

during an influenza epidemic. We have shown, however, that subunit vaccine is well tolerated by asthmatic patients and is immunogenic.

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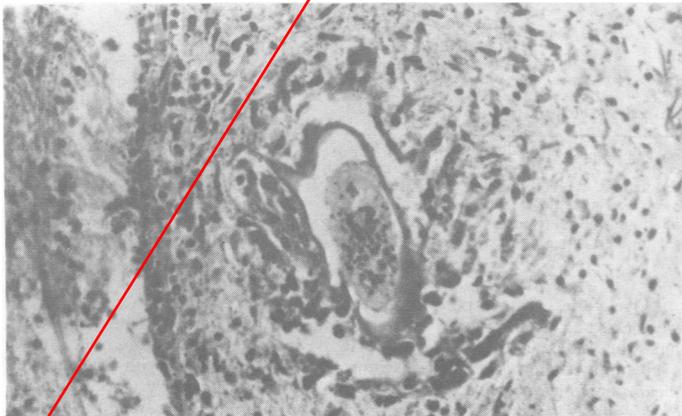
Acute mesenteric ischaemia caused by *Schistosoma mansoni* infection

Symptoms of the three types of schistosomiasis reflect the particular venous system infested by the parasitic ova. Infestation of the pelvic vein explains the bladder and rectal symptoms of schistosomiasis haematobia, schistosomiasis mansoni, which is prevalent in north east Africa and parts of the Middle East, predominantly affects the inferior mesenteric vein, and the oriental parasite *Schistosoma japonicum* has a predilection for the superior mesenteric vein and is therefore most likely to affect the small intestine. Intestinal obstruction may result from an intussuscepting polypoid mass or from fibrotic stenosis of the lower wall.¹

We report a rare case of infestation with *S mansoni*, in which mesenteric venous occlusion led to acute obstruction and infarction of the jejunum.

Case report

A 35 year old Egyptian man presented to Yarmouk Hospital, Baghdad, in June 1985 with the clinical and radiological features of high small bowel obstruction. The absence of bowel sounds, tachycardia (115 beats/min), and abdominal tenderness suggested a diagnosis of strangulation. He was dehydrated and had a blood pressure of 90/60 mm Hg. Five years earlier he had undergone splenectomy



Schistosoma mansoni ovum.

for Egyptian (schistosomal) splenomegaly. In addition, he was found to have iron deficiency anaemia (haemoglobin concentration 11.2 g/l). After nasogastric intubation and fluid replacement (including 1 unit of blood) laparotomy was performed through a paramedian incision. There were some 3 litres of haemorrhagic ascites and a gangrenous segment of jejunum 76 cm long. There was a clear cut line of demarcation between the viable and non-viable bowel but no constriction ring and nothing to suggest previous entrapment of the loop. Thrombosis was observed in the small mesenteric veins draining the affected segment, but the major mesenteric and splenic veins were all patent. The liver and colon seemed normal.

After resection of the gangrenous small bowel with end to end anastomosis the patient recovered and was discharged home 12 days later. Histological examination showed thrombosis of medium sized mesenteric veins and arteries, which contained numerous ova of *S mansoni* type. There was coagulative necrosis of the resected bowel but no evidence of arteritis or any other underlying cause for vascular occlusion.

Comment

The pathological lesions of schistosomiasis result from the deposition of a large number of live ova in the serosal and submucosal layers of the intestine. Enzymatic digestion of the tissues provokes a chronic inflammatory response, characterised by ulceration and thickening of the mucosa, which may accumulate to form polyps.^{2,3} Symptoms include abdominal colic, diarrhoea, rectal passage of blood and mucus, and allergy like reactions, such as fever and urticaria. Though children may develop acute dysentery, emergency presentation is unusual in adults. We are not aware of any reports of acute mesenteric ischaemia as a complication of schistosomiasis. Nevertheless, our patient showed no evidence of any other condition known to be associated with mesenteric ischaemia secondary to occlusive disease of the small vessels, in particular atherosclerosis, Buerger's disease, embolism, and autoimmune disease. Vasculitis was excluded by the histological findings, and there was no relevant drug history.^{4,5} The finding of many parasitic ova in the thrombosis in the mesenteric vessels supports our diagnosis.

