Inhaler syncope

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Syncope can result from certain activities that trigger an exaggerated physiological response in susceptible individuals; examples include cough, laugh, and micturition syncope. We report a novel cause for syncope, that due to reflex bradycardia and asystole produced by the use of asthma inhalers. We discuss the possible mechanisms for this effect and briefly review other breathing-related causes of bradycardia.

Syncope can result from certain activities that trigger an exaggerated physiological response in susceptible individuals such as cough, laugh, and micturition syncope. Vagally induced bradycardia mediates some of these responses. We report the case of a young man with repeated episodes of syncope while using his asthma inhaler. Inhaler syncope is a previously undescribed form of vagally induced bradycardia and asystole resulting in syncope.

CASE REPORT

A 22-year-old man sought evaluation following two episodes of syncope that occurred while using an asthma inhaler. He had had mild asthma since age 5 and used his inhalers infrequently. On the last two occasions, 4 months apart, using albuterol on one occasion and fluticasone on the other, he had syncope without premonitory symptoms, although he was nauseated on awakening. He had been otherwise healthy without a prior history of loss of consciousness. His cardiovascular exam, electrocardiogram, and echocardiogram disclosed no abnormalities. A simple prolonged breath-hold in the office did not provoke bradycardia. A standard tilt table test was performed, which was normal. At the termination of that study, the patient was instructed to use his fluticasone inhaler in his usual fashion, which entailed full expiration followed by a held inspiration of the drug without Valsalva maneuver. Following a breath-hold of less than 10 seconds and upon expiration, he developed a junctional rhythm followed by prolonged asystole of 11 seconds and loss of consciousness *(Figure).* His rhythm quickly recovered, although he remained nauseated, intensely diaphoretic, and hypotensive for several minutes afterward. Subsequent investigations with the patient only mimicking use of the inhaler resulted in a drop of heart rate from 115 during breath-hold to 55 beats per minute during expiration with no pauses. Inhalation of either albuterol or fluticasone by spraying in his mouth during normal breathing resulted in a drop of heart rate from 100 to 70 beats per minute without pauses, which was sustained through the respiratory cycle. A 30-day Holter monitor revealed an average heart rate of 76 with no pauses and no tachycardia independent of exercise.

Based upon these clinical observations, the mechanism of his syncope was believed to be vasovagal. He was instructed to increase his salt and fluid intake and, as his asthma was mild, to avoid using his inhalers. As there was also a hypotensive vasodepressor component to his events, pacemaker placement was reserved for failure of conservative management.

DISCUSSION

Other examples of breathing-related bradycardia and syncope have been described, but to our knowledge, this is the first reported case of syncope secondary to profound bradycardia related to use of an inhaler. The rapidity of onset of the bradycardia indicates a likely reflex mechanism not mediated by hypoxia or the Valsalva maneuver. The onset of asystole during expiration may be an extreme example of a normal respiriphasic sinus arrhythmia in a vagotonic subject; however, that does not appear to be a sufficient explanation, as asystole could not be reproduced by breath-holding without concomitant use of the inhalers. Exposure to inhaler aerosol alone during normal breathing resulted in a heart rate decline in this individual. Exaggerated expiration followed by deep inspiration may be triggering pulmonary stretch receptors eliciting the classic Hering-Breuer reflex, a vagally mediated reflex that results in bradycardia and hypotension (1). In concert, stimulation of pulmonary C-fibers by the inhaled aerosols may also be triggering a vagal effect (2). Neither form of these vagal reflexes is felt to be powerful in adult humans, although it may be that by acting in conjunction they produced this response in a susceptible individual. His baseline tachycardia during these maneuvers was believed to be secondary to anxiety.

