SHORT REPORTS

Simple drug delivery system for use by young asthmatics

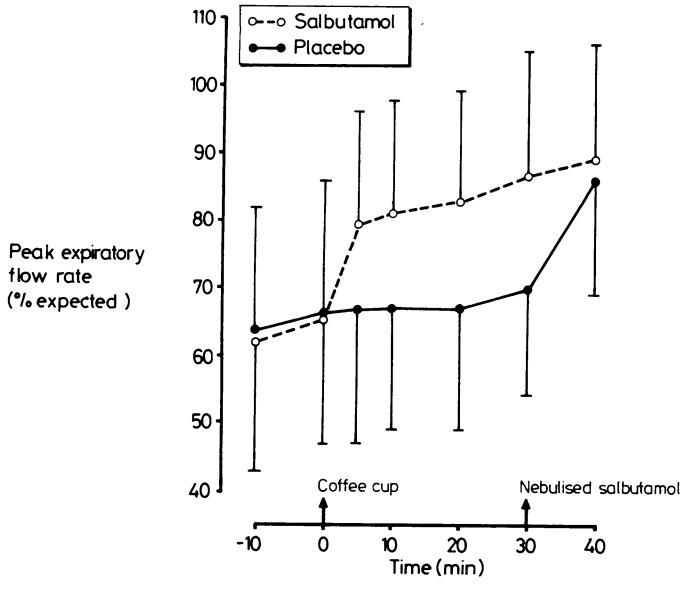
Young asthmatic children find it difficult to coordinate the use of beta agonist inhaler devices, particularly during acute attacks of airways obstruction.[1] This problem may be overcome by the use of nebuliser systems[2] but these are expensive, cumbersome, and not widely available for home use. Alternatively, a standard disposable coffee cup with a hole in the bottom for the metered aerosol may be applied to the face of a young child with asthma, acting as an extension tube.[3] Our aim was to confirm the clinical observation that even without the child's cooperation this system would allow sufficient drug to enter the airways to achieve useful bronchodilatation.

Patients, methods, and results

Twelve asthmatic children aged 3·7 to 7·8 years (mean 5·5 years) participated in the study. Two were assessed while they were in hospital with an acute attack of asthma; the rest were seen during the interval phase between acute episodes. Baseline measurements of peak expiratory flow rate were recorded 10 minutes apart. Then a hole was made in the bottom of a disposable insulated coffee cup for the insertion of a metered aerosol and the open end of the cup was applied to the child's face. The nose was gently pinched to ensure mouth breathing. We administered 10 puffs of either placebo or salbutamol (0·1 mg per puff) at the rate of one puff every 10 seconds; administration was double blind. No attempt was made to coordinate activation with inspiration nor did we ask the children to make a deep inspiratory effort. Peak expiratory flow rates were recorded 5, 10, 20, and 30 minutes after start of inhalation. Each child then inhaled a 2 ml nebulised solution containing 2·5 mg salbutamol. A final measurement of peak expiratory flow rate was made at 40 minutes. Pulse rates were measured before each measurement of peak expiratory flow rate.

The procedure was repeated on the second day with the other treatment.

The response to salbutamol was dramatic and rapid compared with the gradual and non-significant response to placebo (figure). At 5, 10, 20, and 30 minutes the improvement from second baseline was significantly greater after salbutamol than placebo (p values all $<0·001$). After nebulised salbutamol, we found a slight but significant improvement in those who had inhaled salbutamol from the cup ($p<0·01$) but a large improvement in those who had received placebo ($p<0·001$). The mean rise in pulse rate after inhaling salbutamol from the coffee cup was 4 beats/min with no change after placebo. Both groups showed significant increases in average pulse rates after nebulised salbutamol, 8 beats/min in the placebo group ($p<0·01$) and 6 beats/min in the treated group ($p<0·02$).



Mean (SD) peak expiratory flow rate of 12 children with asthma expressed as a percentage of expected before and after administration of placebo or salbutamol via disposable cup delivery system. In both cases nebulised salbutamol was given after the 30 minute recording.

Both inpatients responded to treatment with the coffee cup delivery system, with improvement in peak expiratory flow rate from baselines of 33% and 67% predicted to 55% and 81% predicted. After 2·5 mg of nebulised salbutamol, the readings were 58% and 81% predicted respectively.

