2025 | 25 | 4 | 163-210

FUNDADA EN 2001

ISSN 1852-236

Revista Americana de Medicina Respiratoria

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American Review of Respiratory Medicine

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Revista Americana de Medicina Respiratoria

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Vol 25 | Nº 4 | December 2025
ISSN 1852 - 236X

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American Review of Respiratory Medicine
Revista Americana de Medicina Respiratoria

LETTER FROM THE EDITOR-IN-CHIEF

ISSN 1852-236X

A Journal in Evolution and Renewal: The Same Commitment, new Challenges-Consolidating Quality, Expanding Reach, and Strengthening the Community

Una revista en evolución y renovación: el mismo compromiso, nuevos desafíos: consolidar la calidad, ampliar el alcance y fortalecer la comunidad

The American Review of Respiratory Medicine (*Revista Americana de Medicina Respiratoria*, RAMR) is undergoing a phase of renewal and growth, aligned with the current challenges of scientific communication and driven by the needs and demands of the respiratory community in our region.

This process does not imply a change in identity, but rather a reaffirmation of the values that have historically guided the journal: scientific rigor, plurality of perspectives, and closeness to everyday clinical practice.

In this context, we are pleased to present the **renewal of the RAMR website**, developed in accordance with **international standards for scientific publishing**. The new website is more modern, accessible, and functional, wich aims to optimize the reading and navigation experience, facilitate content search, and enhance the dissemination of scientific knowledge at both regional and international levels. Today, digital platforms serve as a central tool for expanding the journal's reach and increasing the visibility of published works.

The **editorial committee has also undergone a reorganization** aligned with the international standards recommended for scientific journals. The new structure is based on **suitability, experience, and academic commitment** criteria aiming to strengthen editorial processes, ensure rigorous and transparent evaluations, and maintain the scientific quality of each publication. This team represents a collective endeavor, in which diverse perspectives and career paths come together, all committed to the growth of the RAMR.

These transformations reflect an **institutional commitment to continuous improvement** and to the responsibility of providing an editorial space that represents the quality of respiratory medicine in Argentina. The RAMR continues to strive to be a pluralistic journal, one that engages with the diversity of realities across our region and promotes integration of research, teaching, and clinical practice.

We wish to express special thanks to the authors who trust the journal to disseminate their academic work, to the reviewers for their essential and selfless contributions, and to the editorial team for their sustained efforts. Likewise, we invite the entire pulmonology community and healthcare teams involved in respiratory medicine to join us in this new stage-to read, share, and continue choosing the American Review of Respiratory Medicine as a **reference space for the publication and expansion of scientific knowledge**, convinced that a strong journal is built collectively.

Thank you for accompanying us and being part of this community.

Dr. Sandra Inwentarz
Editor-in-Chief
American Review of Respiratory Medicine

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EDITORIAL

ISSN 1852-236X

Obesity and COVID-19. The Story has not been Fully Written Yet

Obesidad y COVID-19. La historia no se ha terminado de escribir

Alejandro J. Videla

In November 2019, China reported the emergence of a new coronavirus of animal origin capable of causing severe respiratory infection. By March 2020, the World Health Organization had declared a pandemic. On March 2, Argentina reported its first case, and more than 10 million cases were recorded in the months that followed. The implementation of restrictive measures and social distancing, together with the introduction of vaccines, helped mitigate the impact of the infection, which nevertheless resulted in 130,829 deaths in the country by January 2026.[1] Seropositivity reached 39.2% in the city of Puerto Madryn.[2]

Very early in the pandemic, several studies identified factors associated with unfavorable outcomes. Studies from the first six months showed that obesity was associated with greater symptom severity, progression to respiratory distress, hospitalization in general wards and intensive care units, and e need for mechanical ventilation. Paradoxically, however, no increased risk of mortality associated with obesity was demonstrated.[3] The unfavorable course has been attributed to persistent inflammation, immune dysfunction, increased viral replication, mechanical ventilatory impairment, and a prothrombotic state .[4]

Over time, concern arose about the development of respiratory sequelae and prolonged manifestations of COVID-19. A meta-analysis of the medical literature published up to 2021 estimated that tomographic abnormalities –such as ground-glass opacities and pulmonary fibrosis– were present in approximately one third of cases.[5] Obesity has been described by some authors as a factor associated with the persistence of tomographic and functional abnormalities.[6,7]

In this context, the study by González et al[8] published in this issue of RAMR provides timely and valuable evidence. The authors conducted a prospective, multicenter cohort study with one-year follow-up after hospital discharge, evaluating the evolution of patients hospitalized for COVID-19 using lung function tests and imaging.

The main finding of the study is that obesity was not associated with a higher prevalence of objectively measurable respiratory sequelae. No statistically significant association was observed between a presence of a body mass index (BMI) $\geq$ 30 kg/m^2 and reduced forced vital capacity, desaturation during the 6-minute walk test, or the presence of a fibrosis-like tomographic pattern on computed tomography after multivariable analysis. These findings with those of the SECUELAR cohort, also collected in our country, in which BMI was not associated with alterations in respiratory functional parameters , as well as with other studies from different countries.[9-11]

These results suggest that COVID-19 may behave differently at different stages of its course. In the acute phase, obesity may be associated with greater clinical severity and worse outcomes, however once this stage has been overcome, BMI does not not necessarily appear to be a prognostic factor for the development of imaging or functional abnormalities. Therefore, BMI –like any other factor potentially associated with an unfavorable outcome– should be evaluated within the individual clinical context, and also considered as a potential confounding factor. It is also important to have local data, since the behavior of each population may vary significantly depending on factors that we may be unable to evaluate

Rev Am Med Resp 2025;25:164-165. https://doi.org/10.56538/ramr.KTTI4932

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or measure, including cultural or socioeconomic determinants.

An interesting aspect of the study is the observed association between a forced vital capacity < 80% at three months and the development of a fibrosis-like tomographic pattern at twelve months. This finding is consistent with previous studies showing that early functional impairment predicts unfavorable outcomes in COVID-19 survivors.[12] The clinical message is that early pulmonary evaluation should be integrated into the follow-up of hospitalized patients after discharge.

In summary, the work by González et al adds a new piece of evidence to our understanding of post-COVID-19 respiratory outcomes. Beyond its potential limitations –and considering how difficult it is to conduct this type of study, particularly in our setting– the effort required and the rigor with which it was carried out deserve recognition . Cohort studies are costly, require substantial human resources, and are often threatened by loss to follow-up.[13] Although the incidence of COVID-19 has declined, it remains important to maintain surveillance of these cases and to obtain objective information, including inflammatory markers, metabolic assessments , and more sensitive studies such as cardiopulmonary exercise testing, in order to further complete our understanding.

Given the findings of Argentina's National Risk Factor Survey that 6 in 10 adults are overweight, healthcare professionals must actively promote healthy lifestyle habits.[14] Another area in which healthcare personnel play a central role is vaccination counseling. Physicians are widely identified as a trusted source of health information, and their explicit and routine recommendation increases vaccine acceptance and uptake across all population groups.[15] The challenge is to recognize that the story of COVID-19 is not fully written yet, and that we can influence the intersection between the obesity endemic and the pandemic.

Conflict of interest

The author has no conflicts of interest to declare in relation to this publication.

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EDITORIAL

ISSN 1852-236X

Place an Airway Prosthesis and you Will Adopt a Patient: Complications Associated with the Montgomery Prosthesis

Ponga una prótesis en vía aérea y adoptará un paciente: las complicaciones asociadas a la prótesis de Montgomery

Gando, Sebastián[1]

The Montgomery T-tube prosthesis is one of the tracheobronchial prostheses commonly used in interventional pulmonology.

Its design, with an external limb that anchors to the tracheostomy opening and two internal limbs with smooth outer edges, gives it advantages over closed tracheobronchial stents. Its advantages include a lower tendency for displacement and reduced risk of tracheal wall injury.

They are not magical devices; when we place a Montgomery prosthesis, we replace a difficult-to-manage problem with others that are easier to manage.

In this issue, Cerruti et al[1] present a retrospective analysis from a single center on complications associated with the Montgomery prosthesis in a group of 15 patients at a mechanical ventilation weaning center.

The results must be interpreted in the context of the study population: patients with a median of 160 days from admission to placement of the prosthesis (more than five months), most of whom had previously undergone tracheostomy and had complex airway pathology, such as tracheal stenosis or tracheoesophageal fistula. In their results, they report a high rate of complications, considering the increase in secretions (80% of patients) and the complexity of their management as one of them.

In this regard, some authors[2,3] –and we agree with them– do not consider the increase in secretions to be a complication, but rather part of the effects of the treatment.

The accumulation of secretions is a common event with this type of prosthesis. Its length and lack of compressibility mean that the patient's secretions must "jump" over the prosthesis with a cough in order to progress, so inadequate management may lead to prosthesis failure.

The instillation of saline solution or nebulizations (we prefer the latter so as not to open the prosthesis to the outside) is required to improve the fluidity of secretions and prevent the formation of mucus plugs and respiratory obstruction.

The most frequent indication for prosthesis placement, as described in the article by Ceruti et al, is subglottic and/or tracheal stenosis. At the time of implantation, it is essential to trim the prosthesis to the strictly necessary length to treat the stenosis, in order to avoid accumulation of secretions.

Some patients require surgical intervention but must await availability, while others are unsuitable candidates for surgery. The description of complications might lead one to think that managing these lesions without a prosthesis would be more effective.

However, Feng-Jie Wu et al[4] showed that the Montgomery prosthesis is more effective than serial endoscopic treatments for stenosis, both in maintaining airway patency and in having a lower complication rate.

Rev Am Med Resp 2025;25:166-168. https://doi.org/10.56538/ramr.ATXA7698

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The eligibility of patients who are candidates for Montgomery prosthesis placement is crucial. Patients with bronchorrhea, ineffective cough, swallowing disorders that make the airway unsafe, obesity –especially morbid obesity– and kyphoscoliosis may be factors that predispose to prosthesis failure.

Swallowing is an important screening factor. The Montgomery prosthesis restores airway patency at the aerodigestive junction, and its safety may be compromised if at-risk patients are not properly identified –for example, by previously performing an endoscopic evaluation of swallowing (FEES).

Two patients in the group had transcordal prostheses. The transcordal prosthesis is indicated specifically for subglottic lesions close to the vocal cords or for vocal cord or laryngeal lesions that require it. The prosthesis should be of the smallest possible diameter, and the portion that contacts the vocal cords is polished to reduce thickness and allow cord mobility. Aspiration and pain are the most common adverse effects of this type of placement.

The article also highlights the number of patients who required secretion suctioning (93%), which is not common and may indicate that the study population had less effective secretion management, something that should be assessed before placing a Montgomery prosthesis.

Complications associated with this type of prosthesis have been reported with variability; however, no mortality directly attributable to its use has been documented. Reported complications include subcutaneous emphysema following insertion, migration requiring removal and reinsertion, posterior displacement toward the trachea causing acute airway obstruction (reports of displacement are rare and described as isolated cases), accumulation of dry intraluminal respiratory secretions requiring bronchoscopic aspiration or removal of the T-tube, airway infection, tracheal hemorrhage, granulation tissue formation, and prolonged healing of the tracheocutaneous fistula.

Juan Margallo Iribarnegaray et al[2] reported a 50% complication rate in a series of 32 patients, excluding accumulation of secretions, bacterial colonization of the MP, or infection of the subcutaneous tissue.

In a retrospective review by Gaissert et al[5] of 140 patients who underwent T-tube placement over a 23-year period, long-term airway patency was achieved in 80% of patients, and the T-tube was the only intervention required in 11%. In the remaining 20%, T-tubes were removed within the first two months after insertion, mainly due to airway obstruction.

Ortiz Naretto[6] and the team from the Hospital Muñiz in Buenos Aires, in another local experience, did not find any complications in nine patients with tracheoesophageal fistula, even when larger-than-usual prostheses were required to occlude the fistulous opening.

The article by Cerruti et al provides insight into the complexity of managing this type of prosthesis and the need for specific training in its care within rehabilitation, progressive care, and weaning centers.

The acquisition of easy-to-use, low-cost disposable bronchoscopes could play an important role in these institutions. They may be useful for the assessment of swallowing, identification of airway lesions, and follow-up of airway prostheses, in addition to serving as a bedside tool in emergency situations.

These centers should maintain close and fluid communication with the teams responsible for prosthesis placement and the management of its complications.

In conclusion, appropriate patient selection, placement by experienced hands, and proper care and follow-up are crucial to reducing the complication rate. The authors help us better understand the complications that may arise based on local experience in an increasingly relevant group of patients with complex airway lesions.

As the saying goes: “Place an airway prosthesis and you will adopt a patient”.

Conflict of interest
The author has no conflicts of interest to declare.

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American Review of Respiratory Medicine
Revista Americana de Medicina Respiratoria

ORIGINAL ARTICLE

ISSN 1852-236X

Complications in the Use of the Montgomery T-Tube in a Mechanical Ventilation Weaning and Rehabilitation Center

Complicaciones en el uso de la Prótesis tipo Montgomery en un Centro de Desvinculación de la Ventilación Mecánica y Rehabilitación

Cerruti, Leandro I.[1]; Bellón, Pablo[1]; Matesa, Amelia[1]; Bataglia, Guillermo[1]; Leone, Bruno[1]; Russo, Julieta[1]; Bosso, Mauro[1,2,3]

Received: 02/10/2025
Accepted: 11/25/2025

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ABSTRACT

Background: The Montgomery-type prosthesis, or Montgomery T-tube (MTG), is a device used for the treatment of various tracheal pathologies, such as stenosis and granulomas, as well as for postoperative management following tracheal surgery. Despite its widespread use, there is limited national evidence regarding its complications in respiratory rehabilitation settings. The objective of this study was to describe the complications associated with the use of MTG in a Mechanical Ventilation Weaning and Rehabilitation Center (MVWRC), including reasons for its placement, postoperative medical indications, discharge status, and survival.

Materials and methods: An observational, cross-sectional, and retrospective study was conducted, including patients aged ≥ 18 years admitted to the MVWRC from 2015 to 2023, who received or were indicated for MTG prosthesis placement during hospitalization. We analyzed clinical and demographic variables, postoperative indications, associated complications, duration of use, and patient discharge destinations.

Results: Fifteen patients were included, with a mean age of 53 years. The most frequent indication for placement was tracheal stenosis (53.3%). 93.3% of patients experienced at least one complication, mainly increased secretions and the need for aspiration. One third of the patients required emergency removal of the MTG. The median duration of use was 104.5 days, and survival rate at discharge was 80%.

Conclusion: Most patients with a MTG experienced complications during hospitalization, with emergency removal being the most frequent intervention. Standardization of postoperative care protocols could reduce complications and optimize clinical outcomes.

Keywords: tracheal prostheses; tracheal stenosis; tracheostomy; respiratory rehabilitation; postoperative complications

Rev Am Med Resp 2025;25:169-174. https://doi.org/10.56538/ramr.IFIA6539

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RESUMEN

Introducción: La prótesis tipo Montgomery o Tubo T de Montgomery (MTG) es un dispositivo utilizado para el tratamiento de diversas patologías traqueales, como estenosis y granulomas, así como en el manejo posoperatorio de cirugías traqueales. A pesar de su amplio uso, existe escasa evidencia nacional sobre sus complicaciones en contextos de rehabilitación respiratoria. El objetivo del estudio fue describir las complicaciones asociadas al uso de MTG en un centro de desvinculación de la ventilación mecánica y rehabilitación (CDVMR), así como los motivos de colocación, indicaciones médicas posquirúrgicas, condición de egreso y sobrevida.

