DOI: https://doi.org/10.22516/25007440.1017

Original article

Characterization of Achalasia Subtypes Based on High-Resolution Manometry in Patients at a Reference Hospital in Colombia

Amaury Amarís-Vergara,[1*] Albis Cecilia Hani,[2] Óscar Mauricio Muñoz-Velandia,[3] Andrés Felipe Ardila,[2] Rosángela Ramírez-Barranco,[1] Julián Sierra-Peña.[4]

OPEN ACCESS

Citation:
Amaris-Vergara AA, Hani AC, Muñoz-Velandia OM, Ardila AF, Ramírez-Barranco R, Sierra-Peña J. Characterization of Achalasia Subtypes Based on High-Resolution Manometry in Patients at a Reference Hospital in Colombia. Revista. colomb. Gastroenterol. 2023;38(2):167-172. https://doi.org/10.22516/25007440.1017

[1] Internist, gastroenterology and digestive endoscopy fellow, Pontificia Universidad Javeriana, Hospital Universitario San Ignacio. Bogotá, Colombia.
[2] Internist, gastroenterology and digestive endoscopy specialist. Professor, Pontificia Universidad Javeriana, Hospital Universitario San Ignacio. Bogotá, Colombia.
[3] Internist, PhD in Clinical Epidemiology. Associate professor, Department of Internal Medicine, Pontificia Universidad Javeriana, Hospital Universitario San Ignacio. Bogotá, Colombia.
[4] Student, Pontificia Universidad Javeriana. Bogotá, Colombia.

***Correspondence:** Amaury Amarís-Vergara.
amaury.amarisv@javeriana.edu.co

Received: 05/02/2023
Accepted: 23/03/2023

Abstract

Introduction: Limited information is available regarding the clinical and manometric characteristics of different subtypes of achalasia. This study aims to describe these characteristics in patients treated at a prominent hospital in Colombia. **Methods:** This descriptive observational study included patients diagnosed with achalasia using high-resolution esophageal manometry at Hospital Universitario San Ignacio in Bogotá, Colombia, between 2016 and 2020. We documented the clinical manifestations, manometric findings, treatment approaches, and response to treatment based on the subtype of achalasia. **Results:** A total of 87 patients were enrolled, with a median age of 51 years, and 56.4% of them were female. The majority had type II achalasia (78.1%), followed by type I (16%) and type III (5.7%). All patients presented with dysphagia, 40.2% experienced chest pain, and 27.6% had gastroesophageal reflux. The clinical parameters, including integrated relaxation pressure value (IRP; median: 24 mmHg, interquartile range [IQR]: 19-33), upper esophageal sphincter pressure (UES; median: 63 mmHg, IQR: 46-98), and lower esophageal sphincter pressure (LES; median: 34 mm Hg, IQR: 26-45), were similar across the different subtypes. Esophageal clearance was incomplete in all patients. Among the 35 patients who received intervention, Heller's myotomy was the most commonly employed procedure (68.5%), followed by esophageal dilation (28.6%). All patients experienced symptomatic improvement, with a median pre-treatment Eckardt score of 5 (IQR: 5-6) and a post-treatment score of 1 (IQR: 1-2). **Conclusions:** Type II achalasia is the most prevalent subtype. The clinical and manometric findings, as well as treatment response, exhibit similarities among the different subtypes of achalasia. In Colombia, the outcomes of this condition align with those reported in other parts of the world.

Keywords

Achalasia, high-resolution manometry, dysphagia, esophageal motility.

INTRODUCTION

Achalasia is a disease with low incidence and prevalence, with an annual incidence of 1-5 cases per 100,000 individuals and a prevalence of 7-32 cases per 100,000 individuals worldwide[(1)]. It is a rare entity characterized by dysphagia for solids and liquids in 90% of patients, regurgitation of undigested food in 75%, chest pain in 50%, and heartburn in 40%[(2)]. Due to these symptoms, patients could present with weight loss, bronchitis, and recurrent pneumonia[(3)].

The gold standard for the diagnosis of achalasia is esophageal high-resolution manometry (HRM), revealing incomplete relaxation of the esophagogastric junction (EGJ) with the absence of organized peristalsis[(4)]. According to the Chicago 4.0 classification, three achalasia subtypes have been described, which are characterized by failure

to relax the lower esophageal sphincter (LES) and various patterns of esophageal contraction[5]: type I achalasia (formerly classic) exhibits an abnormal relaxation pressure integral (RPI) and 100% failed swallows (distal contractility integral [DCI] < 100 mm Hg/s/cm). Type II achalasia, or achalasia with esophageal compression, presents with abnormal RPI, 100% failed swallows, and panesophageal pressurization in at least 20% of swallows. Type III achalasia, or spastic, shows abnormal RPI, 100% failed swallows, and premature or spastic contractions in the distal esophagus in at least 20% of swallows[6,7].

