

We wish to thank Dr. T. J. Thomson, University Department of Materia Medica, Stobhill General Hospital, for his permission to study patients under his care. Mr. P. S. Waldie and the staff of the department of audio visual services at Stobhill General Hospital prepared the tables and illustrations.

References

- Benoit, F. L., Martin, R. L., and Watten, R. H. (1965). *Annals of Internal Medicine*, 63, 604.
- Bloom, W. L. (1959). *Metabolism*, 8, 214.
- Cahill, G. F., et al. (1966). *Journal of Clinical Investigation*, 45, 1751.
- Cohn, S. H., and Dombrowski, C. S. (1970). *Journal of Nuclear Medicine*, 11, 239.
- Drenick, E. J., Swendsied, M. E., Bland, W. H., and Tuttle, S. G. (1964). *Journal of the American Medical Association*, 187, 100.
- Duncan, G. G., Jenson, W. K., Frazer, R. I., and Cristofari, F. C. (1962). *Journal of the American Medical Association*, 181, 309.
- Felig, P., Owen, O. E., Wahren, J., and Cahill, G. F. (1969). *Journal of Clinical Investigation*, 48, 584.
- Goldblatt, P. B., Moore, M. E., and Stunkard, A. J. (1965). *Journal of the American Medical Association*, 192, 1039.
- Graham, J. A. (1970). *Lancet*, 1, 386.
- Kinney, J. M., Duke, J. H., Long, C. L., and Gump, F. E., (1970). *Journal of Clinical Pathology*, 23, Suppl. No. 4, p. 65.
- Page, M. A., and Williamson, D. H. (1971). *Lancet*, 2, 66.
- Rapoport, A., From, G. L. A., and Husdan, H. (1965). *Metabolism*, 14, 31.
- Runcie, J., and Thomson, T. J. (1970). *British Medical Journal*, 3, 432.
- Thomson, T. J., Runcie, J., and Miller, V. (1966). *Lancet*, 2, 992.

Long-term Follow-up of Therapeutic Starvation

J. A. INNES, I. W. CAMPBELL, C. J. CAMPBELL, A. L. NEEDLE, J. F. MUNRO

British Medical Journal, 1974, 2, 356-359

Summary

A total of 75 grossly obese patients were admitted to hospital for 80 episodes of prolonged starvation. Five took their own discharge within two weeks of admission and 12 defaulted from follow-up within 12 months of discharge. The others were all followed up for periods of 12 to 64 months. Altogether 39 episodes in 34 patients were classified as failures, eight as modified successes, and 16 as successes, though five of the latter patients subsequently defaulted. Success was associated with regular follow-up attendance but could not be otherwise predicted. A number of patients obtained tangible benefit from starvation despite a subsequent gain in weight.

Introduction

Starvation is an effective method of weight reduction but entails lengthy periods of stay in hospital and is not without risk. It can be justified only if there is a pressing need for temporary weight loss or if the long-term results are superior to those obtained with conventional treatment. Previous experience had suggested that prolonged inpatient starvation might be of permanent value if patients were reduced to within 25% in excess of their ideal weight (Munro *et al.*, 1970). We describe here the further follow-up of 75 patients with refractory obesity after fasting.

Patients and Methods

All the patients had failed to make satisfactory progress while attending an obesity clinic, had expressed the desire to be

admitted to hospital for starvation, and were willing to remain in hospital until reduced to within 25% in excess of their ideal weight. Altogether 27 were male patients with an average age of 30 years (range 14 to 53 years) and 48 were female patients with an average of 29 years (range 15 to 57 years). They were admitted to a hospital with good rehabilitative facilities and began the starvation regimen after a short assessment period. The emphasis throughout was on trust rather than supervision and many admitted to periodic cheating. Initially a low-energy, carbohydrate-restricted meal was provided if specifically requested and many took one such meal a week. This offer was subsequently withheld but in other respects the regimen as previously described was followed (Munro *et al.*, 1970).

