

ORIGINAL ARTICLE

CORRECTING METERED-DOSE INHALER TECHNIQUE VS SWITCHING TO TURBOHALER IN ASTHMATIC PATIENTS- A STUDY ON 'REAL-LIFE' EFFECTIVENESS

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In practice, asthmatic patients whose metered-dose inhaler (MDI) technique is inefficient are either corrected or changed to dry powder breath-actuated or spacer device that is easier to handle. Based on 'real life clinic circumstances', we studied 15 symptomatic asthmatic patients whose MDI techniques were inefficient that either received correction in their technique (n=9) or were changed to turbohaler (n=6). For comparison, we also studied a similar group of symptomatic asthmatic patients (n=6) with appropriate MDI techniques that were treated by doubling of inhaled corticosteroid (ICS) dose. After 4 weeks, FEV₁ and symptom scores in the turbohaler group was significantly improved from baseline but not in the corrected MDI group. The group whose ICS dose was doubled also showed significant improvement in symptom scores but not in FEV₁. We question the benefit gained by correcting MDI technique in some asthmatic patients compared to that of switching over to more user-friendly devices such as turbohaler. In our study, the improvement observed with turbohaler appears to be more than a mere doubling of drug delivery to the lungs and may relate to the recognized greater consistency of drug delivery by turbohaler compared to MDI device.

Key words : Asthma, metered-dose inhaler, turbohaler

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Introduction

Meter-dose inhaler (MDI) as a means of delivering anti-asthma medication has been available in Malaysia for the past 30 years. The device is relatively cheap compared to the newer dry-powdered inhaler devices and remains popular among healthcare providers and patients (1, 2). However, difficulty in correctly handling the MDI device among many patients is well-documented (3-5) and this problem can seriously compromise the optimal delivery of medication dose in treating asthma. In a local population of Malaysian asthmatic patients, we recently reported that as high as 42% did not handle the MDI device correctly (6). In this study of patients followed up in the medical outpatient clinic, we investigated the 'real-life' effectiveness of correcting MDI techniques compared to switching to dry-powdered device,

turbohaler, in inefficient MDI handlers who continued to have asthmatic symptoms. Since lung deposition from turbohaler is doubled that of MDI (7, 8), we included a similar group of asthmatic patients who correctly handled the device but whose inhaled corticosteroids (ICS) dose was doubled for control of asthma symptoms for comparison with the turbohaler group.

Patients and Methods

Patients

Twenty four physician-diagnosed asthmatic patients with inefficient MDI techniques and 6 with appropriate MDI techniques were recruited from the study population of our earlier study (6). Our criteria of deciding on appropriate or inefficient MDI techniques have been previously described. Briefly, the techniques was assessed by a single chest

Table 1 : Clinical characteristics of asthmatic patients

Groups	POOR MDI TECHNIQUE		CONTROL
	Technique corrected	Device changed to turbohaler	ICS dose doubled (Appropriate technique)
n	9	6	6
Mean age (range) (Yr)	37 (20-57)	52 (45-58)	54 (52-57)
Male, n(%)	3 (33)	2 (40)	1 (17)
Ethnicity, n (%):			
Malay	4 (44)	0	2 (33)
Chinese	0	2 (40)	2 (33)
Indian	4 (44)	3 (60)	2 (33)
Others	1 (12)	0	0
Mean disease duration, yrs (range)	14 (3-32)	26 (7-38)	25 (1-50)
Mean (Litres) baseline FEV ₁	1.63 ± 0.45	1.31 ± 0.67	0.84 ± 0.40
Mean (% pred) baseline FEV ₁	60 ± 5	48 ± 20	32 ± 10
Mean (range) ICS dose, µg/day	628 (400-800)	800 (600-1200)	367 (200-600)
Mean (range) increased ICS dose, µg/day	N/A	N/A	367 (200-600)

Plus-minus values are means±SD
ICS= inhaled corticosteroid
FEV₁= post-bronchodilator Forced Expiratory Volume in One Second
Note: Differences in numeric differences between groups (excluding control) are not statistically significant except for mean age (p=0.03) and mean disease duration (p=0.04)

physician (LCL) on the three crucial steps of adequate lip closure around mouthpiece, coordinated hand-mouth inspiration following expiration and breath-holding of at least 5 seconds. The techniques was considered as inefficient if any one of the three steps was not carried out optimally. The reason for choosing these three steps alone was based on the belief that the other steps such as removing cap before inhaling, taking one inhalation each time, were easily rectifiable compared to the three steps. Other inclusion criteria were on-going asthmatic

symptoms (symptom score ≥ 3) inadequately controlled by the currently prescribed medications and had been using MDI device for at least one year. All patients recruited were taking regular, ICS.

