THE DIGESTIVE TRACT IN CHAGAS' DISEASE

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Carlos Chagas (1916) had already mentioned dysphagia as one of the symptoms of the acute phase of American tripanosomiasis and suspected an aetiological link between the disease which he had discovered and the endemic illness long known in the interior of Brazil as "mal de engasgo".

Amorin & Correa Neto (1932) and Etzel (1934), in studies which have become classic, described the lesions of the intramural plexus found in patients with megaesophagus and megacolon and demonstrated the systematic character of the neuronal involvement which extends throughout the digestive tract.

Koeberle & Nador (1955) and Koeberle, in successive publications (1956; 1960; 1961 a, b; 1968) confirmed by other investigations (Alcantara & Oliveira, 1964; Andrade & Andrade, 1966; Okumura, 1967; Tafuri & Brener, 1967), furnished the anatomical and pathological basis for the definitive acceptance of a chagasic aetiology for endemic megaesophagus and megacolon.

The way by which the neuronal destruction in Chagas' disease proceeds has not been entirely elucidated, however it seems to depend on cellular immunity (Ribeiro dos Santos & Hudson, 1980a, b; Teixeira, 1977; Teixeira et al., 1980).

The lesions are particularly important in the myenteric plexus in virtue of its localization between the longitudinal and circular muscular layers of the digestive tract and of the participation of this plexus in the inflamatory process that develops in the vicinity of parasitized cells after these burst (Koeberle, 1961 a).

Enervation occurs in various levels and in an irregular manner along the digestive tract and the reduction in the number of nerve cells of the intramural plexus has repercussions in the motor physiology of the various segments. However its consequences are greater at the level of the oesophagus and of the colon in function of the physiology of these segments (Koeberle, 1960, 1969a).

From the clinical point of view the final result is the development of megaoesophagus and megacolon which constitute the most significant digestive manifestation of Chagas' disease (Rezende, 1979).

The prevalence of these manifestation in endemic areas varies from one country to another and from one region to another in the same country (Rezende, 1979). This fact indicates the existence of strains of *T. cruzi* with different pathogenicities in relation to the nerve plexus. This has been confirmed in experimental studies (Andrade, 1974).

On the other hand, the great variation in the level of enervation seen among infected individuals belonging to the same community or even to the same family, points to the existence of important immunological factors linked to the host.

In this central region of Brazil, where megaesophagus and megacolon are found with greatest frequency, a radiological investigation carried out in Mambaí, state of Goiás, showed a prevalence of 6.7% for chagasic oesophagopathy among 1.021 infected individuals (Castro et al., 1984). Other epidemiological investigations in endemic areas also indicate a prevalence of 6 to 9% for chagasic oesophagopathy (Coura et al., 1979).

Until now there does not exist similar studies in relation to the colon.

The follow-up of chagasic patients from the acute phase, also allows the proportion of patients that develop megaviscera in consequence of trypanosomiasis to be evaluated.

In 70 cases where the initial period of infection was known, and accompanied during a period of 5 to 25 years by Rassi in Goiânia, there appeared megaoesophagus in three cases and megacolon in one case (Rezende & Rassi, 1983). Dias (1982) in Bambuí, Minas Gerais, accompanied 115 cases for an average time of 27 years and detected 21 cases of oesophagopathy, in which 4 (3.5%) had marked dilation by radiological exam. He also found prolongation, with or without dilation of the sigmoid colon or of the rectal ampulla, in 33 out of the 115 patients.

In the university hospital of Goiânia where patients from a vast endemic region converge, 618 new cases of megaoesophagus were attended during a period of 6 years (1976-1982). On the basis of serological samples, the number of chagasic patients attended in the same period was estimated as 15% and the prevalence of megaoesophagus in the chagasic population could be evaluated in 4.3% (Rezende, 1983). If only the ectasic forms are considered the prevalence falls to 3.6%.

Chronic chagasic cardiopathy was found in 49.6% of 890 cases of megaoesophagus and megacolon. Of this total only 11.5% of the cases showed increase in cardiac area, while 47.1% had important electro-

cardiographic alterations (Rezende, 1983). The most frequent electrocardiographic alterations were single or multifocal ventricular extrasystoles, and the complete right bundle branch block.

In the following section the different segments of the digestive tract will be discussed.

Oesophagus

Chagasic megaoesophagus is clinically indistinguishable from idiopathic achalasia of the oesophagus. Positive serological reaction for Chagas' disease, as well as an association with megacolon or with chronic chagasic cardiopathy allows a differential diagnosis. It is estimated that the proportion among us of idiopathic achalasia to chagasic megaoesophagus is approximately 1:30.

In a region where chagasic oesophagopathy is very prevalent it is possible to find different levels of oesophageal involvement with a great variety of morphological aspects and differences in motor behaviour of the oesophagus, from a minimal alteration in evacuation to advanced forms of dolichomegaoesophagus.

For practical and therapeutical purposes the different levels can be classified into four groups (Rezende, Luar & Oliveira, 1960), resembling the classification for idiopathic achalasia (Olsen, Holman & Anderson, 1953).

In this classification, group I consists of anectasic forms, where the diameter of the oesophagus is within the normal limits, but there is delay in evacuation; in group II there exists moderate dilation and motor activity is uncoordinated; in group III the level of dilation and of retention is higher, and motor activity decreases; group IV consists of advanced forms with prolongation of the organ, that is, dolichomegaoesophagus. The greater number of cases (65%) falls into the intermediate groups I and III (Fig. 1).

