

Surgical risk for patients with Chagasic achalasia and its correlation with the degree of esophageal dilation

José Garcia Neto, Roberto de Cleva, Bruno Zilberstein, Joaquim José Gama-Rodrigues

José Garcia Neto, Surgery Division, Hospital das Clínicas, Federal University of Goiás Medical School, Goiás, Brazil
Roberto de Cleva, Bruno Zilberstein, Joaquim José Gama-Rodrigues, Gastroenterology Department, Digestive Tract Surgery Division, Hospital das Clínicas, University of São Paulo Medical School, São Paulo, Brazil

Correspondence to: Professor. Dr. Roberto de Cleva, Gastroenterology Department, University of São Paulo Medical School, Rua Cel. Arthur Godoy, 125 Apto 152, São Paulo-SP CEP 04018-050, Brazil. roberto.cleva@hcnet.usp.br

Telephone: +55-11-30828000 Fax: +55-11-30828000

Received: 2004-10-23 Accepted: 2004-12-23

Abstract

AIM: To analyze the risk of cardiovascular complications in patients with indication for surgical treatment of Chagasic esophageal achalasia and to correlate the surgical risks with the degree of esophageal dilation, thereby proposing a risk scale index.

METHODS: One hundred and twenty-four patients with Chagasic esophageal achalasia, who received surgical treatment at the Hospital das Clínicas of the Federal University of Goiás, were included in this study. The patients were mostly related to the postoperative complications due to the cardiovascular system. All the patients were submitted to: (1) clinical history to define the cardiac functional class (New York Heart Association); (2) conventional 12-lead electrocardiogram at rest; and (3) contrast imaging of the esophagus to determine esophageal dilatation according to Rezende's classification of Chagasic megaesophagus.

RESULTS: An assessment of the functional classification (FC) of heart failure during the preoperative period determined that 67 patients (54.03%) were assigned functional class I (FC I), 46 patients (37.09%) were assigned functional class II (FC II), and 11 patients (8.87%) were assigned functional class III (FC III). None of the patients were assigned to functional class IV (FC IV). There was a positive correlation between the functional class and the postoperative complications (FC I×FC II: $P<0.001$; FC I×FC III: $P<0.001$). The ECG was normal in 44 patients (35.48%) and presented abnormalities in 80 patients (64.52%). There was a significant statistical correlation between abnormal ECG (arrhythmias and primary change in ventricular repolarization) and postoperative complications ($P<0.001$). With regard to the classification of the Chagasic esophageal achalasia, the following distribution was observed: group

II, 53 patients (42.74%); group III, 37 patients (29.83%); and group IV, 34 patients (27.41%). There was a positive correlation between the degree of esophageal dilation and the increase in postoperative complications (grade II×grade III achalasia: $P<0.001$; grade II×grade IV achalasia: $P<0.001$; and grade III×grade IV achalasia: $P=0.017$). Analyzing these results and using a multivariate regression analysis associated with the probability decision analysis, a risk scale was proposed as follows: up to 21 points (mild risk); from 22 to 34 points (moderate risk); and more than 34 points (high risk). The scale had 82.4% accuracy for mild risk patients and up to 94.6% for the high risk cases.

CONCLUSION: The preoperative evaluation of the cardiovascular system, through a careful anamnesis, an ECG and contrast imaging of the esophagus, makes possible to estimate the surgical risks for Chagas' disease patients who have to undergo surgical treatment for esophageal achalasia.

© 2005 The WJG Press and Elsevier Inc. All rights reserved.

