

Managing constipation in elderly orthopaedic patients using either pear juice or a high fibre supplement

Robyn E. Stumm, Maureen Spence Thomas, Judith Coombes, Jennene Greenhill and John Hay

Abstract

Objective: The aim of the study was to compare two different dietary interventions, pear juice and a fibre supplement, on laxative requirement and bowel function in elderly orthopaedic patients.

Design: A randomised controlled trial with patients assigned to control, pear juice (150 mL bd) or fibre supplement (5 g fibre bd) group for duration of their hospital admission. Bowel opening, fluid and dietary fibre intake, laxative and opiate use were monitored daily.

Subjects: Elderly patients (n = 111) admitted for elective orthopaedic surgery or traumatic fracture requiring bed rest. Eighty-nine patients completed the study.

Setting: Two 32-bed orthopaedic wards in a metropolitan teaching hospital.

Main outcome measures: Bowel function, laxative requirement, oral fluid and dietary fibre intake.

Statistical analysis: Differences between treatments for bowel function, laxative requirement, oral fluid, and dietary fibre intake were analysed using analysis of variance (ANOVA) and Kruskal-Wallis H test. The χ^2 test of association was used to test associations between categorical variables of interest.

Results: Neither pear juice nor fibre supplement impacted on the day the bowels first opened, overall rate of bowel opening or requirement for laxatives. However, pear juice had a significant effect on increasing rate of bowel opening seven days after admission ($P = 0.045$). Most patients consumed less than 20 g of fibre per day and less than 1500 mL of fluid per day.

Conclusions: These results confirm previous reports that elderly orthopaedic patients consume low fibre diets and have poor oral fluid intake while hospitalised, and that attempts to improve fibre intake are met with limited success. Supplementation with pear juice may be beneficial in normalising long-term bowel function.

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Key words: Constipation, pear juice, fibre, orthopaedic, fluids, elderly diet

Introduction

Elderly patients admitted to orthopaedic wards are particularly prone to constipation. Hospital wards lack privacy, and patients tend to ignore the urge to defecate due to embarrassment or the physical discomfort of using a bedpan. Post-operative analgesia, especially opiate use, causes constipation. Immobility and bed rest increase the risk of constipation by decreasing gastrointestinal motility. Elderly patients often voluntarily restrict fluid consumption to reduce urinary frequency (1). Dehydration is a common problem in the elderly with fluid consumption often less than 1500 mL per day (2). In the hospital

setting, constipation is linked to poor health outcomes and impacts on increased costs through increased length of stay and laxative treatment (1,3).

Constipated elderly subjects tend to consume fewer meals and fewer kilojoules than non-constipated subjects (4). A high fibre diet can diminish the symptoms of constipation (5). Fibre has been shown to increase stool weight and bowel frequency, and promote normal transit time (5,6). Many studies have confirmed the efficacy of fibre on constipation (2,7-11).

Increased dietary fibre has not proven to be a successful treatment with patients who are impacted, have clinically slow transit times, opioid-induced constipation, or in the short-term acute hospital setting (1,11,12). In some instances increasing dietary fibre without simultaneously increasing fluid intake, may lead to impaction (1).

There is currently no literature supporting the efficacy of pear juice as a laxative in this population. A small unpublished trial (Potesky L, Launceston Presbyterian Home, Tasmania, 1996; Hughes J, Ardmona Foods, Box Hill, Victoria, 1997; personal communications) in a Tasmanian nursing home population (n = 6) suggested a beneficial effect of pear juice in reducing the laxative use. Pear juice contains a high sorbitol (2.0 g/100 mL) and fructose (6.4 g/100 mL) content (13). Studies in infants suggest that pear juice is associated with carbohydrate malabsorption and diarrhoea (13,14).

Methods

Design

The study was a randomised controlled trial that comprised a control group, and two treatment groups. The 'pear juice' treatment group received a 150 mL glass of pear juice twice daily. The 'fibre supplement' treatment group received an in-house prepared 'fibre ball', which was a bran, prune, oats, apple and coconut mixture equiv-

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Princess Alexandra Hospital, Brisbane, Queensland

R.E. Stumm, BAppSc, DipNutrDiet, Dietitian

M. Spence Thomas, RN, BAppSc (Nursing), MNurs, Clinical Nurse Consultant, Geriatric Services

J. Coombes, BPharm, MSc (ClinPharm), Pharmacist

J. Greenhill, DipAppSc (Nursing), BA, MPlanning & Development, Assistant Director of Nursing

J. Hay, PhD, Lecturer in Biostatistics, University of Queensland

Correspondence: M. Spence Thomas, Geriatric and Rehabilitation Unit, Princess Alexandra Hospital, Ipswich Road, Wolloongabba, Qld 4102.

