

Efficacy of Pneumatic Dilation (PD) in Treatment-Naïve Achalasia Patient: A North African Experience Center

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Abstract

Background: Pneumatic dilation (PD) is often presented today as a “short term” treatment for achalasia but, in truth, it can last for years. our study aims to determine the short and long-term efficacy of pneumatic dilatation on clinical remission in a treatment-naïve achalasia patient. **Materials and Methods:** A single center retrospective, descriptive and analytical study conducted between January 2007 and September 2022. Treatment naïve patients with manometric diagnosis of primary achalasia (subtype I and II) were included. We evaluated the clinical outcomes; single vs multiple PD, complications, and estimated duration of effect. **Results:** 121 patients were included, (mean age $42,2 \pm 14,5$; 53,8% male), 88,4% (n=104) underwent 2 PD and 11,6% (n=17) underwent 3 PD, 23,1% (n=28) needed repeated PD at one year, The PD procedure was completed without major complications in all patients. Patients with subtype II had a better response to PD than subtype I (p=0,003). In the long-term follow up (median time: 50 months), the mean Eckardt score was 2.2. A subsequent 35 mm dilatation was associated with long-term clinical remission than an initial dilatation with 35 mm. (p=0.003). On univariate analysis, the non-responders more often was male gender, had age < 40 years (p=0.0006), and had high baseline LES (lower esophageal sphincter pressure > 50 mmHg), p=0.004). On multivariate analysis only age < or = 40 years (p=0.02) was associated with poor outcome. **Conclusion:** PD is an effective, durable and safe treatment for achalasia. A graded-protocol PD starting with a 30 mm dilation applied in the appropriate achalasia subtypes was shown to be a highly effective approach, in both the short- and long-term. Age < 40 years, male patients and high LES have poorer outcomes following PD.

Keywords: Achalasia- Treatment naïve patient- Pneumatic dilation.

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INTRODUCTION

Achalasia is an esophageal motility disorder characterized by esophageal aperistalsis and impaired relaxation of the lower esophageal sphincter. Since the introduction of high-resolution manometry (HRM) in 2008, achalasia has been classified into clinically relevant subtypes [2, 3]. The updated Chicago classification (version 4.0) categorizes achalasia into 3 subtypes [4], that have important implications for management outcomes [5].

Unfortunately, there is no curative treatment that can target the neurodegenerative process. Therefore, all treatments are symptomatic, aiming to improve esophageal emptying by means of LES tone reduction [6].

Pneumatic dilation (PD) is a safe effective and is a very cost-effective treatment for achalasia. Several other invasive and minimally invasive treatment modalities, such as Laparoscopic Heller Myotomy (LHM) and Peroral Endoscopic Myotomy (POEM), also have a comparable safety and efficacy profile to PD [25]. A few studies have evaluated predictors of non-response and recurrence with PD, but most of them have not investigated the long-term efficacy of this technique [12-24], table 1.

Due to the chronic and progressive character of the disease, many achalasia patients have to undergo several treatments during their life [7]. Therefore, it is important to identify the most efficient and safe way of performing pneumatic dilations.

In this current review, we performed a retrospective analysis of the short-and long term efficacy and we focuses on the, complications, side effects of graded-protocol PD, and factors associates with outcoms in treatment-naïve achalasia patient.

MATERIALS AND METHODS

We conducted a retrospective descriptive analytical study in the department of gastro-hepato-gastroenterology C at the Ibn Sina Hospital in Rabat, over 15 years: 2007→ 2022 a CT scan was performed in all our patients to rule out pseudoachalasia

Inclusion criteria and stratification

Patients with a diagnosis of achalasia confirmed via conventional manometry or HRM with subtypes I and II who underwent graded-protocol pneumatic dilation as a primary means of treatment were included in the initial sample.

Short- and long-term clinical efficacy, complications and gastroesophageal reflux disease (GERD) were recorded.

The patients were clinically reevaluated after one week. Clinical examination, eckardt score and endoscopy were done at 1, 3 and 12 months and repeated yearly for follow-up period.

