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Alimentary Tract

Esophageal motility disorders among elderly patients: An international multicenter study ☆

Pierfrancesco Visaggi[a,1], Daniel L Cohen[b,c,1,*], Elisa Marabotto[d,e], Andrea Pasta[d,e], Francesco Calabrese[d,e], Nicola de Bortoli[a], Amir Farah[f], Alessia Gargani[a], Jawad Hindy[g,h], Basem Hijazi[i], Wisam Abboud[i], Mentore Ribolsi[j], Luisa Bertin[k], Edoardo V. Savarino[k], Amir Mari[l]

[a] Gastroenterology Unit, Department of Translational Research and New Technologies in Medicine and Surgery, University of Pisa, Pisa, Italy
[b] The Gonczarowski Family Institute of Gastroenterology and Liver Diseases, Shamir (Assaf Harofeh) Medical Center, Zerifin, Israel
[c] Faculty of Medical and Health Sciences, Tel Aviv University, Tel Aviv, Israel
[d] Gastroenterology Unit, Department of Internal Medicine, University of Genoa, Genoa, Italy
[e] IRCCS Policlinico San Martino, Genoa, Italy
[f] Department of Surgery, Medical College of Wisconsin, Milwaukee, WI, United States
[g] Department of Gastroenterology and Liver Disease, Bnai Zion Medical Center, Haifa, Israel
[h] Rappaport Faculty of Medicine, Technion, Israel Institute of Technology, Haifa, Israel
[i] Azrieli Faculty of Medicine, Bar Ilan University, Ramat Gan, Israel
[j] Gastroenterology Unit, Fondazione Policlinico Universitario Campus Bio-Medico and Università Campus Bio-Medico di Roma, Rome, Italy
[k] Division of Gastroenterology, Department of Surgery, Oncology and Gastroenterology, University of Padua, Padua, Italy
[l] Gastroenterology Unit, Nazareth Hospital EMMS, Azrieli Faculty of Medicine, Bar Ilan University, Ramat Gan, Israel

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ABSTRACT

Background: The impact of advanced age on esophageal motility remains relatively underexplored, particularly using updated diagnostic protocols.
Aims: To evaluate esophageal motility findings, indications, success rate, and diagnostic yields of high-resolution manometry (HRM) in elderly patients.
Methods: A retrospective multicenter study was conducted across six tertiary medical centers of adult patients undergoing HRM between 2022 and 2024. The indications, success rate, diagnostic yield, and HRM metrics were compared according to the novel definition of elderly (≥75 years old).
Results: 1146 patients were included (275 ≥ 75 years and 871 < 75 years). Dysphagia was the most common indication among elderly patients (≥75 years: 69.0 % vs. <75 years: 45.2 %, $p < 0.001$). The success rate of HRM was similar (91.7 % vs. 90.0 %, $p = 0.575$). Elderly patients exhibited higher rates of type III achalasia (6.1 % vs. 1.2 %, $p < 0.001$), esophagogastric junction (EGJ) outflow obstruction (13.6 % vs. 3.1 %, $p < 0.001$), and hypercontractile esophagus (5.3 % vs. 2.5 %, $p < 0.001$). Diagnostic yield increased with age for any motility disorder ($p = 0.016$) and Disorders of EGJ Outflow ($p < 0.001$). For any motility disorder, the prevalence increased from 45.7 % (<65 years) to 48.9 % (65–74 years) to 56.0 % (≥75 years)($p = 0.016$).
Conclusion: There is a higher prevalence of motility disorders observed in older populations, especially after age 75, supporting the relevance of the novel definition of elderly.

1. Introduction

In its most recent reports, the World Health Organization reported that by 2030, 1 in 6 people in the world will be aged 60 years or over, and that the number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million [1,2]. Although the term elderly has often been used to refer to people aged 65 or older, more recently, due to a phenomenon of "rejuvenation", it has been proposed that the term elderly should be used to indicate individuals aged 75 or older [3].

In the elderly, due to impaired swallowing dynamics, neurological and cardiovascular diseases, and widespread use of

☆ All authors approved the final version of the manuscript.
* Corresponding author.
E-mail address: docdannycohen@yahoo.com (D.L. Cohen).
[1] These authors contributed equally to this work.