Email: Spence-Thomas_Maureen@health.qld.gov.au

alent to 5 g of fibre twice daily. All groups received either a full or soft hospital diet. If all the food was consumed, the full and soft hospital menu supplied at least 25 g of fibre per day. Participants were supplied with at least 2 L of fluid per day and staff encouraged them to drink. Pear juice was supplied by Ardmona Foods Ltd, Box Hill, Victoria.

If participants' bowels did not open for 24 hours, two tablets of Docusate (50 mg) and Senna (8 mg) were administered twice daily as per ward protocol. If bowels did not open for three consecutive days, a Docusate enema was administered as per ward protocol.

Patient population

The study was conducted in a 500 acute bed tertiary referral hospital in Brisbane, Queensland, in the two 32-bed orthopaedic wards. On admission to hospital, 111 volunteers were randomly assigned to one of the three groups. Patients were enlisted if they fulfilled the following criteria: 55 years of age or older; traumatic fracture requiring bed rest or surgery; elective orthopaedic surgery; and expected length of stay of at least four days. Exclusion criteria included impaction; need for a low fibre or texture modified diet; fluid restriction; atonic bowel; and spinal cord injury. Although patients with dementia were not excluded from the study, they were not actively enlisted. Approval for this study was granted by the Princess Alexandra Hospital Ethics Committee and all participants gave informed consent for the study.

Data collection

Data collection commenced as soon as the patient started a full or soft diet post-operatively. Fluid intake, pear juice or fibre supplement intake and tolerance, laxative use, and patient's bowel movements were recorded daily by either nursing staff or the investigators. Daily opiate use was recorded as the morphine equivalent dose (15). Rate of bowel opening was defined as the number of days that bowels opened divided by the number of days in the study. Rate of once daily laxative use was defined as the number of occasions laxative was required once only, divided by the number of days in the study. Rate of twice daily laxative use was defined as the number of occasions laxative was required more than once, divided by the number of days in the study. Participants were asked to comment on their tolerance of the dietary supplement, which was recorded as positive or negative.

A 24-hour food recall was performed between day 4 and day 6 when normal appetite returned. Dietary fibre was calculated from a ready reckoner that had previously been validated using Foodworks (Xyris Software, Brisbane, Foodworks, version 2, 1998) ($n = 10$; $r = 0.97$; $P < 0.001$). Fibre intake from the fibre supplement was not included in the estimate of inpatient dietary fibre intake and was addressed as a separate issue. Pear juice consumption was included in the daily fluid charts. Soluble and insoluble dietary fibre analysis of pear juice was performed using the Association of Official Analytical Chemists method at the Bread Research Institute Australia Laboratories, North Ryde, NSW (16). Data were collected for length of hospital admission to a maximum of nine days.

Statistical analysis

Data were entered into the statistical program SPSS (SPSS Inc, Chicago, SPSS, version 9.0, 1999). Differences between treatments for bowel function, laxative requirement, oral fluid, and dietary fibre intake were analysed using analysis of variance (ANOVA) and Kruskal-Wallis H test. The χ^2 test of association was used to test associations between categorical variable of interest.

Results

Subject characteristics

Eighty-nine participants completed the study with the groups comprising 33 control, 32 pear juice, and 24 fibre supplement patients. Analysis was performed only on those participants who completed the study. As shown in Table 1, there were no significant differences between the groups for age, sex and opiate requirement. There were also no significant differences in any variables for those who dropped out of the study (data not shown). Thirteen of the 22 participants who dropped out of the study were from the fibre supplement group with most citing nausea or dislike of the supplement as the reason for discontinuing. The majority of patients required opiate medication during admission.

Bowel function

Inpatient bowel data are shown in Table 2. There were no significant differences between the groups for length of stay, average rate of bowel opening, day bowels first opened, and rate of laxative requirement. The average length of hospital admission was 6.4 days. On average, bowels opened 2.8 days after admission. Participants had on average, 0.59 bowel motions per day, which was equivalent to approximately once every two days.

