manufacturer describes as a "pleasant feeling of fullness." During 1984-5 seven cases of oesophageal obstruction caused by swelling of tablets containing glucomannan were reported to the Australian Adverse Drug Reactions Advisory Committee. We examined these cases and report our findings.

Case reports and study

All patients were women aged 18-62 (mean 46) years who were taking glucomannan tablets for weight reduction. None had oesophageal disease. Obstruction was complete in five of the seven cases and in all but one was caused by a single tablet. Four of the five complete obstructions were in the upper third of the oesophagus; the site in the fifth case was not noted. The level of obstruction was not established in the two other patients, whose severe dysphagia resolved spontaneously after five and 17 hours. Removal of the expanded tablets by rigid oesophagoscopy under general anaesthesia was necessary in the cases of complete obstruction, and in a woman aged 59 this was complicated by oesophageal perforation leading to mediastinitis, which resulted in her spending two months in hospital.

We measured the expansion rates of six products containing 500 mg glucomannan. These included the two products taken by the patients reported on above, Slim Plan F and Manna Diet Tablets: Slim Plan F was taken by five of these patients, and we believe that it is available in several countries. We tested nine samples of each brand by placing them in up ended, sealed syringes containing tap water or 0.1 molar solution of hydrochloric acid maintained at room temperature or 37°C in a water bath. Volumes were estimated frequently for 20 minutes and at intervals for 12 hours.

Expansion rates varied: Slim Plan F and Manna Diet Tablets increased their mean volumes, from <1.0 ml to 6.9 and 3.1 ml, respectively, at one minute; 8.3 and 4.7 ml at two minutes; 11.8 and 14.8 ml at six minutes; and 12.2 and 16.0 ml at 10 minutes. An encapsulated form started to swell only after six minutes' immersion. Slim Plan F and Manna Diet Tablets expanded significantly faster than any other brands ($p < 0.001$, analysis of variance). No important effects of temperature or acidity were observed. Final volumes ranged from 12.0 to 17.5 ml, so that the rate at which the tablets expanded varied much more than the total extent of expansion. The viscosity of the expanded tablets increased rapidly, and they became rubbery and retained the form of the syringe after removal (figure).

Slim Plan F tablet before and 10 minutes after immersion in water for 30 seconds. The viscosity had increased to the extent that it would bounce when thrown on the floor.

Comment

Obstruction of the oesophagus is a well known hazard of guar and bulk laxatives. Most patients affected have been elderly, and the obstruction has commonly been of the distal oesophagus.^{2,5} In contrast, obstruction by glucomannan, like obstruction by a solid foreign body, often occurs in the upper oesophagus, and the patients have been generally younger. Glucomannan seems to constitute a particular risk because of its great capacity to absorb water and because of the high expansion rates achieved by some proprietary brands. The long history of apparent safe use of this fibre by the Japanese is perhaps because they allow it to expand before ingestion.

In May 1985 marketing of tablets containing glucomannan was prohibited under the consumer product safety provisions of the Trade Practices Act. At present glucomannan in encapsulated and powder forms is still available in Australia.

We thank the doctors who reported these cases to the committee and gave permission for their publication. We also thank Mr Brooke Murphy for statistical

analyses. Fuller details of these cases and a complete list of references are available on request.

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(Accepted 3 December 1985)

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Oral symptoms and candida in the terminally ill

The prevalence of *Candida albicans* in the mouth is 29-50% among healthy adults' mouths,¹ and increased among immunocompromised patients and patients with cancer.^{2,3} This study assessed the prevalence of oral candida in terminally ill patients and correlated oral symptoms and signs with bacteriological evidence of oral candidiasis and antifungal treatment.

Patients, method, and results

Mouth swabs were taken at weekly intervals from the pharyngeal area and the labial-gingival fold near the molars in 140 consecutive patients (71 women) at this hospice (inpatients and outpatients). Swabs impregnated with charcoal and Stewart's transport medium were used. A questionnaire was completed concurrently by the nurse, recording mouth problems and drug treatment. All results were retained by the bacteriology department during the study. The decision to treat patients with oral nystatin was taken on clinical grounds, and additional swabs and data were collected before treatment. Patients were studied until death, or for a maximum of four months. None received chemotherapy or radiotherapy in the four weeks before the study or during it.