Five patients (three women and two men) discharged themselves within a week or so and are excluded from further analysis. The mean admission weight of the remaining 45 women was 75.3% (range 41 to 141%) in excess of their ideal weight and that of the 25 men 77.5% (range 45 to 123%) in excess of their ideal weight.

At the completion of fasting patients were re-fed in hospital for four to seven days and offered further dietary advice. During follow-up the policy was to see them at intervals of four weeks or less. They were given every encouragement to lose weight and they and their close relatives had the opportunity of attending a monthly "group" session held during and after starvation. Many were treated with anorectic drugs, four were readmitted for starvation, and 11 underwent further short periods of outpatient fasting. The patients were subdivided according to sex, percentage in excess of their ideal weight at the time of admission, and whether or not they reduced to within 25% in excess of their ideal weight at the completion of fasting. The following criteria were applied to evaluate the outcome of treatment: *default*, default from the clinic within 12 months of discharge and without subsequent reattendance; *failure*, a gain of 15 kg or of 50% of the total weight lost during starvation; *modified success*, a gain of 10 to 15 kg or of 33 to 50% of the total weight lost during starvation; *success*, a gain of less than 10 kg and less than 33% of the weight lost. Patients followed for at least 12 months but who then failed to attend were classified as "successes," "modified successes," or "failures," with subsequent default.

Results

During a mean fast of 14 weeks the mean weight loss was 29.6 kg, but only 39 patients, including four of the 12 most

Eastern General Hospital, Edinburgh

J. A. INNES, M.B., M.R.C.P., Registrar
I. W. CAMPBELL, M.B., M.R.C.P., Senior House Officer (Now Registrar in General Medicine, Royal Infirmary, Edinburgh)
J. F. MUNRO, M.B., F.R.C.P., Consultant Physician

Edenhall Hospital, Musselburgh, Midlothian

C. J. CAMPBELL, M.B., M.R.C.P., Senior House Officer (Now Registrar, Diabetic Department, Royal Infirmary, Edinburgh)
A. L. NEEDLE, M.B., B.S., Senior House Officer (Present address: Western General Hospital, Edinburgh)

obese, reduced to within 25% in excess of their ideal weight. The mean weight changes in the various subgroups and the follow-up results are shown in tables I and II. After discharge 12 patients defaulted within a year; one died in a road traffic accident and eight were known to have left the district. A further six defaulted after at least 12 months of follow-up and 24 other patients were lost at some stage of follow-up but subsequently reattended. The mean period of follow-up was 28.2 months (range 12 to 64 months), during which the mean weight in excess of the ideal increased from 28.2% (range 7 to 83%) to 62.7% (range nil to 137%). At the time of writing 24 patients were in excess of their preadmission weight.

A total of 39 episodes in 34 patients resulted in failure; 19 occurred after reduction to within 25% in excess of the ideal weight (figs. 1 and 2). Irrespective of whether this was

achieved or not, some patients regained weight exceptionally rapidly (table III, cases 1 and 2). Others managed to maintain their discharge weight for long periods only then to relapse. This was often associated with default but sometimes occurred for other reasons. For example, a mainline engine driver had attended regularly for 36 months without an appreciable gain in weight. He was then seen by a doctor unfamiliar with his problem and discharged from the clinic. Though the error was immediately detected and corrected he began to eat compulsively, in order, he said, to demonstrate to the doctors the importance of his regular attendance (table III, case 4). Eight episodes were classified as "modified successes" and included five patients who reduced to within 25% in excess of their ideal weight (figs. 3 and 4; table III, case 5). Of the 16 successes five were subsequently lost to

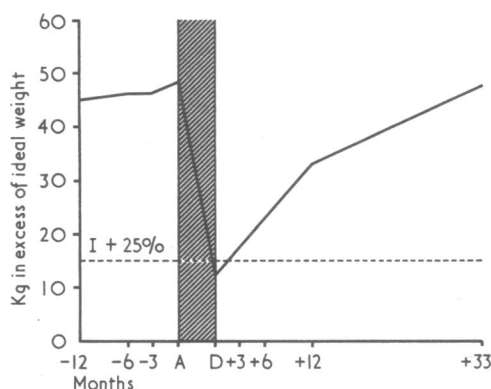


FIG. 1—Mean weight change of follow-up failures who reduced to within 25% in excess of their ideal weight (19 episodes). I=Ideal. A=Admission. D=Discharge.