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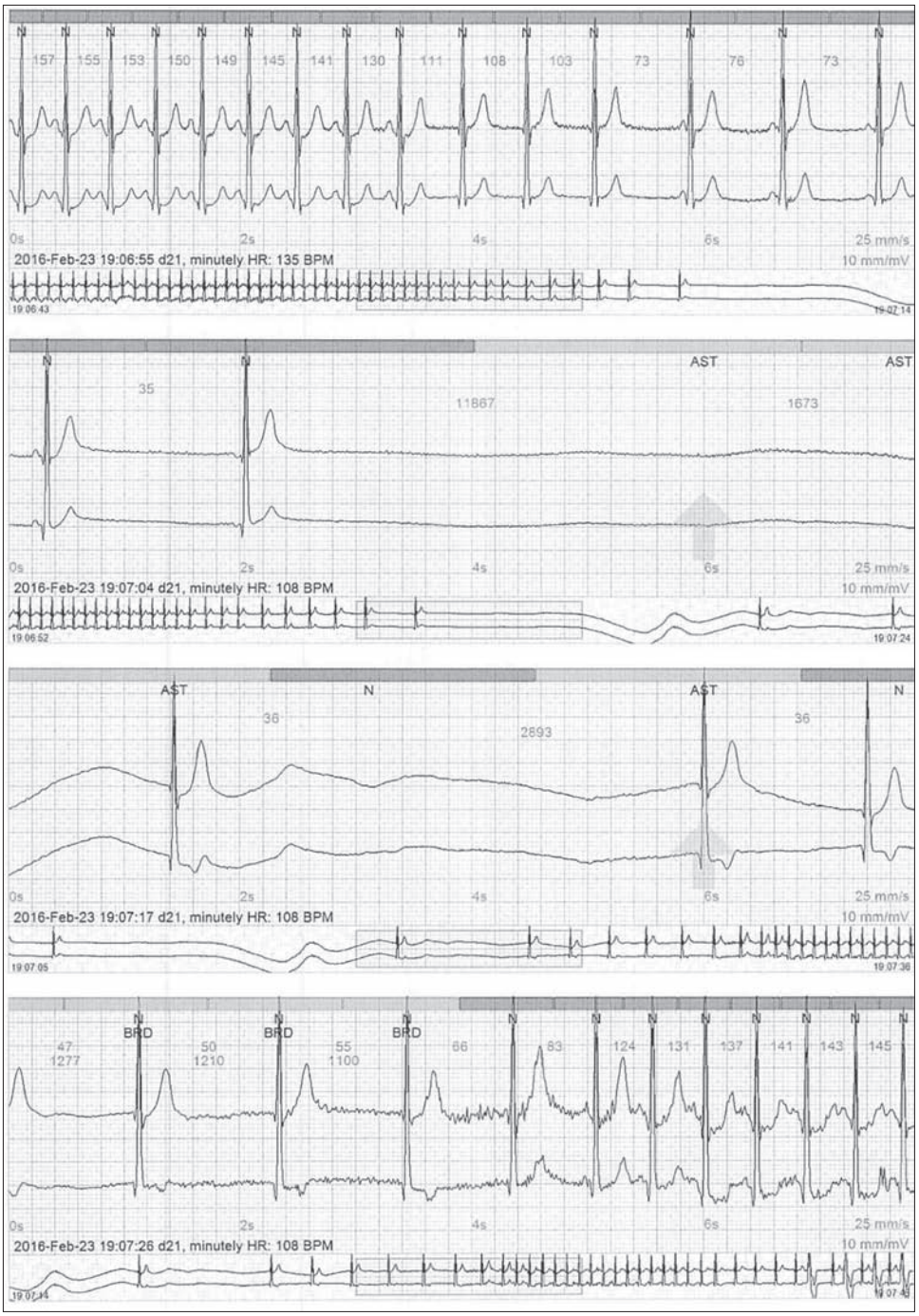

Figure. Continuous rhythm strip with inhaler use.

Among other examples, bradycardia, sometimes profound, is a frequent occurrence during the apneic phases of the condition sleep apnea. The degree of bradycardia produced is proportional to the length of the apnea and the degree of hypoxia produced. The bradycardia can be prevented by supplemental oxygen administration or atropine, indicating that there is a vagal component (3).

Pediatric breath-holding syncope is a condition in infants and young children with loss of consciousness associated with expiratory breath-hold (4). The onset of this syndrome, not familiar to many adult cardiologists, is usually by age 2 with resolution by age 4 to 5. There are two forms, pallid and cyanotic. The pallid form is usually in response to an unexpected sudden event such as a minor injury or a fright. The child gasps or cries briefly, followed by an expiratory breath-hold. This pallid variety is caused by a vagally mediated bradycardia, which can be prevented by atropine administration. The cyanotic variety of syncope has a more complex mechanism, usually following prolonged crying from emotional upset with a terminal expiratory breath-hold. Although a portion of these cyanotic infants also develop bradycardia, the mechanism of syncope is believed to be secondary to hypoxia. Permanent pacemaker placement has been employed in severe cases of both types of pediatric breath-holding syncope (5).

Finally, the diving reflex elicits a powerful bradycardic vagal response, which is employed therapeutically in the termination of supraventricular tachyarrhythmias. This reflex or response is shared in all air-breathing mammals and is a result of the combined and additive effect of breath-holding in association with facial immersion in cold water (6).

As contrasted with the above forms of breathing-related syncope, our case represents a unique variant. Dizziness and lightheadedness are listed as side effects of inhaler use on product labels, and a vagally mediated bradycardia should be considered as a possible explanation in those individuals.

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