recommended that endoscopic reduction should be followed by elective definitive surgery that is recommended to perform laparoscopically with primary anastomosis [29]. There are studies in which the approach with local anesthesia for intestinal resection has been proposed in patients with uncomplicated volvulations and low-risk patients, as an alternative for the definitive management of this disease [30]. For cases in which the surgical risk due to comorbidities contraindicates surgery, procedures with assisted colopexia and percutaneous colostomy have been shown to have good results for relapse prevention [31]. Similarly, the use of simple percutaneous endoscopic colostomy with a probe has also proven to be efficient in elderly patients [32]. Monitoring through *T. cruzi* urinary antigens has proven to be an efficient method for the detection of Chagas disease reactivation in patients presenting with HIV coinfection [33]. The clinical signs and the general condition of the patient will condition the basis for the final management of intestinal obstruction; however, the etiological cause of the volvulation should be monitored.

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