Breath-actuated inhalers: comparison of terbutaline Turbohaler with salbutamol Rotahaler

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ABSTRACT: Two breath-actuated inhalers, the Turbohaler and the Rotahaler, were compared in 24 patients with chronic asthma using an open, cross-over study design. Patients were treated with terbutaline (500 µg) and salbutamol (400 µg) four times daily, each trial period lasting three weeks. Mean morning peak expiratory flow (PEF) values were higher during Turbohaler treatment, but were similar 15 min after inhaler use. The Turbohaler was found to be easier to use than the Rotahaler.

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Inhalation from pressurized aerosols is an effective means of drug administration with a low incidence of side-effects. Nevertheless, many patients are probably unable to achieve full benefit even after careful tuition because of poor technique [1-3]. The problem most frequently encountered is an inability to synchronize inhaler actuation with inspiration and it is for this reason that breath-actuated inhalers have been developed.

The most widely used breath-actuated bronchodilator inhaler is the Ventolin Rotahaler in which each dose is separately loaded in the form of a gelatin capsule containing salbutamol and a lactose carrier.

Operation of the inhaler separates the two halves of the capsule rendering its contents available for inhalation. In patients with good inhaler technique the Rotahaler is less efficient than the pressurized aerosol [4-7] and the recommended dose of salbutamol by the Rotahaler is 400 µg. The Bricanyl Turbohaler [8] is a newly developed breath-actuated device which is preloaded with 200 doses of terbutaline (500 µg). Each dose is dispensed, without carrier powders or propellants, by rotating a plastic ring at the base of the inhaler. The Turbohaler is as efficient as a pressurized aerosol in patients with good inhaler technique [9, 10]. Since 200 µg salbutamol and 500 µg terbutaline are equivalent when given by pressurized aerosol [11, 12] the doses chosen in the present study were 400 µg salbutamol and 500 µg terbutaline.

Patients and materials

Thirty out-patients with chronic asthma were recruited to the study. They were aged 18-69 yrs (mean 35 yrs) and consisted of 23 females and 7 males. Prior to the study all patients were using a bronchodilator pressurized aerosol at least four times daily, and all showed at least 15% improvement in peak expiratory flow (PEF) or forced expiratory volume in one second (FEV1) following inhaled bronchodilator on at least one occasion during the previous 18 months. Patients who were unable to use a pressurized aerosol efficiently were excluded from the study as were those who had previously used the Rotahaler.

Methods

The study was of an open, cross-over design and consisted of two treatment periods each lasting three weeks, allocated in random order. There were clinic visits at the beginning of the study and at the end of each treatment period when patients were assessed and their inhaler technique checked. The trial inhalers compared were Ventolin Rotahaler (salbutamol 400 µg) and Bricanyl Turbohaler (terbutaline 500 µg). Patients were instructed to use one dose in the morning on waking, at midday, in the late afternoon and at bedtime. They were allowed to use their usual bronchodilator pressurized aerosol as rescue therapy and the number of doses used each day was recorded. Other asthma medication was continued unchanged throughout the study. PEF was measured using a mini-Wright peak flow meter:

1. On waking in the morning, before using any medication.
2. Fifteen minutes after using trial inhaler in the morning.
3. At bedtime before taking any medication.

At the end of the study patients completed a questionnaire concerning the practicalities of using each inhaler and were asked which device they preferred to use.

Mean PEF values were calculated for each period of the trial. These values were examined for treatment effects and treatment order interactions using a two-sample
Summary

What are the problems?

t-test. Use of rescue inhaler was analysed in a similar fashion using the Wilcoxon Rank Sum test. Questionnaire and patient preference data were analysed using the Chi-squared test.

Results

Of thirty patients recruited, twenty four completed the study. Two were withdrawn because of deterioration of asthma during the first treatment period (one on Rotahaler, one on Turbohaler) and four failed to return for assessment (three on Rotahaler, one on Turbohaler).

All patients were able to use their trial inhalers correctly before commencing treatment, but after three weeks five had developed faulty Rotahaler technique, and two made errors when priming the Turbohaler for use. It is unlikely that these errors occurred regularly throughout the study since consistent morning bronchodilator responses were recorded by each patient.

The mean PEF values for each three week treatment period are shown in figure 1. The mean initial morning PEF was higher during Turbohaler treatment than with Rotahaler (p=0.022), whereas the mean PEF measured 15 min after using trial inhalers was similar for the two devices (p=0.541). Mean PEF measured in the evening before medication was also similar (p=0.357). The differences between the mean prebronchodilator PEFs for the Turbohaler and Rotahaler treated patients were greater during the first period of the study than during the second, although measurements of FEV₁ at trial entry were similar (Rotahaler first, mean FEV₁ = 2.22±0.10 l; Turbohaler first, mean FEV₁ = 2.18±0.14 l).

Turbohaler was the easier device to use (p=0.02). More patients reported experiencing unpleasant taste or coughing after using the Rotahaler and overall preference was in favour of the Turbohaler (67%) but these differences were not statistically significant.

Discussion

Patients preferred the Turbohaler and this was usually because they found it easier to use than the Rotahaler. Four patients experienced coughing after using the Rotahaler compared with one using the Turbohaler and another six patients reported unpleasant taste after Rotahaler use compared with one on Turbohaler.

In this study terbutaline in a dose of 500 µg administered by the Turbohaler had similar bronchodilator effects to 400 µg of salbutamol inhaled via the Rotahaler. The Turbohaler was found to be easier to use than the Rotahaler and this new multidose, breath-actuated device broadens the clinical choice of bronchodilator inhalation devices available for the many patients unable to use the conventional pressurized aerosol.

Use of a rescue bronchodilator was infrequent and the average number of doses each day (1.5±2.0 puffs) was the same during treatment with Rotahaler and Turbohaler.

Information from the questionnaire is summarized in figure 2. Both inhalers were convenient to carry about but the majority of patients (75%) thought that the Turbohaler was the easier device to use (p=0.02). More patients reported experiencing unpleasant taste or coughing after using the Rotahaler and overall preference was in favour of the Turbohaler (67%) but these differences were not statistically significant.

Fig. 1. - Mean PEF during three weeks treatment with Turbohaler or Rotahaler. Each bar shows the mean and SEM of 24 patients.

Fig. 2. - Summary of questionnaire data.

Any side-effects which might have been caused by trial medication were mild and transient. One patient complained of palpitations for three days on each treatment and a second experienced tremor and palpitations for two days during Turbohaler treatment.

References


Inhalateur activé par la respiration: comparaison entre le Turbohaler de terbutaline et le Rotahaler de salbutamol. A. Anani, A. J. Higgins, G.K. Crompton.

RÉSUMÉ: Deux inhalateurs activés par inhalation, le Turbohaler et le Rotahaler, ont été comparés chez 24 patients asthmatiques chroniques, au cours d'une étude en permutation croisée ouverte. Les patients ont été traités par 500 µg de terbutaline ou 400 µg de salbutamol quatre fois par jour, chaque période d'essai durant trois semaines. Les débits de pointe moyens matinaux s'avèrent plus élevés pendant le traitement au Turbohaler, mais deviennent similaires 15 minutes après l'utilisation de l'inhalateur. Le Turbohaler est plus facile à utiliser que le Rotahaler. *Eur Respir J.*, 1989, 2, 640-642.