

Effect of Guar Gum Added to the Diet of Patients with Duodenal Ulcer

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ABSTRACT. In a randomized, double-blind, controlled clinical study, the effects of 5 g of guar gum, a dietary fiber composed of galactose and mannose, or placebo added to the diet of 20 patients with duodenal ulcer for 1 wk each were examined. Ten patients derived evident benefit and five some help from guar gum, on comparing symptoms during administration of guar gum with those experienced earlier or during the placebo week, whereas four patients found that neither guar gum nor placebo had any effect ($p < 0.001$). The beneficial effect was associated with increased feelings of repletion after meals. Patients with fewest symptoms benefited only slightly, or not at all, from guar gum. In one patient, guar gum abolished pain felt earlier and on placebo, but also caused severe gastric

retention after meals. This patient had pyloric stenosis. In patients who were intolerant to berries, fruits, sugar, sweet rolls, and pizza these foodstuffs were better tolerated during guar gum administration. The diarrhea which occurs in some patients ingesting guar gum was avoided by giving low initial doses. In three patients unpalatability of guar gum was a minor complaint. It is concluded that guar gum is helpful to many patients with uncomplicated duodenal ulcer, but that it is harmful to those having increased gastric emptying, eg, pyloric stenosis patients, and that guar gum may exert its effects by increasing gastric emptying time. (*Journal of Parenteral and Enteral Nutrition* 9:496-500, 1985)

There is controversy about the benefits of dietary therapy in acute and chronic peptic ulcer disease.¹⁻⁴ Nevertheless, approximately one-half of all clinicians use such therapy in treating ulcer disease.⁵ Duodenal ulcer patients do not retain food in the stomach as long as healthy individuals, especially meals which are high in energy content.⁶ Studies demonstrate that increased and more rapid emptying of the stomach correlates with a history of hunger in ulcer subjects. There is an abnormally prolonged gastric acid secretory response to a meal in duodenal ulcer patients which continues into the postprandial period. This acid response is usually quickly inhibited in healthy persons.^{7,8}

There is some evidence that fiber-containing foods may have beneficial effects in duodenal ulcer, and epidemiologists have established that the incidence of duodenal ulcer is low in developing countries, where people eat high-fiber or unrefined carbohydrate diets. However, because rice, bran, and unrefined carbohydrate foods tend to buffer acid *in vivo* and because they also increase acid production, the role of fiber in preventing chronic disease or acute symptoms is not completely understood.^{9,10}

Guar gum, a viscous dietary fiber containing galactose and mannose, which is isolated from the Cluster bean, decreases the gastric emptying rate in rats^{11,12} and in overweight human beings¹³ and could thus be of benefit in duodenal ulcer.

Herein we describe the effects of guar gum in a controlled double-blind study in 20 patients with duodenal ulcer.

METHODS

Subjects

The study included 20 patients (10 men, 10 women) selected at random from the duodenal ulcer outpatients visiting the Surgical Clinic of the Oulu University Central Hospital. At the beginning of the study the patients were symptomatic. The diagnosis was confirmed by the usual clinical methods (case history, clinical examination, gastroduodenoscopy and barium meal/x-ray). The mean age of the male patients was 43 yr (SD \pm 9) and of the female patients 45 \pm 10 yr. (The age ranges were 26-66 and 18-72, respectively). The mean weights were 70.1 \pm 9.3 and 58.3 \pm 8.5 kg, respectively. Pregnant women, patients suffering from severe cardiovascular and pulmonary disease, and patients with cancer or diabetes were excluded. Informed consent was obtained from each patient prior to the beginning of the study. Approval for the study had been given by the Ethical Committee of the University of Oulu.

The treatment given varied from patient to patient and included general and dietary advice. Antacids and sucralfate treatment were not changed during the study (Table I).