Clinical failure is defined by an Eckardt score > 3, more than 3 dilation a year

Exclusion Criteria

Exclusion Criteria Included

- * Patients who have already underwent endoscopic or surgical treatment for achalasia
- * Patients with a history of previous surgical or endoscopic treatment.
- * Patients with secondary achalasia (malignancy, infectious, etc.)
- * Patients who have been lost to follow-up for at least 12 months.
- * One annual dilation which is considered a long-term maintenance treatment.

PD Procedure

Endoscopic PD was performed with a Rigiflex pneumatic dilator using a 30, 35 or 40 mm diameter dilation balloon. The balloon was placed over an endoscopically introduced guide wire. Once in place, the balloon is distended to a pressure of 7 to 15 psi and held for 60 sec while confirming the effacement of ballon waist on fluroscopy. And post-procedural images were obtained to evaluate for extravasation outside the esophageal lumen.

We used a “graded approach”:, starting with a 30-mm diameter balloon and progressing, if necessary, to a larger diameter balloon or starting right away with a

35 mm diameter balloon. The need for further dilation was determined by the persistence of symptoms (Eckardt score >3) 4 weeks after the procedure. Patients with Eckardt scores >3 at 4 weeks after the third dilation were considered early failures and referred to other treatments. Patients achieving an Eckardt score ≤ 3 at the end of the first cycle of the graded approach were considered as successful treatments in the short-term outcome. To assess long-term outcome, we conducted annual follow-up evaluations with Eckardt score with a median time long-term follow up over 50 months.

Statistical Analysis

Statistical analyses were performed using the jamovi project (2020) (Version 1.6) (Computer Software). Quantitative variables were summarized using counts (n), means, medians, ranges, or standard deviations where applicable. Qualitative data were expressed in frequencies (n) or percentages (%). The D’Agostino-Pearson test for normal distribution was applied for the baseline characteristics variables. We presented the epidemiological data for the entire 30 F. To assess the differences before and after therapy we used the Student’s t-test for continuous variables and the χ^2 test for categorical variables. Treatment success was defined as an Eckardt score ≤ 3 . To evaluate which variables were associated with therapeutic success, we carried out a Cox logistic regression analysis. A Kaplan-Meier curve was also used to estimate probability of symptom relapse in patients greater than 40 years old compared with those less than 40.

All results were considered significant if $p \leq 0.05$.

RESULTS

121 patients were included, the mean age was $42,2 \pm 14,5$, predominantly male 53,8% (n=65).

Symptoms at presentation were dysphagie in all patients (n=121) 100%, regurgitation (n=58) 47,9%, chest pain 20,6% (n=25), and weight loss 56,1% (n=68). The mean pre-dilation Eckardt score was $7,32 \pm 1,92$. The majority had type II achalasia 67,7% (n=82), followed by type I in 32,2% of patients (n=39).

The baseline characteristics of the study population are summarized in Table 1.

Table 1: Baseline characteristics of the retrospective cohort

Characteristics	Patients (n=121)
Age (years)	42,2
Male %	53,8 (65)
Dysphagia %	100 (121)
Regurgitation%	47,9 (58)
Weight loss%	56,1 (68)
Chest Pain%	20,6 (25)
Eckardt score pre-dilation	$7,32 \pm 1,92$

The duration of symptoms was 3.2 ± 4.1 years. An initial upper endoscopy was done in all patients and revealed: a dilated oesophagus with food stasis in 64,4% (n=78), protrusion sign in 26,4% (n=32), and both of them in 9,1% (n=11).

Esophageal manometry were done, and showed the absence of peristalsis and incomplete relaxation in all patient, and elevated LES pressure (>30 mmHg) in 73,5% (n=89).

85,9% patients (n=104) underwent 2 PD and 14,04% (n=17) underwent 1 PD, 23,1% (n=28) needed repeated PD at one year, The PD procedure was completed without major complications in all patients.

A subsequent 35 mm dilatation was associated with long-term clinical remission than an initial dilatation with 35 mm. (p=0.003).