This staged development does not necessarily reflect the duration of the illness. There are cases which evolve rapidly to the advanced forms while others remain stable in the initial stages.
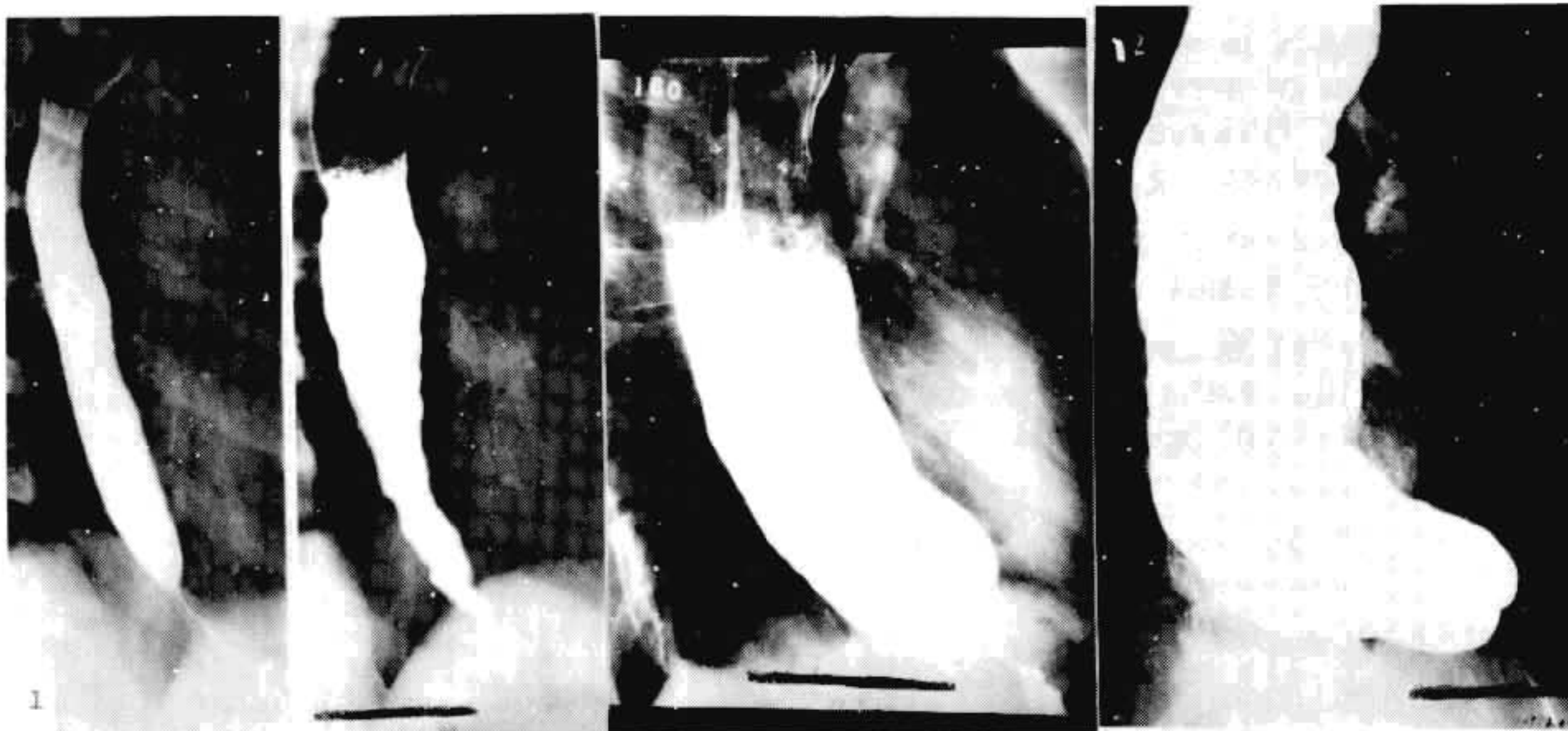

Fig. 1 — Staged development of chagasic oesophagopathy.

From the manometric point of view the results are also very varied and only in advance forms are the classical stages of aperistalsis and of total achalasia found (Godoy, 1972; Rezende, 1978).

In the initial stages it is possible to register in the same tracing peristaltic and synchronous waves (Godoy, 1972; Pinotti, 1968).

In chagasic oesophagopathy, the force of musculatory contractions in the oesophagus is reduced, producing waves of inferior amplitude to those obtained from normal individuals (Dantas et al., 1983). This data can be useful in the distinction from diffused spasm of the oesophagus.

The basal pressure of the lower sphincter in chagasic megaoesophagus, even when continuous perfusion is used, varies within a very broad band. The data from the literature is very contradictory when these values are compared to those in normal individuals. The values are sometimes above (Moraes Filho, 1984; Paula Costa & Rezende, 1978) or sometimes below (Dantas, 1983; Padovan, 1977) those considered as the normal average. Such differences could be the result of the different methods used.

In a manometric study of 50 cases with the oesophagus maintained under continuous aspiration, the basal pressure was shown to be much higher in cases with greater dilation (Paula Costa & Rezende, 1978).