Key words: Postoperative; Chagas' disease; Surgical risk; Chagasic achalasia; Cardiovascular risk

Neto JG, de Cleva R, Zilberstein B, Gama-Rodrigues JJ. Surgical risk for patients with Chagasic achalasia and its correlation with the degree of esophageal dilation. *World J Gastroenterol* 2005; 11(37): 5840-5844

<http://www.wjgnet.com/1007-9327/11/5840.asp>

INTRODUCTION

Preoperative clinical evaluation, a common practice in our midst, aims to estimate the risk of postoperative complications. The patient's clinical status is assessed and emphasis is given to cardiac function, as well as to the inherent risk of the surgical procedure performed, through the use of the several indexes available in the literature. According to Dias *et al.*^[1], the clinical status during the preoperative period answers two questions: what is the surgical risk, and what can be done to reduce it? The adequate management of perioperative risk factors, such as normalizing blood pressure and diabetes mellitus, treating chronic pulmonary obstructive disease and the utilization of endovenous beta-blockers perioperatively in patients with coronary disease, can significantly decrease perioperative complications. Determining perioperative risk factors can be useful as it can provide elements to choose the best procedure or even if surgical treatment should be

performed^[2]. The most commonly used risk indexes are those from the American Society of Anesthesia^[3] and the Goldman index^[4]. It is important to point out that Chagasic cardiopathy is not specifically evaluated in risk indexes, since Chagas' disease is not found in Western countries.

Cardiovascular complications in patients who have to undergo noncardiac surgery and changes in cardiac function caused by Chagas' disease have a direct influence over the morbidity and mortality rate of the surgical procedure^[5]. Establishing guidelines, which identify Chagasic patients at high risk for complications arising from noncardiac surgery, as well as minimizing the onset of such complications during the perioperative period, are very important. The patients with Chagasic esophageal achalasia may have high cardiovascular system impairment.

In view of the scarce literature regarding the surgical risks for noncardiac procedures on the patients with Chagasic esophageal achalasia, and because of the frequent association between cardiopathy and digestive diseases, the purpose of the study was to analyze the risk of cardiovascular complications in patients with indication for surgical treatment of Chagasic esophageal achalasia and to correlate the surgical risks with the degree of esophageal dilation, and thereby proposing a risk scale index.

MATERIALS AND METHODS

A total of 124 patients with Chagasic esophageal achalasia submitted to surgical treatment at the Hospital das Clínicas, Federal University of Goiás from January 1995 and December 2000, were included in this study. Of them, 68 (54.83%) were males and 56 (45.16%) were females, with a mean age of 39 years. All the patients were subjected to: (1) clinical history to define the cardiac functional class^[3] (New York Heart Association); (2) conventional 12-lead ECG at rest; and (3) contrast imaging of the esophagus to determine esophageal dilatation according to Rezende's classification of Chagasic megaesophagus^[6,7] as follows: group I: esophagus with normal caliber but with slow contrast progression and small retention of barium contrast 1 min after ingestion; group II: esophagus with small to moderate dilatation and considerable radiological contrast retention; group III: hypotonic esophagus with important dilatation,

poor motor activity and great retention of radiological contrast; and group IV: esophagus elongated that lies over the diaphragm with great retention of radiological contrast (dolico-megaesophagus, Figure 1).

All the patients were submitted, according to the radiological classification of the Chagasic megaesophagus, to surgical treatment of achalasia (Table 1), utilizing conservative techniques for the non-advanced esophageal achalasia (Grades II and III), employing Pinotti's operation (cardiomyectomy with fundoplication) and resective techniques using Serras Doria operation (Grondahl cardioplasty with hemigastrectomy and Roux en Y diversion) for advanced achalasia (Grade IV). Postoperative complications, directly related to the cardiovascular system, during the hospitalization period, were analyzed.

For statistical analysis, the variance analysis was used for comparisons between continuous numerical variables of distinct (independent) groups; the χ^2 and the Fisher's tests were used for comparisons between the quantities in which each patient was situated at a given level of classification; and multivariate regression and probabilistic decision analyses were used in the final phase of the study to create the surgical risk index.

