related to the stomach wash-out, but the relation of the remaining six to the procedure is probably fortuitous, as infection may develop prior to admission (Mackintosh and Matthew, 1965). We regard this figure as acceptable in view of the value of gastric aspiration and lavage. Selection of patients with the use of the criteria for wash-out that we suggest, together with efficient protection of the lungs whenever necessary, should reduce the complication rate to a negligible figure. In the deeply unconscious patient a cuffed endotracheal tube should always be inserted prior to passing the stomach-tube. If this cannot be done the procedure should be abandoned.

Summary

Since advice regarding gastric aspiration and lavage in acute poisoning is confusing and to date has often been based on outmoded methods of quantitative analysis, 259 poisoned patients were studied to assess the value of this procedure, especially with reference to barbiturate and salicylate poisoning.

More than 200 mg. of barbiturate was recovered in 24 (37%) out of 65 barbiturate cases washed out within four hours of ingestion, but in only 1 out of 65 washed out after four hours.

As much as 20 g. of salicylate was recovered nine hours after ingestion.

Complications of gastric aspiration and lavage were rare.

We would recommend that gastric aspiration and lavage should be performed: (1) in those patients suffering from barbiturate poisoning who ingested the drug within four hours, unless it can be definitely established that fewer than 10 tablets or capsules were taken; (2) if the patient is unconscious and the time of ingestion is not known; and (3) in all

cases of salicylate poisoning irrespective of the time of ingestion.

In poisoning by other sedatives, tranquillizers, and anti-depressant drugs the advice offered for barbiturate poisoning might probably apply.

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Failure of Acute Digitalization to Influence Exercise Tolerance in Angina Pectoris

H. J. SMITH,* M.D., F.R.C.P.(C.); G. A. BOUSVAROS,* M.D.; M. MCGREGOR,* M.D., M.R.C.P., F.R.C.P.(C.)

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There is good reason to consider the possibility that digitalis glycosides might benefit patients with angina pectoris. Experimental restriction of coronary flow in the dog (Sarnoff *et al.*, 1964) and episodes of angina pectoris in man (Müller and Rørvik, 1958; Ross *et al.*, 1962; Malmberg, 1965) are often associated with acute elevation of left ventricular end-diastolic pressure or pulmonary capillary wedge pressure. Furthermore, there is good evidence to suggest that depression of ventricular function resulting from ischaemia may be improved by digitalization (Sarnoff *et al.*, 1964).

Previous studies of the value of digitalis compounds in angina pectoris have had conflicting results. Digitalis therapy has been reported to be beneficial (Edens, 1934), valueless (Gold *et al.*, 1938), or detrimental (Freedberg *et al.*, 1941). In a recent investigation it was observed that digitalization prevented anginal pain and acute elevation of pulmonary capillary wedge pressure in 9 out of 17 patients given a standard exercise load (Malmberg, 1965).

We here report a double-blind study designed to detect whether acute digitalization has any therapeutic effect on angina of effort when this is uncomplicated by heart failure.

Material and Method

Fifteen patients volunteered for study (see Table) and were selected on the grounds that they exhibited angina of effort and were without evidence of valvular heart disease, arrhythmia, congestive failure, or pulmonary disease. Chest radiographs excluded cardiomegaly and pulmonary congestion. Furthermore, at the end of the investigation, when each subject received 2 ml. of mercaptomerin, the largest resultant weight loss was 3½ lb. (1.7 kg.) in 24 hours.

Patients were tested on two separate occasions, one week apart, and on these days they were asked to avoid undue exertion and smoking. No meals were allowed for at least four hours before the tests, which were carried out at the same time of day for each patient. Exercise was performed on a treadmill, the speed of walking and slope having been adjusted on previous occasions so as to precipitate angina of effort within about five minutes. The electrocardiogram was monitored continuously for arrhythmias by means of a bipolar chest lead.

* Joint Cardiorespiratory Service of the Royal Victoria Hospital, McGill University, Montreal, Canada.