In the same way, the action of pentagastrin has led to divergent results. While Padovan (1977) has found in chagasic megaoesophagus, a reduction in the sensitivity of the sphincter to pentagastrin, Moraes Filho (1984) noted hypersensitivity to the normal sphincter.

Using a dose of 0.06 mg/kg weight a response of up to 40% of the value of the initial basal pressure was obtained with chagasic megaoesophagus (Rezende, 1979).

Achalasia most of the time is partial (Godoy, 1972; Pinotti, 1968) and the incomplete opening of the sphincter can be well demonstrated and quantified when continuous perfusion is used (Fig. 2).

The involvement of the function of the sphincter is greater when the motor alteration of the body of the oesophagus is more evident (Godoy, 1972).

We have verified that when there exists a partial opening of the sphincter, relaxation of the sphincter to the same degree has been observed by means of a distension in the stomach walls with an inflatable balloon (Fig. 3).
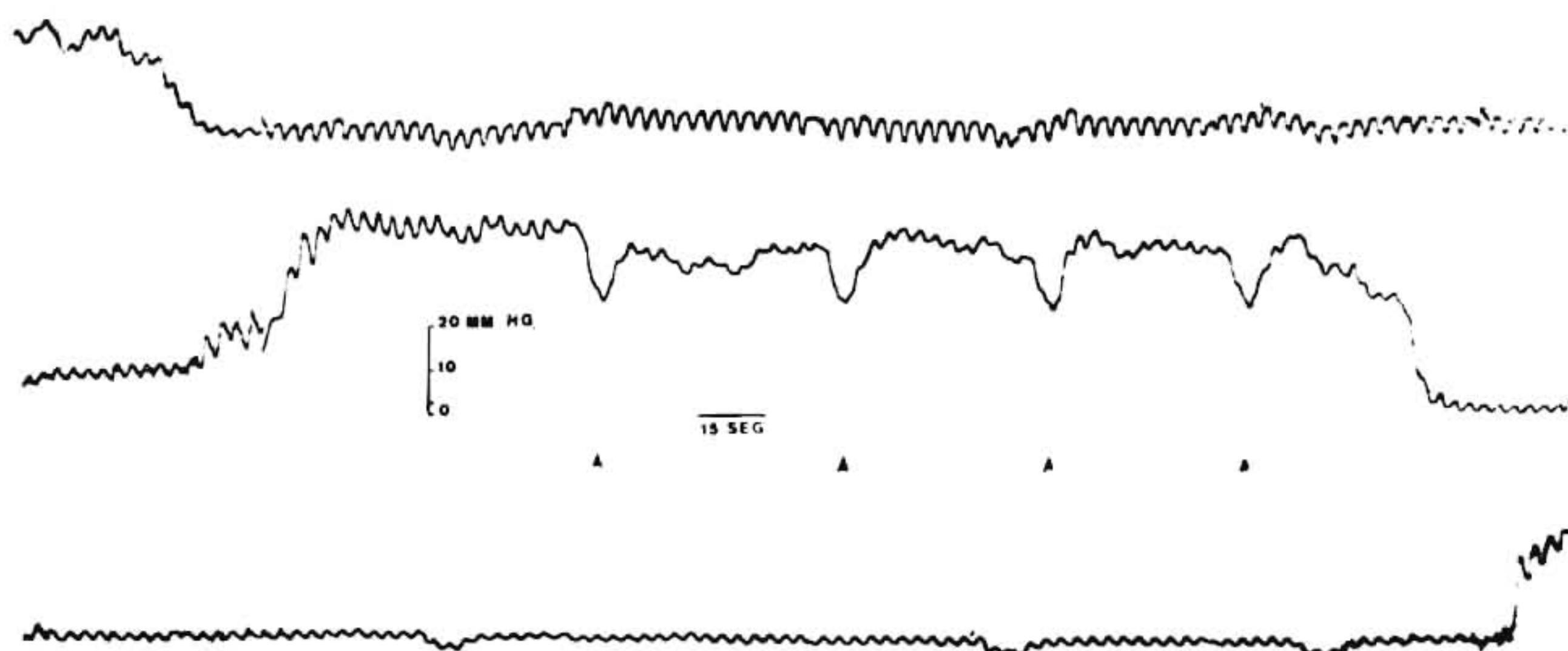
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Fig. 2 — Incomplete opening of the lower sphincter of the stomach, in a case of chagasic megaoesaphagus, produced by swallowing 3ml of water even in the absence of a motor response of the body of the stomach. The upper trace corresponds to the pressure registered 5cm above the sphincter and the lower trace to the gastric background.
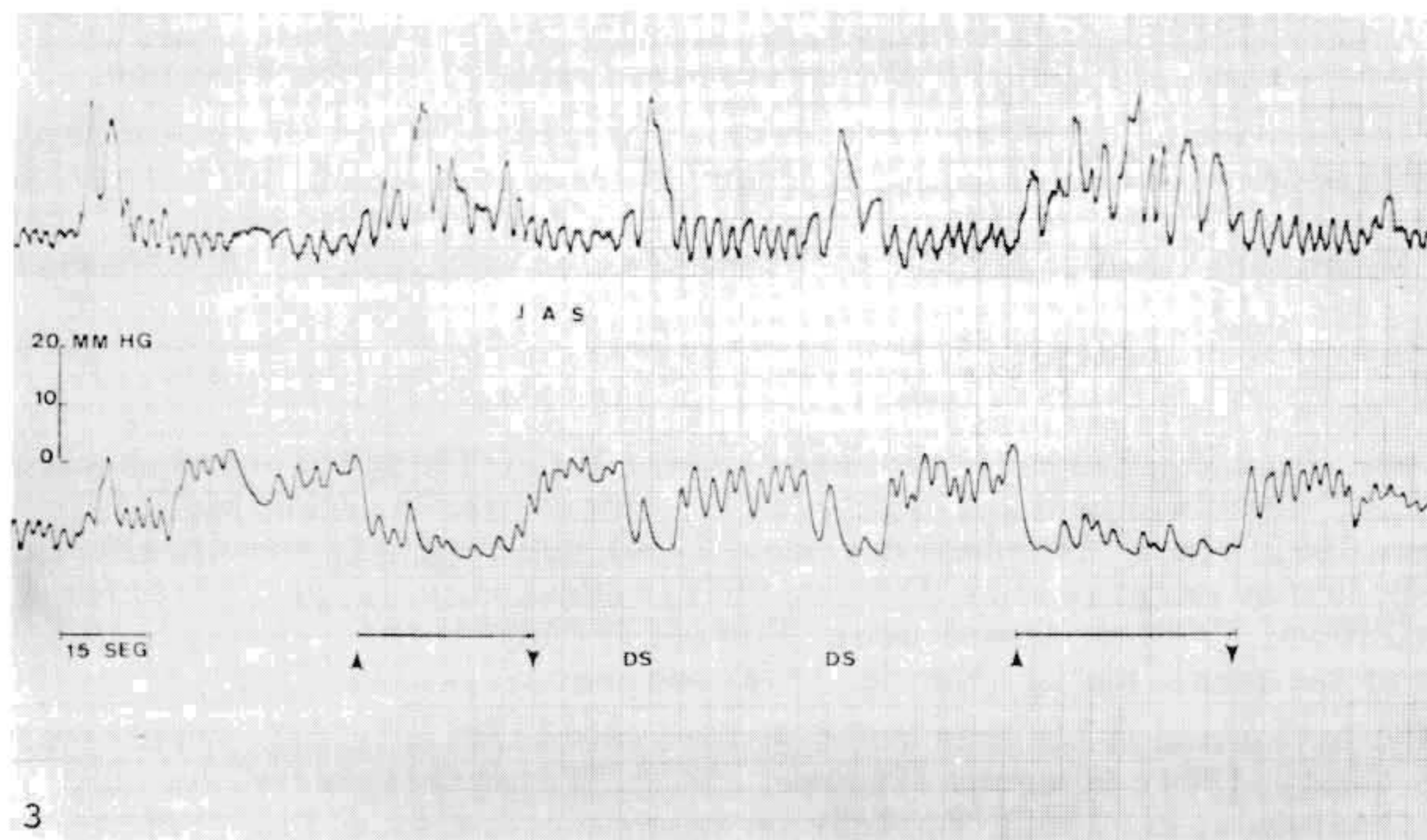
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Fig. 3 — Manometric demonstration of partial relaxation of the lower sphincter of the stomach by distension of the oesophageal walls. The blowing up of a balloon placed in the interior of the stomach produced a rise in pressure in the body of the stomach (upper tracing) and a fall in pressure at the level of the sphincter (lower tracing). The opening of the sphincter obtained by the expansion of the oesaphageal walls has the same amplitude as registered in swallowing (DS).