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medications, dysphagia has been reported in up to 50 % of individuals [4]. Older studies investigating the impact of ageing on esophageal motility have shown that both the sensory functions and visceral perception significantly decrease with advanced age, contributing to dysphagia. The distinctive motility functions of elderly individuals include changes in esophageal peristalsis and delayed esophageal emptying when compared with younger age groups [5]. Other studies found a significant decrease in peristaltic wave amplitudes, as well as decreased pressures of esophageal contraction and reduction in the upper and lower sphincters' pressures [6,7]. Moreover, a systematic review including 16 esophageal motility studies with over 1500 asymptomatic and dysphagia subjects described that aging is associated with an increased prevalence of achalasia and distal esophageal spasm [8]. Such findings have recently been confirmed by a retrospective study in subjects older than 65 years [9].

It must be acknowledged, however, that most of the older studies were conducted using esophageal conventional manometry and previous versions of the Chicago Classification (CC) of esophageal motility disorders, which makes their findings outdated. In particular, the criteria for the diagnosis of esophagogastric junction outflow obstruction (EGJOO) and ineffective esophageal motility (IEM) have been modified, allowing the identification of more clinically relevant disease phenotypes [10–12]. In recent years, conventional manometry has been replaced by the more sophisticated and accurate high-resolution esophageal manometry (HRM), which now represents the gold standard for studying the motility of the esophageal body and the lower esophageal sphincter (LES) [13–15]. In addition, the CC version 4.0 (CCv4.0), currently represents the most updated guideline for performing and interpreting HRM studies [10,16].

There is a lack of data regarding the impact of increasing age on esophageal motility findings and on the prevalence of esophageal motility disorders in elderly patients according to the updated diagnostic testing and criteria with HRM. In addition, it is unclear whether the novel definition of elderly (≥75 years old) has an impact on the prevalence and characteristics of esophageal motility findings among elderly patients. Therefore, in this study, we aimed at investigating the characteristics, indications, diagnostic yield, and success rate of HRM among elderly patients compared to younger patients.

2. Materials and methods

2.1. Study design

This was a retrospective, multicentre study conducted at six tertiary medical centers (Pisa, Padua, Genoa and Rome, Italy; Nazareth Hospital and Shamir Medical Center, Israel). HRM reports of consecutive adult patients who underwent the study from 2022 until 2024 were retrospectively reviewed. Patients under the age of 18 were not eligible for study inclusion. In addition, to investigate only primary esophageal motility disorders, patients with a history of foregut surgery, cerebral vascular accidents, neurological diseases, known connective tissue disease, and patients under medications known to influence esophageal motility were excluded. Demographic and clinical data including age, gender, body mass index (BMI), comorbidities, medications, indication for HRM, and presenting symptoms were collected at the time of the HRM. The indications for performing the study were categorized as either: (1) non-obstructive esophageal dysphagia; (2) gastroesophageal reflux disease (GERD) evaluation (i.e., patients undergoing HRM to locate the EGJ prior to catheter-based pH monitoring); (3) non-cardiac chest pain; (4) epigastric pain; (5) regurgitation and/or vomiting; or (6) pre-esophageal surgery assessment (patients undergoing HRM prior to surgery for benign esophageal conditions including prior to hiatal hernia repair and fundoplication).

2.2. Ethical considerations

The study was approved by the local Institutional Review Board of the Nazareth EMMS Hospital and conducted according to the Declaration of Helsinki (approval 89–22 EMMS). Given the retrospective nature of the study and anonymous data, the need for informed consent was waived.

2.3. HRM protocol and interpretation

HRM was performed using the ManoScan (Medtronic, Minneapolis, MN, USA) and Diversatek (Diversatek Healthcare, Milwaukee, WI, USA) systems. Prior to testing all patients were asked to stop any medication known to modify esophageal motility, including opiates, calcium antagonists, and nitrates for at least 3 weeks. The HRM protocol included a 30-s baseline recording and ten 5-ml water swallows at 20–30 s intervals in the supine position and five in the upright position, following a 60-s adaptation period from the position change as well as a 30-s new baseline period [10,17]. Situations in which the HRM catheter could not be positioned for acquisition of the study due to inability to intubate the upper or lower esophageal sphincter, or due to patients' inability to tolerate the catheter were defined as technical failure. Failed HRM studies were excluded from the analysis of HRM findings but included in the sub-analysis on the success rate.