Materiales y métodos: Se realizó un estudio observacional, transversal y retrospectivo que incluyó pacientes mayores de 18 años ingresados al CDVMR entre 2015 y 2023 con prótesis MTG colocada o indicada durante la internación. Se analizaron variables clínico-demográficas, indicaciones posquirúrgicas, complicaciones, duración del uso de la prótesis y destino al alta.

Resultados: Se incluyeron 15 pacientes con una mediana de edad de 53 años. El motivo más frecuente de colocación fue la estenosis traqueal (53,3%). El 93,3% presentó alguna complicación, principalmente aumento de secreciones y requerimiento de aspiración. Un tercio de los pacientes requirió el retiro de urgencia del MTG. La mediana de uso fue de 104,5 días y la sobrevida al egreso fue del 80%.

Conclusión: La mayoría de los pacientes con MTG presentó complicaciones durante la internación, siendo frecuente el retiro de urgencia. La protocolización de los cuidados posquirúrgicos podría reducir complicaciones y optimizar los resultados clínicos.

Palabras clave: prótesis traqueales; estenosis traqueal; traqueostomía; rehabilitación respiratoria; complicaciones posoperatorias

INTRODUCTION

The Montgomery-type prosthesis, also known as the Montgomery T-tube (MTG), was invented in 1962 by William Montgomery, a physician at Harvard Medical School and the Department of Otolaryngology at Massachusetts General Hospital.[1]

The prosthesis was initially used to prevent tracheal stenosis following post-traumatic reconstructive surgery. Originally, the T-tube was made of acrylic material, complicating insertion and impairing ciliary function, which hindered upper airway secretion mobilization and expectoration. In 1986, the company Boston Medicals developed the so-called "Safe T-Tube,"[2] manufactured from silicone material, which facilitated placement and, in addition, its smoother internal and external walls helped prevent pressure-related injuries such as granulomas, while preserving ciliary function and expectoration, and reducing secretion adherence to the tube.[3]

The prosthesis is composed of an internal structure formed by two intrathoracic limbs –an upper and a lower one– which shape the tracheal lumen, and it has an external limb that exits through a tracheal stoma. This limb secures the device and reduce displacement, allowing it to be opened to access the interior of the prosthesis in order to maintain its patency.[4] The length and diameter of the internal limbs of the prosthesis vary and must be customized according to measurements of the patient's airway, ranging from 4.5 to 16 mm in external diameter. In adults, sizes between 11 and 14 mm are commonly used. Regarding its length, it must be ensured that the upper limb is positioned at least 0.5 to 1 cm away from the vocal cords and that it is not placed in a transcordal position.[5]

In 2005, Wahidi and Ernst emphasized the importance of preserving phonation and proper humidification of inspired air by ensuring correct prosthesis placement and avoiding continuous opening of the external limb.[6]

Currently, the prosthesis is used for the treatment of conditions such as tracheal stenosis, following granuloma resection, and as a postoperative intervention after tracheal anastomosis secondary to tracheomalacia or acute tracheal trauma.[7,8]

The placement technique may vary; it is generally inserted through a pre-existing stoma created

at the time of securing the airway with a tracheostomy cannula, which facilitates placement and ensures adequate ventilation during the procedure.[9-10] It may also be placed via a direct surgical approach.[11] In either case, the procedure is performed under general anesthesia, and the use of rigid fiberoptic bronchoscopy is essential for proper placement and confirmation of MTG positioning.

Immediate surgical complications are directly related to anesthesia. The most common include excessive bleeding at the insertion site, respiratory distress due to incorrect placement, and infections, among others that occur beyond the immediate postoperative period are not usually well described in the available literature. In a 1996 article, Martínez-Ballarín et al described three main complications: the most frequent was prosthesis migration, followed by granuloma formation at the distal edges of the prosthesis and obstruction due to large amounts of secretions.[12,13] Another complication reported in the literature is displacement, either proximal or distal, with subsequent partial or complete aspiration of the prosthesis following obstruction by secretions.[14-16]

The objective of the present study was to describe the complications that occurred in patients with Montgomery-type prostheses that ocurred at a Mechanical Ventilation Weaning and Rehabilitation Center (MVWRC). Secondarily, to describe the reasons for placement, postoperative medical indications, discharge status, and survival of patients with Montgomery prostheses.

MATERIALS AND METHODS

An observational, cross-sectional, retrospective study was conducted, including patients ≥18 years admitted to the MVWRC between January 1, 2015, and December 31, 2023, who had a MTG-type prosthesis in place or required its placement during hospitalization. Patients with missing data for the analysis of the main variables were excluded.

Clinical and demographic variables, as well as variables recorded during admission to the MVWRC, were described. Data on prosthesis placement indications, postoperative medical conditions, complications, discharge destinations, and other variables were recorded. Descriptive statistics values were expressed as frequencies and percentages for qualitative variables, and as median and first and third interquartile ranges (IQR 1–3) or mean and standard deviation for quantitative variables.

Statistical analysis was performed using R software, version 4.2.3.

RESULTS

Fifteen subjects were included, with a median age of 53 years [IQR 1-3, 43.5-71], 40% of whom were male, and with a median Charlson Comorbidity Index of 2 points [IQR 1-3, 0.5-3.5].

Most patients were admitted to the MVWRC with a tracheostomy cannula and required MTG placement as part of the decannulation process (53.3%); the rest were admitted with the prosthesis already in place.

Regarding the reasons for placement, most patients had tracheal stenosis (53.3%), followed by the presence of granulomas (20%), among others. Upon admission, 10 out of 15 patients had postoperative medical indications, the most frequent being instillation of normal saline through the prosthesis (26.7%), nebulization with normal saline using an oronasal mask (26.7%), and aspiration through the external limb of the prosthesis (20%).

Complications were observed in 93.3% of the subjects. The most common complication was the need for aspiration through the prosthesis (93.3%), followed by an increase in the amount and quality of secretions (80%). Additional complications included dyspnea, pneumonia, the need for noninvasive ventilation (NIV), desaturation (a sudden decrease in oxygen saturation below 92% not attributable to secretions and not improving with aspiration), and others (pain at the site, tracheal stoma injury due to prosthesis pressure, stridor, and aphonia). One third of the subjects required emergency removal of the prosthesis (three due to obstruction and two due to malposition), while one individual self-removed the MTG and subsequently refused reinsertion. Only three subjects achieved elective removal.

The median duration of MTG use was 104.5 days [IQR 1-3, 10.75-244]; the median length of stay in the MVWRC was 350.5 days [IQR 1-3, 187.2-624], and the survival at discharge was 80% (n = 12), of whom 50% were discharged home (four with the prosthesis in place and two with a tracheostomy cannula).

DISCUSSION

Based on the reviewed literature, this study is the first in our country to report the characteristics and common complications in subjects with MTG-type prostheses.

TABLE 1. Descriptive analysis

Descriptive analysis	
N	15
Age#	53.00 [43.50, 71.00]
Male biological sex*	6 (40.0)
Reason for ICU admission*	
STROKE/TBI	4 (26.7)
Exacerbated COPD	3 (20.0)
COVID pneumonia	3 (20.0)
Other	5 (33.3)
Charlson Comorbidity Index#	2.00 [0.50, 3.50]
Admission with TQT*	8 (53.3)
Days of TQT prior to Montgomery#	161.00 [125.25, 278.00]
Reason for Montgomery placement*	
Edema	1 (6.7)
Stenosis	8 (53.3)
Tracheoesophageal fistula	2 (13.3)
Granuloma	3 (20.0)
Malacia	1 (6.7)
Topography of lesion*	
Trachea	11 (73.3)
Larynx	4 (26.7)
Postoperative indications*	
Aspiration	3 (20)
Instillation	4 (26.7)
Keep opened	1 (6.7)
Nebulization	4 (26.7)
None	5 (33.3)
No aspiration	1 (6.7)
Transcordal placement*	3 (20.0)
Complications at the MVWRC*	14 (93.3)
Increased secretions	12 (80.0)
Aspiration through Montgomery tube	14 (93.3)
Dyspnea	6 (40.0)
Oxygen saturation below 92% on room air	8 (53.3)
Pneumonia	4 (26.7)
NIV	3 (20.0)
Other	6 (40.0)
Removal of Montgomery tube*	9 (60.0)
Reason for removal*	
Elective	3 (33.3)
Malposition	2 (22.2)
Obstruction	3 (33.3)
Other	1 (11.1)

(continúa)

(continuation)

Descriptive analysis	
Days with MTG in the MVWRC#	104.50 [10.75, 244.00]
Hospitalization days at the MVWRC#	350.50 [187.25, 624.00]
Discharged alive from the MVWRC*	12 (80.0)
Discharge destination*	
3rd level	1 (8.3)
Acute Care Center	3 (25.0)
Home	6 (50.0)
Remains hospitalized	2 (16.7)

#=Data expressed as median and 1st–3rd quartile
*= Data expressed as frequency and percentage
ICU: Intensive Care Unit; TBI: traumatic brain injury; COPD: chronic obstructive pulmonary disease; TQT: tracheostomy; MVWRC: Mechanic Ventilation Weaning and Rehabilitation Center; NIV: non-invasive ventilation

First, most subjects required placement of the prosthesis secondary to a tracheal injury, the most frequent being subglottic stenosis, reducing the tracheal lumen by more than 60%.

Second, when analyzing postoperative indications, most patients were admitted with some type of instruction from the treating medical team. The most frequent instruction was routine instillation and aspiration through the external limb of the prosthesis. Considering that the MTG is made of silicone material, with the aim of preserving proper mucociliary function, this type of indication may lead to contamination of the tracheobronchial tree due to periodic opening of the prosthesis.

Third, most subjects experienced some type of complication during hospitalization associated with the use of the prosthesis, the most frequent being the need for aspiration through it, secondary to an increase in both the quantity and quality of secretions, with episodes of sudden desaturation below 92% while breathing room air. This findings are consistent with what has been reported in the literature by Martínez-Ballarín[12] in 1996 and by Noirez[16] in 2015, who also observed distal displacement of the prosthesis was also associated, secondary to total or partial obstruction by secretions. Regarding the increase in secretions observed in patients, it was not possible in this study to record the time interval between placement and the onset of these symptoms, since the MTG ultimately represents a foreign body in the airway.

Fourth, it was reported that one third of the subjects required emergency removal of the MTG and placement of a tracheostomy tube due to complete obstruction and malposition of the prosthesis, secondary to both proximal and distal displacement. It is not possible to rule out the possibility that these emergency removals were due to an inappropriate prosthesis sizing for the patient's airway. It is essential to conduct a prior evaluation of airway anatomy by computed tomography before placement in order to select the appropriate length and internal diameter of the device.[17] Only three patients underwent elective removal, and of these, the prosthesis was successfully removed in only one case.

Fifth, survival at discharge was 80%. Although several complications occurred during prosthesis use, they were successfully managed during hospitalization. When removal MTG was required, the airway could be rapidly secured with a tracheostomy tube.

Finally, this study has limitations. Fewer than half of the patients were admitted to the MVWRC with the prosthesis already in place; therefore, information prior to placement –such as baseline respiratory function values and the severity of the tracheal lesion– was not available. Likewise, the time interval between prosthesis placement and the onset of any of the described complications was not recorded. In addition, follow-up of subjects was performed only until discharge, with no follow-up of patients who were discharged home with the prosthesis still in place. Further scientific studies are needed to specifically analyze the statistical association between complications and the presence of the prosthesis.

CONCLUSION

Most subjects with MTG prostheses experienced some type of complication during their stay at the MVWRC, of whom one third required emergency removal. Standardization of postoperative care protocols could reduce these complications and improve the success rate of their use.

In this series of patients with Montgomery-type prostheses treated at a Mechanical Ventilation Weaning and Rehabilitation Center, complications were highly prevalent, affecting the vast majority of patients, with the need for emergency removal of the device in approximately one third of cases.

These findings highlight the fact that, although the Montgomery-type prosthesis is a useful tool in the management of certain airway pathologies, its use is not without clinically relevant risks, particularly in the context of prolonged hospitalization and in patients with a high burden of comorbidities.

Standardization of postoperative care, appropriate selection of device size and positioning, and providing specific training to the healthcare team could help reduce complication rates and improve the success rate of this device. Prospective studies with larger patient populations are needed to identify factors associated with complications and to optimize follow-up and management strategies for this prosthesis in the field of respiratory rehabilitation.

Conflict of interest

The authors have no conflicts of interest to declare in relation to this publication.

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ramr
American Review of Respiratory Medicine
Revista Americana de Medicina Respiratoria

ORIGINAL ARTICLE

ISSN 1852-236X

Characteristics of Metabolic Syndrome in a Rural High-Altitude Population of Peru

Características del síndrome metabólico en una población rural de altura del Perú

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Received: 09/02/2025
Accepted: 11/14/2025

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ABSTRACT

Introduction: Metabolic syndrome is a major global public health problem, and its prevalence and risk factors can vary significantly in high-altitude populations due to unique physiological adaptations and sociocultural contexts. Evidence on this condition in isolated rural Andean communities remains limited.

Objectives: To determine the risk factors associated with the presence of metabolic syndrome in adults attending outpatient consultation in Acobamba, a high-altitude region in Peru.

Materials and methods: A cross-sectional analytical study was conducted on 176 adults (mean age 52.5 ± 13.8 years; 60.2% women) between January and June 2025. Metabolic syndrome was defined according to adapted criteria of the NCEP-ATP III (National Cholesterol Education Program Adult Treatment Panel III). Sociodemographic, anthropometric, clinical, laboratory, and lifestyle data were collected. Descriptive, bivariate, and multiple logistic regression analyses were applied to calculate adjusted Odds Ratios with 95% confidence intervals.

Results: The prevalence of metabolic syndrome was 37.5% (30.3-45.1). Independently associated factors included: age (1.68 per decade; 1.25-2.26), low educational level (2.15; 1.02-4.53), obesity (body mass index ≥ 30 kg/m²; 2.78; 1.35–5.72), and insufficient physical activity (1.99; 1.01–3.93).

Conclusions: Significant modifiable and non-modifiable risk factors associated with metabolic syndrome were identified in this Andean high-altitude population, underscoring the need for culturally adapted preventive and clinical management interventions focused on these determinants.

Key words: metabolic syndrome; risk factors; altitude; cross-sectional study; epidemiology; Peru

RESUMEN

Introducción: El síndrome metabólico representa un importante problema de salud pública global, y su prevalencia y factores de riesgo pueden variar significativamente en poblaciones de gran altitud debido a adaptaciones fisiológicas y contextos socioculturales únicos. Existe una escasez de datos específicos sobre esta condición en comunidades rurales andinas aisladas.

Objetivos: Determinar los factores de riesgo asociados a la presencia de síndrome metabólico en adultos atendidos en consulta ambulatoria en Acobamba, una región de gran altitud en Perú.

Rev Am Med Resp 2025;25:175-184. https://doi.org/10.56538/ramr.MBOT8337

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Materiales y métodos: Se realizó un estudio transversal analítico en 176 adultos (edad media 52.5 ± 13.8 años; 60.2% mujeres) entre enero y junio de 2025. El síndrome metabólico se definió según criterios NCEP-ATP III adaptados. Se recolectaron datos sociodemográficos, antropométricos, clínicos, de laboratorio y de estilos de vida. Se aplicaron análisis descriptivos, bivariados y de regresión logística múltiple para calcular Odds Ratios ajustados con intervalos de confianza del 95%.

Resultados: La prevalencia del síndrome metabólico fue del 37.5 % (30.3-45.1). Los factores asociados de forma independiente fueron la edad (1.68 por década; 1.25-2.26), bajo nivel educativo (2.15; 1.02-4.53), obesidad (índice de masa corporal igual o mayor a 30 kg/m²; 2.78; 1.35-5.72) y baja actividad física (1.99; 1.01-3.93).