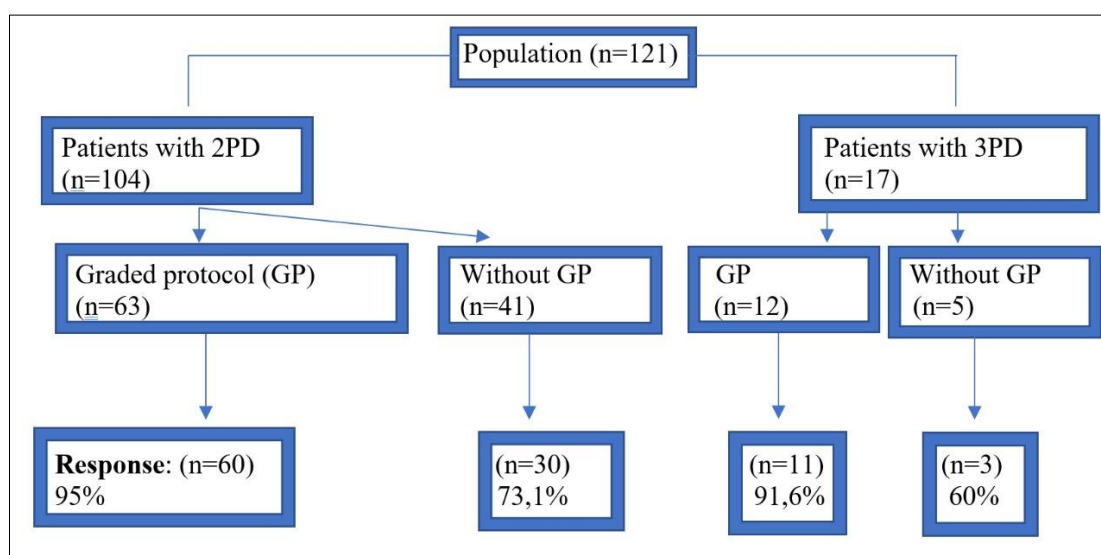


Figure 1: Flowchart of patient inclusion and outcome

In other words, dilatation following a graded protocol of 30,35 and 40mm balloon if required, showed a success rate in patients who received 2 PD, and 3 PD

of 95 and 91% respectively. 23,1% (n=28) needed repeated PD at one year.

Table 2: Long-term results of pneumatic dilation in achalasia subtype I and II

Achalasia subtype	N	Follow up (median)	Clinical remission (%)	Eckardt score at follow up	P-value
Achalasia subtype I	75	85(24-129)	65(86,6%)	1.82±2.1	0.046
Achalasia subtype II	46	42(2-120)	42(91,3%)	1.16±1.97	0.003
Total	121	50(2-129)	107(88,8%)	2.2±1,45	0.031

Patients with subtype II had a better response to PD than subtype I (p=0,042). In the long-term follow up (median time: 50 months), the mean Eckardt score was 2.2.

The remaining 13 did not benefit from redilations and were referred for surgical treatments, laparoscopic heller myotomy (LHM), due to the lack of medical expertise in POEM at the time. None of the patients who underwent redilations had major complications.

Impact of Age and Gender on Outcome

Impact of age on outcome of pneumatic dilation was examined on univariate analysis. Patients were stratified in groups of < 40 and > 40 , younger patients

achieved a longer length of remission, these results statistically highly significant (p = 0.0006).

Manometry

On univariate analysis, the non-responders more often had high baseline LESP (lower esophageal sphincter pressure >50 mmHg), p=0.004). On multivariate analysis only age ≤ 40 years (p=0.02) was associated with poor outcome.

Adverse Events

Three cases of microperforations were noted after dilatation, representing a rate of 2.4%. All three cases were treated conservatively and did not require surgery. The three of them occurred in a patient who underwent 3 PDs. 4,13% (n=5) of patient had a postoperative gastroesophageal reflux (GERD), all

improving with medical treatment. There were no significant correlation between PD and complications in the Spearman correlation analysis ($p = 0.21$).

DISCUSSION

PD was the first endoscopic technique used to treat achalasia symptoms, regardless of the underlying manometric pattern, until POEM was developed [11].

