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Occupational asthma due to styrene

J P Hayes, L Lambourn, J A C Hopkirk, S R Durham, A J Newman Taylor

Abstract

In a patient with asthma who was exposed to styrene serial self recorded measurements of peak expiratory flow showed the asthma to be work related, and inhalation tests with styrene reproducibly provoked a dual asthmatic response and increased responsiveness to inhaled histamine.

Styrene is a volatile monomer widely used in the production of polymers, copolymers, and reinforced plastics. We report a case of asthma that was shown to be due to exposure to styrene at work.

Case report

A 30 year old RAF air frame technician presented with a 20 month history of chest tightness, wheeze, nocturnal dyspnoea, and decreased exercise tolerance, which he associated with working with fibreglass. In the repair of fibreglass moulds he mixed a polyester resin with an accelerator, which contained a solution of cobalt octoate in styrene, and with an organic peroxidase catalyst. The curing of the polyester is initiated by an accelerator and completed by the catalyst. He had no previous personal or family history of asthma or hayfever. He had smoked 10 cigarettes a day for 10 years and had stopped before the onset of symptoms. He was treated with beclomethasone and salbutamol by inhalation and was relocated at work, with subsequent improvement of his respiratory symptoms. During the following year he was able to discontinue the beclomethasone and had used salbutamol only occasionally for chest tightness.

Although he had no direct contact with the mixing process his symptoms recurred after he returned to the area where he had previously worked. He started inhaling salbutamol and beclamethasone again, and was removed from all contact with the fibreglass process, which was again followed by considerable symptomatic improvement. His forced expiratory volume in one second (FEV_1) and forced vital capacity (FVC) were 3·9 and 4·4 litres and did not improve at this time after inhalation of a bronchodilator. Exercise (five minutes' running) provoked a 19% fall in peak expiratory flow (PEF) from 520 to 420 l/min. He recorded the results of his PEF at two hourly intervals from working to sleeping for two weeks while working with fibreglass and for two weeks while away from work. His PEF deteriorated during the period at work and improved while he was away from work (fig 1). He was referred to the Brompton Hospital for inhalation tests.

Several single blind controlled inhalation tests were undertaken in an enclosed chamber on separate days (fig 2). Before the inhalation tests the dose of histamine causing a 20% fall in FEV_1 (PC_{20}) was 2·75 mg/ml and the variability in his FEV_1 measurements was less than 3% during 12 hours. On the control day

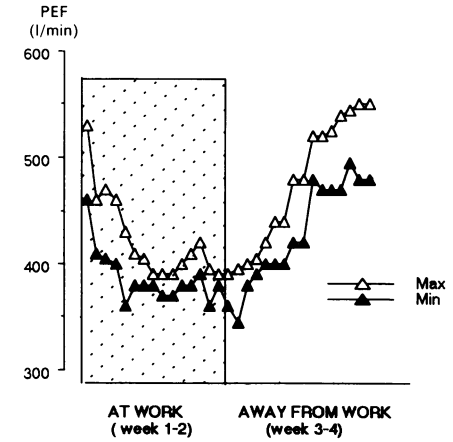

Figure 1 Self recorded peak flow measurements showing a work related fall in peak expiratory flow (PEF).

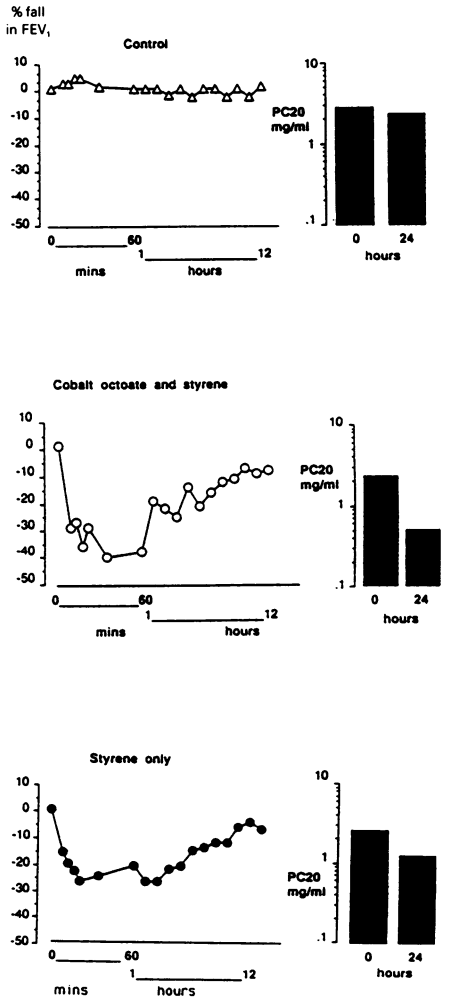

Figure 2 Results of inhalation tests before and after brush painting with 20 ml styrene for one minute, 1% cobalt octoate in styrene for two minutes, and a control substance: percentage fall in FEV_1 and histamine PC_{20} (concentration causing 20% fall in FEV_1).