Drugs Used

Guar gum and placebo. Guar gum was administered in the form of granules. One gram of granules contains 0.95 g of pure gum (Guarem, Remeda Pharmaceutical Co., Kuopio, Finland). The granules were prepared with the help of ethyl cellulose and gelatin spirit, and were dried at + 50°C. The diameter of each granule was less than 2.5 mm. The placebo preparation consisted of similarly prepared wheat flour (0.02 g of dietary fiber/5 g). Five grams of guar gum or placebo were stirred by the patient into a liquid or semiliquid element of the diet.

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Feeding experiment. The patients added 5 g of guar gum or placebo to their meals, on a double-blind basis, for 1 wk. The order of the weeks was randomized. Symptoms and food habits during the study were recorded by the subjects and confirmed by interviews during and immediately after each study week. Experience in dietary survey based on an earlier study of 1200 individuals, carried out using the food record method, in the same area.¹⁴ The severity of the symptoms scored as some or slightly, moderately, or excessively worse/less than those before the study and in the 2 wk of the study without any preparations. The patients were asked to follow their usual dietary habits during the study weeks, except when investigating tolerance to foodstuffs not previously tolerated.

The length of the study was 4 wk consisting of the 1st wk with placebo or guar gum, the 2nd and 3rd wk without any preparation and the 4th wk with placebo or guar gum.

The distributions of the patients with symptoms during guar gum week and placebo week were assessed by the χ^2 test.¹⁵

RESULTS

Ten of the 20 patients benefited distinctly from the use of guar gum, in that the symptoms (upper abdominal pain, belching, and regurgitation) experienced before the study and during the placebo week were reduced, whereas four of the 20 patients were asymptomatic when placebo was used ($p < 0.05$) (Table I). Five patients found guar gum only slightly beneficial, and four patients found it to have no effects, beneficial or otherwise. These patients also found placebo to be ineffective. Thus 15 of the 20 patients found guar gum beneficial, whereas only four of the same 20 patients reported experienced placebo beneficial ($p < 0.01$). The nine patients above mentioned were almost or completely asymptomatic during the study (especially the four who found guar gum and placebo to be ineffective). Their disease was clearly milder and less often evident than that in the 10 patients who benefited most from guar gum. Of the five patients deriving some benefit from guar gum, one ingested wheat bran and other fibrous supplements in her normal daily diet, and one found the taste of guar gum unpleasant. In contrast to the 19 patients just mentioned, one woman found that guar gum abolished the upper abdominal pain experienced before the study and during the placebo week, but caused gastric retention, which got worse. This patient subsequently showed symptoms of pyloric stenosis (indication for operation) as a consequence of chronic duodenal ulcer, and was restricted to a liquid or semisolid diet (cereals and milk).

The 15 patients who benefited distinctly from guar gum also experienced prolonged feelings of repletion after meals. Four patients did not experience this effect. The remaining patient, described in the preceding paragraph, had gastric retention.

Sixteen of the 20 patients were intolerant to food. In four patients this intolerance abated when guar gum was added to meals. The foodstuffs tolerated least well by these four patients were berries or fruits, sugar, sweet

rolls, pizza, and fried foods. Guar gum had no effect on fat intolerance.

In four patients all of whom benefited distinctly from guar gum, diarrhea occurred without meteorism or belching, during the guar gum week. Diarrhea also occurred in two other patients on placebo. (One of these patients benefited distinctly, the other to some extent, from guar gum.) Four of the patients who benefited distinctly from guar gum suffered from meteorism, belching, and upper abdominal pain during the placebo week. Two of these had symptoms of the kind experienced on eating sweet rolls, sweet wheat bread, or pizza. These foods were better tolerated with guar gum. Three patients who benefited distinctly from guar gum suffered from constipation during the placebo week.

All the 10 patients who benefited distinctly from guar gum needed less medication (antacid or sucralfate) during the guar gum than during the placebo week or during the time without any supplementation. Two of the patients who benefited only slightly from guar gum and the patients who suffered from gastric retention from guar gum believed guar gum unpalatable.