Exercise Tolerance Before and After Lanatoside C and Placebo

Case No.	Sex	Age	Weight		Weight Loss with Hg		Treadmill		Exercise Tolerance (sec.)								Mean Control (n = 6) ± 2 SD
			lb.	kg.	lb.	g.	Speed (m.p.h.)	Slope (%)	Control		Placebo		Control		Digitalis		
									1	2	1 hr.	2 hr.	3	4	1 hr.	2 hr.	
1	M	39	149	67.6	2	905	2	5	120	152	156	122	175	178	142	136	151 ± 50
2a	M	48	210	95.2	3	1,360	2	10	232	231	255	235	135	224	303	387	219 ± 86
2b	M	48	210	95.2	—	—	3	10	175	187	185	185	145	214	175	170	181 ± 44
3	M	61	168	76.2	3.7	1,680	2	10	155	202	216	157	175	167	155	133	179 ± 148
4	M	50	179	81.2	3.5	1,585	2	10	145	150	180	200	260	264	258	200	200 ± 104
5a	M	62	156	70.8	3	1,360	2	10	233	242	270	372	120	260	435	840	250 ± 162
5b	M	62	156	70.8	—	—	2.5	10	115	105	165	110	135	120	95	130	125 ± 44
6	M	64	170	77.1	1.5	680	2	10	155	109	122	106	85	90	90	125	111 ± 50
7	F	47	157	71.2	0	—	2	10	130	316	330	203	137	127	132	143	207 ± 186
8	M	71	152	68.9	2.5	1,135	2	13	326	457	272	251	152	107	257	160	261 ± 250
9	M	60	157	71.2	2	905	2	10	191	248	206	205	175	193	146	118	203 ± 50
10	M	39	183	83.0	3	1,360	2	10	207	224	270	250	168	267	193	150	231 ± 76
11	M	59	178	80.7	—	—	3	13	167	137	177	111	138	114	143	133	134 ± 40
12	F	55	129	58.5	3	1.5	1.5	5	210	160	177	147	199	189	128	145	180 ± 48
13	F	51	131	59.4	2	905	1	0	135	98	100	78	45	55	70	60	85 ± 66
14	F	64	138	62.6	1.5	680	1.5	5	420	500	450	520	134	150	255	270	362 ± 344
15	M	54	146.5	66.4	3.7	1,680	1.5	10	21	30	41	45	20	40	45	45	33 ± 21.6

Effort tolerance was limited by chest pain. As suggested by Kattus *et al.* (1959), patients reported the first sensation of angina (first end-point) but continued walking until the pain reached that degree of severity at which they would ordinarily stop exercise (second end-point), both end-points being carefully noted.

Each test was performed as follows. After two control exercise studies separated by one hour's rest the patients received either an intravenous injection of 1.2 mg. of lanatoside C in 20 ml. of normal saline, or a placebo injection (20 ml. of normal saline). The effort tolerance was again determined one and two hours after the injection. One week later the study was repeated in exactly the same fashion, except that patients who received lanatoside C on the first occasion were now given saline, and vice versa. Injections were given in random order by a second observer without either the patient or the observer who conducted the effort test knowing which substance had been used. Two patients (Cases 2 and 5) were restudied after an interval of one month.

Results

There were no significant arrhythmias in the post-exercise electrocardiograms except in one patient who developed multiple ventricular extrasystoles after digitalis injection, but not during the control or post-placebo tests.

When judged by the first end-point (see Table) there was no systematic change in the exercise tolerance after intravenous injection of saline or lanatoside C, when compared with their respective control tests. By pooling the four control and two post-placebo tests it was possible to estimate the spontaneous variability in effort tolerance for each subject. If a change greater than the mean control $\pm$ 2 SD is considered significant, 11 subjects showed no change, two patients (Cases 9 and 10) apparently deteriorated, and two (Cases 2 and 5) improved. However, when the study was repeated in the latter two subjects one month later, digitalis appeared to have no significant effect. Data based on the second end-point were qualitatively very similar.

Discussion

Study of any form of treatment in angina pectoris is complicated not only by observer error but by the possibility of spontaneous changes in effort tolerance which are unrelated to the therapy under study. These variations may be the result of changes in the underlying pathological condition over a period of time or may be due to variables such as meals, temperature, and emotion. To avoid errors due to such factors, several precautions were taken in the present study, in addition to employing a double-blind technique. By performing the exercise tests at the same time of day and maintaining the

same relation to meals, the influence of food intake on effort tolerance was kept as small and as constant as possible. Stable temperature was ensured by the use of an air-conditioned laboratory. The two effort tests were performed only a week apart to minimize the influence of long-term changes in the state of patients. It would have been preferable to employ a more objective criterion of the onset of angina, such as the occurrence of electrocardiographic changes. However, post-exercise depression of S-T segments may occur in normal digitalized individuals and cannot be used as a sign of ischaemia (Liebow and Feil, 1941; Kawai and Hultgren, 1964). We therefore had to rely on the subjects' own perception of the onset of pain. Use of the second end-point increased confidence in the results, since no major discrepancy between the two end-points was observed.

In this study we failed to demonstrate any obvious influence of digitalis on angina pectoris, a result consistent with the work of Gold *et al.* (1938). The discrepancy between our results and those of Malmberg (1965) may well be due to differences in patient-material or in technique of testing. Though the technique used in the present study is rather crude and minor beneficial effects in a small percentage of patients cannot be excluded, tests of this type are capable of demonstrating the therapeutic effect of nitroglycerin (Kinsella *et al.*, 1962; Sosa and McGregor, 1963).

Summary

A double-blind study was carried out in 15 anginal subjects without heart failure. Exercise was performed on a treadmill, and the onset of pain was timed twice before drug administration and one and two hours after intravenous placebo or digitalis. Effort tolerance, measured as the duration of exercise before appearance of angina, was not prolonged by the administration of lanatoside C beyond the limits of spontaneous variability.

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