Table 1 Patients according to the grade of esophageal dilatation and surgical treatment adopted

Esophageal dilatation	Surgical technique	Patients (%)
Group II		53
	Cardiomyectomy with fundoplication (Pinotti's technique)	53
Group III		37
	Cardiomyectomy with fundoplication	32
	Grondahl cardioplasty with hemigastrectomy and Roux-en-Y diversion (Serras Doria operation)	5
Group IV		34
	Grondahl cardioplasty with hemigastrectomy and Roux-en-Y diversion	26
	Mucosectomy	4
	Merendino's operation	2
	Gastrostomy	2

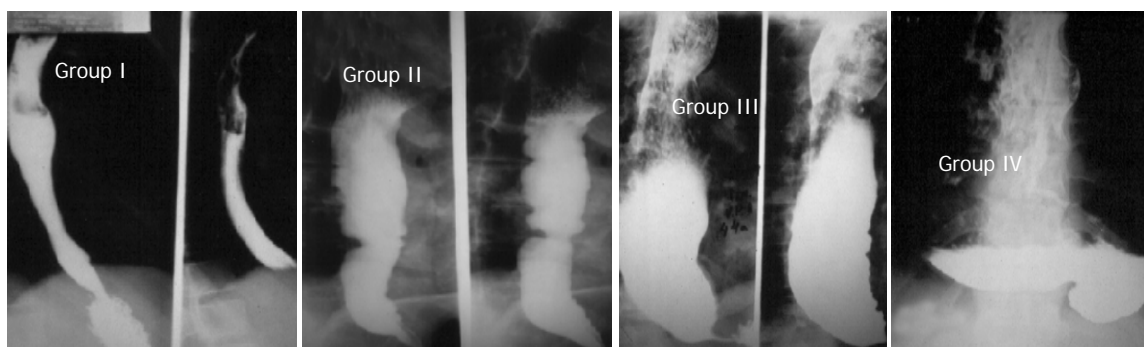


Figure 1 Contrast imaging of the esophagus according to Rezende's classification of Chagasic megaesophagus. Group I: esophagus with normal caliber but with slow contrast progression and small retention of barium contrast 1 min after ingestion; group II: esophagus with small to moderate dilatation and considerable

radiological contrast retention; group III: hypotonic esophagus with important dilatation, poor motor activity and great retention of radiological contrast; and group IV: esophagus elongated over the diaphragm with great contrast retention.

RESULTS

An assessment of the functional classification (FC) of heart failure patients with Chagasic achalasia during the preoperative period determined that 67 patients (54.03%) were assigned functional class I (FC I), 46 patients (37.09%) were assigned functional class II (FC II), and 11 patients (8.87%) were assigned functional class III (FC III). None of the patients were assigned to functional class IV (FC IV). There was a positive correlation between the functional class and the postoperative complications (Table 2).

The ECG results are shown in Table 3. The ECG was normal in 44 patients (35.48%) and presented abnormalities in 80 patients (64.52%). We observed that a single patient could exhibit more than one change in the ECG and the most frequently observed abnormalities were complete right bundle branch block (CRBBB) and ventricular extrasystole in 28 patients (22.58%). We also observed a significant statistical correlation between abnormal ECG (arrhythmias and primary change in ventricular repolarization) and postoperative complications ($P < 0.001$, Table 4).

With regard to the classification of the Chagasic esophageal achalasia, the following distributions were observed: 53 patients (42.74%) were classified into group II; 37 patients (29.83%) into group III; and 34 patients (27.41%) into group IV. The cardiovascular complications related to the esophageal dilation are shown in Table 5. A positive correlation between the degree of esophageal dilation and postoperative complications was observed, i.e., the higher the degree of esophageal dilation, the higher the risk of complications (grade II × grade III: $P < 0.001$; grade II × grade IV: $P < 0.001$; and grade III × grade IV: $P = 0.017$).

Cardiovascular complications, defined as any change detected in the cardiovascular system during the in-hospital postoperative recovery period, are described in Table 6. Four patients (3.22%) died. The cause of death was classified as: cardiogenic shock (one patient); pulmonary embolism (one patient); stroke (one patient); and non-defined causes (one patient) at the 5th postoperative day, although the presence of tachyarrhythmias was suspected.

Analyzing these results and using a multivariate regression analysis associated with the probability decision analysis, with direct and specific application to the Chagasic megaesophagus patient, we proposed a risk scale (Table 7). In terms of classifying preoperative risks, the point scale was as follows: up to 21 points (mild risk); from 22 to 34 points (moderate risk); and more than 34 points (high risk). The scale had 82.4% accuracy for mild risk patients and up to 94.6% for the high risk patients.