Figure 1 shows the rate of bowel opening for different lengths of stay for each group. From the 89 participants who completed the study, the rate of bowel opening could only be calculated on 68 participants. Data were excluded from analysis if patients received laxatives after their bowels had already opened for that day or if bowel opening had not been recorded. There were insufficient data for length of stay of seven days or more for between-group comparisons, due mainly to natural attrition from the study on hospital discharge and data excluded due to

Table 1. Subject characteristics and opiate requirement during admission

Characteristic	Number of participants			
	Total (n = 89)	Fibre supplement group (n = 24)	Pear juice group (n = 32)	Control group (n = 33)
Age (years, mean \pm sd)	73.7 \pm 8.5	74.3 \pm 7.9	75.3 \pm 8.0	71.6 \pm 9.1
Female (n)	52	14	20	18
Male (n)	37	10	12	15
Patients needing opiates during admission (n)	81	22	29	30

Table 2. Comparison between groups for length of stay, inpatient bowel function, and laxative use (mean ± sd)

Descriptive	Total (n = 89)	Fibre supplement		
		group (n = 24)	Pear juice group (n = 32)	Control group (n = 33)
Length of stay	6.39 ± 1.43	6.42 ± 1.69	6.13 ± 1.29	6.64 ± 1.34
Day bowels first opened	2.78 ± 1.15	2.8 ± 1.1	2.66 ± 1.1	2.88 ± 1.3
Rate of bowel opening ^(a)	0.59 ± 0.24	0.57 ± 0.22	0.61 ± 0.24	0.57 ± .26
Rate of once daily laxative use ^(b)	0.28 ± 0.23	0.24 ± 0.18	0.29 ± 0.28	0.29 ± 0.20
Rate of twice daily laxative requirement ^(c)	0.10 ± 0.16	0.14 ± 0.20	0.06 ± 0.10	0.12 ± 0.17

- (a) Rate of bowel opening was defined as the number of days that bowels opened, divided by the number of days in the study.
- (b) Rate of once daily laxative use was defined as the number of occasions laxative was required once only, divided by the number of days in the study.
- (c) Rate of twice daily laxative use was defined as the number of occasions laxative was required more than once, divided by the number of days in the study.

inappropriate laxative usage. Using a within-group analysis, subjects in the pear juice group demonstrated significantly improved bowel function for lengths of stay greater than six days. That is, the longer the patient remained on pear juice, the better their bowels functioned.

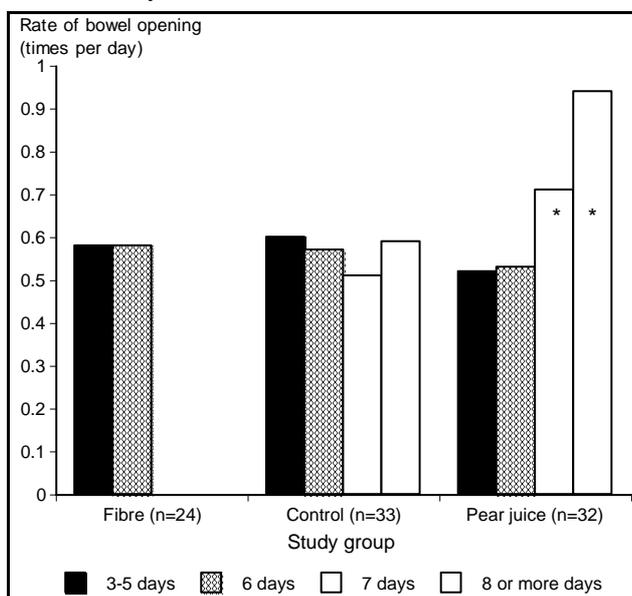
Patient tolerance of treatment

Pear juice received significantly more favourable comments than the fibre supplement as shown in Table 3 ($P = 0.017$, χ^2 with 1 degree of freedom). Only six of the fibre supplement patients consumed half or more of their supplement for their entire length of stay, compared to 22 participants in the pear juice group who consumed half or more of the juice for their entire length of stay.

Fluid and fibre intake

Inpatient fibre intake and oral fluid data are shown in Tables 4 and 5. Most participants consumed less than 20 g fibre per day.

Figure 1. Rate of bowel opening for different lengths of stay ranging from three to five days to eight or more days



* Significantly different to 3–5 days and 6 days, $P < 0.05$.

Complete oral fluid intake data were kept for only 37 participants. Entire cases were excluded from analysis if there were missing data for the variable on any occasion. Of those whose fluid data were complete, most consumed less than an average of 1500 mL per day.

Opiate use

For each day in the study there was no difference detected for the morphine equivalent dose between each of the three groups.

Discussion

Evidence from this study suggests that neither pear juice nor fibre supplement was effective in reducing laxative

Table 3. Patient tolerance of treatment

Comments	Fibre supplement	
	group (n = 15)	Pear juice group (n = 19)
Positive	2	10 ^(a)
Negative	13	9

(a) significant difference between fibre supplement group and pear juice groups $P = 0.017$, (χ^2 with 1 degree of freedom).