DISCUSSION

Methods

There is controversy about the role of diet and dietary fiber in the etiology and treatment of duodenal ulcer.^{1-4,9,10} This is not surprising when the heterogeneity of the various components of dietary fiber regarding chemical, physical, and physiologic properties is taken into consideration.¹⁶ Heterogeneity is avoided, if guar gum, a well-defined type of dietary fiber is used. The possibility that guar gum added to the meals of patients with duodenal ulcer might help such patients, is based on the observation that guar gum retards gastric emptying in rats^{11,12} and overweight humans.¹³ In duodenal ulcer patients, gastric emptying is often abnormally rapid,⁶ and acid secretion between meals is high.^{7,8} The guar gum and placebo used in the study were prepared similarly. The patients were not aware of the content of the preparations, which were described as two different nutrient preparations. The randomization of the patients and the order of guar gum and placebo weeks, and the fact that patients by ingesting both guar gum and placebo served as their own controls minimized effects other than those resulting from use of the preparations. The treatment previously prescribed for duodenal ulcer was maintained unaltered during the study, and normal dietary habits were followed.

Duodenal ulcer seems to be a lifelong disease in at least 50% of sufferers. One week of use of guar gum may not give enough information concerning its effects on symptoms or the healing of ulcer, especially in the case of patients with mild symptoms and long intervals between symptoms. Some patients of this kind took part in the present study.

The tendency toward increased body weight resulting from frequent meals (rich in milk), among patients with uncomplicated duodenal ulcer is generally recognized. Guar gum has been shown to be beneficial in normalizing

TABLE I
The findings in the guar gum (G) and placebo (P) weeks as summary; the placebo weeks were practically similar with the time without any supplementation

Patients, initials	K.E.	K.I.	S.I.	H.A.	H.J.	K.V.	K.M.	H.K.	L.P.	
Was beneficial	G P	+	+	+	+	+	+	+	+	
Was better	G P	+	+	+	+	+	+	+	+	
Pleasant repletion after meal	G P	+	+	+	+	+	+	+	+	
Occurred pains	G P	+	+	+	+	+	+	+	+	
Increased food tolerance	G P	+	+	+		+				
Occurred meteorismus or belching	G P		+		+		+			
Occurred diarrhoea	G P		+		+		+		+	
Occurred vomiting	G P									
Occurred constipation	G P	+		+		+				
Intolerated foods		Berries	Apples Pizza Fried potatoes	Berries Sweet rolls		Fried food Sweet rolls	Fried food Coffee	Spice Fats	Fried food	
Palatability	G P									
Medication		Antacid	Sucralfate	Antacid	Sucralfate	Sucralfate	Sucralfate	Antacid	Antacid	Sucralfate
Reduced need of medication	G P	+	+	+	+	+	+	+	+	
Other remarks	G P				At first loose stools Effect on symptoms sucralfate-like		Loose stools in days 3.-7.		At first loose stools	
Total no.		10	5	4	1					
Was beneficial	G P	+	±	±	-					

body weight in obese subjects eating normal meals, or undergoing weight reduction.^{17,18} The present study was too short to allow any conclusions about the effects of guar gum on body weight in duodenal ulcer patients to be drawn, but, from the feelings of repletion which were recorded in the present study, benefit from guar gum would be expected in duodenal ulcer patients with a tendency to become overweight. The results now obtained justify a longer clinical study on the utility of guar gum in duodenal ulcer.

Results

The feelings of repletion (satiety) following guar gum experienced by the duodenal ulcer patients in this study has also been seen in other patients,¹³ and may relate to the delaying effect of guar gum on gastric emptying after meals. This is also found in other subjects,¹³ but has, apparently, not been measured in duodenal ulcer cases. In most cases, these feelings of repletion were accompanied by beneficial effects overall, but, in one patient with pyloric stenosis, there was vomiting. The pyloric stenosis developed as a complication of chronic duodenal ulcer. This patient could not eat normal food, because of gastric retention, and may have had an abnormally slow

gastric emptying rate with normal food. Her diet had to be changed to liquids and semiliquids (eg, porridge).

