

Aerosol bronchodilators and hand-lung dyscoordination

The earliest form of inhalation therapy for asthma was the 17th-century practice of smoking various parasympatholytic agents, such as stramonium, the dried leaves of the poisonous plant *Datura stramonium*.¹ Aerosol bronchodilators were not used until 1935, when Graeser and Rowe² demonstrated the usefulness of inhaled epinephrine in the treatment of bronchospasm. Subsequent advances in aerosol therapy have included modification of the norepinephrine structure by the addition of molecular bulk to the terminal nitrogen to form increasingly specific β_2 -receptor agonists with rapid effects and action lasting 4 to 6 hours. These alterations have resulted in an increased margin of safety, so that the anxiety apparent during the 1960s about the safety of inhaled aerosols³ is no longer evident. These drugs are, in fact, the cornerstone of correct day-to-day management of asthma.⁴ Beclomethasone dipropionate, a corticosteroid, and disodium cromoglycate, a mast-cell stabilizer, are two agents that, in aerosol form, have greatly contributed to the stabilization of reactive airways. Aerosol bronchodilators are safer to use and more effective than orally administered bronchodilators in the treatment of asthmatic patients who are pregnant or who have bronchospasm induced by exercise.^{5,6}

There remain other considerations. It is difficult for aerosols, which are rapidly moving suspensions of particulate matter in air, to negotiate the acute angulations of the upper respiratory tract, larynx and main branching airways and be deposited deeply within the lung. Morrow⁷ has demonstrated that the mass median aerodynamic diameter of inhaled particles should be 1 to 5 μm or less to achieve maximal penetration to peripheral airways. Most aerosol bronchodilators meet these criteria.⁸ Despite this, only 10% of an ideal aerosol reaches the lung, even when used by a diligent patient.^{9,10}

Perhaps no other self-administered medication demands as much knowl-

edge or dexterity of a patient as an inhaled bronchodilator. For many patients the effort to coordinate the maneuver of exhalation followed by deep inhalation synchronized with release of the aerosol, then holding of the breath followed by slow exhalation is a formidable task even when they are well. Imagine how difficult this must be when the patients are desperately dyspneic: hence the term hand-lung dyscoordination. The severity of this problem is emphasized by Epstein and colleagues in their article in this issue of the Journal (beginning on page 813), who found that only 14 (11%) of 130 patients used their aerosol bronchodilators correctly. An obvious question arises: Who instructs the patient in the correct use of aerosol inhalers? Epstein and colleagues suggest that physicians have been derelict in their duty: only 51.5% of the patients in their study stated that they had received instructions from their doctors. Moreover, it appears that when physicians do give instructions to patients regarding the use of aerosol inhalers there are discrepancies as to which technique is best.¹¹ It is also evident from Epstein and colleagues' study that, if the aerosol is effective and used frequently, the technique of inhalation is likely to be superior.

I and my colleagues request physicians to instruct every patient in the correct use of aerosol inhalers. Immediately afterwards nurses from the respiratory unit give a demonstration with a placebo inhaler. The patient is then given carefully worded and illustrated instruction sheets to take home. Despite this vigorous approach our experience indicates that the use of aerosol inhalers is far from ideal and must be constantly reviewed. Perhaps physicians should consider these drugs just as important to persons with reversible bronchospasm as insulin is to persons with diabetes, and should emphasize to a similar extent the proper technique for using the agents in the two conditions. Instruction to family mem-

bers might encourage the development of a check system at home.

We are indeed on the threshold of developing safer and more specific bronchodilators, such as parasympatholytic agents and improved derivatives of disodium cromoglycate. However, increasingly sophisticated bronchodilators are being misused by untrained and dyscoordinated patients. These are clinical problems of oversight that should be corrected by enthusiastic, repetitive and consistent instruction by physicians and paramedical personnel.

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