There is limited information on the clinical characteristics of the achalasia subtypes[8-10]. The frequency of symptoms could be different in Colombia, considering the relatively high prevalence of Chagas disease.

This study aims to describe patients' clinical characteristics, manometric findings, and treatment according to achalasia subtype from a cohort of patients evaluated at a referral hospital for achalasia in Colombia.

METHODS

This observational descriptive study is based on a retrospective cohort that included patients with a manometric diagnosis of achalasia managed in the physiology and gastroenterology unit of Hospital Universitario San Ignacio in Bogotá, Colombia, between January 2016 and December 2020.

Based on the HRM findings, the Chicago 3.0 classification describes four large groups of esophageal motor abnormalities: achalasia, outlet obstruction at the EGJ, major alterations, and minor alterations[5]. This study included patients older than 18 who met the manometric criteria for achalasia according to this protocol[5]. Patients who had previously undergone surgery, dilations, or treatment with botulinum toxin were excluded. The institutional research and ethics committee of Hospital Universitario San Ignacio approved the study (MI 032-2021). Demographic data and information on symptoms were taken from a form systematically completed before entering the procedure.

HRM was performed with Medtronic®, Given Imaging (Medtronic, Los Angeles, California, United States), the same model used to develop the Chicago 3.0 and 4.0 classification. The following metrics were obtained: esophagogastric junction (EGJ) type, upper esophageal sphincter (UES) pressure, lower esophageal sphincter (LES) pressure, relaxation pressure integral (RPI), distal contractility integral (DCI), distal latency (DL) and the presence of complete or incomplete clearance of the bolus. The HRM was interpreted by a training fellow and an esophageal manometry-certified professor following the Chicago criteria version 3.0[5].

The first four seconds of maximum swallowing relaxation were averaged in the 10-second window to define the RPI, which begins with contiguous or non-contiguous UES relaxation, referenced for gastric pressure. Pan-pressurization with an isobaric contour is ≥ 30% mm Hg. Spastic/premature contractions occurred between UES relaxation and the point of contractile deceleration of less than 4.5 seconds associated with an DCI ≥ 450 mm Hg. The DCI was calculated by multiplying the amplitude, duration, and length of the distal esophageal contraction ≥ 20 mm Hg. Incomplete bolus clearance was defined as acid and bolus content that occurs with abnormal peristalsis and impaired salivation[6,7].

According to the Chicago 3.0 classification[5], the achalasia types were defined as follows: type I achalasia as RPI ≥ 15 mm Hg in the supine (primary) position and 100% failed peristaltic contractions without esophageal pressurization; type II achalasia as RPI ≥ 15 mm Hg in the supine (primary) position and 100% failed peristaltic contractions with esophageal pan-pressurization in ≥ 20% of swallows; type III achalasia as RPI ≥ 15 mm Hg in the supine (primary) position and 100% failed peristaltic contractions with spastic/premature contractions in ≥ 20% of swallows.

Additionally, the sphygmogram reports were reviewed from electronic clinical records. For all of them, the esophageal emptying time, termination with the "bird's beak" sign in the distal esophagus, LES stricture, and esophageal diameter (diameter of the lumen ≥ 30 mm)[4] were determined.

Response to treatment was evaluated for each technique used: esophageal dilation (RigiflexTM, Boston Scientific, Massachusetts, United States), Heller's myotomy, and POEM (peroral endoscopic myotomy)[4]. The severity of dysphagia symptoms was analyzed before and after treatment using the Eckardt score[11,12].

Absolute and relative frequencies describe qualitative variables. Quantitative variables such as median and interquartile range (IQR) were considered not to have a normal distribution. The assumption of normality was evaluated using the Kolmogórov-Smirnov test at a significance level of 5%. The Eckardt score was compared before and after the treatment with a paired t-test. Statistical analysis was performed using Stata (Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC).