Conclusiones: Se identificaron factores de riesgo modificables y no modificables significativos asociados al SM en esta población andina de gran altitud, subrayando la necesidad de intervenciones preventivas y de manejo clínico culturalmente adaptadas y focalizadas en estos determinantes.

Palabras Clave: síndrome metabólico; factores de riesgo; altitud; estudio transversal; epidemiología; Perú

INTRODUCTION

Metabolic syndrome (MS) has emerged as a major public health challenge in the 21st century driven by its impact on morbidity and mortality associated with cardiovascular diseases and type 2 diabetes mellitus. Its prevalence varies according to the geographic and cultural context, and recent studies suggest that altitude may modulate the expression of its components. Chronic exposure to hypobaric hypoxia in Andean populations leads to physiological adaptations that could influence adipose tissue distribution, blood pressure, and lipid profiles; however, its interaction with conventional risk factors such as diet, physical inactivity, and genetic predisposition has not yet been fully elucidated.

At the international level, the evidence supports this variability. The meta-analysis by Zila-Velasque et al[1] reported a MS prevalence of 30.9% (95% CI: 20.0–43.0%) in populations residing at more than 3,500 meters above sea level, highlighting the influence of altitude on the phenotypic expression of the syndrome. Similarly, Huang et al[2] documented in communities of Derong, China (2,060-3,820 meters above sea level) a prevalence of only 3.6%, associated with a lower risk of obesity and dyslipidemia, but a higher risk of hypertension. These findings suggest that altitude may act as a modulating factor, but with heterogeneous effects, depending on cultural and genetic context. In addition, socioeconomic factors also play a relevant role. Su et al[3] (Korea) found a high prevalence of MS (≈47%) among individuals with extremely low income, associated with lower educational level and limited access to health care.

In Peru, several national studies have reported variable prevalences of MS depending on the diagnostic criteria used. Pajuelo and Sánchez[4] estimated a national prevalence of 16.8%, with lower figures in the rural highlands (11.1%), suggesting a protective profile in high-Andean communities. Subsequently, Pajuelo et al. confirmed this trend by finding a significantly lower prevalence in populations living in over 3,000 meters above sea level (10.2%) compared with those below 1,000 meters (19.7%). However, more recent studies show a different picture: Guzmán-Vilca and Carrillo-Larco[6] reported a national prevalence of 46%, with a higher frequency in urban (49%) rather than rural (38%) populations, while Vera-Ponce et al. found an overall prevalence of 40.6%, also highlighting variability according to the diagnostic criteria applied. Taken together, these figures reflect both the country's epidemiological transition and the need to contextualize findings in high-altitude rural populations.

Despite this growing research, important knowledge gaps remain, particularly with regard to rural high-Andean communities with specific socioeconomic conditions. Most studies have focused on capital cities or urban areas, leaving limited information on isolated localities such as Acobamba. In

these communities, socioeconomic profiles, limited access to health-care services, traditional dietary patterns (high consumption of carbohydrates and fats, use of coca leaves), and levels of physical activity shape a unique risk profile. Moreover, the diagnostic cut-off points used have rarely been validated for Andean populations, which could lead to underestimation or overestimation of prevalence.

Within this framework, the present study aims to identify risk factors associated with the presence of MS in adults receiving outpatient care at the Hospital Provincial de Acobamba, a high-altitude region of Peru. The objectives are to determine the prevalence of MS and its individual components, and to quantify the association between sociodemographic, anthropometric, lifestyle, and clinical history variables and the likelihood of having MS in this population. Understanding these patterns will improve the epidemiological characterization of the syndrome in the region and lay the groundwork for culturally appropriate preventive and therapeutic interventions.

MATERIALS AND METHODS

An observational, analytical, cross-sectional study was conducted between January and June 2025 in the outpatient clinic of the Hospital Provincial de Acobamba, Huancavelica, Peru. This locality is situated at more than 3,000 meters above sea level, and its population is predominantly rural, making it ideal for this analysis.

The study population included adults aged 18 years and older who attended outpatient consultations. The sample size was 176 individuals, calculated using the single-proportion formula for finite populations, based on the expected prevalence of MS reported in studies of populations with similar geographic and socioeconomic characteristics,[8] a 95% confidence level, a 5% margin of error, and 80% statistical power. Inclusion criteria were limited to legal adulthood and provision of informed consent. Pregnant women, patients with severe acute illnesses, conditions that precluded proper evaluation, or a prior diagnosis of MS under intensive treatment were excluded. Systematic random sampling was implemented, selecting patients from appointment records; a participation rate of 85% was recorded.

The dependent variable was MS, defined according to NCEP-ATP III criteria, considering the presence of three or more of the following components: abdominal obesity (≥ 90 cm in men, ≥ 80 cm in women, adapted for the Andean population), triglycerides ≥ 150 mg/dL, low HDL cholesterol (< 40 mg/dL in men, < 50 mg/dL in women), blood pressure ≥ 130/85 mmHg or antihypertensive treatment, and fasting glucose ≥ 100 mg/dL or a prior diagnosis of type 2 diabetes. Independent variables included sociodemographic, anthropometric, clinical, laboratory, lifestyle, and medical history factors (Table 1). Anthropometric measurements were performed using calibrated instruments and following standardized protocols. Clinical and laboratory data were obtained after an 8-12 hour fast, using standardized enzymatic methods in the hospital laboratory. Physical activity was assessed using the IPAQ-SF (International Physical Activity Questionnaire – Short Form), whose validity has been established in populations with comorbidities.[9]

Data collection was carried out by trained personnel using a structured questionnaire previously pilot-tested in a small sample to verify clarity and comprehension, along with a form for the collection of clinical and laboratory data. All information was coded to ensure confidentiality.

Statistical analysis was performed using SPSS v27.0. Categorical variables were described using frequencies and percentages, while continuous variables were calculated using means and standard deviations or medians and interquartile ranges, depending on their distribution as assessed by the Shapiro-Wilk test. Comparisons between groups with and without MS were conducted using the Chi-square or Fisher's exact test for categorical variables, and Student's t-test or the Mann-Whitney U test for continuous variables. Risk factors were identified through binary logistic regression, calculating crude and adjusted odds ratios (ORs) with 95% confidence intervals (95% CI). Variables with $p < 0.20$ in the bivariate analysis, or those considered clinically relevant, were included in the multivariate model using a backward stepwise selection method. Collinearity was assessed using the variance inflation factor (VIF); and model goodness of fit was evaluated with the Hosmer–Lemeshow test.[10] A p value < 0.05 was considered statistically significant.

The study protocol was approved by the Research Ethics Committee of the Hospital Provincial de Acobamba (HPA-CEI-005-2024). All participants provided written informed consent, and we ensured confidentiality and anonymity in handling data.

RESULTS

Characteristics of the participants

The sample included 176 adults (85% participation rate), with a mean age of 52.5 ± 13.8 years, and 60.2% were women. Table 2 shows significant differences between participants with and without MS, highlighting older age, lower educational level, higher BMI and waist circumference, as well as a higher prevalence of general and abdominal obesity in the group with MS.

Prevalence of metabolic syndrome and its components

The overall prevalence of MS was 37.5% (95% CI: 30.3-45.1). The most frequent component was abdominal obesity, followed by hypertriglyceridemia and low HDL cholesterol (Table 3). Figure 1 shows a significant increase in the prevalence of MS with age.

Comparison of clinical and biochemical parameters

Table 4 shows that patients with metabolic syndrome (MS) had significantly higher values of

TABLE 1. Study variables, operational definitions, and measurement scales

Main variable	Operational definition	Type of variable	Measurement scale	Role in the study
Metabolic syndrome (MS)	Presence of ≥ 3 NCEP-ATP III criteria (with adapted waist circumference cut-offs)	Categorical	Dichotomous (yes/no)	Dependent
Age	Age in years at the time of the interview	Continuous	Ratio (years)	Independent
Sex	Self-report	Categorical	Nominal (man/woman)	Independent
Educational level	Highest level of education attained	Categorical	Ordinal (categories)*	Independent
Body Mass Index (BMI)	Weight (kg) / height (m)²	Continuous	Ratio (kg/m²)	Independent
Waist circumference (WC)	Measurement in centimeters at the midpoint between the last rib and the iliac crest	Continuous	Ratio (cm)	Independent
Systolic blood pressure (SBP)	Mean of two measurements in mmHg	Continuous	Ratio (mmHg)	Independent
Diastolic blood pressure (DBP)	Mean of two measurements in mmHg	Continuous	Ratio (mmHg)	Independent
Fasting blood glucose	Level after ≥ 8 hours of fasting (mg/dL)	Continuous	Ratio (mg/dL)	Independent
Triglycerides (TG)	Level after ≥ 8 hours of fasting (mg/dL)	Continuous	Ratio (mg/dL)	Independent
HDL Cholesterol (HDL-C)	Level after ≥ 8 hours of fasting (mg/dL)	Continuous	Ratio (mg/dL)	Independent
Physical activity	Level according to IPAQ-SF	Categorical	Ordinal (low/mid/high)	Independent
Tobacco consumption	Current smoking status	Categorical	Nominal (is a smoker/is not a smoker/former smoker)	Independent
Alcohol consumption	Frequency and amount (standard units per week)	Categorical/continuous	Ordinal/ratio	Independent
Family history of diabetes	Reported diabetes in first-degree relatives	Categorical	Dichotomous (yes/no)	Independent
Coca leaf consumption	Reported habitual consumption	Categorical	Dichotomous (yes/no)	Independent

blood pressure, fasting blood glucose, triglycerides, uric acid, and ALT (alanine aminotransferase), along with a higher prevalence of hypertension, altered glucose, and hypertriglyceridemia. In contrast, HDL cholesterol levels were lower in both sexes, with a higher prevalence of reduced HDL-C. Figure 2 illustrates the differences in glucose and triglyceride levels between the groups.

Risk factor analysis

The bivariate analysis identified several factors significantly associated with the presence of MS (Table 5). Among these, notable factors include age (per every 10-year increase), low educational level, general obesity (BMI ≥ 30 kg/m²), abdominal obesity, low physical activity, and a family history of diabetes.

Subsequently, in the multiple logistic regression analysis adjusted for sex, the factors that maintained an independent and significant association with the MS were: age, low educational level, obesity (BMI ≥ 30 kg/m²), and low physical activity (Table 6). The adjusted Odds Ratios for these factors are visually presented in Figure 3.

DISCUSSION

This study found a 37.5% prevalence of metabolic syndrome among adults in Acobamba, a high-altitude Andean region. This figure is higher than

TABLE 2. Sociodemographic and anthropometric characteristics of participants (N = 176) with/without metabolic syndrome (MS)

Characteristics	Total (n = 176)	Without MS (n = 110)	With MS (n = 66)	p-value
Age (years), Mean ± SD	52.5 ± 13.8	48.7 ± 12.5	58.6 ± 13.1	< 0.001[1]
Sex, n (%)				0.178[2]
Man	70 (39.8)	48 (43.6)	22 (33.3)	
Woman	106 (60.2)	62 (56.4)	44 (66.7)	
Educational level, n (%)				0.035[2]
No formal education/Primary education	65 (36.9)	35 (31.8)	30 (45.5)	
Secondary education	78 (44.3)	52 (47.3)	26 (39.4)	
Higher education	33 (18.8)	23 (20.9)	10 (15.1)	
BMI (kg/m²), Mean ± SD	28.9 ± 4.5	27.1 ± 3.8	31.8 ± 4.1	< 0.001[1]
Obesity (BMI ≥ 30 kg/m²), n (%)	58 (33.0)	25 (22.7)	33 (50.0)	< 0.001[2]
WC (cm), Mean ± SD				
Men	93.5 ± 10.2	89.8 ± 8.5	99.7 ± 9.3	< 0.001[1]
Women	90.1 ± 11.5	85.5 ± 9.7	97.2 ± 10.8	< 0.001[1]
Abdominal obesity*, n (%)	102 (58.0)	50 (45.5)	52 (78.8)	< 0.001[2]

[1] Student's t-test for independent samples.
[2] Chi-square test.
* WC ≥ 90 cm in men ≥ 80 cm in women. SD= standard deviation

TABLE 3. Prevalence of metabolic syndrome and its individual components in the study population (N = 176)

Component	n	% (95% CI)
Metabolic syndrome (≥ 3 components)	66	37.5 (30.3-45.1)
Abdominal obesity[1]	102	58.0 (50.3-65.4)
Hypertriglyceridemia (≥ 150 mg/dL)	97	55.1 (47.4-62.6)
Low HDL-C[2]	88	50.0 (42.4-57.6)
High arterial pressure[3]	83	47.2 (39.7-54.8)
Altered fasting glucose (≥ 100 mg/dL)	73	41.5 (34.1-49.2)

[1] WC ≥ 90 cm men ≥ 80 cm women
[2] HDL-C < 40 mg/dL men, < 50 mg/dL women
[3] SBP ≥ 130 or DBP ≥ 85 mmHg or on treatment

historical estimates in high-Andean communities, where prevalences of 11.1% and 10.2% were reported in populations living above 3,000 meters above sea level.[4,5] In contrast, it is lower than recent national studies reporting prevalences of 46% and 40.6%,[6,7] although other analyses have described even higher figures, such as 73% in a cross-sectional study based on the VIANEV survey (Food and Nutrition Surveillance by Life Stages).[11] Additionally, Vera-Ponce et al[12] reported that more than 87% of the Peruvian population presents at least one metabolic alteration, more common in women, underscoring the need to reassess diagnostic criteria and design differentiated prevention strategies. This trend reflects the epidemiological transition of MS in Peru, where figures have increased steadily over the past two decades, challenging the previous notion that altitude confers a protective profile against the syndrome.

At the international level, the prevalence observed exceeds that reported in Tibetan communities (3.6%);[2] approaches that observed in low-income populations in Korea (≈47%),[3] and is close to the global average described in the meta-analysis

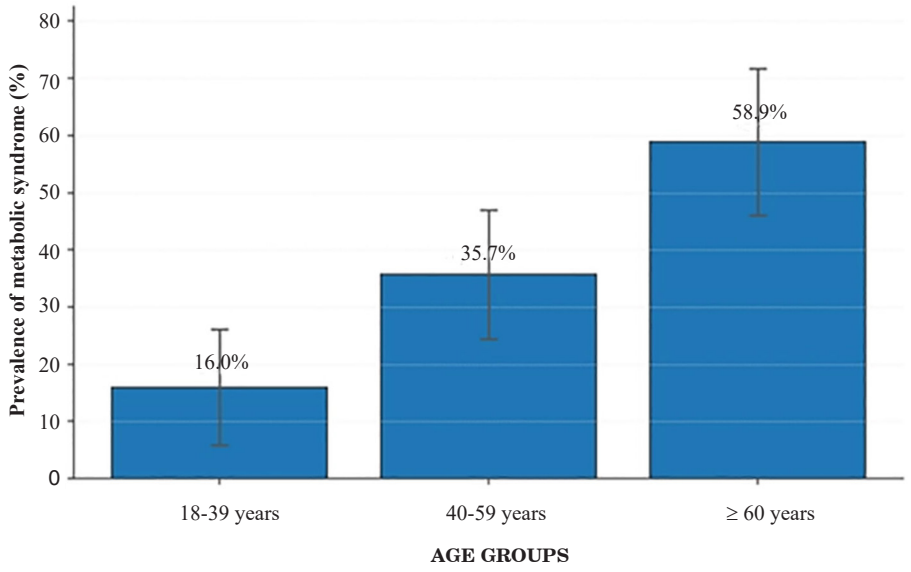

Figure 1. Prevalence of metabolic syndrome (with 95% confidence intervals) by age group in the study population (N = 176), Acobamba 2025. p for trend < 0.001 (Chi-square test for trend).