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Bronchoconstrictor properties of preservatives in ipratropium bromide (Atrovent) nebuliser solution

The original formulation of ipratropium bromide nebuliser solution (Atrovent) caused paradoxical and severe bronchoconstriction in some asthmatic patients. We showed that this response was due to hypotonicity of the original solution,¹ and as a consequence it was reformulated to render it isotonic. Recently, however, bronchoconstriction after inhalation of isotonic ipratropium bromide solution has also been reported. As well as containing the active ingredient ipratropium bromide, Atrovent also contains benzalkonium chloride (0.25 g/l) and edetic acid (EDTA) (0.5 g/l). We investigated the role of these additives in causing bronchoconstriction.

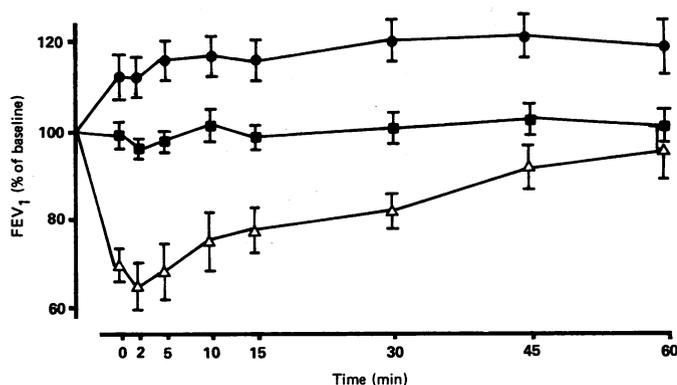
Patients, methods and results

Twenty two subjects with stable asthma (10 women, 12 men, mean (SEM) age 41 (3) years) whose airways response to isotonic Atrovent nebuliser solution had not been determined were studied. All patients initially attended the laboratory to inhale 4 ml isotonic Atrovent followed by measurement of forced expiratory volume in one second (FEV₁) for up to 60 minutes. Those in whom the FEV₁ fell

by more than 20% of the baseline value participated in the remainder of the study. On two occasions subjects inhaled single blind 4 ml solutions of isotonic saline and of nebulised isotonic ipratropium bromide free of benzalkonium chloride or edetic acid and had their FEV₁ measured over 60 minutes. On two further occasions they inhaled double blind 4 ml solutions of increasing concentrations of nebulised benzalkonium chloride (0.125 to 5.0 g/l) or edetic acid (0.25 to 10.0 g/l) until the FEV₁ had fallen by >20%. All solutions were nebulised by compressed air using an Inspiron nebuliser at a flow rate of 8 l/min. The aerosol was inhaled through a mouthpiece during tidal breathing from a starting volume of 4 ml in the nebuliser to dryness.

The airway response was expressed as percentage change in FEV₁ from the baseline value, and the differences between the challenge solutions were evaluated by analysis of variance and application of the Newman-Keul's test. The PC₂₀ FEV₁ values (cumulative concentration of benzalkonium chloride or edetic acid causing a 20% fall in FEV₁) were obtained from each concentration-response curve and geometric mean values calculated for the group.

There was no significant difference between the baseline FEV₁ measurements on the different study days. After inhaling 4 ml Atrovent six patients developed bronchoconstriction with a mean (SEM) fall in FEV₁ of 35.3 (5.4)% two minutes after inhalation (figure). When these six subjects inhaled 4 ml preservative free ipratropium bromide solution all showed bronchodilatation, the mean FEV₁ increasing to 112.3 (4.9)% of baseline at two minutes (figure). Inhalation of 4 ml saline produced no significant change in airway calibre. The change in FEV₁ after inhaling Atrovent was significantly different from that after inhaling preservative free ipratropium bromide at all time points after inhalation ($p < 0.05$) and from the response after saline for the first 30 minutes ($p < 0.05$).



Changes in airway calibre after inhalation of nebulised Atrovent (Δ), preservative free ipratropium bromide (●) and saline (■) in the six asthmatic subjects in whom the FEV₁ fell >20% after inhalation of 4 ml solution of nebulised Atrovent. Each point represents the mean FEV₁ expressed as per cent of baseline, and each bar the SEM.

Inhalation of the preservatives administered separately produced dose related bronchoconstriction, which persisted for longer than 60 minutes. The cumulative geometric mean (range) PC₂₀ FEV₁ was 0.30 g/l (0.13-2.0) for benzalkonium chloride and 2.40 g/l (1.2-12.8) for edetic acid.