Study Design

Clinical details including duration of asthma, post-bronchodilator FEV₁ and the duration of MDI used, were obtained from all subjects. Wherever possible, this information was validated from hospital medical notes. In an open fashion, taking

into consideration individual preference and correctability of inhaler technique, those whose technique was poor were treated by correction of inhaler technique or a change to turbobaler device while leaving the dose of ICS unescalated. After 4 weeks, the same physician reassessed all subjects. The outcome measures were changes in FEV₁ and symptom scores at four weeks. In the control group whose MDI technique was appropriate, inhaled CS dose was doubled and similar assessment carried out at 4 weeks. All other anti-asthma medications, if any, were kept unchanged over this study period.

Symptom scores

Patients' asthmatic symptoms were asked by the single investigator during the study visits and graded from score 1 to 4. Score 1 indicates that patient is hardly aware of his/her asthmatic symptoms over the last 3 days. Score 2 indicates that patient is aware of his/her asthmatic symptoms but not bothered by them in his/her daily activities. Score 3 indicates that patient is bothered by his/her asthmatic symptoms during his/her daily activities. Score 4 indicates that the daily activities of the patient are hindered by his/her asthmatic symptoms. This symptom scoring is a validated method used in a large-scale asthma study (9).

Statistical analysis

Descriptive statistics were used to study patients' clinical characteristics and statistical differences in numeric variables between groups were studied using unpaired t test. Changes in mean FEV₁ and symptom score at baseline and after intervention were tested for significance using paired t tests (two-tailed) as they approximate Gaussian distribution. P value of less than 0.05 was considered as statistically significant. All analysis were performed using PrismGraph, Statistical Package Version 8.

Results

The mean age and disease duration are significantly greater in the turbobaler group compared to the MDI group. All other asthma-related variables i.e. mean FEV₁ and ICS daily dose are comparable [Table 1]. The mean change in FEV₁ (% predicted normal) is statistically significant in the turbobaler group [mean difference (95% CI)= -11.58 (-18.39 to -4.77) p=0.007] but not so in the MDI group [-4.88 (-12.68 to 2.89) p=0.18] or the control group whose ICS dose was doubled [-10.13

(-28.60 to 8.33); p=0.21] [Figure 1]. The mean change in symptom scores are statistically significant in the turbobaler group [2.33 (1.47 to 3.19); p=0.0009] and control group whose ICS dose was doubled [1.33 (0.06 to 2.60); p=0.04] while the change in the MDI group is not statistically significant [0.55 (-0.22 to 1.33); p=0.13] [Figure 2].

Discussion

Following our previous larger study on the technical use of MDI device by asthmatic patients, we followed up a small group of these patients with inefficient MDI technique who were managed as in 'real life clinic circumstances' by either correction of MDI technique or by switching to a dry-powdered breath-actuated device, turbobaler. At 4 weeks, FEV₁ and symptoms were significantly improved in the group whose MDI devices were changed to turbobaler, but not in the group whose intervention was to correct the MDI technique.

As commonly practiced, correction of MDI technique is the next move in a patient whose MDI technique is clearly inefficient. If the patient continues to have difficulty in correctly handling the MDI device, it is then advisable to switch to a more 'straightforward' device such as a dry powdered or MDI facilitated by spacer device. The results of our 'real life' study challenge the effectiveness of correcting MDI technique in some asthmatic patients considered as 'teachable', let alone those who require constant reinforcement on the correct way of handling MDI device.

Since there is no objective measurement of drug deposition into the lung in our study, it is not possible to ascertain the degree of drug delivery that has been improved by correction of MDI technique. Nevertheless their trend towards improvement in FEV₁ and symptoms indicated that there is some improvement in drug delivery but is clearly small compared to significant improvement observed in the turbobaler group. The control group whose patients' ICS dose was doubled is added for comparison with turbobaler group, since use of turbobaler device effectively doubled the delivery of ICS. The degree of improvement is smaller than that of turbobaler group, indicating that doubling of ICS dose alone is not sufficient to explain to benefit brought about by switching to turbobaler and lend support to the idea that the reduction of intersubject and intrasubject variability when using turbobaler compared to MDI is clinically important (7, 8).