The action of glucagon on the lower sphincter of the oesophagus seems to depend on the degree of involvement of the innervation of the sphincter. While in some cases glucagon does not have any effect on the sphincter, on other occasions it can produce a marked basal decline as shown in Fig. 4 (data not published).

One of the characteristics of chagasic oesophagopathy is the hyperreactivity of the oesophageal musculature when submitted to a colinergic stimulus (Godoy, 1972). An injection of 0.05 mg/kg weight of metacolin subcutaneously or another colinergic agent such as betanecol produces intense and uncoordinated contractions of the oesophageal musculature above all in the distal segment. This type of reaction is more evident in cases from group II.

This pharmacological test of enervation, by its sensitivity allows us to verify the precocity with which enervation in Chagas' disease occurs. The test has been positive in one patient with only 45 days of infection and consequently still in the acute phase (Raia & Gama-Rodrigues, 1983a).
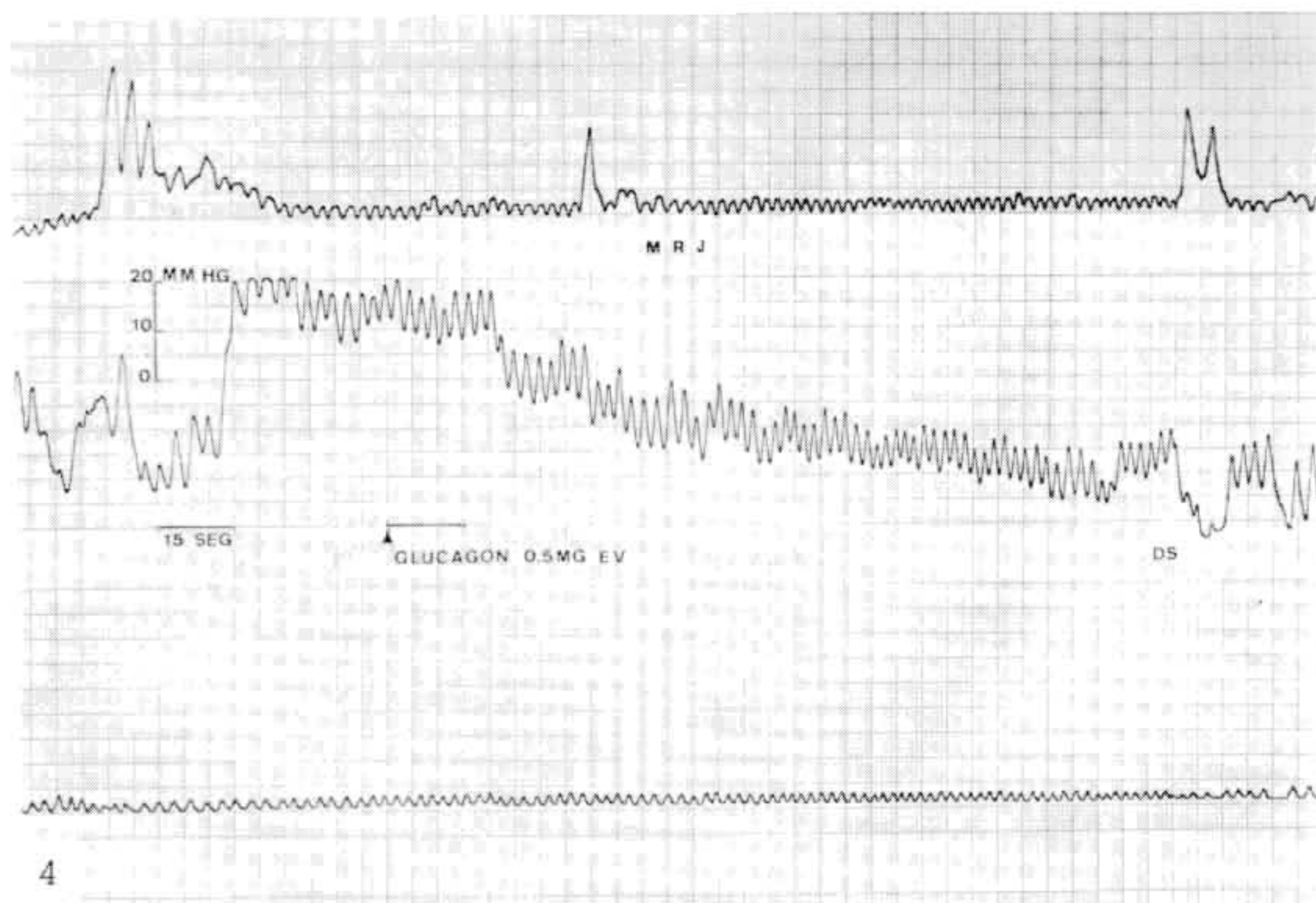
Fig. 4 — The action of glucagon on the lower sphincter of the stomach in a case of group II chagasic megaoesaphagus with incomplete achalasia.

The treatment of chagasic megaoesophagus as in idiopathic achalasia is carried out by instrumental dilation of the cardia or by surgery.

Dilation by means of a pneumatic or hydrostatic balloon consisted in the past, the treatment of choice, and only patients with an unsatisfactory response to dilation, or who had complications, were advised to be operated.

The results of dilation were not very satisfactory in the long term, and the improvements of surgical techniques has resulted in dilation being currently considered as a second option.

The most common operation used, above all, in groups II and III consists in cardiomyotomy associated with some type of anti-reflex procedure. Alternatively where there are precise indications, different kinds of cardioplasty, jejunal interposition or sub-total oesophagectomy are used, with the reconstruction of intestinal tract movement by means of oesophagocoloplasty or cervical gastroesophageal anastomosis.

Stomach

Chronic chagasic gastropathy was singled out by Vieira (1968) who found an association between this symptom and megaoesophagus and megacolon. It is characterized by acidic-peptic hyposecretion (Etzel, 1935; Padovan, 1972; Vieira, Meneghelli & Godoy, 1964), hyperreactivity to colinergic stimulus (Vieira & Godoy, 1964), loss or receptive relax (Oliveira, 1978), alteration in the gastric evacuation, which can be accelerated (Oliveira, 1978) or slowed down (Fonseca & Toledo, 1952; Padovan, 1979; Vieira, 1968), hypertrophy of the piloric muscle (Kunzle, 1973) and chronic gastritis (Padovan, 1972; Vieira, 1968).

Acidic hyposecretion has been noted in the various tests of gastric stimulation: Cafein (Vieira, Meneghelli & Godoy, 1964), Histamine (Padovan, 1972), Histalog (betazole) (Oliveira, 1972), Pentagastrin (Leão, 1976; Padovan et al., 1982). Parallelly in these patients basal and post-prandial hypergastrinemy were found (Troncon, 1982).

The chronic gastritis as well as duodenal-gastric biliary reflex is frequently found in patients with the digestive form of Chagas' disease. In a series of endoscopies carried out on patients with chagasic megaoesophagus, duodenal-gastric reflex was found in 30.4% of them. This can be an additional factor for the appearance of chronic gastritis (Rezende et al., 1984).

The studies carried out until now indicate that the chronic chagasic gastropathy occurs in various forms depending on the level of enervation of the intramural plexuses and on the evolutive state of the disease.