χ^2 analysis with Yates's correction was used to compare the groups with and without candida and the group treated with nystatin with the untreated patients. Confidence intervals are reported as these more appropriately reflect the clinical spread of data.

Prevalence of mouth disorders and of administration of drugs in patients positive and negative for candida. (Figures are numbers (%) of patients)

	Candida positive (n=112)	Candida negative (n=28)	Significance (χ^2 test)	95% Confidence interval
Symptoms:				
Loss of taste	31 (28)	9 (32)	NS	-0.23 to +0.15
Dysphagia	23 (21)	9 (32)	NS	-0.30 to +0.08
Sore tongue	27 (24)	3 (11)	NS	-0.01 to +0.27
Dry mouth	71 (63)	13 (46)	NS	-0.04 to +0.38
Red mucosa	32 (29)	4 (14)	NS	-0.01 to +0.30
Dirty tongue	79 (71)	15 (54)	NS	-0.03 to +0.37
White lesions	48 (43)	5 (18)	$p < 0.01$	+0.08 to +0.42
Cheilitis	12 (11)	2 (7)	NS	-0.07 to +0.15
Drugs:				
Steroids	47 (42)	9 (32)	NS	-0.09 to +0.30
Antibiotics	27 (24)	4 (14)	NS	-0.05 to +0.25
Morphine mixture	29 (26)	9 (32)	NS	-0.25 to +0.13
Morphine tablets (sustained release)	52 (46)	11 (39)	NS	-0.13 to +0.27
Laxative syrup	75 (67)	17 (61)	NS	-0.14 to +0.26
Nystatin	34 (30)	10 (35)	NS	-0.25 to +0.15

The incidence of positive swabs showed a linear increase with the number of swabs taken; being 58% in the 31 patients from whom one swab was taken and increasing to 89% in the 45 patients from whom six or more swabs were taken. Of the 82 patients from whom more than two swabs were taken, 68 were positive for *C. albicans* and four for other species of candida; negative results were interspersed among positive ones irrespective of treatment. The incidence of oral candida was unaffected by admission to the hospice (69% of patients) or by the wearing of dentures (77% of patients).

The table shows that there was a significant correlation between white lesions of the mouth and candida ($p < 0.01$; 95% confidence interval $+0.08$ to $+0.42$). No correlation was shown between candida and any other mouth symptom. No significant improvement occurred in the symptoms or signs of the 43 patients who received oral nystatin. A total of 510 swabs were taken; 226 grew *C. albicans*, 62 grew other species of candida, and 222 did not grow any candida. Statistical analysis of these results against symptoms and drugs was invalid as these were not strictly independent swabs.

Comment

The observed prevalence of candida in 56% of all swabs correlates with results of previous studies,⁴ but a high proportion (23%) of positive swabs were taken in the presence of white curd like lesions. Staphylococcal white lesions of the mouth occurred in two patients.⁵ Swabs from patients receiving oral morphine mixture showed a slightly lower prevalence of candida, which may have been an effect of preservative in the mixture on the mouth flora.

These results do not confirm that oral candida is associated with symptoms or signs in the mouth, although oral candidiasis is common among the terminally ill. Prophylactic antifungal treatment has not been beneficial in previous studies,² and oral candida and symptoms were unaffected by nystatin in this study. Candidal infection may be the result rather than the cause of mouth problems, indicating that general mouth hygiene is more important than antifungal treatment.

I thank Dr J McGavigan and the microbiology department of Falkirk District Royal Infirmary for processing the swabs; Mr Harper Gilmour (department of community medicine, Glasgow University) for statistical advice; and the nursing staff of this hospice for taking swabs and compiling information. This study was supported by Forth Valley Health Board.

