

The Study of Usage of Inhalation Devices and Inhalation Techniques in Bronchial Asthma and Chronic Obstructive Pulmonary Disease attending a tertiary care hospital.

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Abstract: Inhalers are the main stay of treatment in asthma and COPD. Most of the patients have faulty inhaler technique and it hampers their treatment significantly. An observational cross-sectional Study was done in Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune-411011 from July, 2016 to September, 2018 to study the use of inhaler devices by the patients of bronchial asthma and COPD according to standard steps and errors committed in different steps of use. Results of the study showed that majority of patients were unable to use their inhalers correctly. The maximum mistakes committed, which was common for all the devices, was that 61% of the subjects had short breath hold after inhaling the drug from device, while 2nd most common mistake was 58% did not exhale to residual volume before inhaling the drug.

Thus proper training at each visit should be carried out to get maximum benefit from inhalers

Keywords: Asthma , Copd , Inhalers, faulty technique

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I. Introduction

Inhalation therapy targets drug delivery to the lungs and allows a distinct therapeutic advantage over systemic therapy with the use of smaller drug dose, a more rapid onset of therapeutic action and decreased side effects. One of the important reasons for suboptimal control of asthma and COPD is the insufficient delivery of inhaled drug due to either wrong selection of inhalation device or incorrect inhalation technique [1]. Faulty inhalation techniques are associated with decreased medication delivery and poor disease control [2-4]. Metered Dose Inhaler (MDI), Dry Powder Inhaler (DPI), Metered Dose Inhaler with Spacer (MDI with Spacer), Breath actuated Metered Dose Inhaler (baMDI) are the different types of inhalers which are used in the management of bronchial asthma and COPD.

Bronchial asthma is estimated to affect some 300 million people worldwide and accounts for about one per cent of all disability-adjusted life years lost.[5] Distinguishing asthma from COPD can be problematic particularly in smokers and older adults. COPD is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.[6] Chronic obstructive pulmonary disease claimed 3.0 million lives in 2016.[7]

Now a days, asthma and COPD (Chronic obstructive Pulmonary disease), are mainly treated by inhaled therapy [8]. This practice became popular many years after the introduction of atropine and adrenaline, as bronchodilators [9], only when efficient nebulizer ampoules and inhalers [10] finally became available. Nebulizers, pressurized inhalers and dry powder inhalers are the different types of dispensers for lung deposition of drugs. In patients with asthma or COPD who show poor inhaler technique with a pMDI, the addition of a large-volume spacer and education from a health professional (rather than simply changing inhalers) might be the best initial strategy for improving inhaler technique [11]

Over the decades, inhalation therapy has become the backbone in the treatment of these disorders, although new inhalers have been designed to improve ease of use, significant rates of incorrect use have been reported among COPD and bronchial asthma patients, even among regular adult users.[12] About 90% of COPD and asthma patients are using standard pressurised metered dose inhalers (pMDIs) or dry-powder inhalers (DPIs) with incorrect technique [13] With short-acting β_2 agonists (relievers), poor inhaler technique results in loss of bronchodilator effect [14,15]. The patients who use standard pMDIs without a spacer, failure to coordinate inspiration with actuation, results in reduced lung deposition of medication [16]. Education about medications occurs mostly during doctor consultations at the time of prescribing, and yet evidence points to the passivity of

the patient and a low level of information exchange during such consultations [17]. Incorrect use of pMDIs for inhaled corticosteroids (ICS) has been associated with increased reliever use, increased use of emergency medical services, worsening asthma [18]. Inefficient technique with DPIs may also lead to insufficient drug delivery and therefore insufficient lung deposition [19].

Hence, it is very important on the part of the treating physicians and the health care providers to teach inhalation techniques correctly to the patients. It is also equally important to regularly check their technique and to understand the difficulties which are faced by the patients in their inhalation technique. However, only few previous studies have investigated the frequency and impact on asthma control due to poor knowledge regarding correct use of inhalers by patients or health care givers [8].

II. Aim And Objectives

To study the use of inhaler devices by the patients of Bronchial asthma and COPD according to standard steps and Errors committed in different steps of use.

III. Method Of Study

The study included 100 outdoor and indoor patients of bronchial asthma and COPD. It was an observational cross-sectional Study done at Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pune from July, 2016 to September, 2018. Inclusion criteria consisted of Patients with bronchial asthma age group more than 12 years of age and patients with COPD with age group of 40-70 years on inhalation therapy. Exclusion criteria included uncontrolled asthma, acute exacerbation of COPD, patient not willing for demonstration inhalation technique and on multiple devices

Statistical Analysis: Categorical variables were summarized as frequencies & percentage and compared with Chi-Square test. The level of significance was set at 0.05. Data were analysed by Microsoft Excel 2010, MedCalc@Version14.8.1

IV. Results

Table showing frequency of inhalation technique steps (correct/incorrect) with respect to inhalation devices