In some patients neither guar gum nor placebo had any effects. These patients were totally asymptomatic during the weeks of the study. Guar gum may be helpful in the treatment of symptomatic, uncomplicated duodenal ulcer, and this may be a result of retarded gastric emptying. Measurement of the gastric emptying rate might help in selecting patients most likely to benefit from guar gum. On the other hand, the preventive value of prolonged use of guar gum against the reoccurrence of duodenal ulcer should be investigated.

Normalization of rapid gastric emptying may decrease the secretion of gastric acid and related symptoms. Alteration of the intragastric pH and/or the protective effect of guar gum on the mucosa may explain the increased tolerance to foods which were previously an irritant, ie, those rich in ascorbic acid or monosaccharides. No information about intragastric pH in duodenal ulcer patients after a meal containing guar gum is available. The increased tolerance to foods rich in monosaccharides may relate to the effect observed to be produced by guar gum in other types of patients on gastric emptying and absorption of glucose into the blood after meals or fluids rich in glucose.^{13,19} Diet high in fiber is known

R.T.	K.A.	K.E.	H.S.	A.T.	H.K.	K.T.	K.L.	V.E.	V.K.	M.S.
+	±	±	±	±	±	±	±	±	±	-
+	±	±	±	±	±	±	±	±	±	-
+	+	+	+	+	+	±	±	±	±	+(unpleasant)
	(+)	±	(+)	(+)	±	(+)	(+)			-
+	+	+	+	+	+	(+)	(+)			+
		±				±	±	±	±	-
		+				±	±	±	±	+
		+					+			+
Sweet rolls	Meat	Fried food	Sweet rolls			Cauliflower	Fried foods	Fried foods	Fried foods	Others than por-
Pizza	Spice	Milk	Bread			Fats		Onion		ridge
Fats	Onion	Coffee								
			-			-				-
Antacid	Antacid	Antacid	Sucralfate	Sucralfate	Antacid	Antacid	Antacid	Sucralfate	Antacid	Antacid
			Not needed							
	Used								Ate only por-	
	other								ridge, had	
	fibers								pyloric ste-	
	already								nosis	

to produce dumping and diarrhea in subjects used to a low fiber diet.¹⁶ In this study, subjects, who initially experienced loose stools were able to avoid them by slowly increasing the dose. Dumping and diarrhea are known to result from altered bacterial activity in the colon.¹⁶ Placebo administration resulted in constipation, dumping, and belching. Some patients found the effect similar to wheat flour intolerance. The main component of the placebo was, in fact, wheat flour. This can alter intragastric pH and increase gastric emptying rate. For some patients with duodenal ulcer wheat flour may have provoked symptoms, ie, it may not have been a true placebo.

The viscose bulky mass formed from guar gum makes it unpalatable for some patients. This may be helped by mixing food and guar gum properly, and when the guar gum gives relief to severe symptoms the motivation of its intake may thus be increased.

Within the framework of the present study, it is not possible to draw any prolonged conclusions about the effects of guar gum on the need for drugs in duodenal ulcer, but its capacity to abolish or reduce symptoms reduced requirements for drug therapy in some patients during the guar gum week of this investigation.

More studies are needed on the influence of guar gum on gastric emptying rate, intragastric pH, concentrations of serum gastrin and pepsinogens, the need for drugs, and the recurrence of symptoms if the mechanisms of action of guar gum, and its place in the treatment of duodenal ulcer, are to be established.

CONCLUSION

It is concluded that guar gum is helpful to many patients with uncomplicated duodenal ulcer, but that it is harmful to those with increased gastric emptying, eg, pyloric stenosis patients, and that guar gum may exert its effects by retarding gastric emptying time. The diarrhea that occurs in some patients ingesting guar gum is avoided by giving low initial doses. The unpalatability of guar gum may be a minor obstacle for its use in some patients.

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