RESULTS

Eighty-seven patients were included. The demographic, clinical, and manometric characteristics according to the achalasia type are shown in **Table 1**. Most of the patients had a diagnosis of type II achalasia (78.1%), followed by type I (16%) and type III (5.7%). The median age of involvement was 51 years, with a higher proportion of women

Table 1. Clinical and manometric features and esophagram findings in patients diagnosed with achalasia

Variable	Type I n = 14	Type II n = 68	Type III n = 5	Total n = 87
Clinical features				
Age, median (IQR)	51.5 (45-66.2)	43.5 (35-64.5)	57 (49.5-65)	50 (37-65)
Male sex, n (%)	6 (42.9)	31 (44.1)	1 (20.0)	38 (43.6)
Prevalent symptoms, n (%)				
- Dysphagia	6 (42.9)	19 (27.9)	2 (40.0)	27 (31.0)
- Dysphagia + chest pain	2 (14.3)	8 (11.8)	0 (0)	10 (11.5)
- Dysphagia + weight loss	0 (0.0)	1 (1.5)	0 (0)	1 (1.1)
- Dysphagia + chest pain + weight loss	1 (7.1)	10 (14.7)	0 (0)	11 (12.6)
- Dysphagia + chest pain + regurgitation	1 (7.1)	4 (5.9)	0 (0)	5 (5.7)
- Dysphagia + chest pain + weight loss + GERD	1 (7.1)	7 (10.3)	1 (20.0)	9 (10.3)
- Dysphagia + GERD	3 (21.4)	19 (27.9)	2 (40.0)	24 (27.6)
Manometric features				
UES pressure, median (IQR)	55 (35.5-89.5)	65 (47.7-105.0)	46 (35.5-50.0)	63 (46-98)
LES pressure, median (IQR)	29 (21.2-34.5)	35.5 (25.0-48.2)	43 (31.5-56.0)	34 (26-45)
RPI, median (IQR)	23 (18-31.5)	25.5 (19.2-4.7)	23 (19-41)	24 (19-33)
Incomplete bolus clearance, n (%)	14 (100)	68 (100)	5 (100)	87 (100)

LES: lower esophageal sphincter; UES: upper esophageal sphincter; GERD: gastroesophageal reflux disease; RPI: relaxation pressure integral; IQR: interquartile range. Source: The authors.

(56.4%). All presented with dysphagia, an isolated symptom in 31% of the cases. Other symptoms associated with dysphagia were chest pain (40.2%) and regurgitation or heartburn (5.6%). Regarding the manometric findings, the pressure of the UES and LES were similar in all achalasia types. The median RPI was 24 (IQR: 19-33), and bolus clearance was incomplete in all patients evaluated.

Table 2 presents the findings of the esophagogram, where imaging was available. In type I achalasia, esophageal dilation was not found, while 81.8% of the patients had it in type II achalasia. The bird's beak sign was present in 68.3% of the patients.

Response to treatment was assessed in 35 patients. The therapeutic option and the symptomatic response to the established treatment are shown in **Table 3**. For all achalasia types, Heller's myotomy was the most widely used intervention, and in all patients, the symptoms improved significantly, regardless of the treatment used. Eckardt median pretreatment was 5 (IQR: 5-6), and posttreatment was 1 (IQR: 1-2). Changes were similar in both type I achalasia patients (Eckardt mean 5.8 ± 2.0 vs. 1.4 ± 0.5; $p = 0.009$) and type II achalasia patients (Eckardt mean 5.7 ± 1.4 vs. 1.6 ± 0.8, $p < 0.001$).

DISCUSSION

Achalasia is a primary esophageal motor disorder of unknown etiology characterized by degeneration of the myenteric plexus, resulting in impaired relaxation of the EGJ, along with loss of organized peristalsis in the esophageal body. The most common form of achalasia is idiopathic and is seen mainly sporadically. This disorder can also be secondary to chronic infection by *Trypanosoma cruzi*, considered endemic in Latin America. Still, achalasia secondary to Chagas disease in Colombia has been reported with a low frequency of 13.1% of cases[13].

Most of our patients were women (56%), a finding that differs slightly from the world population, in which it occurs equally among men and women[4]. The average age of involvement was 51 years, which is related to other population groups, with averages of 20 to 60 years[4], and was similar for the achalasia subtypes, different from what

Table 2. Esophagram features in patients diagnosed with achalasia

Variable	Type I n = 6	Type II n = 33	Type III n = 2	Total n = 41
LES stricture, n (%)	6 (100)	6 (18.2)	1 (50.0)	13 (31.7)
Esophageal dilation and LES stricture, n (%)	-	27 (81.8)	1 (50.0)	28 (68.3)
Time between diagnostic esophageal manometry and esophagram, median number of days (IQR)	71 (4.5-143.5)	77 (30-126)	76.5 (58.7-94.2)	72 (17-120)

LES: lower esophageal sphincter; IQR: interquartile range. Source: The authors.