Table 2 Postoperative complications according to the functional class classification

Results	Functional class/number of patients					
	I (n = 67) ^{b,d}		II (n = 46) ¹		III (n = 11)	
	n	%	n	%	n	%
No complications	39	58.21	11	23.91	-	0.00
With complications	28	41.79	35	76.09	11	100.00
Heart failure/shock	0	0.00	4	11.43	7	63.64
Death	1	3.57	2	5.71	1	9.09
Others	27	96.43	29	82.86	3	27.27

^b $P < 0.001$ FCI vs FCII; ^d $P < 0.001$ FCI vs FCIII; ¹ $P = 0.072$ FCII vs FCIII.

Table 3 Preoperative ECG results in patients with Chagasic esophageal achalasia

ECG results	Patients (n)	%
Normal ECG	44	35.48
Isolated ventricular extrasystoles	58	37.09
Complete right bundle branch block	35	28.22
Primary change in ventricular repolarization	12	9.67
First-degree atrioventricular block (1 st degree AVB)	16	12.9
Second-degree atrioventricular block (2 nd degree AVB)	02	1.61
Mobitz I		
Second-degree atrioventricular block (2 nd degree AVB)	03	2.41
Mobitz II		
Complete atrioventricular block (CAVB)	08	6.4
Upper anterior divisional block (DB)	11	8.87
Complete left bundle branch block (CLBBB)	03	2.41
Paired ventricular extrasystoles	09	7.25
Supraventricular extrasystoles	06	4.83
Atrial fibrillation (AF)	04	3.22

Table 4 Correlation between postoperative complications and ECG changes

Results	ECG results			
	Normal (n = 44)		With abnormalities (n = 80)	
	n	%	n	%
No complications	27	61.4	23	28.8
With complications				
CHF/shock	2	11.8	8	14.0
Death	1	5.9	3	5.3
Others	14	82.4	46	80.7

$\chi^2 = 12.548$; $P < 0.001$.

Table 5 Postoperative complications according to the degree of dilation of the Chagasic achalasia

Complications	Achalasia groups					
	II (n = 53) ^{b,d}		III (n = 37) ¹		IV (n = 34)	
	n	%	n	%	n	%
No complications	33	62.26	13	35.14	4	11.76
With complications	20	37.74	32	64.86	38	88.24
CHF/shock	-	0.00	6	18.75	7	18.42
Death	-	0.00	2	6.25	2	5.26
Others	20	100.00	24	75.00	29	76.32

^b $P < 0.001$ GII vs GIII; ^d $P < 0.001$ GII vs GIV ¹ $P = 0.017$ GIII vs GIV.

Table 6 Postoperative cardiovascular complications after surgical treatment of Chagasic esophageal achalasia

Complications	Patients (%)
Decompensated congestive heart failure	12 (9.67)
Cardiogenic shock	03 (2.41)
Ventricular extrasystole	58 (46.77)
Sinus bradycardia	22 (17.74)
Non-sustained ventricular tachycardia	12 (9.67)
Sustained ventricular tachycardia	01 (0.80)
Acute atrial fibrillation	05 (4.03)
Supraventricular tachycardia	03 (2.41)
Temporary complete atrioventricular block	01 (0.80)
Acute arterial occlusion	04 (3.22)
Stroke	03 (2.41)
Pulmonary embolism	02 (1.67)
Acute renal failure	02 (1.67)

Table 7 Risk index for Chagasic achalasia

a) Points	
Achalasia	Points
Grade II	9
Grade III	13
Grade IV	17
Primary changes in ventricular repolarization	Points
Yes	15
No	0
Arrhythmias	Points
Yes	12
No	0
Functional class	Points
1	6
2	12
3	24
(b) Final index	
Points	Risk level
Up to 21	Mild
From 22 to 34	Moderate
Above 34	High
(c) Probability of accuracy of the risk level	
Risk levels	Probability (%)
Mild	82.4
High	94.6