TABLE 4. Components of metabolic syndrome and clinical/biochemical parameters (N = 176) with/without metabolic syndrome (MS)

Parameter	Without MS (n=110)	With MS (n=66)	p-value
SBP (mmHg), Mean ± SD	122.5 ± 13.8	141.3 ± 15.2	< 0.001[1]
DBP (mmHg), Mean ± SD	78.9 ± 9.2	89.5 ± 10.1	< 0.001[1]
Arterial hypertension*, n (%)	35 (31.8)	48 (72.7)	< 0.001[2]
Fasting glucose (mg/dL), Mean ± SD	95.8 ± 10.5	115.6 ± 22.3	< 0.001[1]
Altered fasting glucose (≥ 100 mg/dL)*, n (%)	28 (25.5)	45 (68.2)	< 0.001[2]
Triglycerides (mg/dL), Median (IQR)	130 (105-160)	195 (165-250)	< 0.001[3]
Hypertriglyceridemia (≥ 150 mg/dL)*, n (%)	42 (38.2)	55 (83.3)	< 0.001[2]
HDL Cholesterol (mg/dL), Mean ± SD			
Men	45.2 ± 8.8	38.5 ± 7.5	< 0.001[1]
Women	50.1 ± 9.5	42.3 ± 8.1	< 0.001[1]
Low HDL-C*, n (%)	38 (34.5)	50 (75.8)	< 0.001[2]
Uric acid (mg/dL), Mean ± SD	5.5 ± 1.5	6.8 ± 1.8	< 0.001[1]
ALT (U/L), Median (IQR)	22 (18-28)	30 (24-40)	< 0.001[3]
Abdominal obesity*, n (%)	102 (58.0)	50 (45.5)	52 (78.8)

[1] Student's t-test. [2] Chi-square test. [3] Mann-Whitney U test.
* Defined according to NCEP-ATP III criteria.

by Zila-Velasque (30.9%).[1] These differences indicate that, in addition to altitude, socioeconomic and cultural factors modulate the expression of the MS. Therefore, comparisons should be interpreted with caution, taking into account diagnostic criteria, sample characteristics, and the modulating effect of altitude, which according to Wang et al[13] may reduce central obesity while increasing hypertension. In this regard, the systematic review by Villegas-Abrill et al[14] confirmed that the most commonly used parameters in high-altitude studies are BMI, waist circumference, blood pressure, triglycerides, HDL cholesterol, and serum glucose, consistent with the criteria applied in this study. This methodological concordance reinforces the validity of the findings and highlights the importance

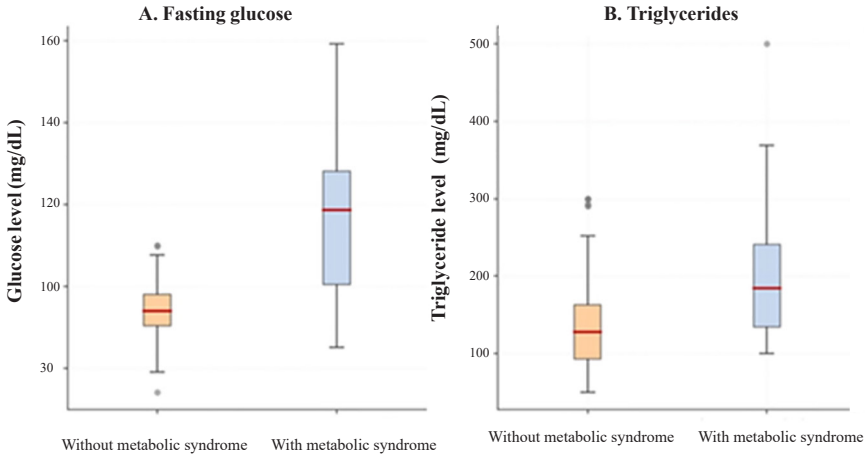

Figure 2. Distribution of fasting glucose (A) and triglyceride (B) levels according to the presence or absence of metabolic syndrome. The boxes represent the interquartile range (IQR), the middle line indicates the median, and the whiskers extend to 1.5 times the IQR. Dots represent outliers. *** p < 0.001 (Mann–Whitney U test).

TABLE 5. Bivariate analysis of risk factors associated with metabolic syndrome (N = 176)

Risk factor	Crude OR	95% CI	p-value
Age (per every 10-year increase)	1.85	1.40-2.45	< 0,001
Sex (woman vs. man)	1.52	0.80-2.89	0.198
Educational level (low* vs. high**)	2.80	1.35-5.80	0.005
Obesity (BMI ≥ 30 vs. < 30)	3.45	1.78-6.69	< 0,001
Abdominal obesity (yes or no)	4.21	2.15-8.23	< 0,001
Physical activity (low vs. mod/high)	2.50	1.30-4.80	0.006
Tobacco consumption (current smoker/ non-smoker/former smoker)	1.95	0.95-4.01	0.068
Alcohol consumption (at risk/ no risk)	1.70	0.88-3.29	0.112
Family history of diabetes (yes/ no)	2.10	1.08-4.09	0.029
Family history of AHT (yes/ no)	1.88	0.99-3.56	0.053
Coca leaf consumption (yes/ no)	1.65	0.82-3.31	0.159
Uric acid (mg/dL), Mean ± SD	5.5 ± 1.5	6.8 ± 1.8	< 0.001[1]
ALT (U/L), Median (IQR)	22 (18-28)	30 (24-40)	< 0.001[3]
Abdominal obesity*, n (%)	102 (58.0)	50 (45.5)	52 (78.8)

* Low: No formal education/Primary education. ** High: Secondary/Higher education. Risk consumption defined as >7 U/week (women), >14 U/week (men).

TABLE 6. Multiple logistic regression analysis of risk factors associated with metabolic syndrome (N = 176)

Risk factor	Adjusted OR (aOR)	95% CI	p-value
Age (per every 10-year increase)	1.68	1.25-2.26	0.001
Educational level (low* vs. high**)	2.15	1.02-4.53	0.044
Obesity (BMI ≥ 30 vs. < 30)	2.78	1.35-5.72	0.005
Physical activity (low vs. mod/high)	1.99	1.01-3.93	0.047
Family history of diabetes (yes/ no)	1.85	0.92-3.71	0.083

*Model adjusted for sex. Hosmer–Lemeshow test: p = 0.458. Maximum VIF (Variance Inflation Factor) < 2.5.
* Low: No formal education/Primary education. ** High: Secondary/Higher education

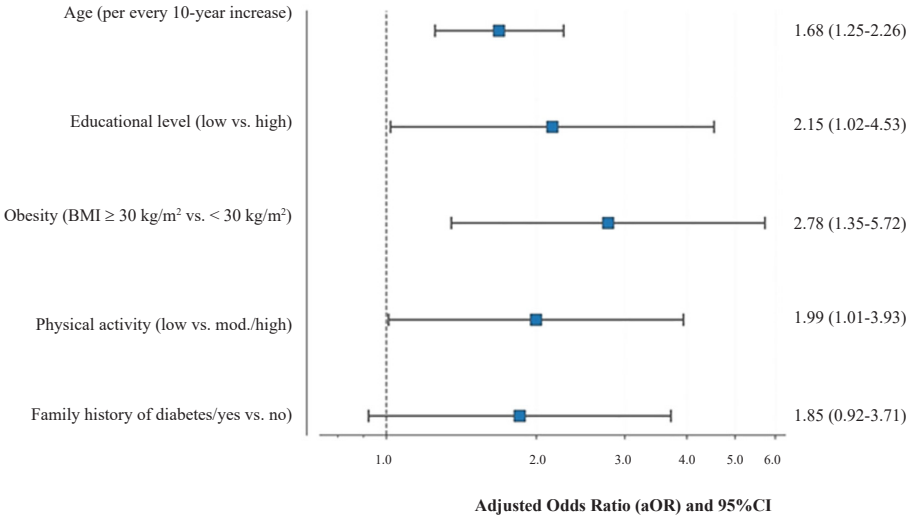

Figure 3. Adjusted Odds Ratios (aOR) and 95% Confidence Intervals for risk factors associated with metabolic syndrome derived from the multiple logistic regression model. The model was adjusted for sex. The vertical line at OR = 1 indicates no association.

of considering multiple diagnostic components in high-altitude populations.

Regarding sociodemographic factors, the positive association between age and the risk of MS is well documented in the literature, and our study is no exception, showing an adjusted OR of 1.68 for each 10-year increase. In a sample of more than 17,000 adults in the United States, Hirode and Wong,[15] reported a significant increase in prevalence from 19.5% among young adults (20-39 years) to 48.6% among people older than 60 years, confirming the strong influence of age on the expression of MS. In addition, Pigeot and Ahrens[16] emphasize that obesity and metabolic disorders develop during childhood and tend to persist into adulthood, reinforcing the importance of considering age as a transversal determinant in the evolution of the syndrome.

Even more revealing is the association with low educational level (aOR = 2.15), a factor that has also been identified among adults in Brazil[17] and among low-income Korean women.[18] This cross-cultural consistency suggests that education could act as a proxy for limited access to health information, reduced capacity to adopt healthy lifestyles, and barriers to prevention-all factors that could be exacerbated in isolated rural communities such as Acobamba. Interestingly, and in line with Gouveia et al[17] but contrary to general expectations, sex did not emerge as an independent predictor in our model. However, in a Swiss cohort, Alipour et al[19] found that low educational level predicts MS in women but not in men, and that women with MS present a higher cardiovascular risk. This discrepancy should be further explored in future studies, to consider gender roles and differential exposure to risk factors in the Andean context.

General obesity, measured by BMI, emerged as a strong independent predictor of MS (aOR = 2.78). In Brazil, Gouveia et al[17] also identified BMI as a key predictor (OR = 1.18), while Kim et al,[20] using machine learning models in a Korean population, identified it as the most important individual factor, even surpassing the waist-to-hip ratio. Although abdominal obesity is a central criterion of the syndrome, the strong association with BMI underscores its value as a simple screening tool in primary care, especially in resource-limited settings.

Regarding lifestyle factors, low physical activity was significantly associated with a higher risk of MS (aOR = 1.99). In Korea, Seo et al[21] demonstrated a dose-dependent protective effect of recreational physical activity, while Gemeda et al[22] in Ethiopia found a strong association between physical inactivity and MS in diabetic patients (aOR = 6.938). In rural Andean populations, occupational activity (agriculture, herding) can be considerable, but it does not always meet the intensity or type of effort that confers metabolic

benefits. For this reason, it tends to be underestimated in questionnaires such as the IPAQ-SF, which prioritize structured or leisure-time physical activity. Although this could be perceived as a limitation, it actually highlights the fact that what is relevant for metabolic risk is not only the amount of activity performed, but also its type and intensity.

The implications of these findings are multiple. This study provides evidence on MS in a high-altitude ecosystem, showing that universal factors such as age and obesity remain relevant, while socioeconomic variables such as education acquire particular importance in rural Andean areas. From a public health perspective, the results call for culturally adapted prevention and control strategies, with an emphasis on promoting physical activity, improving health education, and addressing obesity from early ages, leveraging existing community structures.

Among the limitations, the cross-sectional design precludes the establishment of causality, the sampling restricted to users of a health center may introduce selection bias, and the assessment of lifestyle factors through self-reports is susceptible to recall bias. In addition, the possibility of residual confounding persists, and generalization to other high-altitude populations should be undertaken with caution.

Future research should include longitudinal studies to confirm associations and explore cultural barriers to healthy lifestyles, as well as validate biomarkers and cut-off points specific to high-altitude populations. The use of advanced analytical techniques, such as machine learning models, could help identify more complex risk profiles.

This study provides evidence on the prevalence and determinants of metabolic syndrome in a high-altitude Andean community, highlighting the need for culturally adapted strategies for its prevention and control.

Conflict of interest

The authors have no conflict of interest to declare.

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American Review of Respiratory Medicine
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ORIGINAL ARTICLES

ISSN 1852-236X

Influence of Flexible Endoscopic Evaluation of Swallowing (FEES) on Feeding Route Decisions in Hospitalized Patients with Dysphagia

Influencia de la fibroendoscopía de la deglución (FEES) en la toma de decisiones sobre la vía de alimentación en pacientes con disfagia

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Received: 11/202/2025
Accepted: 12/12/2025

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ABSTRACT

Introduction: Dysphagia is common in hospitalized patients and is associated with complications. Flexible Endoscopic Evaluation of Swallowing is a safe, direct method for assessing swallowing.
Objective: To evaluate the impact of Flexible Endoscopic Evaluation of Swallowing on feeding route decisions in hospitalized patients with dysphagia.
Materials and Methods: Retrospective observational study in patients evaluated with Flexible Endoscopic Evaluation of Swallowing during hospitalization. Clinical variables and changes in feeding route were analyzed.
Results: In 33.7% of cases, Flexible Endoscopic Evaluation of Swallowing led to a change in feeding decision. Lack of laryngeal elevation and altered consciousness were significantly associated with non-oral feeding indication.
Conclusion: Flexible Endoscopic Evaluation of Swallowing has both diagnostic and therapeutic impact. Systematic use supports better clinical decision-making regarding feeding safety.

Key words: dysphagia; flexible endoscopic evaluation of swallowing; endoscopy; swallowing; feeding route

RESUMEN

Introducción: La disfagia es frecuente en pacientes internados, asociada a complicaciones. La fibroendoscopia de la deglución permite evaluar de forma directa y segura la deglución.
Objetivo: Evaluar el impacto de la fibroendoscopia de la deglución sobre la conducta alimentaria en pacientes internados con disfagia.
Material y Métodos: Estudio retrospectivo observacional en pacientes evaluados con fibroendoscopia de la deglución durante la internación. Se analizaron variables clínicas y la modificación de la vía de alimentación.
Resultados: En el 33,7 % de los pacientes, luego de realizada la fibroendoscopia de la deglución, cambió la vía de alimentación. La ausencia de elevación laríngea y el com-

Rev Am Med Resp 2025;25:185-190. https://doi.org/10.56538/ramr.ZEZB9304

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promiso del nivel de conciencia se asociaron con indicación de no alimentar por vía oral. **Conclusión:** La fibroendoscopia de la deglución tuvo impacto diagnóstico y terapéutico. Su uso sistemático optimiza decisiones clínicas relacionadas con la seguridad alimentaria.

Palabras clave: disfagia; fibroendoscopia de la deglución; endoscopia; alimentación; evaluación de la deglución

INTRODUCTION

Dysphagia is a common condition in hospitalized patients with neurologic or traumatic diseases. It is associated with respiratory complications, malnutrition, dehydration, prolonged hospital stays, and increased mortality.[1] The use of subjective clinical strategies for its evaluation remains a common practice in many centers, despite their low sensitivity and specificity.

The flexible endoscopic evaluation of swallowing (FEES) introduced by Langmore in 1988, has proven to be an objective, safe, and highly useful tool for both acute and chronic settings.[2] This technique enables direct and detailed assessment of laryngopharyngeal structures, secretion management, and the passage of the food bolus, with immediate application of therapeutic strategies during the procedure. Assessing the sensitivity of the laryngeal structures through direct contact with the fiberscope is another benefit provided by this method.

In hospitalized patients with dysphagia –particularly those with tracheostomy, neurological impairment, or motor impairments– FEES has been shown to be superior to clinical evaluation. Systematic use of FEES has been associated with a significant reduction in diagnostic errors, respiratory complications, and unnecessary use of enteral nutrition.[3, 4]

The standardization of food stimuli through the IDDSI (International Dysphagia Diet Standardisation Initiative) enables precise categorization of consistencies and viscosities used during dysphagia evaluation. This facilitates result comparisons, interdisciplinary communication, and targeted therapeutic planning.[5]

Despite its potential benefits, there are few studies that quantify the real impact of FEES on clinical decision-making regarding the choice of the feeding route, particularly in inpatient and rehabilitation settings. This study analyzes the influence of FEES on the feeding route choice in hospitalized patients diagnosed with dysphagia, also evaluating predictive factors associated with the decision to use enteral feeding.

