



# Outcomes of Per-oral Endoscopic Myotomy in Sigmoid and Advanced Sigmoid Achalasia

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## Introduction

Sigmoid achalasia may develop in up to 10% of patients with longstanding achalasia.<sup>1</sup> Heller's myotomy (HM) is considered the preferred modality of treatment in these patients. Few small studies with short follow-up duration suggest that peroral endoscopic myotomy (POEM) may be an effective alternative to HM in these cases.<sup>2–5</sup>

In this study, we evaluated the outcomes of POEM in sigmoid and advanced sigmoid-type achalasia.

## Methods

The data of patients who underwent POEM (December 2014 to November 2018) for sigmoid achalasia was analyzed, retrospectively. The sigmoid esophagus was categorized into sigmoid and advanced sigmoid achalasia.<sup>6</sup> Clinical success

(Eckardt  $\leq 3$ ) was evaluated at long-term follow-up ( $> 3$  years). Objective evaluation including esophageal manometry, upper GI endoscopy, and 24-h pH study were performed at 3 months. A timed barium esophagogram was performed at 3 months and yearly, thereafter.

The demographics and POEM procedural characteristics are presented as mean  $\pm$  SD or median (range). Categorical and continuous variables were compared using the chi-square test and Student's *t* test, respectively. A *p* value  $< 0.05$  was considered statistically significant.

## Results

Thirty-two patients (23 males, mean age  $43.84 \pm 13.29$  years) underwent POEM for sigmoid ( $n = 22$ ) and advanced sigmoid achalasia ( $n = 10$ ). Sixteen (50%) patients received previous treatment (pneumatic dilatation-13, HM-3). POEM was successfully performed in all the patients with a mean procedure duration of  $62.69 \pm 32.71$  min. Severe submucosal fibrosis requiring double tunnel POEM was found in five patients.

The mean follow-up was  $34.03 \pm 13.78$  months. Of these, long-term follow-up ( $\geq 3$  years) was completed in 11 patients. Overall, clinical success was recorded in 27 (84%) patients. Long-term clinical success was seen in 8 (72.7%) patients. Eckardt scores were higher at long-term follow-up ( $1.18 \pm 0.87$  vs  $2.54 \pm 1.75$ ;  $p = 0.032$ ). The mean duration of symptoms was significantly more in patients with relapse of symptoms ( $166.40 \pm 44.77$  vs  $101.04 \pm 32.81$  months;  $p = 0.001$ ) (Table 1). Deterioration in the free flow of barium at  $\geq 1$ -year follow-up ( $n = 21$ ) was evident in 10 (47.6%) patients on follow-up (Fig. 1).

Major adverse events occurred in two patients including delayed mucosal barrier failure (1) and symptomatic pleural effusion requiring drainage (1). Increased esophageal acid exposure was detected in 3 patients. Erosive esophagitis was

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**Table 1** Comparison of parameters between cases with and without clinical success

	Clinical success ( <i>n</i> = 27)	Clinical failure ( <i>n</i> = 5)	<i>p</i>
Mean age, years	43.37 ± 13.49	46.8 ± 12.52	0.602
Mean duration of symptoms (months)	101.04 ± 32.81	166.40 ± 44.77	0.001
Previous treatment	PBD10 LHM 3	PBD 3 LHM 0	1.000
Sigmoid: advanced sigmoid	19/8	3/2	0.637
Mean Eckardt score	6.78 ± 1.65	7 ± 1	0.776
Mean IRP, mmHg	22.22 ± 14.03	28.58 ± 10.69	0.346
Mean length of myotomy, cm	9.78 ± 3.71	8.2 ± 1.92	0.365
Mean follow-up, months	33.22 ± 13.68	38.4 ± 15.07	0.449

IRP, integrated relaxation pressure; PBD, pneumatic balloon dilatation; LHM, laparoscopic Heller's myotomy

detected in 18 (56.2%) patients including grades A and B esophagitis in 7 and 11 patients, respectively.