All HRM studies were reviewed by an expert in esophageal motility testing at the hospital in which the study was performed, and all studies were diagnosed as per CCv4.0 [10]. To assess the yield of HRM, motility diagnoses were evaluated both individually and in sub-groups. The motility disorders were grouped as Disorders of EGJ Outflow and Disorders of Peristalsis as per the Chicago Classification [10,18]. The primary endpoint was the assessment of esophageal motility at HRM in patients older than 75 years versus younger patients (aged 18–74 years) given the proposed new definition of elderly [3]. Additionally, we sought to describe the differences in HRM diagnoses between patients meeting the older definition of elderly (i.e., ≥65 years of age) and patients meeting the novel definition of elderly (i.e., ≥75 years of age), as well as the technical success of HRM in elderly versus younger patients, and to evaluate any differences between subgroups of elderly patients (i.e., age between 75–79 versus age ≥ 80 age groups).

For the assessment of dysphagia, the dysphagia component of the Eckardt score was used [19]. To assess GERD symptoms, the GERDQ score was used [20]. As CCv4.0 does not comment on upper esophageal sphincter metrics, these were not assessed in the study.

2.4. Statistical analysis

Categorical variables are presented as frequency and percentage. Normality was evaluated using the Anderson-Darling test. Continuous variables were presented as mean and standard deviation. The Pearson chi-square test and Fisher's exact test were used to compare categorical variables. Mann-Whitney test or student *t*-tests were performed to compare continuous variables. A multivariate logistic regression analysis was performed to assess the influence of different variables that were statistically significant on univariate analyses. All statistical tests were two-sided with a p-value of <0.05 considered significant. Analyses were performed using IBM SPSS Statistics v.28 software (Armonk, NY, USA)

Table 1
Demographics and background medical conditions of the patient cohort.

		Total cohort		Age <75		Age ≥75		
		n	%	n	%	n	%	p-value
Sex	Male	500	43.6 %	374	42.9 %	126	45.8 %	0.401
	Female	646	56.4 %	497	57.1 %	149	54.2 %	
Age		58.4 ± 17.8		51.8 ± 15.2		79.3 ± - 3.7		**<0.001**
BMI		25.7 ± 4.6		25.9 ± 4.7		25.1 ± 4.4		**0.024**
Ischemic Heart Disease		81	7.2 %	45	5.3 %	36	13.1 %	**<0.001**
Diabetes		122	10.8 %	86	10.1 %	36	13.1 %	0.161
Neurologic disease		116	10.5 %	85	10.1 %	31	11.5 %	0.528
Connective Tissue Disease		32	2.9 %	24	2.8 %	8	2.9 %	0.936
Alcohol use		144	12.8 %	68	8.0 %	76	27.6 %	**<0.001**
Smoking		172	15.2 %	154	18.0 %	18	6.5 %	**<0.001**
Chest Radiation		20	1.8 %	18	2.1 %	2	0.7 %	0.132
Neck Radiation		3	0.3 %	3	0.4 %	0	0.0 %	0.325
PPI use		626	55.4 %	451	52.7 %	175	63.6 %	**0.002**
H2B use		15	1.3 %	11	1.3 %	4	1.5 %	0.834
NSAID use		165	14.6 %	110	12.9 %	55	20.0 %	**0.004**
SSRI use		106	9.4 %	83	9.7 %	23	8.4 %	0.506
TCA use		26	2.3 %	22	2.6 %	4	1.5 %	0.282

BMI: body mass index; PPI: proton pump inhibitor; H2B: histamine H2 blocker; NSAID: non-steroidal anti-inflammatory drug; SSRI: selective serotonin uptake inhibitor; TCA: tricyclic antidepressant.

3. Results

3.1. Patient demographics and baseline medical conditions

A total of 1146 patients were included in the study; of them 500 were men (43.6 %) and 646 women (56.4 %). The mean age was 58.4 ± 17.8. The total cohort was subdivided into two groups: patients younger than 75 years (871 subjects, 76.0 %) and patients aged 75 or older (275 subjects, 24.0 %). Differences were noted between the younger group and the older group in terms of baseline characteristics (Table 1). Elderly subjects had higher rates of ischemic heart disease (13.1 % vs 5.3 %, $p < 0.001$), alcohol use (27.6 % vs 8.0 %, $p < 0.001$), non-steroidal anti-inflammatory drugs use (20.0 % vs 12.9 %, $p = 0.004$), and PPI use (63.6 % vs 52.7 %, $p = 0.002$). Smoking rates and BMI were lower in the elderly group compared to the younger group ($p < 0.001$ and $p = 0.024$, respectively).