Comment

Delivery of 1 mg salbutamol using a disposable coffee cup was simple, cheap, and effective and did not necessitate the child's cooperation. Over two years one of us (JGD) used this system to treat more than 50 children while they were in hospital with acute asthma. In most cases the clinical outcome was good and only a few children failed to respond and required nebulised treatment. A formal dose response curve was not performed but experience suggested that 10 puffs of salbutamol (total dose 1 mg) was clinically effective and without significant toxicity. The dose offered was considerably lower than the standard oral or nebulised doses for children.

This method of delivering bronchodilators does not replace the need for nebulised treatment in severe attacks of asthma. It should, however, enable many children unable to manage a rotahaler during acute asthma attacks to be treated successfully at home. Obviously, if there is inadequate response the children need reassessment, which will almost certainly include nebulised sympathomimetics delivered via a compressor pump.

Financial support was provided by the Asthma Research Council and Nestle Paediatic Travelling Fellowship (Australia). Allen and Hanbury provided the unlabelled aerosols.

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(*Accepted 7 April 1983*)

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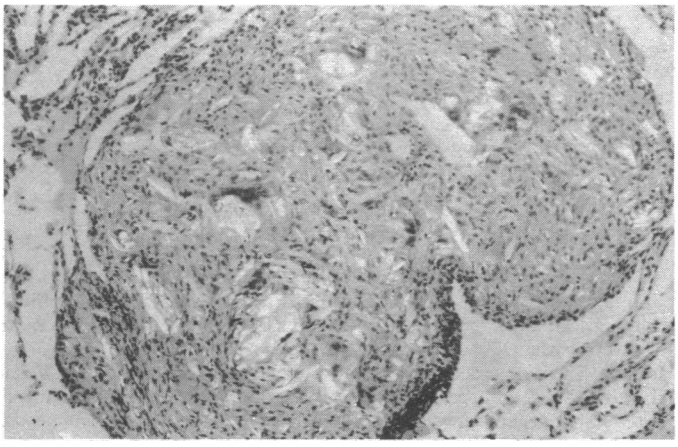
Cellulose granulomas in the lungs of a cocaine sniffer

Pulmonary granulomatosis is well recognised in drug addicts who inject intravenously drugs intended for oral use, talc filler being the most common offending agent.[1,2] We describe foreign body granulomas in the lungs of a cocaine sniffer.

Case report

A 26 year old university student complained of abdominal colic, breathlessness on exertion, and cough; bilateral miliary opacities were seen in chest radiographs. Fibreoptic transbronchial lung biopsy specimen showed foreign body granulomas containing numerous birefringent needle shaped particles measuring up to 120 μm in length (figure). A relation to blood vessels could not be established but the particles were assumed to be talc crystals reaching the lungs after intravenous injection of drugs intended for oral use.

The patient freely confessed to taking drugs but vehemently denied injecting himself; he claimed that his drug abuse was limited to sniffing cocaine. Assuming that the needle shaped birefringent particles represented the plate like crystals of talc cut across, it was reasoned that they were too heavy to have reached the pulmonary alveoli by inhalation and that the



Lung biopsy specimen showing a foreign body granuloma containing many birefringent elongated particles. Section viewed with partly polarised light. Haematoxylin and eosin × 100.

patient must have been injecting himself intravenously. Subsequent investigation, however, gave more credence to the patient's claim that he had not injected himself. Examination of a deparaffinised 5 μm thick section of the lung biopsy specimen in a scanning electron microscope equipped for electron microprobe analysis with energy dispersive x ray diffraction apparatus failed to detect magnesium, silicon, or any other mineral constituents. On the other hand, the supposed "crystals" stained with periodic acid Schiff, silver methenamine, and Congo red, these reactions being compatible with their representing cellulose rather than talc.[3]

Comment

When the foreign material was recognised to be cellulose rather than talc we realised that the needle shaped particles represented organic fibre rather than plate like crystals seen edge on and that the aerodynamic properties of the material would consequently be quite different. If long inorganic fibres such as asbestos are capable of reaching the alveolar tissue, lighter organic fibres of similar length could be expected to behave in the same way and the patient's denial of intravenous injections appeared more credible.