DISCUSSION

The caseload of 124 patients is quite representative of the high incidence of megaesophagus with the indication for surgical treatment in a region where Chagas' disease is endemic. Although there may be an overlapping of clinical and morphological characteristics among dilated cardiomyopathies, it is very important to take into consideration the inherent characteristics of the Chagasic cardiomyopathy, such as autonomic denervation, fascicular and atrioventricular blocks, in addition to arrhythmogenic foci in the ventricles^[8-11]. These peculiar characteristics are enough to elicit different responses to the surgical trauma relative to those observed in non-Chagasic patients^[12-14].

Thus, it is our opinion that in order to estimate the surgical risk for these patients, it is imperative that the risk index developed should be simple and low-cost. These characteristics, however, should compromise neither its validity nor its feasibility.

In the score scale, the clinical history of the patients, used to determine precisely the functional class through the symptoms of myocardial dysfunction, associated to simple and inexpensive tests which are readily available, such as ECG, can estimate the risk for complications for the Chagasic achalasia patient. In view of the frequent association between a compromised digestive system and an equally compromised cardiovascular system^[15], the positive predictive value of the scale is increased when the degree of dilation of the esophagus is included.

FC presents some problems because of the subjective interpretation of terms, such as "routine activity", and "excessive fatigue". They cause the consequent limitations in terms of precision and reproducibility^[16]. However, our findings showed that the functional class of the patient was

determined with a good degree of security.

Naturally, indexes, such as Goldman index, are not as precise for the analysis of specific groups, such as those with Chagasic cardiopathy^[17-23]. These patients, according to the Goldman index, would have been classified as low risk.

Our findings equally suggested that the longer the degree of evolution of Chagasic esophageal achalasia, the higher the tendency for advanced cardiomyopathy. Our results showed a positive correlation between the degree of esophageal dilation and postoperative complications. The risk scale, which is being proposed^[24] with a considerable degree of confidence, can provide an adequate and reliable predictor of cardiovascular complications in the patients with Chagasic esophageal achalasia during the postoperative period.

In conclusion, the evaluation of the cardiovascular system, through a careful anamnesis, an ECG and contrast imaging of the esophagus, makes it possible to estimate the surgical risks for the patients with Chagasic esophageal achalasia.

REFERENCES

- 1 **Dias LD**, Bittencourt LAK, Cavicchio JR, Figueiredo MJ, Simões NA. Importância e fundamentos da avaliação pré-operatória para pacientes submetidos a cirurgia não-cardíaca: quem deve ser avaliado e quem deve avaliar. *Rev Soc Cardiol Estado De São Paulo* 2000; **10**: 259-265
- 2 **Bittencourt LAK**, Simões AMR, Figueiredo MJO. O clínico e o período pré-operatório. In: Halbe HW, ed. *Tratado de Ginecologia*. São Paulo: Roca 2000: 2392-2401
- 3 **Eagle KA**, Brundage BH, Chaitman BR, Ewy GA, Fleisher LA, Hertzner NR, Leppo JA, Ryan T, Schlant RC, Spencer WH 3rd, Spittell JA Jr, Twiss RD, Ritchie JL, Cheitlin MD, Gardner TJ, Garson A Jr, Lewis RP, Gibbons RJ, O'Rourke RA, Ryan TJ. Guidelines for Perioperative Cardiovascular Evaluation for noncardiac surgery. Report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines. Committee on Perioperative Cardiovascular Evaluation for noncardiac Surgery. *Circulation* 1996; **93**: 1278-1317
- 4 **Goldman L**, Caldera DL, Nussbaum SR, Southwick FS, Krogstad D, Murray B, Burke DS, O'Malley TA, Caplan CH, Nolan J, Carabello B, Slater EE. Multifactorial index of cardiac risk in noncardiac surgical procedures. *N Engl J Med* 1977; **297**: 845-850
- 5 **Bestetti RB**, Dalbo CM, Freitas OC, Teno LA, Castilho OT, Oliveira JM. Noninvasive predictors of mortality for patients with Chagas heart disease: a multivariate stepwise logistic regression study. *Cardiology* 1994; **84**: 261-267
- 6 **de Rezende J**, Lauer KL, de Oliveira AR. Aspectos clínicos e radiológicos da aperistalsis do esôfago. *Rev Bras Gastroenterol* 1960; **12**: 247-262
- 7 **Rezende JM**. Classificação radiológica do megaesôfago. *Rev Goiana Med* 1982; **28**: 187-191
- 8 **Amorim DS**, Godoy RA, Manço JC, Tanaka A, Gallo L Jr. Effects of acute elevation in blood pressure and atropine on heart rate in Chagas' disease. *Circulation* 1968; **38**: 289-294
- 9 **Bestetti RB**, Freitas OC, Muccillo G, Oliveira JM. Clinical and morphological characteristics associated with sudden cardiac death in patients with Chagas' disease. *Eur Heart J* 1993; **14**: 1610-1614
- 10 **Blaustein AS**. Preoperative and perioperative management of cardiac patients undergoing noncardiac surgery. *Cardiol Clin* 1995; **13**: 149-461
- 11 **Braunwald E**. Heart Disease. A Textbook of Cardiovascular Disease. Saunders, 2th 1984: 1815-1825
- 12 **Detsky AS**, Abrams HB, Forbath N, Scott JG, Hilliard JR.