3.2. HRM indications, presenting symptoms, and technical success rate

Table 2 summarizes the indications and symptoms of included patients. Significant differences were noted in the indications for HRM testing between the younger and elderly groups. Dysphagia was the most common indication in the elderly group (69.0 % vs 45.2 % in the younger group, $p < 0.001$), while GERD evaluation was less common in the elderly group (21.5 % vs 36.6 %, $p < 0.001$). However, there were no statistically significant differences in the symptom scores for GERD (4.74 ± 4.55 vs 1.00 ± 1.73; $p = 0.172$) and dysphagia (i.e., Eckardt Score) (3.74 ± 2.41 vs 3.56 ± 2.59; $p = 0.734$) between the groups.

The technical success rate of HRM was 90.0 % for patients younger than 75 years and 91.7 % for patients aged 75 or older ($p = 0.575$). Accordingly, age was not a predictor of technical success of HRM.

3.3. HRM diagnoses and yield

The diagnostic yield of HRM was higher in the elderly group (≥75) compared to the younger group (<75) in various groupings of motility disorders (Table 2). The elderly group was more likely to have any motility diagnosis (56.0 % vs 46.4 %, $p = 0.006$), a Disorder of EGJ Outflow (28.4 % vs 13.6 %, $p < 0.001$), and achalasia (15.3 % vs 10.6 %, $p = 0.034$). However, no significant difference between the age groups was noted for Disorders of Peristalsis (27.6 % vs 32.8 %, $p = 0.108$).

In terms of specific HRM diagnoses, there were also significant differences between patients <75 and ≥75 years of age (Table 2). The elderly group had higher rates of type III achalasia (6.1 % vs 1.2 %; $p < 0.001$), EGJOO (13.6 % vs 3.1 %; $p < 0.001$), distal esophageal spasm (DES) (4.2 % vs 0.9 %; $p < 0.001$), and hypercontractile esophagus (5.3 % vs 2.5 %; $p < 0.001$) compared to the younger group. The elderly group also had lower rates of normal motility (41.7 % vs 53.4 %; $p < 0.001$) and ineffective esophageal motility (IEM) (12.9 % vs 23.9 %; $p < 0.001$) compared to the younger group.

3.4. Comparison of the yield of HRM between different elderly age groups

To investigate differences between the prior definition of elderly (age ≥65 years) and the novel (age ≥75 years), we divided the cohort into three different age groups: <65 years old, 65–74 years old, and ≥75 years old (Table 3). Again, the diagnostic yield significantly increased with age for any motility disorder (from 45.7 % to 48.9 % to 56.0 %; $p = 0.016$) and a Disorder of EGJ Outflow (from 12.5 % to 16.9 % to 28.4 %; $p < 0.001$) (Fig. 1A). However, the diagnosis of achalasia was comparable between age groups ($p = 0.078$).

To further evaluate the impact of increasing age on HRM findings within the elderly group, we then divided the subjects into three age groups: <75 years old (871 subjects, 76.0 %), 75–79 years old (167 subjects, 14.6 %), and ≥80 years old (108 subjects, 9.4 %). Table 4 shows a comparison of the diagnostic yields of HRM studies between groups. The diagnostic yield of HRM increased significantly with age for any motility disorder ($p = 0.006$), a Disorder of EGJ Outflow ($p < 0.001$), and achalasia ($p = 0.011$) (Fig. 1B). The prevalence of any motility disorder increased from 45.6 % in the <75 group, to 52.2 % in the 75–79 group, and to 62.0 % in the ≥80 group ($p = 0.006$), while the diagnosis of achalasia increased from 9.9 % to 13.3 % and to 20.4 %, respectively ($p = 0.011$).

3.5. Yield of HRM in patients presenting with dysphagia

Next, we sought to assess whether the increase in motility disorders in elderly patients was true or if it was related to patient selection as the elderly group had more patients complaining of

Table 2
HRM indications, diagnoses, and diagnostic yield.

