

### Comparison of Acapella™ Versus Flutter for airway clearance in COPD patients- A Cross-Over Trial

\*Anantlaxmi Goud, \*\*Dr.Abhijit Diwate,\*\*\*Dr.Deepak Anap,\*\*\*\*Dr.Nidhi Ahya

\*Intern,\*\*Professor and HOD (Cardiopulmonary Physiotherapy), \*\*\* Professor & HOD (Musculoskeletal Physiotherapy), \*\*\*\*Assistant Professor (Cardiopulmonary Physiotherapy)

**Address for Correspondence :** PDVVPF's College Of Physiotherapy, Ahmednagar

**Mail id** -physio@vims.edu.in

**Mob. No. -** 9420698473

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#### Abstract :

**Background :** Mechanical devices like Acapella and Flutter, which are able to create oscillatory positive expiratory pressure (PEP) have been used to promote mucus clearance. These devices prevent airway collapse by stenting the airways to promote collateral ventilation and thus assist in removal of secretions. The objective of present study was to compare Acapella versus Flutter for airway clearance in COPD patients.

**Method :** 10 males and 5 females diagnosed as COPD based on GOLD's criteria and aged 45-65 years were conveniently selected from Vikhe Patil Hospital, Ahmednagar. **Design:** Crossover Trial. **Result :** 30 subjects were included for cross over trial. The outcome measure was sputum volume in ml to compare between Acapella and Flutter. There is significant difference ( $p < 0.0001$ ) in sputum volume for acapella and flutter where  $p = 0.05$ . **Conclusion:** Both the devices are effective however Flutter is more effective than Acapella for airway clearance in COPD patients.

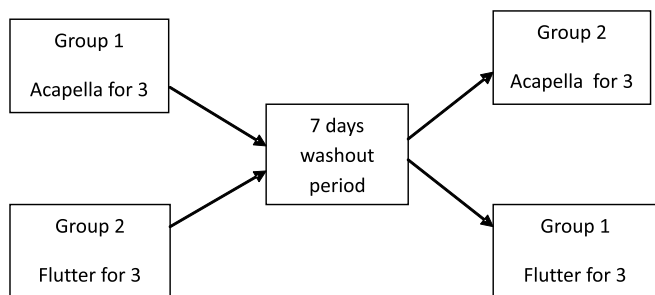
**Keywords:** Acapella, Flutter, COPD, Airway Clearance, PEP devices

**Introduction :** Chronic obstructive pulmonary disease (COPD) is defined as a fixed post-bronchodilator ratio of forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC) as assessed by spirometry.<sup>[1]</sup> Therapeutic interventions aim to improve the health-related quality of life of COPD patients by either maintaining or increasing pulmonary function, by improving mucus clearance and by decreasing the number of exacerbations.<sup>[2]</sup> Medical management includes prescription of drugs like beta agonists, anticholinergics, anti-inflammatory agents and antibiotics. The mainstay of physiotherapy

management for COPD has been chest physiotherapy and postural drainage. More recently, mechanical devices which are able to create oscillatory positive expiratory pressure (PEP) like Acapella, Flutter, Thera PEP, Quake etc have been used to promote. These devices either prevent airway collapse by stenting the airways or increase intrathoracic pressure distal to retained secretions, by promoting collateral ventilation and thus assist in removal of secretions.<sup>[3]</sup> The Flutter is a handheld device consisting of heavy stainless steel ball placed in a circular cone. The Acapella consists of counterweighted lever and magnet inside a boat shaped body. Both devices can create an oscillatory PEP between 5 and 35 cm H<sub>2</sub>O by obstructing the expiratory flow with a metered force. Flutter uses the force of gravity whereas Acapella uses the force of magnetic attraction.<sup>[4]</sup> A previous study which compared Acapella with Flutter concluded that both devices have similar flow-pressure characteristics, however, for variation of expiratory flows, Acapella is available in different models (>15 or <15 L per min) as compared to flutter in which flow can be varied depending on the angulation at which it is held.<sup>[5]</sup> In the reviewed literature, there exists a paucity of recent studies comparing the two frequently used PEP devices, thus explaining the need for the present study.