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(Accepted 10 December 1985)

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Myopathy after short term administration of procainamide

Myopathy as a direct result of short term intravenous or oral treatment with procainamide has not been previously recorded. We report such a case of severe generalised myopathy confirmed by electromyography and histological examination.

Case report

A 51 year old Nigerian man presented with acute inferior myocardial infarction. Ventricular tachycardia and ventricular fibrillation developed, and over the first six hours he required direct current conversion 24 times despite bolus doses and an infusion of lignocaine (total dose 930 mg over five hours). Throughout this period he was mechanically ventilated. Because of recurrent ventricular fibrillation procainamide was started, with an intravenous bolus of 250 mg followed by an infusion of 3 mg/min. Sinus rhythm was established, and he was extubated. Attempts to reduce the rate of infusion of procainamide resulted in ventricular tachycardia. Oral procainamide (Durules 1.5 g twice daily) was started and the infusion stopped 24 hours later. Total serum creatine kinase activity was raised at 9849 units. Isoenzyme fractions confirmed this to be of skeletal muscle origin.

Four days after admission he complained of weakness of the arms and legs and developed involuntary dystonic arm movements, ataxia, and paradoxical chest movements. Respiration deteriorated, necessitating reventilation; oral procainamide was stopped and an infusion restarted. The skeletal muscle isoenzyme activity remained >9000 units. Normal blood gas tensions were easily achieved during mechanical ventilation (oxygen tension 16.8 kPa (126 mm Hg), carbon dioxide tension 5.3 kPa (40 mm Hg) on 50% oxygen). An electrocardiogram showed prolongation of the QRS interval (initially 0.08 s, extending to 0.12 s), and the blood procainamide concentration was 48 mg/l (normal 4-10 mg/l). The procainamide infusion was stopped and lignocaine substituted at 2 mg/min (blood concentration 3 mg/l). The neurological signs gradually improved, and he was extubated. Creatine kinase activity rapidly returned to normal.

Transverse section of vastus lateralis muscle showing myophagic fibres. Inset: Detail of myophagic fibre. (Haematoxylin and eosin.)

Electromyography showed a sensory polyneuropathy and myopathy. Biopsy of the right vastus lateralis muscle showed acute myopathic features ranging from hyaline eosinophilic sarcoplasm to myophagia. There was no evidence of vasculitis or primary inflammatory myopathy (figure). Myocardial biopsy specimens were normal.

He gradually recovered and was discharged taking tocainide 600 mg twice daily. Six weeks later he continued to complain of breathlessness but had no evidence of heart failure. Results of tests of respiratory muscle function were below the lower limit of normal but two weeks later were normal, subsequent left vastus lateralis biopsy showed only minimal abnormality associated with an advanced stage of degeneration of muscle fibres.

Comment

Several criteria for reporting adverse drug reactions have been recommended, including timing, associated conditions, and rechallenge or "dechallenge."¹ According to these criteria, our patient's myopathy was probably an adverse reaction to procainamide. The onset of the neurological abnormalities was temporally related to the high procainamide concentrations and to other recognised toxic manifestations of procainamide, such as prolongation of QRS interval and cerebellar ataxia.² Clearly, rechallenge could not be performed. The patient improved rapidly, however, when procainamide was stopped and did not relapse when tocainide or lignocaine was introduced.

The dosage of procainamide administered was within that recommended by the manufacturers. The high serum concentration achieved was probably due to several factors, including renal impairment (after the hypotensive period associated with multiple cardiac arrests) and heart failure.

Toxicity is common when procainamide concentrations are above 16 mg/l³ and includes headaches, insomnia, dizziness, ataxia, and hallucinations. Myopathy and myositis have been reported after long term, but not short term, ingestion of procainamide.⁴ In this case biopsy showed changes of acute or subacute infarction of the muscle with no evidence of the changes similar to those of collagen disease that are often a complication of procainamide.

Multiple defibrillations may cause muscle damage, but this is only localised.⁵ We believe, therefore, that this myopathy was due to a direct toxic action of procainamide. The drug's manufacturers and the Committee on Safety of Medicines have not received any similar reports.

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