We now believe that the cellulose filler damaging this patient's lungs might well have reached them via the airways rather than the blood stream. Cellulose granulomas have previously been described in the lungs of drug addicts but these patients injected their drugs.[3 4] Buchanan *et al* reported pulmonary granulomatosis in an addict who inhaled powdered drugs but denied intravenous injections: drill biopsy revealed "acicular refractile material, probably talc, though the specimen was too small for further analyses."[5] We excluded talc and identified cellulose using only five 5 μm paraffin sections of a fibre-optic transbronchial biopsy.

We thank Dr R P H Thompson for allowing us to report this case.

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(*Accepted 7 April 1983*)

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Bursal fluid lactate determination and the diagnosis of bursitis

Bursitis in common is both general and hospital practice. The vast majority of cases are idiopathic but trauma and gout may be aetiological factors. Such patients respond well to simple treatment though some may require antibiotics and even drainage for infection, Not infrequently the clinical signs are misleading and sepsis is not recognised. Furthermore, microscopical appearances of an aspirate may be equivocal and the results of bacteriological culture may not be available for 48-72 hours. If in the interim corticosteroids are administered locally disastrous sequelae may ensue.

Attention has been drawn to the usefulness of cerebrospinal,[1] synovial,[2-4] and pleural and peritoneal[5] fluid lactate determinations for the rapid diagnosis of infection. We report the value of this test in the differentiation of septic and non-septic bursitis.

Methods and results

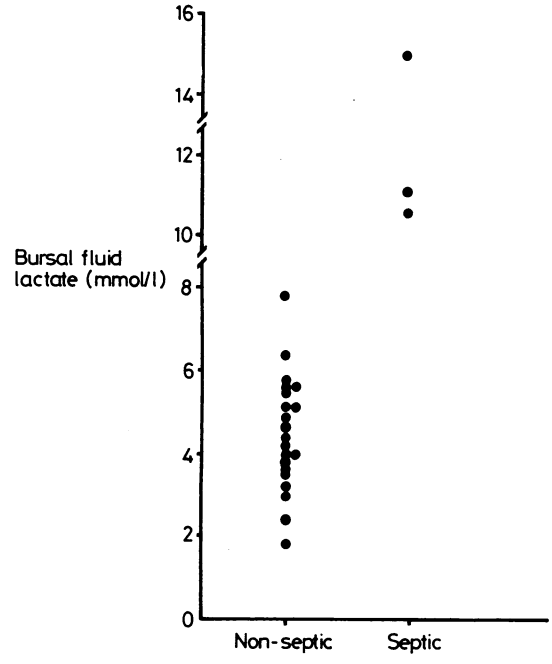
Twenty four aspirates from 23 acutely painful and clinically inflamed bursas (12 olecranon, 11 prepatella, and one tendo Achillis) were referred to this laboratory for analysis. The 23 patients (three women) were aged 22-86 years. Two cases were the result of repeated minor trauma, and in only one patient were there signs of a systemic arthropathy (chronic gout). In four cases the inflammation was a complication of a bursa that had been present for several months.

The fluids were collected into plain sterile containers and analysed within six hours. All specimens were centrifuged and the deposit cultured aerobically and anaerobically on blood agar and aerobically on "chocolate" agar. A cooked meat enrichment broth was inoculated and a Gram stained film of the deposit examined. The lactate estimation was performed on the supernatant using the Boehringer-Mannheim (BCL, Lewes, Sussex) enzymatic UV (ultraviolet) system according to the manufacturer's instructions. A sample of only 0·1 ml was required, and a Vitatron MPS colorimeter with a mercury lamp and 366 nm interference filter was used. The coefficient of variation of this method was 3·5%.[2]

The results (figure) showed a clear separation between culture positive fluids (mean 12·2 (SD 2·4) mmol/l; 110·0 (SD 21·6) mg/100 ml) and culture negative fluids (mean 4·5 (SD 1·3) mmol/l; 40·5 (SD 11·7) mg/100 ml). *Staphylococcus aureus* was isolated from all the infected samples.

In one non-septic specimen the results fell outside the statistically normal range, but this specimen had been aspirated from a clinically infected bursa in a diabetic patient three days after beginning flucloxacillin. Culture at that time was negative.

One patient had received Magnapen (ampicillin and flucloxacillin) for seven days before aspiration. Culture at that time was sterile and the lactate concentration was 4·7 mmol/l (41·9 mg/100 ml).



Bursal fluid lactate concentrations in cases of septic and non-septic bursitis.

Conversion: SI to traditional units—Lactate: 1 mmol/l ≈ 9 mg/100 ml.