To our knowledge, there has been no study

Figure 1 : Changes in FEV₁ (% predicted normal) at baseline and 4 weeks after (A) correction of MDI technique (n=9) (B) changing from MDI device to turbohaler in patients with inefficient inhaler technique (n=6) and (C) doubling of inhaled corticosteroid (ICS) dose in patients with appropriate MDI technique (n=6). Horizontal bars represent mean. Connecting lines indicate changes in individual subjects. The change in mean FEV₁ is statistically significant in group whose MDI device was changed to turbohaler.

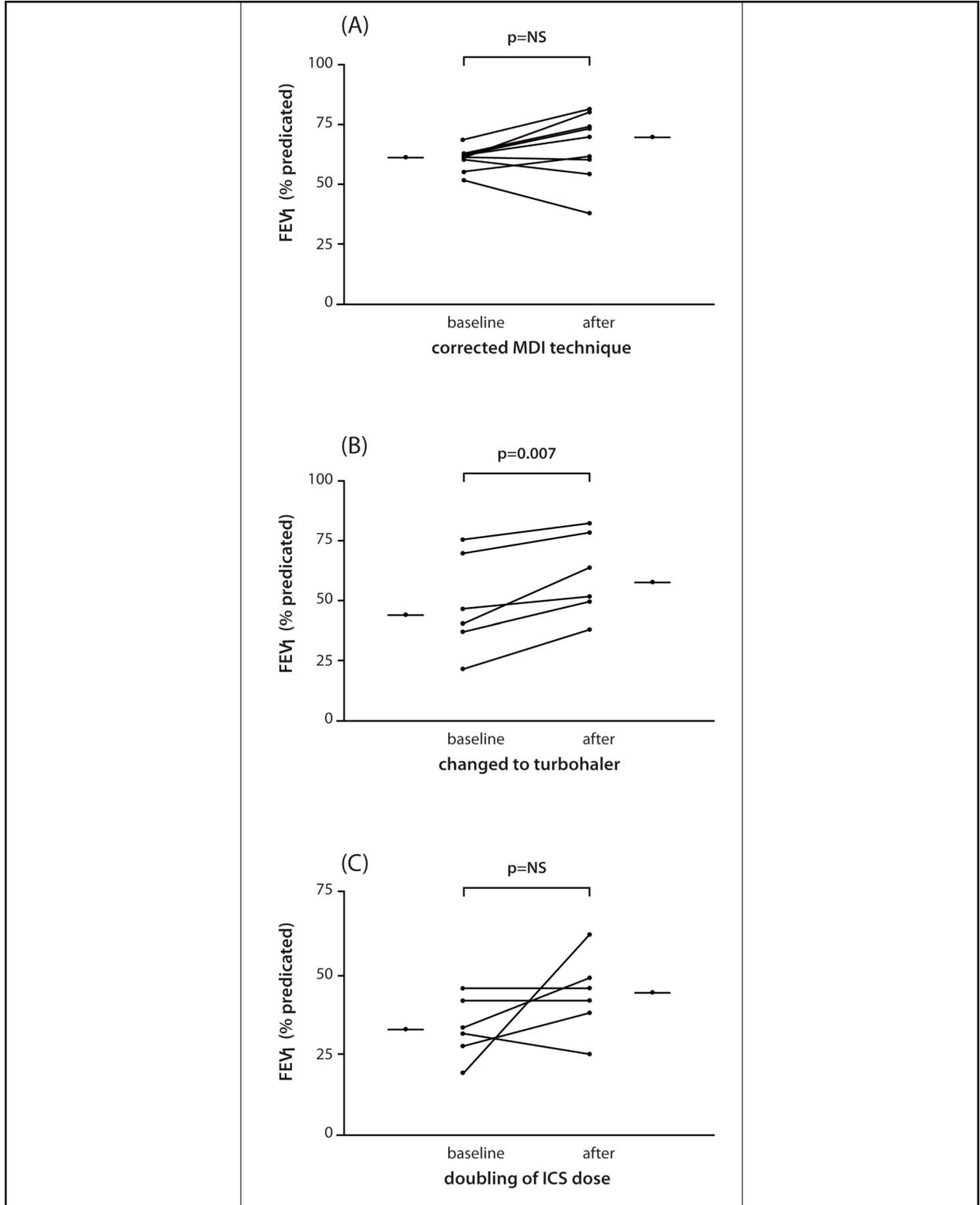
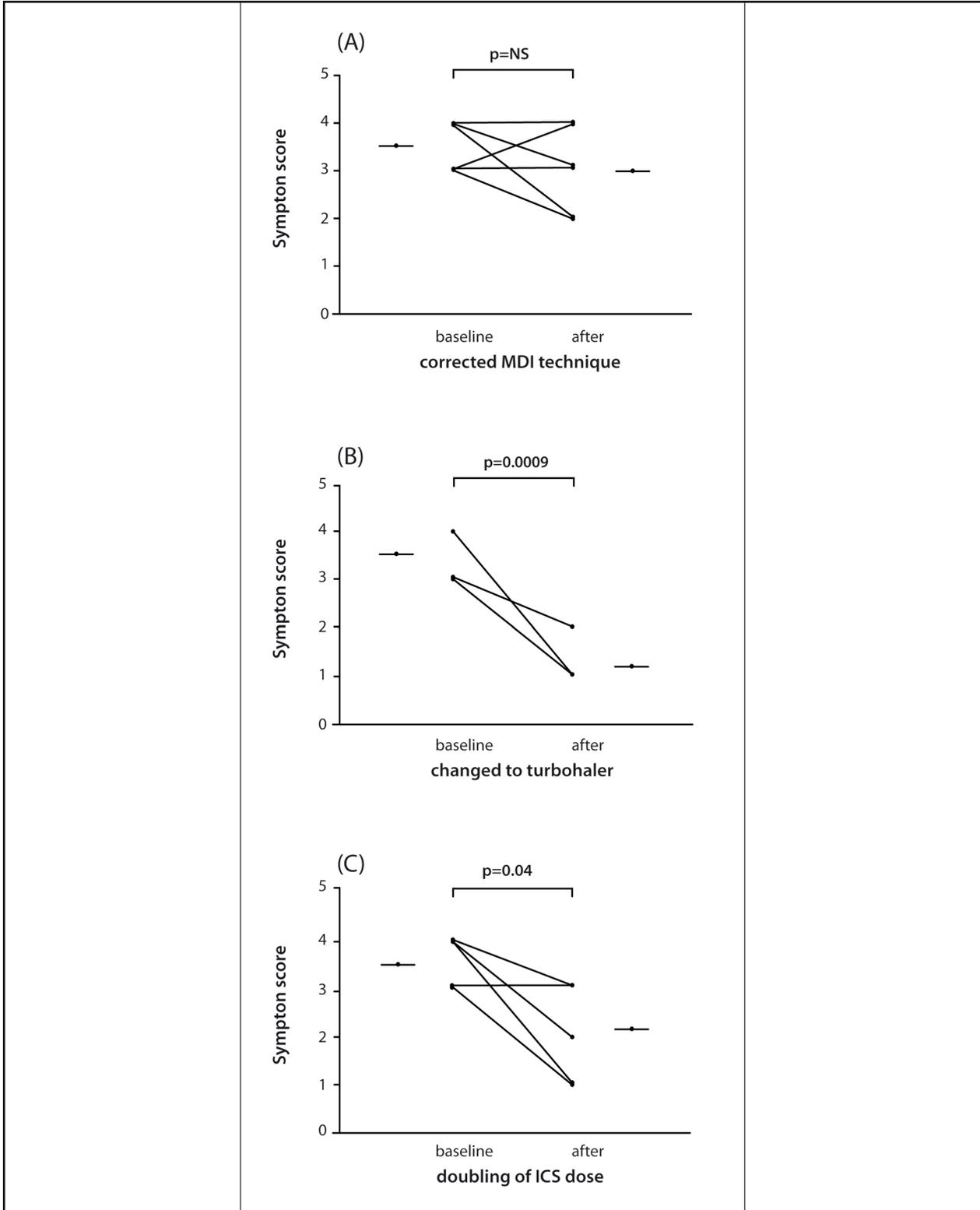


Figure 2 : Changes in symptom scores at baseline and 4 weeks after (A) correction of MDI technique (n=9) (B) changing from MDI device to turbohaler in patients with inefficient inhaler technique (n=6) and (C) doubling of inhaled corticosteroid (ICS) dose in patients with appropriate MDI technique (n=6). Horizontal bars represent mean scores. Connecting lines indicate changes in individual subjects. The changes in mean symptom scores are statistically significant in group whose MDI device was changed to turbohaler and group whose ICS dose was doubled.



comparing the 'real life' effectiveness of correcting MDI technique with switching to dry powder device such as turbohaler. This is understandable considering the difficulty of establishing comparable study cohorts in standard drug efficacy study protocol (10) and perhaps, lack of interest to study such issues nature by pharmaceutical firms. Our resort to 'real life clinic circumstances' as a means of studying the 'real life' effectiveness is practical and provide early evidence that can pave the way forward a larger study, either to validate or refute our present conclusion that the benefit of correcting MDI technique in seemingly 'teachable' asthmatic patients is small and that greater consideration should be given for switching to dry powder breath-actuated devices.

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