Step	Interpretation	DPI Multi Dose	DPI Single Dose	PMDI	PMDI with Spacer	Total
Remove Cap/Cover	Correct	7	32	31	30	100
Shake the Inhaler	Correct	0	0	15	20	35
	Not Correct	0	0	16	10	26
	Not Included	7	32	0	0	39
Insert inhaler in spacer	Correct	0	0	0	27	27
	Not Correct	0	0	0	3	3
	Not Included	7	32	31	0	70
Placing of Capsule in chamber	Correct	0	31	0	0	31
	Not Correct	0	1	0	0	1
	Not Included	7	0	31	30	68
Pressing the spike button	Correct	0	28	0	0	28
	Not Correct	0	4	0	0	4
	Not Included	7	0	31	30	68
Loading the drug by pressing lever/twisting grip around till click heard	Correct	4	0	0	0	4
	Not Correct	3	0	0	0	3
	Not Included	0	32	31	30	94
Exhalation before inhalation	Correct	4	8	12	18	42
	Not Correct	3	24	19	12	58
Placing the mouthpiece	Correct	7	27	26	27	87

between teeth without gap	Not Correct	0	5	5	3	13
Breathing deeply after loading drug/Inhaler dose in the spacer	Correct	5	20	0	17	42
	Not Correct	2	12	0	13	27
	Not Included	0	0	31	0	31
Breathing in & releasing 1 dose simultaneously by pressing canister	Correct	0	0	8	0	8
	Not Correct	0	0	23	0	23
	Not Included	7	32	0	30	69
Breath Hold	Correct	4	6	15	14	39
	Not Correct	3	26	16	16	61
Exhale into spacer, inhale & hold breath again	Correct	0	0	0	20	20
	Not Correct	0	0	0	10	10
	Not Included	7	32	31	0	70
Remove the inhaler and breathe out	Correct	7	29	26	30	92
	Not Correct	0	3	5	0	8
Open to check leftover powder	Correct	0	22	0	0	22
	Not Correct	0	10	0	0	10
	Not Included	7	0	31	30	68

Out of the 100 subjects, the maximum mistakes committed which was common for all the devices was that 61(61%) subjects had short breath hold after inhaling the drug from device, while 2nd most common mistake was 58 subjects (58%) did not exhale to residual volume before inhaling the drug. In the PMDI devices with or without spacer, 32 subjects (52.45%) of subjects had short breath hold while second most common error was not exhaling before inhaling in 31 subjects (50.81%). The third and a major mistake was that 26(42.62%) subjects didn't shake the inhaler before use. In PMDI devices without spacer the major issue was of hand breadth coordination where 23 subjects (74.19%) committed error and did not have proper coordination. It was followed by short breadth hold and not shaking the inhaler where in both steps 16(51.61%) subjects committed mistakes. In the PMDI with spacer, 16 subjects (53.33%) of subjects had short breadth hold while second most common error was unable to breathe in deeply from the spacer in 13 subjects (43.33%) and the third common error was not exhaling before inhaling in 12 subjects (40%). In DPI devices the maximum mistakes committed which was that 29(74.35%) subjects had short breath hold after inhaling the drug from device, while 2nd most common mistake was 27 subjects (64.10%) did not exhale to residual volume before inhaling the drug.

V. Discussion

In the present study it was observed that out of the 100 subjects, the maximum mistakes committed which was common for all the devices was that 61(61%) subjects had short breath hold after inhaling the drug from device, while 2nd most common mistake was 58 subjects (58%) did not exhale to residual volume before inhaling the drug.

In the PMDI devices with or without spacer, 32 subjects (52.45%) of subjects had short breadth hold while second most common error was not exhaling before inhaling in 31 subjects (50.81%). The third and a major mistake was that 26(42.62%) subjects didn't shake the inhaler before use. This findings can be correlated with the study by Arora et al,²³ where most common errors made by the MDI users were "No/Short Breath hold" (45.71%), "Not exhaling to residual volume" (40%). In another study by Pothirat et al²¹ for the pMDI, the steps "breathe out gently to residual volume" and "shake inhaler thoroughly" were most frequently performed incorrectly. On the other hand in a study by Sehajpal R et al²⁰ the step at which maximum number of patients committed mistake was exhalation (65.88%) followed by breath holding (45.88%). But in our study when we consider the PMDI devices without spacer the major issue was of hand breadth coordination where 23 subjects (74.19%) committed error and did not have proper co-ordination. It was followed by short breadth hold and not shaking the inhaler where in both steps 16(51.61%) subjects committed mistakes. Pothirat et al²¹ has seen that for the pMDI with spacer, the step "breathe in and out through mouthpiece at least three times" was most frequently performed incorrectly.

In our study in DPI devices the maximum mistakes committed which was that 29(74.35%) subjects had short breath hold after inhaling the drug from device, while 2nd most common mistake was 27 subjects (64.10%) did not exhale to residual volume before inhaling the drug. Pothirat et al²¹ has seen that for the Accuhaler, the steps "breathe out gently to residual volume" and "inhale forcefully and deeply" were most frequently performed incorrectly. For the Handihaler, the step "hold breath for at least 10 seconds" was most

frequently performed incorrectly. In a study by Arora et al,²³ DPI users had “Insufficient acceleration (52.31%), “Not inhaling deeply enough (36.92%)” and “Poor seal around mouth piece (29.23%). In another study by Saxena et al²² the most crucial steps in case of DPI which most of the subjects were found to be performing incorrectly were found to be ‘forceful inhalation through the mouth’ (71.7%), followed by ‘slow exhalation (70.2%), followed by ‘breath holding after inhalation’ (69.1%) and ‘continuing to inhale until lungs were full’ (44.7%).

There are various factors which can influence the patient’s adaptation to the inhalation technique specially the type of instructor who taught the technique which affects the correctness of technique at the preliminary level. It could be due to lack of reinforcement of the technique and periodic observation in subsequent visits that could have ensured that patients maintained adequate technique or it could be deficits in technique of the physicians themselves that could lead them to often choose to not to instruct the patient. In our study, it was seen that less the mistake done when instruction mode was demonstration than Verbal. There was significant difference between the modes of instructions (Verbal vs. Demonstration). So simply asking the patient whether they are using an inhaler properly is not sufficient. As proficiency in good technique tends to decrease over time and patient might introduce errors unknowingly hence repetitive education as well as demonstration is very much necessary.

VI. Conclusion

It was observed that majority of patients were unable to use their inhalers correctly; thus, proper training at each visit should be carried out to get maximum benefit from inhalers.

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