MATERIALS AND METHODS

An observational, analytical, longitudinal, and prospective study was conducted in a cohort of 107 adult patients hospitalized in a rehabilitation center between January 2023 and April 2025. All patients had a clinical diagnosis of dysphagia and required instrumental evaluation using FEES.

Procedure

FEES was performed by an interdisciplinary team comprising a pulmonologist and a speech-language pathologist specialized in swallowing disorders. Standardized scales, such as the Langmore secretion scale for documenting secretion pooling sites before food stimulus, helped predict aspiration risk. The Rosenbek Penetration-Aspiration Scale was also used to quantify penetration and aspiration events for each consistency and volume.

The study was carried out at the bedside, with patients in a seated or semi-seated position, depending on their tolerance.

The following general clinical variables were recorded:

- Tongue motility
- Soft palate elevation
- Velopharyngeal closure
- Vocal cord mobility
- Laryngeal elevation
- Laryngeal contractility
- Reflex cough

Swallowing evaluation

Food stimuli of 5 mL and 10 mL were administered in consistencies defined by the IDDSI:

- **Level 0**: Thin liquids
- **Level 1**: Slightly thick liquids
- **Level 4**: Puree

Objectives

The primary objective of this study was to evaluate the impact of FEES on clinical decision-making regarding the feeding route in patients with dysphagia. The primary outcome was defined as a change in nutritional indication

(initiation, suspension, or modification of oral intake) following the study.

As a secondary objective, the association between selected clinical variables and the decision to withhold oral feeding was analyzed using univariable and multivariable statistical analyses, with the aim of identifying potentially useful clinical predictors in the context of feeding route decision-making.

RESULTS

General characteristics of the cohort

A total of 107 consecutive patients with a clinical diagnosis of dysphagia were evaluated. The mean age was 66 years (standard deviation [SD] ± 15.6), with a range from 17 to 89 years. 72% were male (n = 77). The most frequent reason for hospitalization was stroke (56%), followed by polyneuropathies (25%) and traumatic brain injury (TBI) (9%).

General status and conditions at the time of the study

87% of patients had preserved alertness, while 13% showed some degree of impaired level of consciousness (9% disoriented, 4% drowsy). Regarding patient position during the study, 58% were evaluated in a seated position and 42% in a semi-seated position (45 degrees). Only 10% had a tracheostomy (n = 11).

Functional findings on FEES before swallowing evaluation

94% had vocal cord mobility; 98% had velopharyngeal closure; and 96% had soft palate elevation. However, 82% did not have adequate pharyngeal contractility. 45% lacked tongue motility, and 29% did not show laryngeal elevation-two key parameters for safe swallowing.

Endoscopic evaluation of swallowing

Swallowing impairments were frequently observed during the administration of 5 mL and 10 mL volumes at IDDSI levels 0 (thin liquid), 1 (slightly thick liquid), and 4 (puree). At IDDSI levels 1 and 4, more than 90% of patients presented some type of swallowing disorder. Penetration or aspiration events were identified in 26.7% with thin liquids (IDDSI 0), 52.3% with nectar-thick liquids (IDDSI 1), and 59.3% with puree (IDDSI 4). The higher frequency of events observed with thicker consistencies (IDDSI 1 and 4) compared to thin liquids (IDDSI 0) is explained by the study protocol, which prioritized starting with safer consistencies. If significant aspiration or penetration was observed, progression to thinner consistencies was discontinued to avoid risks, which may have led to an underestimation of events at IDDSI 0.

According to the Rosenbek Penetration-Aspiration Scale, the distribution of scores was as follows: a score of 2 (penetration that resolves spontaneously) was the most common for IDDSI levels 1 and 4. silent aspirations (score of 8) were recorded in a small percentage of patients, mostly in IDDSI level 4.

Change in clinical management post-FEES

One every three patients (n = 33; 31%) had their feeding route modified after the instrumental evaluation. Twenty-six patients (24%) initiated oral feeding after previously lacking an oral route, while 7 patients (6%) discontinued oral feeding due to risk findings (p = 0.002).

Clinical variables associated with the decision to withhold oral feeding

In the subgroup of patients in whom oral feeding was not initiated or was suspended (regardless of prior oral intake), specific clinical patterns were identified. The two main significant predictors of the decision to withhold oral feeding were: absence of laryngeal elevation observed during the endoscopic study, strongly associated with contraindication to oral feeding (p = 0.001), and altered level of consciousness, including disoriented or drowsy patients, also significantly correlated said contraindication (Figure 1, Table 1).

These findings remained significant in the multivariable analysis, reinforcing their value as independent predictors of contraindication to oral feeding in this clinical context (Table 2).

Change in voice tone was common, but not significantly associated with the clinical decision (p = 0.56), underscoring the need for objective instrumental assessments.

Complications

A low complication rate was recorded (0.9%); the most frequent was nasal discomfort, followed by nausea. Only one patient was unable to tolerate the procedure.

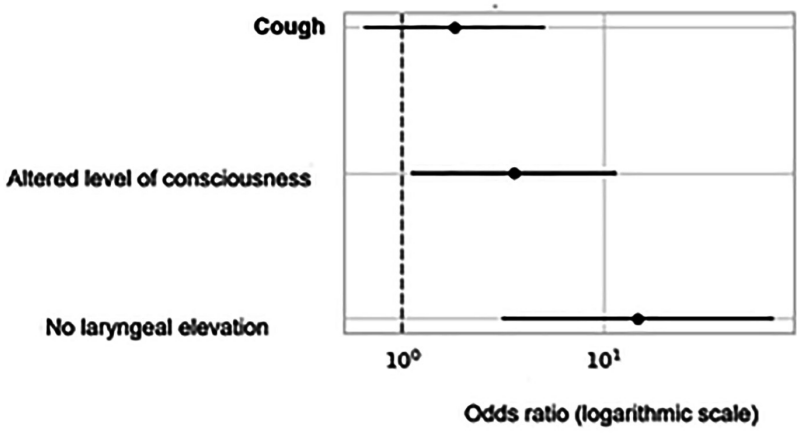

Figure 1. Multivariable analysis: predictors of contraindication to oral feeding

TABLE 1. Univariable analysis for withholding oral feeding after FEES

Variable	Test	P-value	Significance	n
Sex	Fisher	0.624	Non-significant	33
Level of consciousness	Fisher	0.710	Non-significant	33
Position	Fisher	0.674	Non-significant	33
Tracheostomy	Fisher	0.555	Non-significant	33
Change in voice tone	Fisher	0.556	Non-significant	33
NGT (nasogastric tube)	Fisher	0.018	Significant	33
Tongue motility	Fisher	0.494	Non-significant	33
Soft palate elevation	Fisher	0.788	Non-significant	33
Contractility	Fisher	0.788	Non-significant	33
Laryngeal elevation	Fisher	0.044	Significant	33
Cough	Fisher	0.023	Significant	33

TABLE 2. Multivariable analysis for withholding oral feeding after FEES

Variable	*p*-valor	OR (exp (B)
Laryngeal elevation	0.001	14.85
Cough	0.101	3.743
Level of consciousness	0.033	3.590

DISCUSSION

The present study shows that the systematic use of FEES with standardized food consistencies such as those described by the IDDSI, has a significant impact on clinical decision-making regarding the feeding route in hospitalized patients with dysphagia. In our cohort, one every three patients experienced a change in their feeding route after the procedure, reinforcing its role as a diagnostic but also a therapeutic evaluation tool.

These findings are consistent with previous studies. Dziewas et al evaluated FEES in critically ill patients with tracheostomy, applying a standardized swallowing assessment protocol that included neuromuscular and sensory functions. The study showed that FEES not only safely identifies swallowing disorders but also allows for structured, early guidance toward oral feeding progression in these vulnerable patients.[3] The standardization of assessment using tools such as FEESST (flexible endoscopic evaluation of swal-

lowing with sensory testing) or FEES+ facilitates more objective feeding decisions in the context of prolonged hospitalization.

Similarly, Terzi et al analyzed the clinical utility of FEES in patients admitted to a respiratory care unit and found that more than 40% of the abnormalities detected by endoscopy were not clinically suspected. Instrumental evaluation allowed for reclassification of feeding management in a significant proportion of cases, highlighting the risk of underestimating or overestimating dysphagia when assessed only clinically.[6]

In our cohort, a high frequency of swallowing disorders was also observed with thicker consistencies (IDDSI 1 and 4), along with elevated penetration/aspiration levels according to the Rosenbek scale, underscoring the pathophysiological complexity of dysphagia in hospitalized patients. Among clinical predictors, absence of laryngeal elevation and altered level of consciousness were significantly associated with the decision to withhold oral feeding. These findings are consistent with studies proposing the inclusion of these variables as objective clinical screening criteria prior to FEES.[3, 4]

Notably, commonly used clinical signs such as the "wet voice" were not significantly associated with decision-making regarding the feeding route. This is consistent with findings reported by Suiter and Leder, who analyzed the specificity of this clinical sign and concluded that, in the absence of an instrumental evaluation, its predictive value is low and may lead to unnecessarily restrictive decisions.[7] This finding reinforces the need to prioritize objective, instrument-based tools over an isolated clinical examination.

Our study presents several relevant methodological strengths. The prospective design, with systematic implementation of FEES under real clinical conditions, allowed for a robust evaluation of hospitalized patients with diverse profiles. The application of international standards such as those established by the IDDSI, significantly enhanced the reproducibility of the findings and their comparability with other studies. In addition, the use of a rigorous multivariable analysis allowed the identification of clinically relevant predictors associated with feeding route decisions.

However, certain limitations should also be considered. This was a single-center study, which may limit the generalizability of results to other healthcare settings. Furthermore, no longitudinal follow-up of patients was conducted, making it impossible to assess the impact of FEES-based clinical decisions on nutritional recovery, incidence of aspiration pneumonia, or medium- and long-term morbidity and mortality. Additionally, no direct comparison was made between FEES and other instrumental methods such as videofluoroscopy, limiting the comparative analysis of diagnostic sensitivity and specificity. Finally, the small number of patients with tracheostomy made it difficult to draw solid conclusions for this specific subgroup.

CONCLUSION

The systematic use of FEES, with IDDSI standardization significantly impacts clinical decision-making on feeding routes in dysphagic patients. Standardized food stimuli enabled the categorization of consistencies during instrumental evaluation, enhancing case comparability and result quality.

Variables such as absence of laryngeal elevation and impaired level of consciousness were reliable predictors to withhold oral feeding. In contrast, the "wet voice" sign showed no association with feeding management changes, indicating it should not be used alone as a clinical criterion. These findings support the routine use of FEES in hospital settings as a safe, objective, and cost-effective tool.

Conflict of interest

The authors have no conflicts of interest to declare.

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American Review of Respiratory Medicine
Revista Americana de Medicina Respiratoria

ORIGINAL ARTICLE

ISSN 1852-236X

Impact of Obesity on Functional and Tomographic Respiratory Sequelae of Patients Hospitalized for COVID-19

Impacto de la obesidad en las secuelas respiratorias funcionales y tomográficas de pacientes hospitalizados por COVID-19

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Received: 01/10/2025
Accepted: 20/11/2025

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ABSTRACT

Introduction: Obesity has been recognized as a risk factor for the development of severe forms of COVID-19. However, its impact on long-term functional and tomographic evolution remains a subject of study.

Objective: To evaluate the impact of obesity on the respiratory functional and tomographic evolution of patients hospitalized for COVID-19, with follow-up at 12 months post-discharge.

Materials and methods: A multicenter, prospective, analytical study was conducted on patients hospitalized for moderate and severe COVID-19. Participants were divided into two groups based on their body mass index (BMI): with and without obesity (BMI ≥30 kg/m²). Clinical and functional parameters were evaluated: forced vital capacity (FVC), desaturation during the 6-minute walk test (6MWT), and the presence of a fibrotic pattern on high-resolution computed axial tomography (HRCT) were evaluated at 3, 6, and 12 months.

Results: Of the 78 patients included, 46 (59%) were obese. No statistically significant differences were observed between the groups regarding the evolution of FVC, desaturation during the 6MWT, or the presence of a fibrotic pattern. In the multivariate analysis, obesity was not an independent predictor of tomographic or functional sequelae.

Conclusion: In this cohort, obesity was not associated with a higher prevalence of objective post-COVID-19 respiratory sequelae at 12 months post-hospital discharge. These findings suggest that, once the acute phase of the disease is overcome, the BMI is not a determining predictor of persistent tomographic damage. However, additional studies with much larger samples are required in order to confirm these results.

Key words: COVID-19; hospitalization; obesity; sequelae

RESUMEN

Introducción: La obesidad ha sido reconocida como un factor de riesgo para el desarrollo de formas graves de COVID-19. Sin embargo, su impacto en la evolución funcional y tomográfica a largo plazo sigue siendo motivo de estudio.

Rev Am Med Resp 2025;25:191-195. https://doi.org/10.56538/ramr.KYVV3883

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Objetivo: Evaluar el impacto de la obesidad en la evolución funcional respiratoria y tomográfica de pacientes hospitalizados por COVID-19 con seguimiento a los 12 meses del alta.

Materiales y métodos: Estudio multicéntrico, analítico, prospectivo en pacientes hospitalizados por COVID-19 moderado y grave. Los participantes fueron divididos en dos grupos según índice de masa corporal (IMC) con y sin obesidad (IMC ≥30 kg/m²). Se evaluaron parámetros clínicos, funcionales: capacidad vital forzada (CVF), desaturación durante la prueba de caminata de 6 minutos (PC6M); y presencia de patrón fibrótico en TACAR a los 3, 6 y 12 meses.

Resultados: De los 78 pacientes incluidos, 46 (59%) presentaban obesidad. No se observaron diferencias estadísticamente significativas entre los grupos en cuanto a la evolución de CVF, la desaturación en la PC6M o presencia de patrón fibrótico. En el análisis multivariado, la obesidad no fue un predictor independiente de secuelas tomográficas ni funcionales.

Conclusión: En esta cohorte la obesidad no se asoció a una mayor prevalencia de secuelas respiratorias objetivas post-COVID-19 a los 12 meses del alta hospitalaria. Estos hallazgos sugieren que, una vez superada la fase aguda de la enfermedad, el IMC no es un predictor determinante de daño tomografico persistente. No obstante, se requieren estudios adicionales con muestras más grandes para confirmar estos resultados.

Palabras claves: COVID-19; hospitalización; obesidad; secuelas

INTRODUCTION

The COVID-19 pandemic has had a significant impact on global public health, not only during its acute phase but also due to the sequelae that may persist months after the initial infection.[1-4] Various studies have identified obesity as a risk factor for developing severe forms of the disease, with a higher risk of hospitalization, admission to Intensive Care Units, and mortality. This has been attributed to a chronic inflammatory state, immune dysfunction, and ventilatory mechanical alterations associated with excess adipose tissue.[5,6]

While the role of obesity in the acute phase is well established, its influence on long-term recovery remains an area of active research. Some studies indicate that once the critical phase has been overcome, the BMI does not necessarily predict the presence of objective pulmonary sequelae.[7-11]

The objective of this study is to analyze whether obesity affects the functional and tomographic evolution of patients hospitalized for moderate and severe COVID-19, with outpatient follow-up for up to 12 months after hospital discharge.