The advanced phase which we can label decompensated is characterized by marked changes in mobility and secretion with chloridic-peptic hyposecretion, delay in gastric evacuation and eventually pyloric hypertrophy.

The cases classified as achalasia of the pylorus probably correspond to this last phase of chagasic gastropathy.

In such cases the practice or pyloroplasty is justified as an addition to cardiomytomy, in patients undergoing surgical treatment of megaesophagus (Raia & Gama-Rodrigues, 1983 b).

Duodenum

In a pioneer study, Fonseca & Toledo (1952) were the first to describe radiological alterations in the duodenum of patients with endemic megaesophagus and megacolon.

Excluding the oesophagus and the colon, the duodenum is the sector of the digestive tract in which motor alterations and dilation most commonly occur. The dilation can be limited to the bulb, to the 2nd and 3rd portions or can extend throughout the duodenum (Fig. 5).
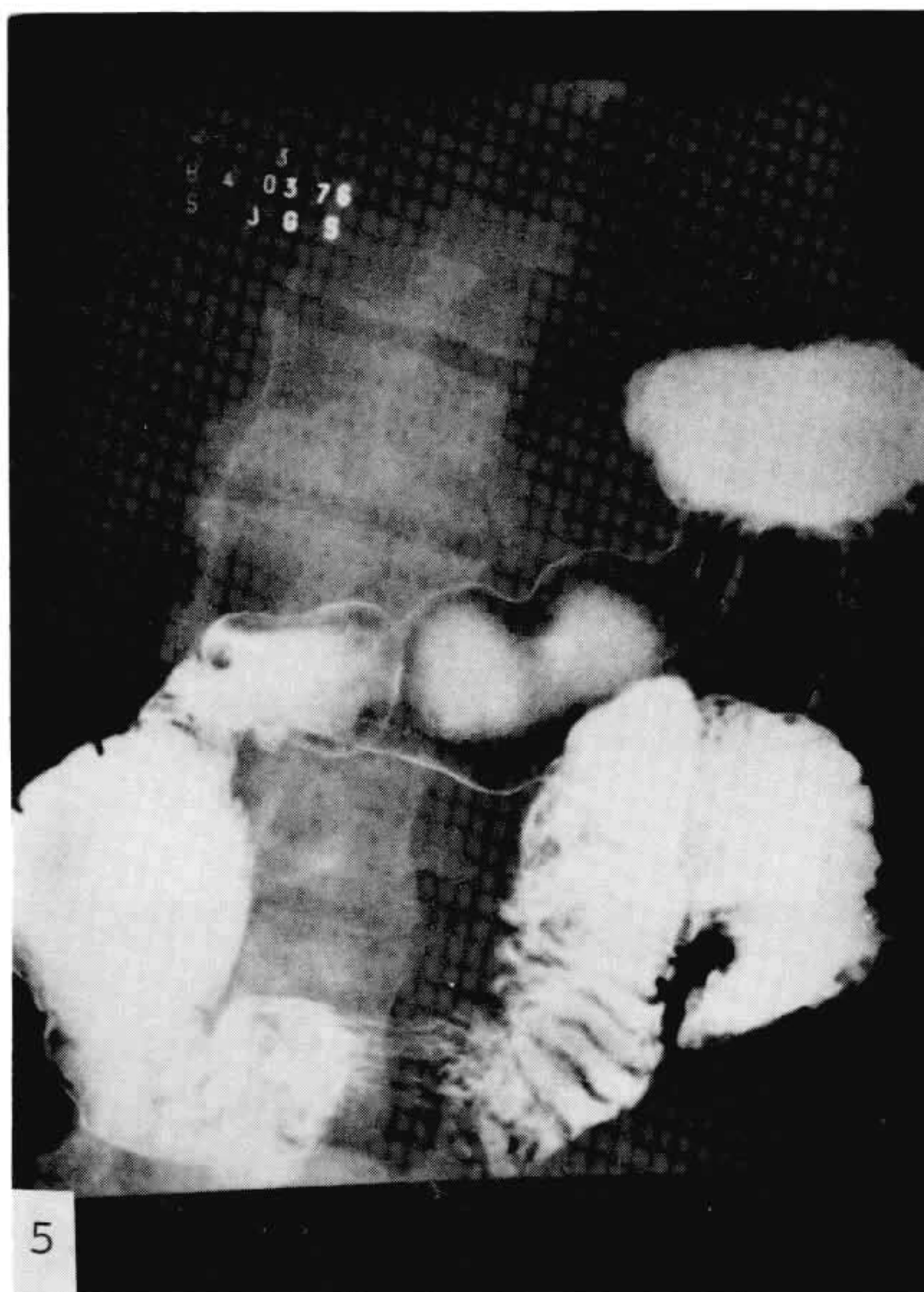

Fig. 5 – Total megaduodenum in a chagasic patient. The proximal jujunum is seen to be equally dilated.

Usually the megaduodenum, in any of its forms, is associated with megaoesophagus and megacolon and rarely occurs as an isolated symptom.

Even in patients without duodenal dilation the existence of enervation can be demonstrated by means of a pharmacological test (Rezende, 1979).

The megaduodenum produces ill-defined symptoms, that can be confused with gastric dyspepsia, which cause the patient discomfort and post-prandial fullness.