Table 4. Comparison of fibre intake between groups

Average fibre intake	Number of participants			
	Total (n = 89)	Fibre supplement		
		group (n = 24)	Pear juice group (n = 32)	Control group (n = 33)
< 20 g/day	68	16	24	28
> 20 g/day	21	8	8	5

Table 5. Comparison of fluid intake between groups

Average oral fluid intake	Number of participants			
	Total (n = 37)	Fibre supplement		
		group (n = 5)	Pear juice group (n = 17)	Control group (n = 15)
< 1500 mL/day	30	3	15	12
> 1500 mL/day	7	2	2	3

requirement or in improving bowel function for lengths of stay less than seven days. Pear juice appears to have a more long-term effect on bowel function. For lengths of stay of seven days or more, pear juice significantly increased the rate of bowel opening. This result would appear to be consistent with anecdotal evidence that suggests that, in nursing home populations, pear juice works best as a preventative agent (Potesky L, Launceston Presbyterian Home, Tasmania, 1996; Hughes J, Ardmona Foods, Box Hill, Victoria, 1997; personal communications).

It is impossible to draw conclusions regarding the effectiveness of the fibre supplement due to poor consumption, high drop out rate, and incomplete fluid and bowel data. Also, feedback from our participants suggested that the fibre supplement was unappealing and that small fibrous particles lodged between dentures and gums making them unpalatable. Other studies have reported similar problems (1,9,10). Pear juice, on the other hand, was palatable and well tolerated by participants.

From our independent analysis, pear juice contains no soluble or insoluble dietary fibre. Pharmacological doses of sorbitol range from 14 g per day to 42 g per day for laxation (19). The dose of 300 mL of pear juice per day, which is equivalent to 6 g of sorbitol and 19 g of fructose, does not contain sufficient sorbitol or fructose to cure constipation. However, the cumulative effect of sorbitol and fructose in two glasses of pear juice daily may be sufficient as a long-term preventative measure in a population where other attempts to increase dietary fibre do not work.

The late trend to benefit for the pear juice group could not be explained by lower morphine doses, as morphine doses for all three groups were the same for each day of the study. Opioid analgesia affects the autonomic nervous system slowing peristalsis and thereby inducing constipation (5). It has been reported that all patients with opioid-induced constipation require stimulant laxatives to induce intestinal motility (1). Most people in the study required opiate medication and therefore experienced constipation to some degree.

The results suggest poor oral fluid and fibre intakes among older people in hospital. Fibre intake among this group is generally low with reports of intake between 13 and 16 g per day (4,17). A position paper recently published by The American Dietetic Association recommended 20 to 35 g per day or 10 to 13 g per 4200 kJ for the elderly population (18). With the majority of participants consuming less than 20 g of fibre per day in hospital, the results presented are consistent with suggestions that high fibre diets are difficult to achieve with elderly patients (1,5,6). This population is often resistant to change. Failure to achieve an increase in fibre has been reported to be due to poor dentition, food preferences, and difficulty chewing hard, fibrous foods (1,10,17).

Although there was no difference in oral fluid consumption between the groups, overall fluid consumption fell well short of the recommended 1500 mL per day. Chronic poor fluid intake is an important risk factor for impaction in the elderly (6). Therefore, any measure that will not only assist bowel habit but also assist overall fluid consumption, should be recommended.

The major problems associated with the study were missing fluid and bowel chart data and deviation from

ward protocol regarding laxative use. Patients were often given laxatives even though their bowels had opened, and not given laxatives when their bowels had not opened. Maintaining accurate input and bowel data was crucial in determining the effectiveness of the supplements but was extremely labour intensive. It was not possible for the investigators to be present and collect data 24 hours per day in addition to their normal workload. Unfortunately, this resulted in incomplete or only partial recording of some fluid and bowel charts. Similar problems have been reported elsewhere (1,9). This problem could be rectified with a research assistant dedicated to data collection.

The ad hoc use of laxatives may have been prevented through adherence to ward protocol regarding the treatment of constipation and recognition among staff of the importance of bowel function on patient outcome. Accurate monitoring of bowel function is essential in preventing impaction and discriminating between overflow and diarrhoea. In addition to encouraging fibre and fluid intake, it has been suggested that normal bowel habit could be maintained by providing maximum privacy, and timing toilet visits after meals to coincide with the gastrocolic reflex (1).

A further problem with the study was the poor compliance with the fibre supplement. The fibre supplement given was a standard dietary treatment for constipation used within the hospital, and as such, was assumed to be acceptable to patients. This study represents the first time actual long-term consumption and tolerance of the fibre supplement were examined. Future studies could examine the efficacy of a better tolerated fibre supplement.

This study confirms previous reports that elderly orthopaedic patients consume low fibre diets and have poor oral fluid intake while hospitalised, and that attempts to increase dietary fibre and/or fluid intake are met with limited success. Neither pear juice nor fibre supplements improved bowel function in the short term. As a long-term measure, that is for more than six days, supplementation with pear juice may be beneficial in normalising bowel function.

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