By increasing the pressure inside the inflatable balloon, the therapeutic action of PD aims to stretch the smooth muscle fibers of the LES, thereby achieving an effective dilation of the sphincter. Thus, unlike other techniques such as POEM, it cannot act on the symptoms that result from contraction and pressurization of the proximal muscle of the esophagus, such as patients with a specific subset of achalasia characterized by prominent contractions (formerly referred to as “vigorous achalasia”) [12, 13]. This observation became more apparent with the advent of HRM and pressure topography plotting, which precisely delineated the manometric characteristics of these patients and defined them as subtype III achalasia [14].

Comparison studies have confirmed a poorer response of subtype III to PD compared with POEM, which allows smooth muscle dissection up to proximal esophageal segments [15-23].

We included in our study type I and II patients treated with PD. The results reported in this retrospective study, showed excellent long term response rates of 86% and 91% for subtypes I and II achalasia, respectively.

Most of the data on the efficacy of PD in the treatment of achalasia include subgroup III, and thus yield a lower response rate than those reported in this study, where we have selected only subtypes I and II [17-18]. A recent study by Andolfi *et al.*, reported the success rates of PD for each achalasia subtype: 61% and 84% in subtypes I and II, respectively, after a mean follow up of 24 months, which is consistent with our study showing that type II has a better clinical response than type I.

Most initial studies show clinical improvement in up to 70% of patients after one after one dilatation

session, but with recurrence at 6 months in half of them recurrence. A progressive diameter dilatation program enables patients with early recurrence or with early recurrence or failure, since a larger balloon leads to a better success rate success rate, at the cost of a significantly higher perforation rate, ranging from 4% with 30 mm balloons to 30% with 35 mm balloons. A recent meta-analysis shown that 35mm dilatation appears to be the best compromise after an initial 30mm dilatation.

In comparison with Heller myotomy, a randomized controlled trial with a progressive progressive pneumatic dilatation program was similar in terms of symptom resolution, with symptoms, with 25% of patients requiring a further series of dilatations within 5 years.

Notably, our results were in line with the excellent success rates showed by Rohof *et al.*, who used a protocol of graded dilation with redilations in patients with symptom recurrence [19]. The graded PD protocol that we have been using since 2007 is the safest and most effective one among those available [9], and was recently recommended by European Society of Gastrointestinal Endoscopy guidelines as a therapeutic option [20]. The absence of complications in the short term demonstrated in our study confirms and expands previous evidence for PD safety. A gradual dilation starting from a 30-mm balloon aims to adapt the diameter of the device to the esophageal caliber, to allow progressive and safe stretching of the smooth muscle fibers. On the other hand, in the long-term, the occurrence of reflux was considerable; 22.3% and 28% in subtypes I and II, respectively, although these results were consistent with published data [8-22]. All the procedures were performed in a tertiary referral center for esophageal dysmotility and thoracic surgery was available as a back-up in case of complications.

According to our study, PD is still a safe and effective approach for treating patients with achalasia subtype I and II. Notably, PD can be performed in an outpatient setting with reasonable costs, provided that the procedure is performed in a tertiary referral center with experienced operators and thoracic surgery available to manage possible complications promptly.

Table 3: Preferred treatment options according to achalasia subtypes [1]

Condition	Preferred treatment	Comment
<i>CC v3.0 achalasia subtypes</i>		
Type I achalasia	PD, LHM, POEM	<ul style="list-style-type: none"> All treatments efficacious Expect more reflux after POEM, especially in patients with hiatal hernia
Type II achalasia	PD	All treatments are highly efficacious, PD has least morbidity and lowest cost
Type III achalasia	POEM	Can calibrate the myotomy to the spastic segment

CC Chicago classification-PD pneumatic dilation – POEM per-oral endoscopic myotomy-LHM laparoscopic Heller myotomy

CONCLUSION

The majority of treatment naïve achalasia patients achieve symptom remission for more than one year after pneumatic dilation. Overall, pneumatic dilation remains a safe procedure that may be more durable than generally believed.

This technique should always consider the achalasia subtype (with subtypes I and II being most suitable for PD treatment); and should be performed using a graded approach, as applied in this study and recommended by most important literature review.

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