Surgical treatment is seldom indicated but can be carried out by means of a duodenojejunal anastomosis. In cases which are associated with megajejunum a partial enterectomy is justified (Raia & Gama-Rodrigues, 1983a).

Small intestine

Alterations in the tonus, mucal relief and intestinal passage in patients with megaesophagus were initially described by Fonseca (1955). The dilation of the small intestine, to form a megajejunum or mega-ileum is very rare (Fig. 5).

Oliveira et al. (1983) demonstrated the existence, in chronic cases of Chagas' disease of abnormalities in the interdigestive migratory motor complexes. In patients with Chagas' disease these complexes have contractions of the same frequency as normal individuals, although of lesser extention and slower propagation, as well as longer duration in the jejunum.

There exists, accelerated absorption in relation to sugars, such as glucose (Meneghelli et al., 1961) and galactose (Meneghelli & Reis, 1967).

The hyperabsorption of glucose explains the precocious hyperglycemia that is observed in some cases during the realization of the oral overloading test for glucose (Reis, 1965; Reis, Oliveira & Vieira, 1960).

Colon

The intrinsic enervation of the intramural plexuses of the colon produces important alterations in the colonal motility leading to the stagnation of the feces and dilation.

A greater knowledge of the physiopathology of the chagasic megacolon has become possible through the application to the colon of manometric studies and the pharmological test of enervation used before in studies of chagasic oesopagopathy (Habr-Gama, 1967; Habr-Gama, Costa Curta & Raia, 1970; Moreira, 1974a; Vieira, Godoy & Carril, 1964).

The following alterations were noted:

1) Rectal-sigmoid incoordination;

2) Hyperreactivity to colinergic stimulus [acetylcoline, prostigmin (neostigmine)] ;

3) Achalasia of the internal sphincter of the anus.

The litterature data is divergent regarding basal motility. While Habr-Gama (1967) found hypermotility, Meneghelli et al. (1982) showed the existence of hypomotility. This discrepency could be due to the presence or absence of feces in the colon stimulating its motility (Meneghelli et al., 1982).

Meneghelli et al. (1983) showed that pentagastrin is devoid of action on the motor activity of the colon in chagasic megacolon. This fact could be related to the absence of the so called gastric-colic reflex, observed in patients with megacolon (Meneghelli, 1977).

Motor alterations can be found in the precocious phase of chagasic colopathy before it is possible to make a radiological diagnosis of megacolon.
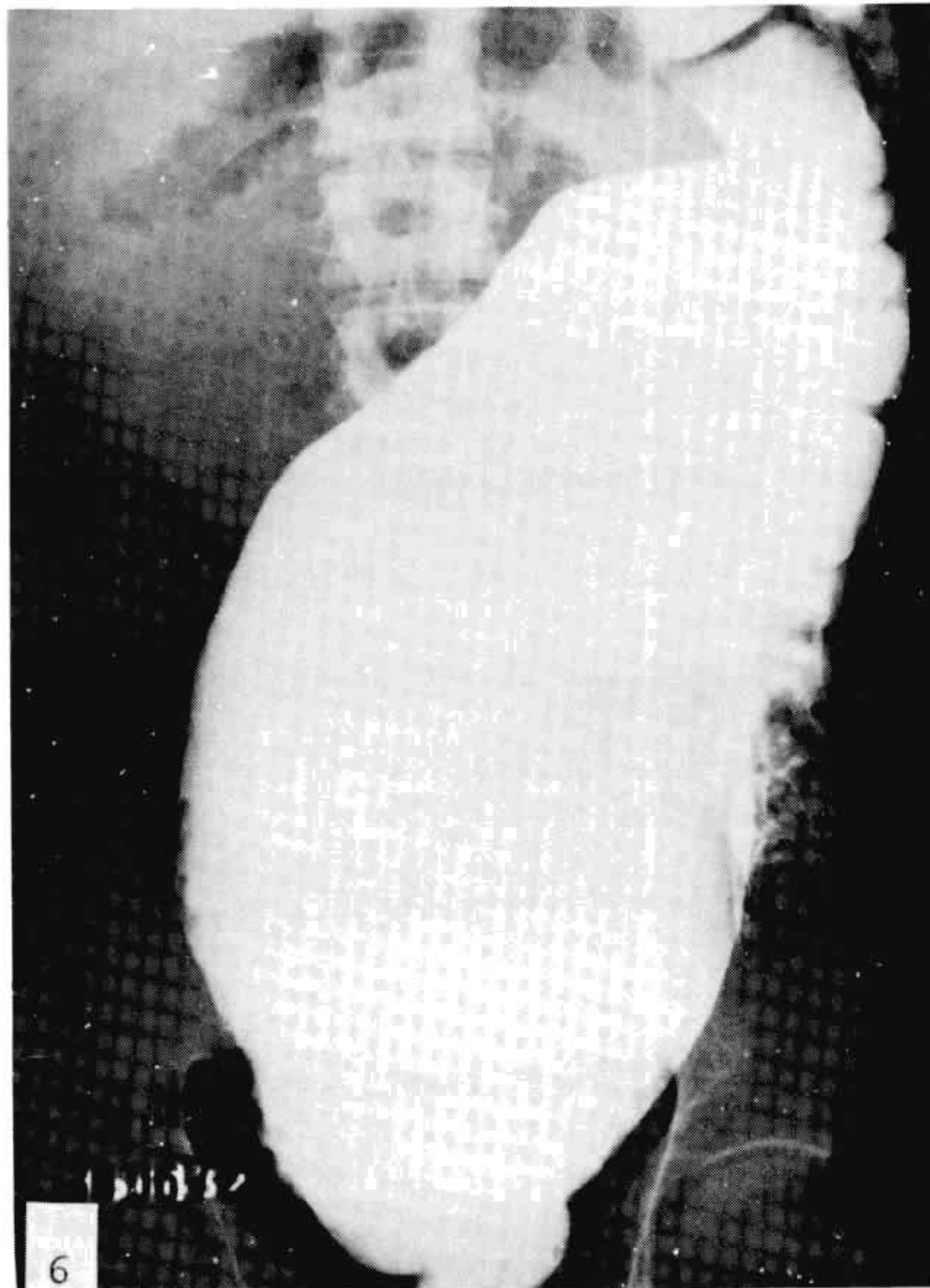