## Discussion

In this study, POEM was found to be a safe, effective, and durable treatment option for patients with sigmoid and advanced sigmoid achalasia. However, symptom scores and barium esophagogram findings deteriorate with increasing duration of follow-up warranting close follow-up in these patients.

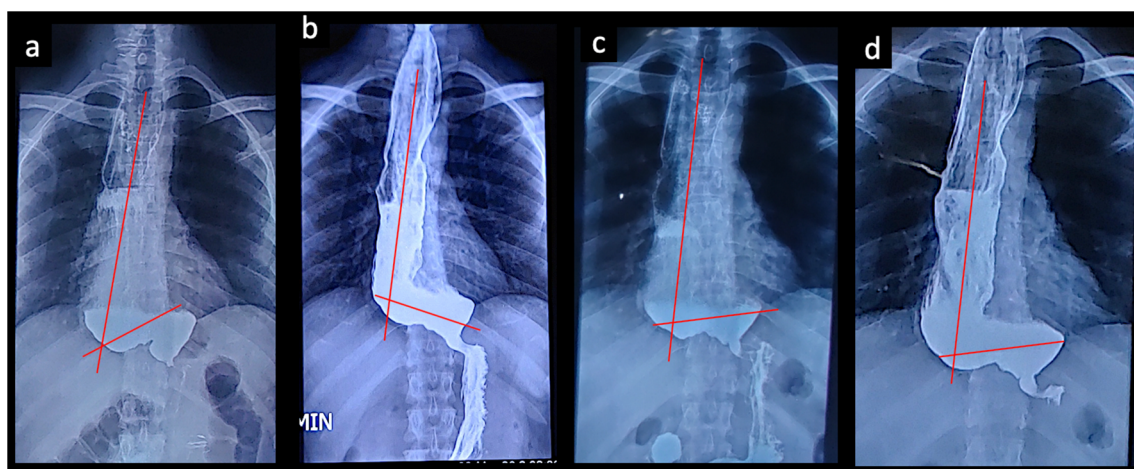
Sigmoid achalasia is especially difficult to treat a subgroup of achalasia. Limited data suggests that it may be effective in sigmoid achalasia as well.<sup>2–5</sup> In the current study, clinical success was recorded in the majority of the patients at short-term follow-up and nearly 3/4th of the patients who completed more than 3 years of follow-up. However, there was a progressive increase in symptom scores during follow-up and deterioration in barium emptying in nearly half of the patients with time. Relapse of symptoms on long-term

follow-up may be attributed to incomplete myotomy especially in cases performed during learning curve, fibrosis, or progression of the disease. In addition, the symptoms of GERD may mimic those of achalasia and should be taken into account while concluding clinical failure in these patients. In this study, erosive esophagitis was found in more than half of the patients.

We acknowledge few important drawbacks of the study including retrospective design and lack of objective evaluation (24-h pH study and timed barium esophagogram) in all the patients.

## Conclusion

POEM is an effective alternative to HM in cases with sigmoid achalasia. Longer duration of symptoms may be associated with symptom relapse. Relative deterioration in symptoms and high incidence of GERD demand close follow-up of these patients after POEM.



**Fig. 1** Serial images of pre and post POEM barium esophagograms during follow-up. **a** Pre-POEM barium esophagogram revealing significant stasis and no flow of barium across gastroesophageal junction (GEJ). **b** Post POEM barium esophagogram at 1 year revealing reduction in esophageal tortuosity and free flow of barium across GEJ. **c** Post

POEM barium esophagogram at 2 years revealing an increase in esophageal tortuosity as compared with previous film at 1 year. **d** Post POEM barium esophagogram at 3 years revealing significant stasis and absence of free flow across GEJ

**Author Contributions** Zaheer Nabi and Mohan Ramchandani were involved in the conception of the study.

Jahangeer Basha and Rajesh Goud were involved in the acquisition and analysis of the data.

Santosh Darisetty and D. Nageshwar Reddy were involved in revising the manuscript for important intellectual content.

All the authors agreed to the final version of the manuscript.

### Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

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