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he painted white spirit on to cardboard for 15 minutes without appreciable change in his FEV_1 or histamine PC_{20}. On the first test day he brush painted the accelerator (1% cobalt octoate in styrene) for two minutes he developed a dual asthmatic response with a decrease in histamine PC_{20} from 2·3 mg/ml before the test to 0·5 mg/ml 24 hours after the test. Two days later brush painting of styrene alone for one minute provoked a similar dual asthmatic response with a similar reduction in histamine PC_{20}—from 2·7 to 1·3 mg/ml 24 hours after the test. Brush painting with 20 ml pure styrene on another day, which generated an atmospheric styrene concentration of 12 ppm (Gastec colorimeter method, threshold limit value 100 ppm) provoked a similar dual asthmatic response. Mandelic acid, the principle metabolite of styrene,[1] was not detected in the patient's blood or urine, which were sampled immediately and 24 hours after this exposure.

The patient was told of the cause of his asthma and has subsequently avoided exposure to styrene at work. Six months after diagnosis he remains well and uses his bronchodilator inhaler only before strenuous exercise.

Discussion

Styrene or phenylethylene ($C_6H_5CHCH_2$) was used by this patient for the production and repair of fibreglass moulds. The only previous report of asthma associated with occupational exposure to styrene[2] described two patients in whom inhalation tests with styrene provoked an immediate asthmatic response. The authors therefore were not able to distinguish whether an irritant or a hypersensitivity response was the cause of the asthma. The findings in this case are consistent with asthma as a manifestation of a specific hypersensitivity response to styrene. Exposure to styrene in an atmospheric concentration of 12 ppm (TLV 100 ppm), insufficient for mandelic acid to be detectable in blood or urine, reproducibly provoked both an immediate and a late asthmatic response and an associated reduction in histamine PC_{20}. Styrene seems able to initiate asthma by inducing a specific hypersensitivity response.

1 Guillemin M, Berode M. Biological monitoring of styrene: a review. *Am Ind Hyg Ass J* 1988;**49**:497–505.
2 Moscato G, Biscaldi G, Cottica D, *et al.* Occupational asthma due to styrene. *J Occup Med* 1987;**29**:957–60.

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Long survival after excision of a primary malignant melanoma of the oesophagus

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Abstract

A woman who had a large primary malignant melanoma of the oesophagus, with evidence of submucosal invasion and several local metastases, underwent resection two years after the onset of retrosternal pain and has survived for 12 years with no recurrence.

Primary malignant melanoma of the oesophagus is an extremely rare tumour associated with poor survival. Of the 115 cases reported worldwide, the five year survival is 4%.[1] The treatment of choice is surgical resection. We present a patient with primary malignant melanoma of the oesophagus who survived 12 years after surgery.

Case report

A 40 year old woman presented with a two year history of retrosternal pain associated with progressive dysphagia and weight loss (6 kg in four months). She had no important past medical history and physical examination showed nothing remarkable. Haematological and biochemical investigations gave results within normal limits. Barium swallow examination showed a large, irregular soft

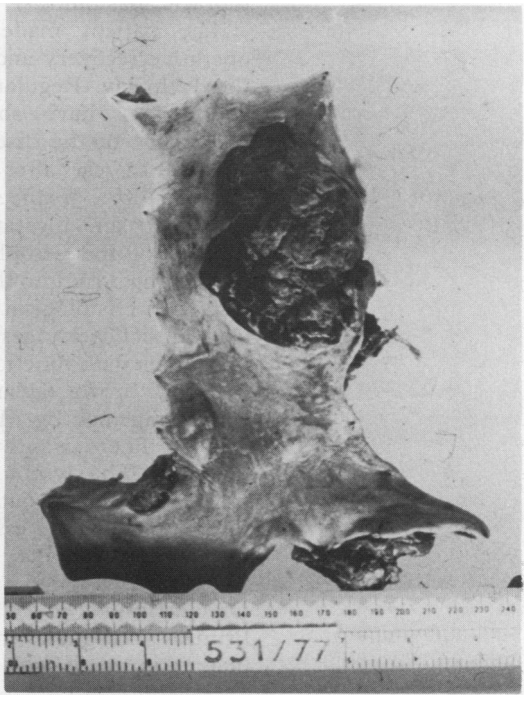

Figure 1 Resected specimen showing an ulcerated black fungating tumour of the lower oesophagus. At its widest the specimen is 17 cm.

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