MATERIALS AND METHODS

Descriptive, analytical, prospective, multicenter study (Hospital A. Posadas, Hospital Ramos Mejía, Hospital F. Santojanni, Hospital Churruca-Visca. Secuelar-19 Study). The study was approved by the Ethics and Research Committee of each participating hospital. All patients signed informed consent.[12,13]

The study included adult patients hospitalized in general wards or in the Intensive Care Unit (ICU) for moderate or severe COVID-19, confirmed by nasal swab, between June 1, 2020, and April 9, 2021. Outpatient follow-up was conducted with evaluations at 3, 6, and 12 months after hospital discharge.

The following data were recorded: clinical data (age, sex, BMI), comorbidities, hospitalization in general ward or ICU and requirement of mechanical ventilatory assistance, functional parameters (FVC, oxygen desaturation during 6MWT), tomographic parameters (presence of a fibrosis-like pattern on HRCT).

The following operational definitions were used for the variables evaluated:

Moderate COVID-19 disease (Cao category 4): defined as disease requiring hospitalization in a general ward with a PaO_2/FiO_2 ratio greater than 200, without signs of sepsis and/or hemodynamic instability. Severe COVID-19 disease (Cao categories 5-6): defined as disease requiring hospitalization in the ICU, intermediate care, or ward requiring NG support, with a PaO_2/FiO_2 ratio less than 200, and signs of sepsis and/or hemodynamic instability.

Six-Minute Walk Test (6MWT): performed according to the criteria established by the 2009 Guidelines of the ATS/ERS (American Thoracic Society/European Respiratory Society). "Desaturating patients" (DP) were defined as those with a drop of ≥4 percentage points in oxygen saturation (SaO_2) during the 6MWT. "Non-desaturating patients" (NDP) were defined as those who did not reach this threshold.

HRCT imaging: a fibrotic-like HCRCT pattern was defined as the presence of at least one of the following tomographic findings: interlobular septal thickening,

reticulations, traction bronchiectasis, and/or honeycombing.[21] A non-fibrotic pattern was defined by the following tomographic signs: ground-glass opacities (GGOs), crazy paving, nodules, and alveolar consolidation.[14]

Analysis groups: patients with obesity (BMI ≥ 30 kg/m²) and non-obese patients (BMI < 30 kg/m²).

Statistical analysis: categorical variables were reported as frequency and percentage. Continuous variables that assumed a normal distribution were reported as mean and standard deviation (SD). Otherwise, the median and interquartile range (IQR 25-75%) were used. To compare continuous variables between independent groups, the Student's T-test or the Mann-Whitney U test was used, as appropriate. For the comparison of categorical variables, the Chi-square test or Fisher's exact test was used, as appropriate.

To estimate the odds ratios (ORs) and 95% confidence intervals (95% CI) for the association between obesity and different outcome variables –fibrosis-like pattern on HRCT, forced vital capacity < 80%, and desaturation during the 6MWT at 12 months– adjusted multiple logistic regression models were used.

Demographic variables, respiratory functional parameters, and imaging findings were analyzed by comparing the obese and non-obese groups.

An online data collection platform was used (www.mawetools.com). A p value < 0.05 was considered statistically significant. Data analysis was performed using SPSS® for Macintosh software, version 25.0 (IBM Corp., Armonk, NY, USA).

RESULTS

In the SECUELAR-19 study, 111 of 305 patients were excluded for various reasons.

At the 12-week analysis, 194 participants were included; 129 (66.5%) continued after 6 months of follow-up, and 103 (53%) completed the study up to week 52. 78 of those patients were included in the present study because they had complete data on obesity status, of whom 46 (59%) were obese.

Table 1 shows the demographic and clinical variables at study admission for obese and non-obese patients. Patients with obesity were predominantly female (p = 0.036) and had a higher prevalence of arterial hypertension (p = 0.016). Patients with a history of smoking (former/current smoker) accounted for 33% of the sample (26 patients).

In the functional evaluation at 3, 6, and 12 months, no significant differences were observed between the two groups in terms of FVC or desaturation during the 6MWT.

The fibrosis-like tomographic pattern was frequent at baseline (greater than 50%) and then progressively decreased in both groups, without significant differences (Table 2). (Fig.1).

In contrast, the presence of FVC < 80% at 3 months showed a strong association with the persistence of fibrotic patterns on CT.

DISCUSSION

This study has shown that in this cohort, obesity was not associated with a higher prevalence of tomographic post-COVID-19 sequelae at 12 months after hospital discharge.

In the SECUELAR-19 study, improvement was observed in all variables when comparing the evaluations at 3, 6, and 12 months. However, functional and tomographic abnormalities persisted after one year, with a fibrosis-like tomographic pattern in 35%, reduced FVC in about one quarter of patients, and desaturation in 12.8% of patients.[12,13]

Regarding tomographic findings, Athon Wells questioned whether the fibrotic-like pattern truly indicates irreversible damage in a lung recovering from acute respiratory distress syndrome (ARDS), as the "honeycomb" sign typically does. He also questioned the non-fibrotic–like pattern described

TABLE 1. Basal characteristics of participants 3 months after hospital discharge

Variables	All (n=78)	Obese (n=46)	Non- Obese (n=32)	P value
Age, mean (SD)	56.2 (9.1)	56.9 (9.2)	55.2 (9.0)	0.41
Females, n (%)	25 (32.1%)	19 (41.3%)	6 (18.8%)	0.036
BMI, median (IQR)	30 (28-34)	33 (31-36)	26.5 (25-28)	<0.001
Desaturation after 3 months, n (%)	25 (32.1%)	15 (32.6%)	10 (31.3%)	0.90
FVC < 80% after 3 months, n (%)	29 (37.2%)	15 (32.6%)	14 (43.8%)	0.32
Charlson Index, median (IQR)	2 (1-3)	1 (1-3)	2 (1-3)	0.24
History of respiratory diseases, n (%)	13 (16.7%)	7 (15.2%)	6 (18.8%)	0.68
Arterial hypertension, n (%)	24 (30.8%)	19 (41.3%)	5 (15.6%)	0.016
Diabetes, n (%)	22 (28.2%)	11 (23.9%)	11 (34.4%)	0.31
Requirement of MVA, n (%)	25 (32.1%)	11 (23.9%)	14 (43.8%)	0.065
Severe pneumonia, n (%)	42 (53.8%)	25 (54.3%)	17 (53.1%)	0.91

TABLE 2. Evolution of the fibrotic-like pattern on CT by group

Follow-up time	Non- Obese (n=32)	Obese (n=46) p-value	p-valor
SF a los 3 meses	19 (59.4%)	24 (52.2%)	0.691
SF a los 6 meses	13 (40.6%)	14 (30.4%)	0.491
SF a los 12 meses	11 (34.4%)	13 (28.3%)	0.744

CT: computed tomography Chi²: square Chi test.
No statistically significant differences were found between groups at any of the time points evaluated (p > 0.05).

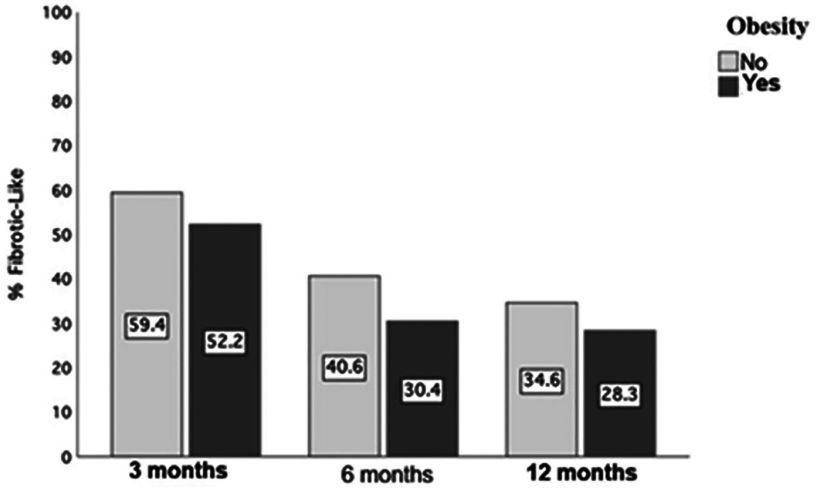

Figure 1. Evolution of the fibrotic-like pattern on CT by group

TABLE 3. Logistic regression analysis: factors associated with the fibrotic-like pattern

Variable	OR (95% CI)	p value
Age	1.058 (1.016 - 1.102)	0.006
Males	0.949 (0.415 - 2.171)	0.902
Obesity	0.705 (0.338 - 1.470)	0.351
Severe pneumonia	1.467 (0.718 - 2.997)	0.293
Predicted FVC <80% (3 months)	3.873 (1.732 - 8.661)	0.001
Desaturation (3 months)	1.205 (0.531 - 2.734)	0.656

by Han et al, noting that ground-glass opacities can sometimes indicate irreversible interstitial fibrosis in other interstitial lung diseases. In this clinical context, lung injury may be mediated by viral pathogenicity, but it may also be related to lung injury induced by mechanical respiratory assistance (MRA). Other mechanisms of viral lung injury have also been proposed, including autoimmune-mediated inflammation and vascular damage. It has also been suggested that 5–10% of adults have pre-existing lung diseases, and that mechanical ventilation in ARDS can leave residual imaging abnormalities for up to a year, further complicating the interpretation of lung imaging.[15]

Several international studies have shown that obesity is a significant risk factor for an unfavorable course during the acute phase of COVID-19, with a higher risk of hospitalization, admission to the Intensive Care Unit, mechanical ventilation, and mortality. These effects are explained by several pathophysiological mechanisms, including reduced respiratory functional capacity due to mechanical limitations, immune dysfunction induced by adipose tissue, and the chronic pro-inflammatory state characteristic of obesity. [7-11]

Our study, however, focuses on long-term outcomes and found that in patients who survived the acute phase and underwent structured outpatient follow-up, obesity was not significantly associated with functional or tomographic respiratory sequelae at 12 months after discharge.

A recent systematic review found that obese patients had a higher prevalence of persistent symptoms, including dyspnea, fatigue, and cognitive impairment, as well as reduced functional capacity in exercise testing.[16,17] Studies using cardiopulmonary exercise testing have shown that post–COVID-19 obese patients present abnormalities in gas exchange and an abnormal ventilatory response, including inefficient hyperventilation and reduced peak oxygen consumption. This supports the hypothesis that functional impairment is not always detectable by standard testing.[18]

Our findings align with the SECUELAR-19 study conducted in Argentina, which identified diabetes, pre-existent respiratory disease, and early fibrotic pattern on HRCT as factors associated with persistent functional impairment–not implicating obesity.[17] This consistency suggests that once the acute phase has been overcome, BMI *per se* does not necessarily predict lasting structural lung damage.

Among the limitations of the present study are the small sample size, the lack of stratification by obesity class (I, II, III), and the absence of baseline functional data prior to COVID-19 infection. Additionally, metabolic variables and factors such as vaccination status or viral variants –which could have influenced outcomes– were not evaluated.

Despite these limitations, the results provide relevant local evidence indicating that obesity, in the context of protocolized follow-up, is not associated with a higher prevalence of objectively measurable long-term pulmonary sequelae. Larger prospective studies including body composition measurements, inflammatory markers, and cardiopulmonary exercise testing are required to better clarify the impact of post-COVID obesity.

Conflict of interest
None to declare

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IMAGING IN PULMONOLOY

ISSN 1852-236X

Silicotuberculosis: A case report

Silicotuberculosis: A propósito de un caso

Luis Alberto Tancara Condori

CASE DESCRIPTION

63-year-old man, originally from Potosí (Bolivia), former underground miner with more than 20 years of exposure to crystalline silica (working as a driller). He came to the Emergency Department with a one-month history of mucopurulent sputum associated with grade 2 dyspnea (mMRC), night sweats, asthenia, adynamia, and weight loss. At the time of admission, the patient had been unemployed for 5 years.

Physical examination revealed a baseline oxygen saturation of 65% measured by pulse oximetry on room air, accompanied by tachypnea and use of accessory respiratory muscles. Pulmonary auscultation revealed isolated crackles in both hemithoraces. Chest X-ray showed a tortuous trachea deviated to the right and upper lobes with signs of atelectasis (Image 1). Chest computed tomography (CT) showed solid nodules with conglomerate formations and the development of progressive massive fibrosis in segment 1 bilaterally, with dystrophic calcifications within them, mediastinal lymph nodes measuring 1.2 cm with calcification, and air cysts. These findings suggest a classic presentation of silicosis (Images 2 and 3).

Laboratory findings showed leukocytosis with a left shift and elevated C-reactive protein (151 mg/L). Arterial blood gas analysis revealed type I (hypoxemic) respiratory failure: PaO_2: 38 mmHg, PCO_2: 41 mmHg.

DIAGNOSIS AND CASE DISCUSSION

After admission, a fiberoptic bronchoscopy with bronchoalveolar lavage (BAL) was performed, and the results showed no growth in conventional microorganism cultures. Given the clinical suspicion and a negative sputum bacilloscopy, a GeneXpert MTB/RIF test was requested on the BAL sample as the initial diagnostic test, yielding a "Detected" result for Mycobacterium tuberculosis sensitive to rifampicin. Based on the occupational history, clinical findings, and imaging results, this confirms pulmonary silicotuberculosis. Antituberculous therapy for drug-sensitive TB was initiated with the four-drug regimen (RHZE, rifampicin, isoniazid, pyrazinamide, and ethambutol). Given the good tolerance and clinical improvement, outpatient management with home oxygen therapy was decided.

Silicotuberculosis is the combination of silicosis (a chronic, fibrotic, and irreversible lung disease) and pulmonary tuberculosis (a potentially curable infectious disease). It remains a significant public health problem in countries with high mining activity such as Bolivia.[1] The development of new technological processes has increased the risk of silicosis in various sectors. Silicosis not only affects lung function, but also increases the risk of COPD (chronic obstructive pulmonary disease), lung cancer, and especially tuberculosis.[2]

Rev Am Med Resp 2025;25:196-198. https://doi.org/10.56538/ramr.MGFP7852

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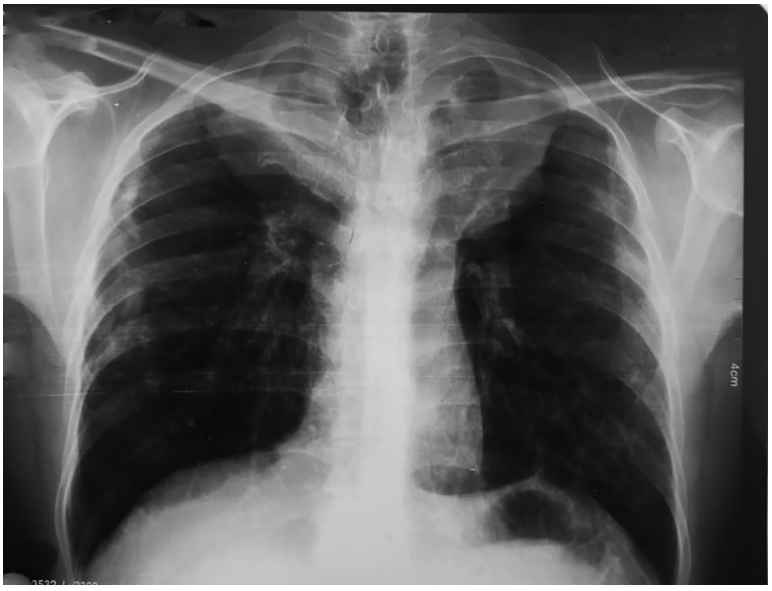

Image 1. Chest X-ray (posteroanterior view) demonstrating a tortuous trachea displaced to the right and signs of volume loss (atelectasis) in both upper lobes.