		Total cohort		Age <75		Age ≥75		
		n	%	n	%	n	%	p-value
HRM Indication	**Dysphagia**	**581**	**50.9 %**	392	45.2 %	189	69.0 %	**<0.001**
	GERD evaluation	**377**	**33.0 %**	318	36.6 %	59	21.5 %	
	Pre-operative evaluation	**44**	**3.9 %**	39	4.5 %	5	1.8 %	
	Chest pain	**64**	**5.6 %**	54	6.2 %	10	3.6 %	
	Epigastric pain	**42**	**3.7 %**	40	4.6 %	2	0.7 %	
	Regurgitation/vomiting	**34**	**3.0 %**	25	2.9 %	9	3.3 %	
GERDQ score		4.41 ± 4.49		4.74 ± 4.55		1.00 ± 1.73		0.172
Eckardt score		3.59 ± 2.56		3.74 ± 2.41		3.56 ± 2.59		0.734
HRM Diagnoses	Normal	**574**	**50.7 %**	464	53.4 %	110_b	41.7 %	**<0.001**
	Achalasia I	**20**	**1.8 %**	15	1.7 %	5	1.9 %	
	Achalasia II	**88**	**7.8 %**	67	7.7 %	21	8.0 %	
	Achalasia III	**26**	**2.3 %**	10	1.2 %	16	6.1 %	
	EGJ Outflow Obstruction	**63**	**5.6 %**	27	3.1 %	36	13.6 %	
	Distal Esophageal Spasm	**19**	**1.7 %**	8	0.9 %	11	4.2 %	
	Hypercontractile Esophagus	**36**	**3.2 %**	22	2.5 %	14	5.3 %	
	Absent Contractility	**65**	**5.7 %**	48	5.5 %	17	6.4 %	
	Ineffective Esophageal Motility	**242**	**21.4 %**	208	23.9 %	34	12.9 %	
Any motility disorder		**559**	**48.7 %**	405	46.4 %	154	56.0 %	**0.006**
Disorder of EGJ Outflow		**197**	**17.2 %**	119	13.6 %	78	28.4 %	**<0.001**
Disorder of Peristalsis		**362**	**31.6 %**	286	32.8 %	76	27.6 %	0.108
Achalasia		**134**	**11.7 %**	92	10.6 %	42	15.3 %	**0.034**

GERD: gastroesophageal reflux disease; HRM: high-resolution manometry; EGJ: esophagogastric junction.

Table 3
Comparison of the diagnostic yield of HRM between different elderly age groups based on the old and new definitions of elderly.

	Age <65		Age 65–74		Age ≥75		
	n	%	n	%	n	%	p-value
Any motility disorder	295	45.7 %	110	48.9 %	154	56.0 %	**0.016**
Disorder of EGJ Outflow	81	12.5 %	38	16.9 %	78	28.4 %	**<0.001**
Disorder of Peristalsis	214	33.1 %	72	32.0 %	76	27.6 %	0.258
Achalasia (all subtypes)	65	10.1 %	27	12.0 %	42	15.3 %	0.078

Table 4
Comparison of the diagnostic yield of HRM between different elderly age groups.

	Age <75		Age 75–79		Age ≥80		
	n	%	n	%	n	%	p-value
Any motility disorder	405	46.5 %	87	52.1 %	67	62.0 %	**0.006**
Disorder of EGJ Outflow	119	13.7 %	41	24.6 %	37	34.3 %	**<0.001**
Disorder of Peristalsis	256	32.8 %	46	27.5 %	30	27.8 %	0.270
Achalasia (all subtypes)	92	10.6 %	20	12.0 %	22	20.4 %	**0.011**

Table 5
Yield of motility disorders in the subgroup of patients with dysphagia.

	Total		Age <75		Age ≥75		
	n	%	n	%	n	%	p-value
Any motility disorder	321	55.2 %	202	51.5 %	119	63.0 %	**0.009**
Disorder of EGJ Outflow	169	29.1 %	102	26.0 %	67	35.4 %	**0.019**
Disorder of Peristalsis	152	26.2 %	100	25.5 %	52	27.5 %	0.607
Achalasia (all subtypes)	118	20.3 %	80	20.4 %	38	20.1 %	0.932

dysphagia and less undergoing GERD evaluation. Accordingly, we performed a sub-analysis only including patients referred due to dysphagia (Table 5). In this subpopulation, the elderly group of age ≥75 years remained more likely to have any motility diagnosis (63.0 % vs 51.5 %; $p = 0.009$) and a Disorder of EGJ Outflow (35.4 % vs 26.0 %; $p = 0.019$). However, there was no longer a difference in the diagnostic yield for achalasia between the two age groups ($p = 0.932$).