**Methodology :** This study was conducted from April 2015 to August 2015, after getting approval from Institutional ethics committee. The subjects were taken only after getting informed consent form. A complete respiratory assessment of subjects has been done and sputum volume, PFT values were recorded before the treatment. In order to omit bias, each alternate subject was given the same PEP device for the first 3 days and on 4th day sputum volume and PFT values were recorded followed by a washout period of 7 days and then treatment with second PEP devices for the next 3 days and again on next day sputum volume and PFT values were recorded. Patient was instructed to sit comfortably in upright position holding the mouthpiece of PEP device tightly between lips and take larger than normal tidal breath but not to total lung capacity. Exhalation was gentle and such that the exhalation time was at least 3 times longer than inhalation. Patient performed 2-3 PEP breaths followed by 2-3 forced exhalation maneuvers or huffs. Same procedure was repeated until the secretions were cleared.

**Fig:1** Study protocol. Assessments were performed at the start and end of each treatment period.



**Fig : 2** Airway clearance technique using Flutter



**Fig:3** Airway clearance technique using Acapella

**Result and Discussion :** The subjects (n=30) including 5 females and 10 males were recruited for cross-over in the present study. Sputum volume in ml and PFT values were recorded twice for each patient before and after change in treatment sequence

Analysis of sputum volume for both the groups done by using unpaired t test showed that there was no significant difference between the groups at baseline (p=0.9648) Table no.1 depicts the result of the same. Table no.2 shows significant difference (p= 0.0064) in comparison of sputum volume between Acapella and Flutter after the treatment by applying Unpaired t test. Table no.3,4 shows significant difference (p<0.0001) in sputum volume for both acapella and flutter pre and post by using paired t test. But Flutter is more significant than Acapella. Data analyse was done in statistical software (GraphPad InStat v.3) at significant level of p=0.05

**Table no. 1:** Comparison of sputum volume between Acapella and Flutter at baseline

Group	Mean±SD	p value	Unpaired t value	Results
Acapella	0.88±0.62	0.9648	0.044	Not significant difference
Flutter	0.89±0.60			

**Table no. 2 :** Comparison of sputum volume between Acapella and Flutter after the treatment

Group	Mean±SD	p value	t value	Results
Acapella	2.53±0.95	0.0150	2.591	Significant difference
Flutter	3.5±1.08			

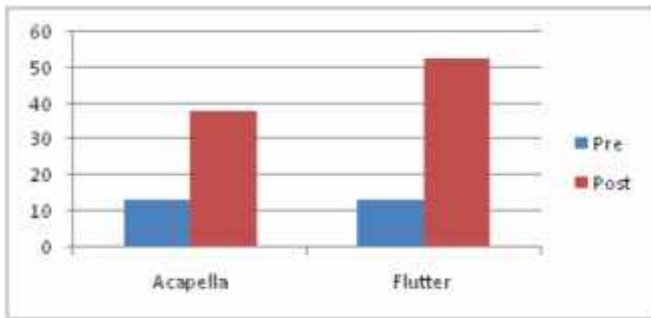
**Table no. 3:** Comparison of sputum volume for Acapella Pre and Post

Group	Mean±SD	p value	t value	Results
Pre	0.88±0.62	<0.0001	10.65	Significant difference
Post	2.53±0.95			

**Table no.4:** Comparison of sputum volume for Flutter Pre and Post

Group	Mean±SD	p value	t value	Results
Pre	0.89±0.60	<0.0001	12.21	Significant difference
Post	3.5±1.08			

Graph : Sputum Volume between Acapella and Flutter



The purpose of present study was to compare Acapella versus Flutter for sputum volume in COPD patients. Our results shows that there is significant difference in sputum volume after using Acapella and Flutter for airway clearance. It was showed that the flutter was more effective than acapella for airway clearance, The results from the previous study by Monika Fagevik et al shows that there is significant difference in Sputum volume for flutter. The Magdy Abu-Rayan<sup>[6]</sup> found that use of Acapella device for chest physiotherapy when compared to multimodality chest physiotherapy resulted in significant increase in mean value of sputum amount, Thus results of the present study are consistent with the previous studies.. Low et al<sup>[7]</sup> found that oscillations of positive airway pressure ventilation maintains open airways and enhances aeration to obstructed regions of the lungs. The mechanism by which these devices help in airway clearance is by built up of positive expiratory pressure which makes the airway walls to vibrate, loosens mucus, thereby decreasing its viscoelasticity. Although our results are in accordance with previous studies, our sample size was small. A large scale Randomized Controlled Trial should be undertaken to confirm the findings of the present study.

**Conclusion:** Both Acapella and Flutter devices are effective for airway clearance in COPD patients however, Flutter is more effective than Acapella for airway clearance in COPD patients.

**Conflict of interest :** None reported

**Funding :** None

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