Gastric emptying of barium sulphate suspension compared with that of water

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SUMMARY Test meals consisting of water or a suspension of barium sulphate were given to two normal subjects. The rates of decrease of the volume of the gastric contents were indistinguishable for the two meals.

Interest in the effect of barium on gastric emptying arose because we were unable to confirm that metoclopramide increased the rate of gastric emptying (Margieson *et al.*, 1966; James and Hume, 1968). In our studies we used a variety of aqueous solutions (Ramsbottom and Hunt, 1970), whereas the earlier authors had used barium meals. In the present study we found that water and a suspension of barium sulphate, specific gravity 1.36, left the stomach at equal rates.

Method

SUBJECTS

The subjects taking part in these experiments were two men with no radiological evidence of gastrointestinal disease.

THE MEALS

Test meals consisted of either 250 ml distilled water; or 250 ml barium sulphate suspension prepared by mixing 125 ml distilled water with 125 ml Micro-paque. The specific gravity of the resulting suspension was 1.36 and osmolality 46 mmol/1000 g water.

All meals were given at room temperature.

EXPERIMENTAL PROCEDURE

Between 7 and 8 am each subject swallowed a rubber tube 80 cm in length and with a 3 mm bore. They washed out their stomachs by drinking 250 ml tap water and completely aspirated the gastric contents. After the washout one of the above meals was instilled into the stomach down the tube. After

a fixed time interval, which varied between one and 15 minutes, the gastric contents were completely aspirated, and the volume of the aspirate measured and recorded. A further wash was given to check that aspiration was complete. Throughout the experiments the subjects remained seated.

Results

In Figs 1 and 2, the volumes of the gastric contents were plotted against the time interval between instilling and recovery of the meals. This relation appears to be linear. Lines were then fitted to the results for each type of meal. The regression constants are shown in the Table.

It can be seen that intercepts and the slopes for

Fig. 1 The volumes of gastric contents recovered from the stomach after varying intervals of time in subject KX.

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Fig. 2 The volumes of gastric contents recovered from the stomach after varying intervals of time in subject RM.

Table Volumes of meals recovered plotted against time between instilling and recovery of meals

Subject	Type of meal	a	b	SE of b	No. of observations
KX	Water	217	-13.0	1.54	12
KX	Barium	239	-12.9	1.12	12
RM	Water	219	-10.4	1.68	12
RM	Barium	209	-9.1	1.99	12

$y = a - bx$.
 y = volume of gastric contents.
 a [intercept] = volume calculated to be recovered at zero time.
 b [slope] = rate of fall in volume of gastric contents [ml/min].

barium suspension and water meals are virtually identical.

Discussion

Using the test meal method a large range of substances either in solution or suspension have been

shown to alter the rate of gastric emptying relative to water (Hunt and Knox, 1968). However, to our knowledge, no attempt has been made to quantify the emptying of barium sulphate suspensions, which is of concern to the radiologist. Under our conditions the rate of fall of the volume of the gastric contents was not influenced by the presence of barium sulphate. We measured the volume of the gastric contents because that is what the radiologist assesses. It could be argued that the more rapid emptying of the barium suspension was offset by the increased rate of gastric secretion. From published results (Hunt, 1951; Hunt and Macdonald, 1952) we judge the volume of secretion in the gastric contents to be about 10% of the total at 15 minutes. It seems unlikely that changes in this small percentage would have much influence on the results.

It appears that the specific gravity of the gastric contents does not affect the rate of gastric emptying, at least when the subject is sitting in the upright position.

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