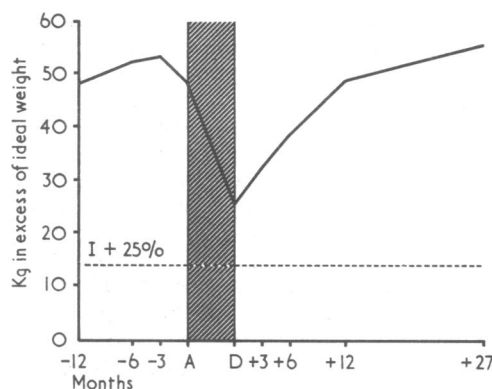


FIG. 2—Mean weight change of follow-up failures who failed to reduce to within 25% in excess of their ideal weight (20 episodes). I=Ideal. A=Admission. D=Discharge.

TABLE I—Outcome of 47 Episodes of Starvation in Female Patients related to % in Excess of Ideal Weight on Admission and Ability to Reduce to within 25% in Excess of Ideal Weight

	% Excess on Admission:	40-59	60-79	80-99	≥100	Total
	No of Episode:	12	21	7	7	47
	Weight loss in kg (range):	14.7 (2.0-27.0)	24.8 (14.0-36.0)	36.8 (28.0-43.0)	47.7 (27.0-72.0)	27.4 (2.0-72.0)
Reduced to < 25% in Excess of Ideal Weight	No.	8	10	3	1	22
	Default	1	2	1	0	4
	Success	2+1*	1+1†	0	0	3+1*+1†
	Modified success	1	1+1‡	0	0	2+1‡
	Failure	3	4	2	1	10
Reduced to > 25% in Excess of Ideal Weight	No.	4	11	4	6	25
	Default	1	2	0	1	4
	Success	0	3	0+1†	0	3+1†
	Modified success	0	2	0	1	3
	Failure	3	4	3	4	14

*Defaulted at 24 months.
†Defaulted at 18 months.
‡Defaulted at 12 months.

TABLE II—Outcome of 28 Episodes of Starvation in Male Patients related to % in Excess of Ideal Weight on Admission and Ability to Reduce to within 25% in Ideal Weight

	% Excess on admission:	40-59	60-79	80-99	>100	Total
	No. of episodes:	6	13	4	5	28
	Weight loss in kg (range):	24.8 (16.0-39.0)	27.6 (13.0-46.0)	37.0 (21.0-46.0)	57.6 (38.0-77.0)	33.1 (13.0-77.0)
Reduced to < 25% in Excess of Ideal Weight	No.	6	7	1	3	17
	Default	1	1	0	0	2
	Success	1	1+1*	0	0+1†	2+1*+1†
	Modified success	0	2	0	0	2
	Failure	4	2	1	2	9
Reduced to > 25% in Excess of Ideal Weight	No.	0	6	3	2	11
	Default	0	0	1	1	2
	Success	0	2	1	0	3
	Modified success	0	0	0	0	0
	Failure	0	4	1	1	6

*Defaulted at 12 months.
†Defaulted at 18 months.