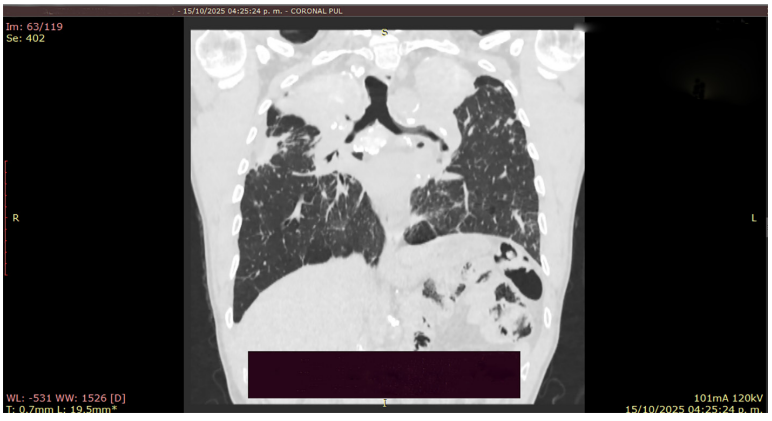

Image 2. Chest CT, coronal reconstruction (lung window), showing solid nodules with a tendency toward coalescence, forming progressive massive fibrosis (PMF) masses in bilateral apical segments. Intranodular dystrophic calcifications, calcified mediastinal lymphadenopathy (1.2 cm), and perilesional air cysts are observed, findings consistent with complicated silicosis.

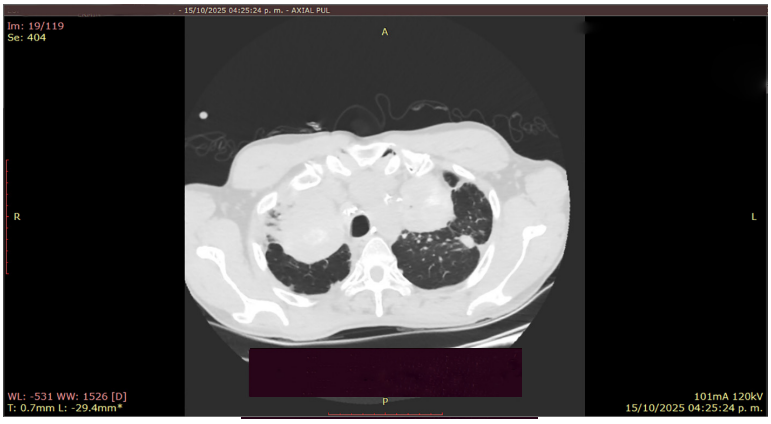

Image 3. Chest CT, axial view, showing nodular conglomerates and fibrotic masses with associated calcifications, characteristic of progressive massive fibrosis formation in advanced stages of pneumoconiosis.

The treatment duration for silicotuberculosis in Bolivia is significantly longer than the standard regimen. This is because silicosis produces masses of progressive massive fibrosis, which have poor vascularization that may limit the penetration of antituberculous drugs.[2-3] These lesions may act as "niches" where the bacillus remains latent, making eradication more difficult and increasing the risk of relapse.

Treatment follows the National Guidelines of the Bolivian National Tuberculosis Control Program (PNCTB), which establish a prolonged 12-month regimen to ensure bacterial sterilization in this type of patient with prior structural lung damage.[4] This approach aims to maximize the elimination of slowly replicating bacilli in fibrotic tissues. After two months of treatment, the patient shows notable improvement, with a baseline oxygen saturation of 80% on room air and stable laboratory follow-up results. The patient continues under the prolonged treatment regimen until completing 12 months as established by national guidelines.

Conflict of interest
The authors have no conflicts of interest to declare in relation to this publication.

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American Review of Respiratory Medicine
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CASE REPORT

ISSN 1852-236X

Pulmonary Sequestration Treated with Anatomical Segmentectomy: Case Report

Secuestro pulmonar tratado con segmentectomía anatómica: reporte de caso

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Received: 10/11/2025
Accepted: 04/12/2025

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ABSTRACT

Pulmonary sequestration is a rare congenital lung malformation. It is characterized by an abnormal mass of dysplastic lung tissue supplied by an anomalous systemic artery separated from the normal bronchopulmonary tree. Misdiagnosis and inadequate treatment can lead to recurrent pneumonia and fatal hemoptysis. We present the case of a 43-year-old male patient diagnosed with pulmonary sequestration, accompanied by a brief review of clinical features, diagnostic approaches, and management options. Predominant symptoms were cough and hemoptysis. The contrast-enhanced chest computed tomography revealed an anomalous artery arising from the descending aorta, and it was decided to perform a resection of the left basal pyramid. Symptomatic patients with pulmonary sequestration should be treated surgically to avoid the risk of death from massive hemoptysis.

Key words: pulmonary sequestration; intralobar sequestration; hemoptysis; aberrant artery; surgery

RESUMEN

El secuestro pulmonar es una malformación pulmonar congénita poco común. Se caracteriza por una masa anormal de tejido pulmonar displásico irrigado por una arteria sistémica anómala y frecuentemente separada del árbol broncopulmonar normal. Un diagnóstico erróneo y un tratamiento inadecuado pueden provocar neumonías recurrentes y hemoptisis mortal. Presentamos el caso de un hombre de 43 años al que se le diagnosticó secuestro pulmonar y realizamos una breve revisión sobre las características clínicas, estrategias de diagnóstico y opciones de manejo. Los síntomas predominantes fueron tos y hemoptisis, la tomografía computarizada de tórax con contraste reveló una arteria anómala desde la aorta descendente, se decidió realizar resección de la pirámide basal izquierda. Los pacientes sintomáticos del secuestro pulmonar deben ser tratados mediante cirugía para evitar el riesgo de muerte por hemoptisis masiva.

Palabras clave: secuestro pulmonar, secuestro intralobar, hemoptisis, arteria aberrante, cirugía

Rev Am Med Resp 2025;25:199-202. https://doi.org/10.56538/ramr.LLGJ4943

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INTRODUCTION

Pulmonary sequestration (PS) is a relatively rare entity that accounts for 0.15% to 6.4% of all congenital pulmonary malformations. It generally consists of a systemic arterial supply to an abnormal pulmonary segment, associated with various forms of venous drainage.[1] In most cases, there is a single nutrient artery, although multiple systemic arteries may occasionally be present.[2] In the majority of cases, these segments do not have a connection with the tracheobronchial tree. Pulmonary sequestration is classified into two main types: intralobar and extralobar. The intralobar type is defined as a pulmonary segment contained within the same pleural lining as the adjacent lung, whereas the extralobar type has its own separate pleural covering.[1] Nearly 97% of cases are located in the lower lobe, with the left side being more common.[2] Sixty percent of these lesions are diagnosed within the first decade of life, and they are more common in males, with a 3:1 ratio.[1] Symptoms may vary depending on the type of sequestration. The extralobar form, which is often discovered through prenatal or neonatal ultrasound or magnetic resonance imaging (MRI), is frequently associated with other congenital anomalies, including cardiac defects, pulmonary hypoplasia, foregut duplication cysts, vertebral anomalies, or diaphragmatic anomalies. Infants may be asymptomatic or may develop respiratory distress due to pulmonary hypoplasia or a mass effect. Infection is rare because its pleural lining prevents contact with inhaled air. On the other hand, intralobar sequestration usually presents during childhood, although up to half of the cases appear after 20 years of age. Most patients remain asymptomatic for years, with diagnosis often prompted by a routine physical examination or after recurrent bacterial pneumonia in the affected lobe. Symptoms are usually nonspecific; the most common includes cough or sputum production, fever, hemoptysis, and chest pain.[2] Sequestration may be incidentally discovered in radiographic studies. Confirmation requires computed tomography angiography (CTA) or magnetic resonance angiography (MRA), which show the systemic feeding artery and its venous drainage.[3] The arterial supply is variable: 74% originates from the thoracic aorta, while the remainder arises from the abdominal aorta and its branches, including the gastric or splenic arteries. Venous drainage from these pulmonary segments typically occurs through the pulmonary venous system, although systemic venous drainage has also been reported.[1]

CASE REPORT

A 43-year-old male patient, previously healthy and a swimmer, was admitted due to frank hemoptysis associated with episodes of nonproductive cough, with no other accompanying symptoms.

Physical examination revealed a healthy-appearing patient. Vital signs, including oxygen saturation on room air, were within normal limits. Blood residues were observed on the mucosa of the palatal vault.

Laboratory tests –including complete blood count, renal function tests, electrolytes, D-dimer, and inflammatory markers–were negative. The initial chest computed tomography (CT) revealed atelectatic changes in the left lung base, involving the anterior and lateral segments, superimposed with ground-glass opacity and airway lumen filled with secretions. In addition, an anomalous origin of the left lower lobar artery arising directly from the descending aorta was observed, with venous drainage directly into the right atrium, and no evident abnormality of the tracheobronchial tree.

Hospitalization in a closed unit was indicated for clinical monitoring. A computed tomography angiography (CTA) with 3D reconstruction was performed, which demonstrated pulmonary parenchyma of homogeneous density with a heterogeneous opacity containing areas of ground-glass attenuation and others with a consolidative appearance, involving the entire basal pyramid of the left lower lobe. There was also compensatory hyperinflation of the apical segment of the left lower lobe. The mediastinum showed normal morphological features, with a systemic artery arising from the distal thoracic aorta that courses through the triangular ligament of the mediastinum toward the left lower lobe. The venous drainage and bronchial tree were normal. **(Figure 1)**

The patient remained hospitalized for four days in stable condition. During this time, he experienced one episode of coughing with hemoptoic sputum, without hemodynamic alterations or laboratory changes.

Considering the clinical history of the patient, the imaging findings compatible with intralobar sequestration, and the persistence of symptoms, resection of the left basal pyramid was indicated.

A left video-assisted thoracoscopic surgery (VATS) was performed, identifying the anomalous systemic artery supplying the basal pyramid. The artery was repaired and subsequently ligated and sectioned. Then, a basal pyramid segmentectomy was carried out following the standard surgical technique. **(Figure 2)**

DISCUSSION

Intralobar pulmonary sequestration is a relatively rare congenital anomaly, typically diagnosed in childhood but occasionally identified in adulthood.[2] Intralobar sequestration (ILS) is more common than extralobar sequestration (ELS), accounting for about 75% of cases. Patients may present with an incidental pulmonary lesion detected on imag-

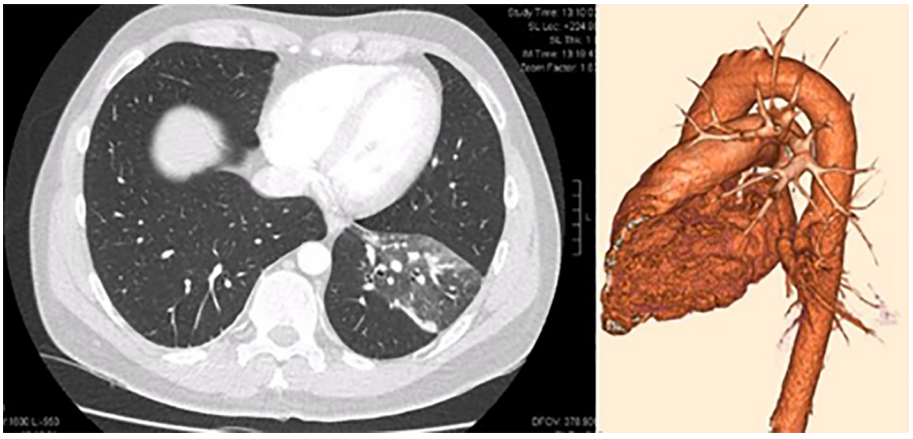

Figure 1. CT angiography: heterogeneous opacity in the basal pyramid of the left lower lobe. 3D reconstruction: evidence of an anomalous artery arising from the thoracic aorta.

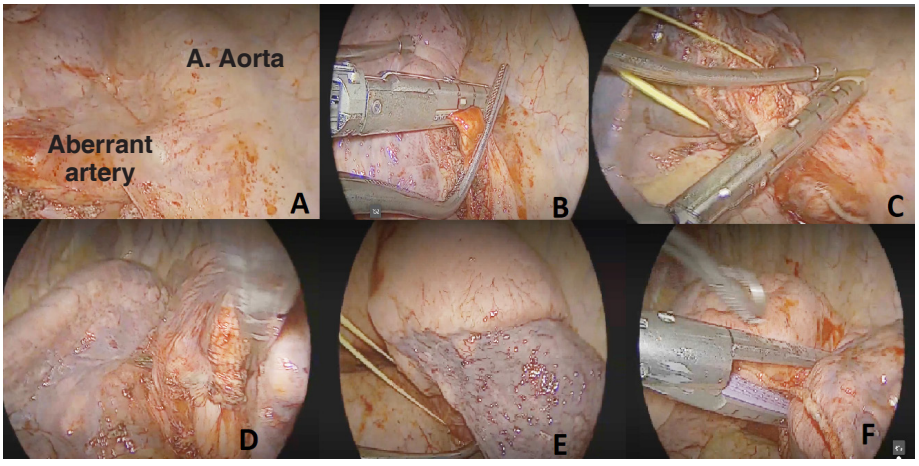

Figure 2. Steps of the anatomical segmentectomy A) Video-assisted thoracoscopic surgery showing the anomalous systemic artery. B) Repair and sectioning of the anomalous artery. C) Identification and sectioning of the vein of the basal pyramid. D) Identification and sectioning of the artery of the basal pyramid. E) Clamping of the bronchus of the basal pyramid and collapse of the segment. F) Sectioning of the pulmonary parenchyma corresponding to the basal pyramid.

ing and otherwise remain asymptomatic. However, the most common presentation includes recurrent pneumonia, chronic cough, and hemoptysis. Few reports have described more severe complications, such as superimposed aspergillosis or even fatal hemoptysis.[4] For these reasons, sequestration has been traditionally treated with definitive resection of the affected pulmonary segment.

In our experience, contrast-enhanced chest computed tomography enabled diagnosis and delineated key anatomical features for surgical planning.

Definitive treatment involves resection of the affected pulmonary segment. Several key elements must be considered, including preoperative antibiotics for pneumonia exacerbation and precise preoperative identification of arterial supply.[1] The extent of resection aims to preserve as much normal lung tissue as possible, justifying the anatomical segmentectomy when feasible. Lobectomy is appropriate when sequestered tissue is difficult to distinguish from functional parenchyma.[3]

An alternative approach must be mentioned: exclusion of the aberrant arterial supply via endovascular embolization using several occlusion devices, indicated in neonates with large-caliber pulmonary sequestration and severe hemodynamic instability.[5] However, embolization raises main concerns, including possible incomplete vascular occlusion, subsequent evolution of sequestered tissue, and symptom recurrence.[2]

In our experience, surgical resection remains the preferred approach in symptomatic patients due to the risk of potentially fatal hemoptysis and infectious recurrence.

Conflict of interest
Authors have no conflicts of interest to declare.

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HIGHLIGHTS

ISSN 1852-236X

Highlights of International Congresses. Report from our Representatives at the Following International Events

Highlights de los Congresos Internacionales. Informe de nuestros representantes en los siguientes eventos internacionales

HIGHLIGHTS OF 2025 EUROPEAN CONGRESS

During the 2025 European Congress, numerous scientific advances of great clinical relevance were introduced, with notable participation from Argentine researchers and pulmonologists in oral and poster sessions. From this section, we would like to congratulate all the members who actively contributed with their work, reflecting the high academic level and excellence of national respiratory medicine. Amid the abundant scientific production, we wish to highlight three novelties of special interest, presented in various thematic sessions of the congress.