Comment

This study shows that Atrovent nebuliser solution, the current isotonic formulation of ipratropium bromide, may cause bronchoconstriction in asthmatic subjects. This bronchoconstriction is due to the benzalkonium chloride and edetic acid in the solution, since both agents were potent bronchoconstrictor agonists when inhaled alone.

Benzalkonium chloride, a mixture of quaternary benzyldimethyl alkylammonium chlorides, may cause bronchoconstriction by releasing spasmogenic mediators from mast cells within the bronchial wall, since it has been shown to release histamine and 5-hydroxytryptamine from rat serosal mast cells.^{2,3} Although the mechanism by which edetic acid causes bronchoconstriction is uncertain, it probably relates to its action as a chelator of calcium ions.^{4,5}

All six subjects who developed pronounced bronchoconstriction with the isotonic Atrovent solution showed bronchodilatation after inhaling preservative free ipratropium bromide. These results suggest that an ipratropium bromide nebuliser solution free of preservatives is likely to be a more effective bronchodilator than the currently available solution. We recommend that nebuliser solutions should be made available without benzalkonium chloride, edetic acid, or other agents which may provoke bronchoconstriction in asthmatic patients.

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Inability of trained nurses to perform basic life support

Effective basic life support within the first three to four minutes after a cardiac arrest increases the chance of survival. In hospital a large proportion of cardiac arrests occur on the wards, where the nurses have to perform basic life support before the arrival of the crash team in three to five minutes. Though it is essential that nurses can perform basic life support competently, there has been no report of the skills in basic life support of trained nurses in the United Kingdom. The first aim of this study was to assess the effectiveness of these skills in trained nurses and the second to examine the relation between self assessed skills and actual skills.

Subjects, methods, and results

Fifty three nurses (15 sister/charge nurses, 28 staff nurses, and 10 state enrolled nurses) were studied. They had been qualified for an average of 4.8 years (range 1-16 years) and had trained at 43 hospitals throughout the United Kingdom. All the nurses were attending an orientation course for newly appointed staff at the hospital. Nurses were tested without prior warning for two minutes on a manikin (recording Resusci-Anne (Laerdal)). Each nurse's performance was rated on a scale of 0-5 with a checklist derived from the Resuscitation Council (UK) guidelines 1984. Their experience with basic life support was determined by a questionnaire covering their grade, years since qualification, hours spent in resuscitation training, whether a manikin had been used in training, time since they had last attended a basic life support revision course, and number of cardiac arrests attended. They also estimated the percentage of all resuscitation attempts at the Royal Free Hospital in 1984 that had resulted in the patient being discharged alive. Nurses rated their confidence in being able to resuscitate a patient and how many points out of 10 they would gain on a test of resuscitation skills and knowledge where the average score was 5.

Nurses' basic life support skills and self assessed ability in relation to seniority

	All nurses (n=53)	Sisters/charge nurses (n=15)	Staff nurses (n=28)	State enrolled nurses (n=10)
Total basic life support skills score*				
0	30	9	18	3
1	0	0	0	0
2	8	2	3	3
3	8	3	3	2
4	7	1	4	2
5	0	0	0	0
Self assessed ability† (mean (SD))	4.4 (1.9)	5.5 (1.8)	3.9 (1.6)	4.3 (2.1)

* Basic life support skills score = sum of 1 = assessment, open airways, check breathing and pulse (AABC); 2 = effective ventilation and compression (irrespective of ratio), 1 = effective ventilation and compression (ratio between 4:1 and 9:1), 1 = effective ventilation and compression (5:1 or 15:2) (maximum score = 5).

† Self assessed ability assessed with a 9 point rating scale: 0 = not at all confident in being able to resuscitate a patient, 8 = extremely confident.

None of the 53 nurses performed basic life support adequately (score of 5)¹; 30 were assessed as completely ineffective (score of 0) (table). None of the six measures of experience was related to basic life support skills. The nurses overestimated the success of resuscitation as an intervention, with the estimated mean percentage survival rate for hospital arrests over one year being 41.1% (SD 23.4%) (actual survival 10%). Nurses scoring highest on basic life support skills, however, estimated the procedure as significantly more successful