- Cardiac assessment for patients undergoing noncardiac surgery. *Arch Inter Med* 1986; **146**: 2131-2134
- 13 **Forgosh LB**, Movahed A. Assessment of Cardiac risk in Non-cardiac Surgery. *Clin Cardiol* 1995; **18**: 556-562
- 14 **Froehlic JB**. Clinical determinants in perioperative cardiac evaluation. *Prog Cardiovasc Dis* 1998; **40**: 373-381
- 15 **Rassi A**, Lorga AM, Rassi SG. Diagnóstico e tratamento das arritmias na cardiopatia crônica. In: Cançado JR, Chuster M. eds. *Cardiopatia Chagásica. Belo Horizonte: Fundação Carlos Chagas* 1985: 274-288
- 16 **Hlatky MA**, Boineau RE, Higinbotham MB, Lee KL, Mark DB, Califf RM. A brief self-administered questionnaire to determine functional capacity (The Duke Activity Status Index). *Am J Cardiol* 1989; **64**: 651-654
- 17 **Goldman L**, Caldera DL, Southwick FS, Nussbauam SR, Murray B, O'Malley TA, Goroll AH, Caplan CH, Nolan J, Burke DS, Krogstad D, Carabello B, Slater EE. Cardiac risk factors and complications in noncardiac surgery. *Medicine* 1978; **57**: 357-370
- 18 **Hollonberg SM**. Preoperative cardiac risk assessment. *Chest* 1999; **115**: 51S-57S
- 19 **Lee T**, Pujysum EM, Goldman L. Impact of inter-physician communication on the effectiveness of medical consultations. *Am J Med* 1983; **74**: 106-117
- 20 **Lee T**, Marcantonio ER, Mangione CM, Thomas EJ, Polanczyk CA, Cook EF. Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. *Circulation* 1999; **100**: 1043-1049
- 21 **Massie BM**, Mangano DT. Risk stratification for noncardiac surgery. *Circulation* 1993; **87**: 1752-1755
- 22 **Mehta RH**, Bossone E, Eagle KA. Perioperative cardiac risk assessment for noncardiac surgery. *Cardiologia* 1999; **44**: 409-418
- 23 **Prause G**, Ratzenhofer-Comenda B, Pierer G, Smolle-Juntner F. Can ASA grade or Goldman's cardiac risk index predict perioperative mortality? A study of 16227 patients. *Anaesthesia* 1997; **52**: 203-206
- 24 **Macpherson DS**. Preoperative laboratory testing: should any tests be "routine" before surgery? *Med Clin North Am* 1993; **77**: 289-308

Science Editor Kumar M and Guo SY Language Editor Elsevier HK