3.6. Effect of gender, smoking, and diabetes on the presence of motility disorders

We evaluated if gender, smoking, and diabetes affected the prevalence of motility disorders (Supplementary Table 1). This revealed that men, in comparison to women, had higher rates of any motility disorder (52.8 % vs 45.7 %, $p = 0.017$), Disorders of EGJ Outflow (20.0 % vs 15.0 %, $p = 0.027$), and achalasia (14.0 % vs

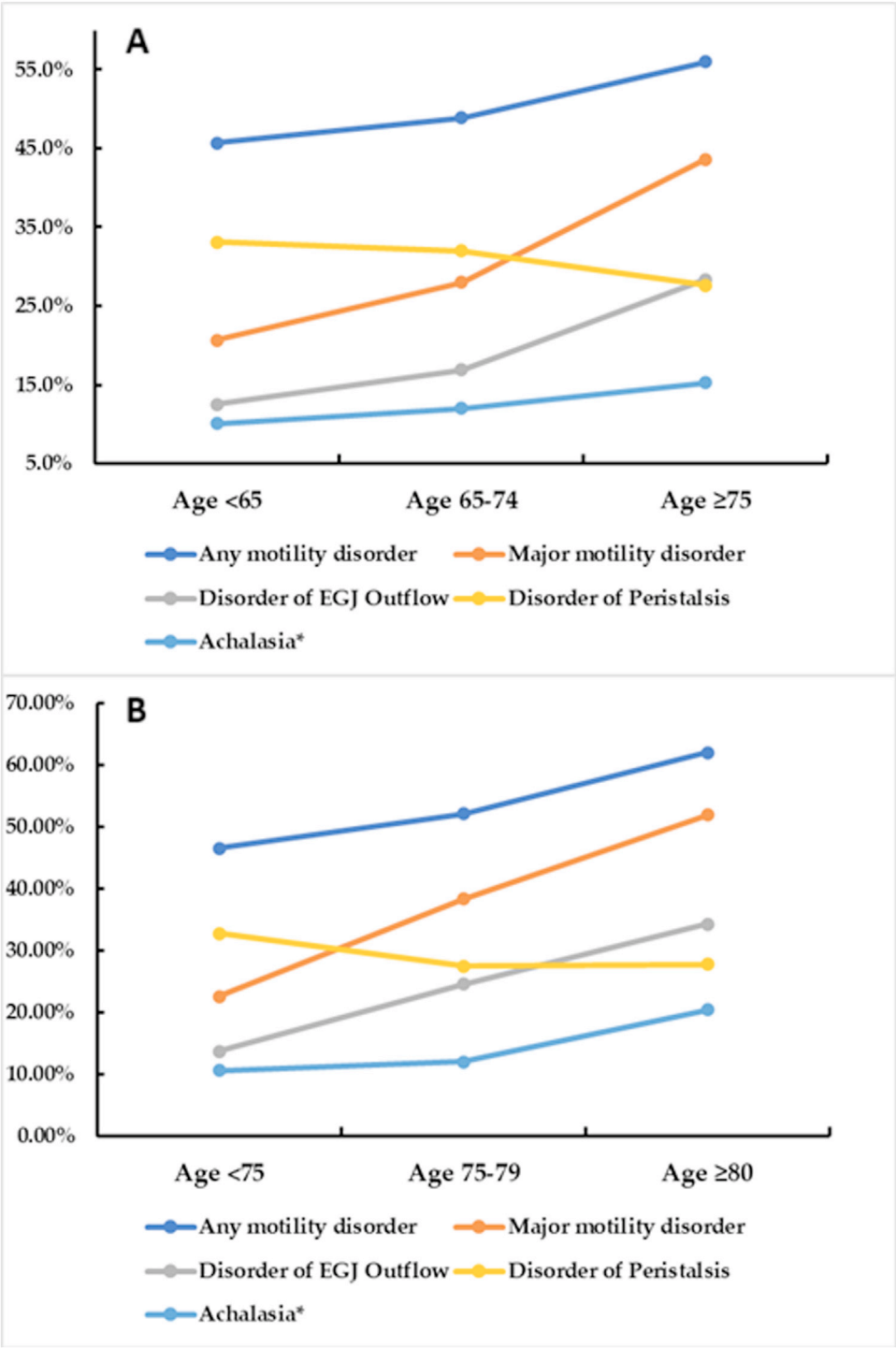

Fig. 1. Increasing rates of different groupings of motility disorders with older age.