1. TETON-2 Study results: inhaled treprostinil therapy in idiopathic pulmonary fibrosis

The phase 3 TETON-2 trial evaluated the use of inhaled treprostinil (Tyvaso®) in patients with idiopathic pulmonary fibrosis (IPF). The results showed a significant improvement in forced vital capacity (FVC) after 52 weeks, reaching a difference of 95.6 mL compared to placebo ($p < 0.0001$). Additionally, a 29% reduction in the risk of clinical worsening was observed, along with a favorable trend in quality of life parameters (KBILD, King's Brief Interstitial Lung Disease questionnaire) and diffusing capacity of the lung for carbon monoxide (DLCO).

The drug demonstrated a safety profile consistent with previous studies, consolidating its role as a potential therapeutic option for IPF.

2. Update of the Multidisciplinary Classification of Interstitial Pneumonias (ERS/ATS 2025)

The new ERS/ATS 2025 international consensus proposed a comprehensive revision of the classification of interstitial pneumonias, incorporating both idiopathic and secondary causes. Three main innovations are recognized:

- The inclusion of the bronchiolocentric pattern (BIP) as a major entity, alongside the classic UIP (usual interstitial pneumonia) and NSIP (nonspecific interstitial pneumonia) patterns.
- The replacement of the terms "acute interstitial pneumonia" with idiopathic diffuse alveolar damage and "desquamative interstitial pneumonia" with alveolar macrophage pneumonia, in order to better reflect the underlying pathophysiology.
- The differentiation between fibrosing and non-fibrosing interstitial disorders, as well as between interstitial and alveolar filling patterns, with clear prognostic and therapeutic implications.

The document emphasizes the importance of the level of diagnostic confidence and a standardized multidisciplinary approach to optimize clinical decision-making.

3. ERS/EULAR 2025 Guidelines on Interstitial Lung Disease Associated with Connective Tissue Diseases (CTD-ILD)

The new guidelines of the ERS/EULAR (European Respiratory Society/European Alliance of Associations for Rheumatology) developed using the GRADE methodology, provide evidence-based recommendations for the screening, diagnosis,

monitoring, and treatment of interstitial lung disease associated with connective tissue diseases. Among the most notable recommendations are:

- Systematic use of high-resolution CT (HRCT) for initial detection in systemic sclerosis, inflammatory myopathies, and mixed connective tissue disease (MCTD). In the context of rheumatoid arthritis, its use remains restricted to "high-risk" patients.
- Periodic lung function testing every 3–6 months during the first years.
- Use of immunosuppressive treatments (mycophenolate, rituximab, cyclophosphamide) and antifibrotic agents such as nintedanib or pirfenidone in cases of progressive fibrosis. These guidelines promote an individualized and multidisciplinary approach, integrating the expertise of pulmonologists and rheumatologists to optimize clinical outcomes.

Non-CF Bronchiectasis (Miguel Penizzotto)

We were present at various activities where the topic of non–cystic fibrosis bronchiectasis was widely addressed at this congress. From my point of view, the importance of this topic in the program increased notably compared to previous years. The activities were divided into courses, symposia (including patient testimonies), oral presentations, and –undoubtedly– the most relevant highlight was the presentation of the ERS 2025 Guidelines. The importance of EMBARC was consistently emphasized across multiple activities and initiatives.

In summary, I believe the following are the most important insights to consider after the different sessions (including the ERS 2025 Guidelines presentation):

- *The relevance of the HRCT (with an appropriate protocol) as the diagnostic standard was reinforced, along with severity stratification using validated scores (BSI and EFACED).*
- *The importance of identifying the underlying cause was highlighted, including ciliary dyskinesia, where global diagnostic challenges were discussed.*
- *The importance of distinguishing endotypes was emphasized, with particular focus on phenotypes (eosinophilic, Pseudomonas infection, non-tuberculous mycobacteria [NTM], and asthma/COPD overlap) to optimize patient management.*
- *The need to identify frequent exacerbators (≥2/year or ≥1 severe) was stressed due to their impact on prognosis. Attention was also given to treatable traits such as chronic infection, type of inflammation, mucociliary dysfunction, bronchospasm, and comorbidities.*
- *There was a positive recommendation for the use of macrolides in frequent exacerbators after optimizing physiotherapy and infection management.*
- *New EMBARC data suggest that patients with childhood onset may reach adulthood with more severe disease compared to adult-onset cases, underscoring the value of structured transition from pediatric to adult care. Hence, the importance of documenting age at onset.*
- *Pseudomonas aeruginosa remains a marker of worse prognosis and higher exacerbation risk. The 2025 guidelines prioritize early eradication strategies and consider inhaled antibiotics in chronic colonization with frequent exacerbations.*
- *With regard to eradication strategies, a local eradication protocol is suggested at the first isolation, followed by reassessment at 3 and 6 months.*
- *As a new concept, the resistome/microbiome concept was discussed, with emphasis beyond traditional cultures (i.e., sequencing) to better understand resistance and dysbiosis, with future implications for targeted therapies.*
- *In my opinion, the most important novelty is the use of DPP-1 inhibitors (dipeptidyl peptidase 1), especially brensocatib, which is already approved by the Food and Drug Administration (FDA). Additionally, other drugs currently under investigation were presented and are expected to become available in the coming years for patients with non–CF bronchiectasis who are frequent exacerbators with a neutrophilic profile.*
- *Another key point was the growing importance of atypical mycobacteria, emphasizing close monitoring and treatment when indicated.*
- *The importance of continuing respiratory physiotherapy and mucociliary clearance through education and individualized techniques was highlighted.*
- *Regarding hypertonic saline solutions and mannitol, an individual trial-and-response approach was recommended. A lack of efficacy of dornase alfa in this group of patients was suggested.*
- *Bronchodilators and inhaled corticosteroids remain useful in phenotypes with obstruction/hyperreactivity.*

- *Routine use of inhaled corticosteroids should be avoided unless there is coexisting asthma and/or elevated eosinophils. Elevated FeNO (fractional exhaled nitric oxide) may be helpful in guiding this type of treatment.*

Dr. Maria Otaola - Coordinator, Interstitial Lung Diseases Section

EARCO: Meetings of the CRC (Clinical Research Collaboration) called EARCO, sponsored by the European Respiratory Society, were held. Updated data were provided on the number of patients included in the alpha-1 antitrypsin deficiency registry, as well as the need to increase patient follow-up. More than 4,300 patients had been enrolled as of September 2025. The discussion also covered the idea of incorporating a CT scan platform for patients. This initiative is contributing to a better understanding of the natural history of the disease.

A review was presented of all clinical studies published based on data from the registry.

In addition, the session discussed progress on new **European guidelines for the diagnosis and treatment of this condition**, based on the GRADE methodology.

A total of 52 **posters** related to alpha-1 antitrypsin deficiency (AATD) were presented. One of them showed the follow-up of a cohort of more than 3,000 patients in Denmark in relation to thromboembolic disease.

Clinical trial results for new therapies in AATD

- BEAM-302 – Beam Therapeutics: BEAM-302, a DNA base-editing therapy for AATD, demonstrated its ability to correct the PiZ mutation responsible for the disease. It uses CRISPR technology. Initial data from a phase 1 and phase 2 trial showed promising results, marking an important step toward a potential cure.
- INBRX-101 – Inhibrx (now Sanofi): Sanofi presented ongoing data on INBRX-101, a recombinant human AAT-Fc fusion protein designed to normalize serum AAT levels with less frequent dosing. An open-label phase 2 extension trial is currently evaluating its long-term safety and efficacy in patients with AATD-related emphysema. The drug, now known as **SAR447537**, is a recombinant fusion protein aimed at improving AATD treatment.
- Fazirsiran for liver disease: Updates were provided on fazirsiran, an RNA interference therapy being investigated for its effect on liver disease associated with AATD. Fazirsiran is a small interfering RNA (siRNA) that silences the gene responsible for producing the mutant AAT protein in the liver. By reducing production of this defective protein, the drug prevents its accumulation. A phase 3 trial is currently recruiting patients with liver fibrosis to determine whether the drug can reduce scarring.
- The clinical trial of Kamada's inhaled formulation for AATD is ongoing and could eliminate the need for intravenous infusions in the specific treatment of the disease. It is currently in an advanced phase of enrollment of patients with severe AATD. **Phase 3 (InnovAATe study):** A double-blind, placebo-controlled trial evaluating the long-term safety and efficacy of inhaled AAT in patients with AATD.

Dr. Mariano Fernández Acquier Best of ERS in Pulmonary Circulation

The latest Task Forces from the 7th World Symposium on Pulmonary Hypertension (7WSPH), held in Barcelona in July 2024, were recently published, underscoring the importance of early diagnosis, defined as detection in patients with risk conditions (such as scleroderma or portal hypertension). A key challenge remains in those patients who were diagnosed late, often because they were asymptomatic—yet by that time, up to 60% of the disease has already progressed. This raises an important question: should we treat presymptomatic patients, or should we aim to detect the disease even earlier?

A study conducted at the Mayo Clinic, led by Steven Cassady and Bradley Cole, explored the use of artificial intelligence for early detection of pulmonary arterial hypertension (PAH) based on echocardiographic studies. The use of right heart catheterization during exercise was also highlighted as a tool for early disease detection.

Marc Humbert, MD
Universite Parie-Saclary
France

PULMONARY HYPERTENSION-IPF-SARCOIDOSIS

During the congress, relevant advances were presented in the therapeutic approach to pulmonary hypertension (PH) and interstitial lung diseases, highlighting the development of new pharmacological strategies and the consolidation of combination therapies.

NOVEL THERAPIES IN THE TREATMENT OF PULMONARY HYPERTENSION

In the field of pulmonary arterial hypertension (PAH), the emerging role of sotatercept was highlighted. This drug is an activin signaling inhibitor, currently in phase III, with consistent evidence of clinical efficacy and a favorable safety profile, based on the PULSAR and STELLAR studies. In addition, phase II studies are underway, evaluating new therapeutic alternatives in both adult and pediatric populations, thereby broadening treatment options for this condition.

TREATMENT OF PULMONARY HYPERTENSION IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND INTERSTITIAL LUNG DISEASE

Regarding pulmonary hypertension (PH) associated with chronic lung diseases (Group III), the use of inhaled prostanoids was discussed, particularly in patients with idiopathic pulmonary fibrosis (IPF) and progressive pulmonary fibrosis (PPF), in line with the latest classification from the World Symposium on Pulmonary Hypertension held in Barcelona. In contrast, it was emphasized that PH-specific medications are not recommended in patients with COPD, due to the lack of solid clinical evidence supporting their use.

The treatment of chronic thromboembolic pulmonary hypertension (CTEPH) continues to be multimodal, with pulmonary endarterectomy as the cornerstone therapy, complemented by balloon pulmonary angioplasty (BPA) and medical treatment, targeting both proximal and distal lesions of the pulmonary microvasculature.

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IDIOPATHIC PULMONARY FIBROSIS

In the field of idiopathic pulmonary fibrosis, innovative therapies under investigation were presented. Taladegib, currently in phase II studies, showed benefits by inhibiting the Hedgehog signaling pathway, reducing fibroblast activation and improving lung function. Similarly, nerandomilast, a selective phosphodiesterase 4B inhibitor, demonstrated antifibrotic and immunomodulatory effects.

References: ALAT–ATS, September 2025.

With regard to combined antifibrotic therapy, the TETON-1 and TETON-2 studies demonstrated that the use of inhaled treprostinil, in combination with pirfenidone and/or nintedanib, is associated with significant improvements in FVC and a reduction in time to clinical worsening. There was a 29% reduction in the probability of adverse clinical events, while maintaining an acceptable safety profile.

TETON-1, a phase III, randomized, double-blind, controlled clinical trial, supports the use of inhaled treprostinil in the treatment of IPF without pulmonary hypertension, according to data published by United Therapeutics. These results initiate a new era in combined antifibrotic treatment, including inhaled treprostinil associated with pirfenidone.

TETON-2 also demonstrated significant differences in the primary endpoint, evaluating the combination of inhaled treprostinil, nintedanib, and pirfenidone. Benefits were also observed in the secondary endpoint, corresponding to time to clinical worsening, defined by a combination of different variables: death, hospitalizations, and a decline in FVC of more than 10%.

The FIBRONEET-ILD study, a phase III, randomized, double-blind, placebo-controlled trial, evaluated doses of 9 mg and 18 mg in patients with progressive pulmonary fibrosis (PPF) receiving concomitant antifibrotic treatment (nintedanib or

pirfenidone) for more than 52 weeks. The study met its primary objective, demonstrating a significant reduction in the absolute change in FVC compared to baseline.

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SARCOIDOSIS

In sarcoidosis, efzofitimod –currently in phase III– was highlighted as a promising therapeutic strategy. Its immunomodulatory mechanism, mediated by binding to the neuropilin-2 (NRP2) receptor on activated immune cells, represents a novel targeted therapeutic approach in this systemic inflammatory disease.

References: Richeldi L et al New England Journal of Medicine. 2025;392:2193-2202.

In conclusion, the data presented at the congress reflect significant progress toward more personalized, combination, and targeted treatments, both in pulmonary hypertension and interstitial lung diseases. This poses a paradigm shift in the management of these complex conditions.

Dr. Daniela Bustos - Coordinator, Pulmonary Circulation Section

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OBITUARY

ISSN 1852-236X

Dr. Julio Sandoval Zárate

The passing of Julio Sandoval Zárate is mourned not only by Mexican pulmonology, but also by Latin American and global medicine.

Julio was Deputy Director of Clinical Research at the National Institute of Cardiology of Mexico, professor of the postgraduate high-specialty course in Cardiopulmonary Pathophysiology and Clinical Practice, and Master's and Doctoral advisor at the *Universidad Nacional Autónoma de Méjico*.

Until May 2010, he served as Head of the Cardiopulmonary Department of the National Institute of Cardiology of Mexico. He was a full member of the National Academy of Medicine (Mexico) and of Mexico's National System of Researchers. He was the founder and former Director of the Pulmonary Circulation Department of the Latin American Thoracic Association (ALAT) and of the Mexican Society of Cardiology, of which he was a honorary member. Member of the Scientific Leadership Council of the Pulmonary Hypertension Association (PHA), founder and group leader of the *Pulmonary Vascular Research Institute* (PVRI). He was also part of the working groups of the World Symposia on Pulmonary Hypertension held in Evian (1998), Venice (2003), Dana Point (2008), and Nice (2013).

His main fields of research included pulmonary hypertension and right ventricular failure. In addition, he was the author and co-author of book chapters and of more than two hundred scientific articles published in national and international journals.

Julio Sandoval was a person capable of blending his personal qualities of warmth and kindness with a refined sense of humor, alongside his outstanding medical expertise.

Master and pioneer in Pulmonary Hypertension, he transformed the approach to Pulmonary Arterial Hypertension (PAH) with fundamental contributions such as atrial septostomy, still in use in international guidelines to this day.

He consolidated the services of the National Institute of Cardiology of Mexico and coordinated the Mexican PAH Registry.

He was a brilliant researcher and world-renowned lecturer, as well as an undisputed international reference in his specialty.

Those of us who had the privilege and honor of knowing him will remember him as one of the pioneers in the development of the study of Pulmonary Circulation diseases.

Julio Sandoval Zárate: physician, teacher, visionary, and a gentleman.

Jorge Cáneva[1] and Juan Antonio Mazzei[2]
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American Review of Respiratory Medicine
Revista Americana de Medicina Respiratoria

ISSN 1852-236X

Reviewers 2025

The process of publishing an article involves, in addition to the work of the author, that of other specialists responsible for the evaluation, correction, and publication of the manuscript. Since peer-review is conducted under a double-blind procedure, the role of the reviewer is usually not recognized within the scientific community and is often not given enough credit. We express our gratitude to the specialists who, throughout 2025, selflessly collaborated by dedicating their time and effort to enhancing the academic and scientific quality of the Journal.

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