Fig. 6 – Voluminous megacolon in a chagasic patient. In a large number of cases the dilation occurs preferentially in the sigmoid colon and for this reason in these cases the denomination megasigma or megasiogmoid is used.

The achalasia of the internal sphincter of the anus seems to play an important role in the physio-, pathology of chagasic megacolon and could be easily demonstrated manometrically. While in normal individuals the distension of the rectal walls by means of a balloon produces immediately the relaxation of the sphincter, in chagasic colopathy the reflex of the opening of the sphincter disappears.

The dilation is localized, in 80% of the cases in the rectum and sigmoid (Carril, 1966). In other cases it can occur only in the sigmoid colon, only in the rectum, or can extend to the higher reaches of the colon or throughout the colon causing the so called total megacolon (Fig. 6).

Chagasic megacolon once formed should be treated surgically. Clinical treatment, by means of diet, laxatives or intestinal washes should be carried out only in cases where surgical treatment is contra-indicated temporarily or definitely for some reason.

The simple resection of the dilated segment with the conservation of the rectum and colorectal anastomosis leads to a later relapse with megacolonization of the lower colon (Cutait, 1953).

For this reason a large part of the rectum should also be resectioned (Cutait, 1953), such as in Swenson's operation for congenital megacolon, or the rectum should be disfunctionalized by lowering the retro-rectal of the colon after resection of the sigmoid (Duhamel's Operation). There exists many technical variations of the surgical procedures. Moreira (1974b) demonstrated that the simple lowering of the retro-rectal of the sigmoid colon without any resection is sufficient to obtain a reduction in the diameter of the dilated segment and to re-establish intestinal function. Such a practice however involves technical difficulties and its use as a routine procedure is not advised. The megacolon is frequently complicated with the formation of fecaloma and with the sigmoid volvulus.

Gall bladder

Today we know that the extra-hepatic biliary ducts are affected in the digestive form of Chagas' disease.

Conte (1981) proved the existence in patients with chagasic megaesophagus of the intrinsic enervation of the vesicular wall with the total disappearance of the nerve cells of the myoenteric plexus. Despite the enervation the enerved gall bladder presents a normal response to stimulus by ceruline (Conte, 1981).

Villanova (1983) demonstrated, in chagasic colecystopathy, hypersensitivity to the octapeptide of colecystocin as well as to endogenous colecystocin liberated by the introduction into the duodenum of a lipid emulsion made from milk and egg yoke.

Under colinergic stimulus the evacuation of the vesicula also was speeded up as shown by Rosa, Normanha & Rezende (1984) in 18 patients with megaoesophagus.

The marked increase in the volume of the gall bladder with a concommitant dilation of the choledochus has been noted by various authors (Fonseca, 1960; Huggins, 1976; Koeberle, 1968).

In 50 cholecystocholangioghraphies carried out in patients with megaoesophagus and megacolon we found two cases that could be labelled as megavesicula.

Guelrud et al. (1983) showed the existence of hypertonia and an increase in the active phase of the Oddi sphincter in chagasic patients with megaoesophagus. This disfunction of Oddi sphincter in Chagas' disease may be related with the dilation, sometimes found, of the extra-hepatic bilary system.

The occurrence of cholelithiasis in patients with chagasic megaoesophagus was investigated in the city of São Paulo, by Pinotti et al. (1980) and the occurrence was not found to be significantly different to that found in the population in general. However, Palmero et al. (1982), in the city of Cordoba, Argentina, found a greater prevalence of cholelithiasis among chagasic patients.

Salivary glands

The hypertrophy of the salivary glands, notably the parotids, is a frequent occurrence in any obstructive pathology of the oesophagus. In patients with megaoesophagus it is found in around 25% of the cases (Rezende, 1983) (Fig. 7).

This hypertrophy is frequently attributed to the oesophago-salivary reflex described by Rogers at the beginning of the century.

However, Vieira & Camelo (1963) and Vieira (1964) demonstrated that there exists in the chagasic patients a hypersensitivity of the salivary glands to different stimuli ranging from mastigation to the effect of pilocarpine. This fact is attributed to the involvement of the innervation of this gland.

As a result of the hypertrophy of the salivary glands, the amylasemia of the chagasic patient can show higher than normal values (Vieira, 1964).

Fig. 7 — Hypertrophy of the parotids in a patient with megaoesa-
phagus. The face takes on a triangular appearence and is known
as "Cats's face".

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