9.9 %, $p = 0.032$). However, smoking and diabetes were not associated with increased rates of any grouping of motility disorders.

Supplementary Table 2 shows an evaluation of motility disorders according to age and by gender. For men, the rate of Disorders of EGJ Outflow (13.4 % to 20.0 % to 34.9 %, $p < 0.001$) increased with increasing age, while Disorders of Peristalsis (37.1 % to 33.3 % to 23.0 %, $p = 0.020$) decreased with increasing age. For women, rates of any motility disorder (42.0 % to 45.9 % to 54.4 %, $p = 0.038$) and Disorders of EGJ Outflow (11.9 % to 14.8 % to 22.8 %, $p = 0.007$) all increased with increasing age.

Finally, since both age and gender were associated with motility disorders, we performed a multivariate logistic regression analysis assessing the impact of these variables on the presence on any motility disorder (Supplementary Table 3). This analysis revealed that both age and gender remained significant factors. Female sex was associated with a decreased likelihood of having any motility

disorder (OR 0.750, CI 0.593–0.949), while age ≥75 remained associated with a greater likelihood of a motility disorder (OR 1.505, CI 1.132–2.001).

4. Discussion

In this large multicenter study, we investigated HRM findings, indications, and success rate among elderly patients. Of note, by adopting the most recent definition of elderly (≥75 years of age) we were able to assess the impact of the new definition of elderly on esophageal motility findings compared to the previous one (≥65 years of age). In addition, by stratifying patients in age groups, we were also able to evaluate the impact of ageing on esophageal motility findings.

We found that patients aged 75 or older were more likely to have Disorders of EGJ Outflow ($p < 0.001$) but had a similar prevalence of Disorders of Peristalsis compared to patients younger than 75 years of age ($p = 0.270$). We also found that, in patients aged <75 years, 75–79 years, and ≥80 years, increasing age corresponded to increasing prevalence of any esophageal motility disorder ($p = 0.006$) and Disorders of EGJ Outflow ($p < 0.001$). In addition, when investigating the impact of the novel definition of elderly, we found that there was a significant increase in any motility disorder ($p < 0.001$) and Disorders of EGJ Outflow ($p < 0.001$) when comparing patients aged <65 years old, 65–74 years old, and ≥75 years old, although the prevalence of achalasia was comparable between groups ($p = 0.078$). Both men and women had increasing rates of motility disorders with age, and increasing age remained associated with a higher likelihood of having a motility disorder even when controlling for gender on multivariate regression. Finally, with regards to HRM indications, we found that dysphagia was the most common indication in the elderly group while GERD evaluation was the least frequent ($p < 0.001$). Strengths of the present study include the multicenter setting and the large sample size. In addition, all studies were performed and interpreted according to the CC v4.0 protocol by experienced physicians.

The increased prevalence of certain motility disorders among elderly patients may have clinical implications, especially in trying to prevent complications and side effects in patients that may have significant comorbidities. Medications with less side effects may be recommended for hypercontractile esophagus, while EGJOO should be confirmed with a complementary study and then may be treated with a less invasive treatment such as botulinum toxin injection or per-oral endoscopic myotomy (POEM). There is also good evidence that POEM is well-tolerated by elderly patients for the treatment of achalasia [21].

Several pathophysiological patterns of esophageal motor function have been described among the elderly population in previous manometry studies. However, such studies used outdated definitions of elderly and obsolete diagnostic techniques and criteria. Previous studies showed decreased UES resting and relaxation pressures, amplified pharyngeal contractility, increased occurrence of failed peristalsis, as well as higher occurrence of spastic contractions among elderly patients, usually defined as patients older than 60 years of age [8,22]. However, in recent years, the definition of elderly has changed, due to a phenomenon of “rejuvenation” of the population, with individuals aged 65–74 now being considered pre-old, and those older than 75 years now being considered elderly [3].