Table 3. Treatment of achalasia and change in dysphagia according to the Eckardt score after treatment in patients diagnosed with achalasia

Variable	Type I n = 5	Type II n = 29	Type III n = 1	Total n = 35
Treatment performed, n (%)				
- Esophageal dilation	1 (20.0)	9 (31.0)	-	10 (28.6)
- Heller's myotomy	4 (80.0)	19 (65.5)	1 (100)	24 (68.5)
- POEM	-	1 (3.4)	-	1 (2.9)
Eckardt pretreatment, median (IQR)	6 (4-6)	5 (5-6)	9	5 (5-6)
Eckardt posttreatment, median (IQR)	1 (1-2)	1 (1-2)	2	1 (1-2)
Days between treatment and posttreatment Eckardt measurement, median (IQR)	104 (86-149)	35 (27-68)	103	40 (27-90)

POEM: peroral endoscopic myotomy; IQR: interquartile range. Source: The authors.

was reported in Arab and French studies, whose patients with subtype I tend to be younger[14].

The most frequent symptom was dysphagia, followed by chest pain and symptoms of gastroesophageal reflux disease (GERD), findings similar to those published in the literature[4,15]. The HRM achalasia subtypes exhibited similar clinical symptoms, as described in a cohort of 108 patients in North America[16]. We also found that esophageal dilatation was much more prevalent in type II achalasia, as already reported in this population.

It is known that the severity of the symptoms can be evaluated by the Eckardt score, which makes it possible to assess and predict the response to treatment. A score ≥ 9 points indicates a failed POEM with a sensitivity of 87.5% (95% confidence interval [CI]: 47.3%-99.7%) and a specificity of 73.8% (95% CI: 64.4%-81.9%). A score of 0-1 corresponds to stage 0, 2-3 to stage I, 4-6 to stage II, and greater than 6 to stage III[11,12]. The present study found that symptoms improved significantly after the intervention in both type I and type II achalasia, regardless of the therapeutic intervention. These findings were consistent with data published by other authors[4,17-19]. Some authors have reported that the success rate with pneumatic dilation may be significantly higher in subtype II, compared to the other subtypes, and laparoscopic Heller myotomy could be the best treatment in subtype III[20,21]; however, further studies will be required to confirm these findings.

Our study is the largest in patients with achalasia in Colombia; however, we acknowledge that the sample size is relatively small for comparisons or formal hypothesis testing, including assessment of treatment response.

Despite the limitations, our data are remarkably similar to those found in the literature, suggesting that achalasia in Colombia behaves similarly to that reported in other parts of the world. More extensive multicenter studies will be required to evaluate the treatment response according to the achalasia type and treatment used.

Conflicts of interest

We state no conflicts of interest.

REFERENCES

1. Savarino E, Bhatia S, Roman S, Sifrim D, Tack J, Thompson SK, et al. Achalasia. Nat Rev Dis Prim. 2022;8(1):28. https://doi.org/10.1038/s41572-022-00356-8
2. Vela MF, Richter JE, Wachsberger D, Connor J, Rice TW. Complexities of managing achalasia at a tertiary referral center: use of pneumatic dilatation, Heller myotomy, and botulinum toxin injection. Am J Gastroenterol. 2004;99(6):1029-36. https://doi.org/10.1111/j.1572-0241.2004.30199.x
3. Vaezi MF, Pandolfino JE, Vela MF. ACG clinical guideline: diagnosis and management of achalasia. Am J Gastroenterol. 2013;108(8):1238-49. https://doi.org/10.1038/ajg.2013.196
4. Khashab MA, Vela MF, Thosani N, Agrawal D, Buxbaum JL, Abbas Fehmi SM, et al. ASGE guideline on the management of achalasia. Gastrointest Endosc. 2020;91(2):213-227.e6. https://doi.org/10.1016/j.gie.2019.04.231
5. Kahrilas PJ, Bredenoord AJ, Fox M, Gyawali CP, Roman S, Smout AJ, et al. The Chicago Classification of esophageal motility disorders, v3.0. Neurogastroenterol Motil Off J Eur Gastrointest Motil Soc. 2015;27(2):160-74. https://doi.org/10.1111/nmo.12477
6. Hani A, Bernal W, Leguízamo A, Zuluaga C, Vargas R, Vergara H, et al. Cómo realizar e interpretar una manometría esofágica de alta resolución usando la clasificación de Chicago 3.0. Rev Colomb Gastroenterol. 2017;32(4):369-78. https://doi.org/10.22516/25007440.181
7. Hani A, Leguízamo A, Carvajal J, Mosquera-Klinger G, Costa V. Cómo realizar e interpretar una manometría esofágica de alta resolución. Rev Colomb Gastroenterol. 2015;30(1):74-83. https://doi.org/10.22516/25007440.25
8. Zhou MJ, Kamal A, Freedberg DE, Markowitz D, Clarke JO, Jodorkovsky D. Type II Achalasia Is Increasing in Prevalence. Dig Dis Sci. 2021;66(10):3490-4. https://doi.org/10.1007/s10620-020-06668-7
9. Fisichella PM, Raz D, Palazzo F, Niponmick I, Patti MG. Clinical, radiological, and manometric profile in 145 patients with untreated achalasia. World J Surg. 2008;32(9):1974-9. https://doi.org/10.1007/s00268-008-9656-z
10. Khoudari G, Saleh MA, Sarmini MT, Parikh MP, Vega KJ, Sanaka MR. The Prevalence and Epidemiology of Achalasia in the USA: A Population-Based Study. Am J Gastroenterol. 2019;114:S270-S271. https://doi.org/10.14309/01.ajg.0000591384.93014.6c
11. Ren Y, Tang X, Chen Y, Chen F, Zou Y, Deng Z, et al. Pretreatment Eckardt score is a simple factor for predicting one-year peroral endoscopic myotomy failure in patients with achalasia. Surg Endosc. 2017;31(8):3234-3241. https://doi.org/10.1007/s00464-016-5352-5
12. Gockel I, Junginger T. The value of scoring achalasia: a comparison of current systems and the impact on treatment--the surgeon's viewpoint. Am Surg. 2007;73(4):327-31. https://doi.org/10.1177/000313480707300403
13. Panesso-Gómez S, Pavia P, Rodríguez-Mantilla IE, Lasso P, Orozco LA, Cuellar A, et al. Detección de Trypanosoma cruzi en pacientes colombianos con diagnóstico de acalasia esofágica. Am J Trop Med Hyg. 2018;98(3):717-23. https://doi.org/10.4269/ajtmh.17-0417
14. Roman S, Zerbib F, Quenehervé L, Clermidy H, Varannes SB, Mion F. The Chicago classification for achalasia in a French multicentric cohort. Dig Liver Dis. 2012;44(12):976-80. https://doi.org/10.1016/j.dld.2012.07.019
15. Oude Nijhuis RAB, Zaninotto G, Roman S, Boeckxstaens GE, Fockens P, Langendam MW, et al. European guidelines on achalasia: United European Gastroenterology and European Society of Neurogastroenterology and Motility recommendations. United European Gastroenterol J. 2020;8(1):13-33. https://doi.org/10.1177/2050640620903213
16. Meillier A, Midani D, Caroline D, Saadi M, Parkman H, Schey R. Difference of achalasia subtypes based on clinical symptoms, radiographic findings, and stasis scores. Rev Gastroenterol Mex. 2018;83(1):3-8. https://doi.org/10.1016/j.rgmxen.2017.03.013
17. Jung HK, Hong SJ, Lee OY, Pandolfino J, Park H, Miwa H, et al. Korean Society of Neurogastroenterology and Motility. 2019 Seoul Consensus on Esophageal Achalasia Guidelines. J Neurogastroenterol Motil. 2020;26(2):180-203. https://doi.org/10.5056/jnm20014
18. Fox M, Sweis R, Yadlapati R, Pandolfino J, Hani A, Defilippi C, et al. Chicago Classification version 4.0 © Technical Review: Update on Standard High Resolution Manometry Protocol for the Assessment of Esophageal Motility. 2021 Neurogastroenterol Motil. 2021;33(4):e14120. https://doi.org/10.1111/nmo.14120
19. Yadlapati R, Kahrilas PJ, Fox MR, Hani A, Pandolfino JE, Roman S, et al. Esophageal motility disorders on high-resolution manometry: Chicago classification version 4.0©. Neurogastroenterol Motil. 2021;33(1):e14058. https://doi.org/10.1111/nmo.14058
20. Rohof WO, Salvador R, Annese V, Bruley des Varannes S, Chaussade S, Costantini M, et al. Outcomes of treatment for achalasia depend on manometric subtype. Gastroenterology. 2013;144(4):718-e14. https://doi.org/10.1053/j.gastro.2012.12.027
21. Ou YH, Nie XM, Li LF, Wei ZJ, Jiang B. High-resolution manometric subtypes as a predictive factor for the treatment of achalasia: A meta-analysis and systematic review. J Dig Dis. 2016;17(4):222-35. https://doi.org/10.1111/1751-2980.12327