Our findings update and corroborate previously published literature on the topic. Jung et al. performed a study that included asymptomatic individuals who underwent HRM aimed to evaluate the effect of age on HRM metrics using the Chicago classification [23]. The main findings of the study were the positive association between increased age and a higher integrated relaxation pressure (IRP) as a measure of outflow obstruction as well as shorter distal latency (DL), as an indicator of esophageal wall spasticity. The decreased relaxation of the LES, as reflected by the increased IRP metric and higher achalasia and EGJOO occurrence, might be explained by various pathophysiological mechanisms such as an age-related degeneration of inhibitory ganglions of the myenteric plexus, decreased esophageal sensory and distension function, as well as defective LES compliance [24–26]. Accordingly, we also found that EGJOO and achalasia was significantly more common among the elderly compared to younger patients. Of note, achalasia type III was significantly more prevalent among the elderly group. This important finding might be explained by the previous suggested mechanisms [27–29].

Moreover, other motility disorders including hypercontractile esophagus and absent contractility were more prevalent in the elderly group. Hypercontractile esophagus is characterised by vigorous esophageal contractility and is associated with symptoms such as dysphagia and chest pain [30]. This finding might be explained by increased cholinergic activity and concomitant asynchrony of circular and longitudinal muscle contractions that cause esophageal hyperkinesis which mostly affect patients older than 60 years of age [31,32]. Absent contractility is a rare motor disorder characterised by absent esophageal contractility along with normal LES relaxation [33]. Absent contractility was slightly increased in our elderly patients, most probably due to decreased esophageal contraction amplitude and their associated background illnesses and medications [33]. Our findings are in line with the recent published data by Pasta et al. were patients older than 65 years had more achalasia, EGJOO, DES, hypercontractile esophagus, and absent contractility [9].

There are limitations to this study that should be mentioned. First, this was a retrospective study conducted in a tertiary care setting and there is the inherent risk of selection bias and the possibility that our findings may be not generalizable to lower-volume centers. However, we minimized this by including consecutive patients undergoing HRM studies regardless of the indication. In this regard, we also performed a subgroup analysis based on the study indication, which allowed to correct the analysis for potential confounders related to patients’ selection. Finally, in contrast to previous studies, we performed comparison analyses according to CC v4.0 diagnoses and groupings, including Disorders of EGJ Outflow and Disorders of Peristalsis, without comparing individual HRM metrics.

In conclusion, we found that the prevalence of esophageal motility disorders, especially Disorders of EGJ Outflow, increases with age and is higher in patients that are defined as elderly according to the novel definition (≥75 years of age), corroborating the validity of this novel definition in the HRM setting. Finally, although we excluded patients with conditions and medication use known to influence esophageal motility, future studies should explore the impact of comorbidities and medication use on esophageal motility in the elderly population.

Data availability statement

The data underlying this study are available within the manuscript and Supplementary Materials.

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None.

Conflict of interest

ALL authors except EVS and EM declared no conflict of interest. EM: Dr Falk, Alfasigma. EVS has served as speaker for Abbvie,

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Author contribution

Pierfrancesco Visaggi: Conceptualization, Funding acquisition, Data curation, Writing – original draft. **Daniel L Cohen:** Formal analysis, Data curation, Writing – original draft, Writing – review & editing. **Elisa Marabotto:** Formal analysis, Data curation, Supervision, Writing – review & editing. **Andrea Pasta:** Formal analysis, Data curation. **Francesco Calabrese:** Formal analysis, Data curation. **Nicola de Bortoli:** Formal analysis, Data curation. **Amir Farah:** Writing – original draft. **Alessia Gargani:** Formal analysis, Data curation. **Jawad Hindy:** Formal analysis, Data curation. **Basem Hijazi:** Formal analysis, Data curation. **Wisam Abboud:** Formal analysis, Data curation. **Mentore Ribolsi:** Formal analysis, Data curation. **Luisa Bertin:** Formal analysis, Data curation. **Edoardo V. Savarino:** Conceptualization, Funding acquisition, Data curation, Writing – original draft, Supervision, Writing – review & editing. **Amir Mari:** Conceptualization, Funding acquisition, Data curation, Writing – original draft, Supervision, Writing – review & editing.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dld.2025.04.044.

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