TABLE III—Clinical Data on Nine Patients

Case No.	Age and Sex		Ideal Weight (kg)	Excess Weight Before Fast (kg)		Excess Weight at Fast		Duration of Fast (Weeks)	Excess Weight on Discharge		Excess Weight after Discharge (kg)				Final Excess Weight		Length of Follow-up (Months)
				12 Months	3 Months	kg	% Ideal Weight		kg	% Ideal Weight	6 Months	12 Months	24 Months	36 Months	kg	% Ideal Weight	
1	34	M.	78	74	81	90	115	19	45	58	80	107			104	133	14
2	33	M.	76	99	76	81	107	27	18	24	47	56			56	74	12
3	26	F.	59	39	37	43	73	10	12	20	12	2	8	15	48	81	52
4	42	M.	73	28	31	32	44	13	3	4	4	3	14	6	43	59	60
5	41	F.	61	29	36	43	71	29	9	15	15	15	19		21	34	30
6	18	M.	71	51	62	69	97	19	26	37	17	21	60	25	23	32	60
7	41	M.	68	45	43	34	50	13	8	11	12	12	12		15	22	26
8	29	M.	70	*	*	85	121	10	9	13	40	64			62	89	18
9	46	F.	66	97	98	81	123	45	56	85	75	68	80		75	107	12
	49								23	35	25	33			38	58	19

* Data missing.

follow-up, and at the time of writing their status was uncertain. Of the 11 still attending five reduced to within 25% in excess of their ideal weight. The mean weight changes of this group and of the six who failed to reduce to within 25% in excess of their ideal weight are shown in figs. 5 and 6. The latter group included a patient whose weight increased to almost the preadmission value but who by means of short spells of out-patient starvation reduced it to less than his weight at discharge (table III, case 6). Most of the "successes," however, maintained a fairly constant weight (table III, case 7).

Of the four patients readmitted two were reduced on both occasions to within 25% in excess of their ideal weight only to regain weight rapidly (table III, case 8). The third continued to struggle to keep her weight at about 100 kg compared with her prestarvation weight of 162 kg and was a "modified success" (table III, case 9). The fourth regained weight rapidly after the second admission but did much better after a third period of starvation and was also a "modified success."

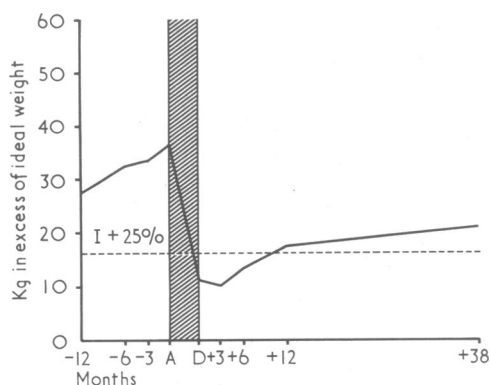


FIG. 3—Mean weight change of follow-up modified successes who reduced to within 25% in excess of their ideal weight (four episodes). I=Ideal. A=Admission. D=Discharge.

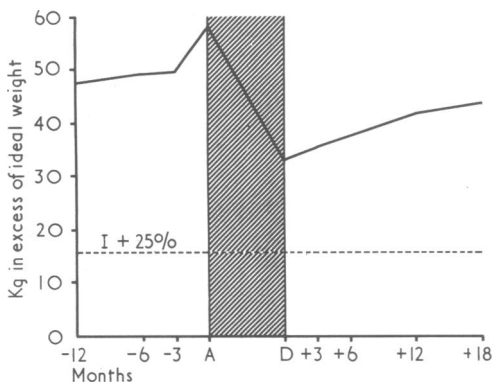


FIG. 4—Mean weight change of follow-up modified successes who failed to reduce to within 25% in excess of their ideal weight (three episodes). I=Ideal. A=Admission. D=Discharge.

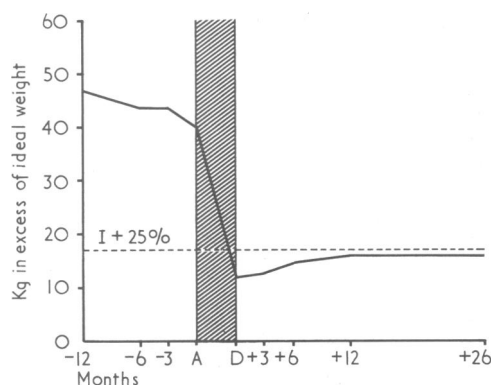


FIG. 5—Mean weight change of follow-up successes who reduced to within 25% in excess of their ideal weight (five episodes). I=Ideal. A=Admission. D=Discharge.

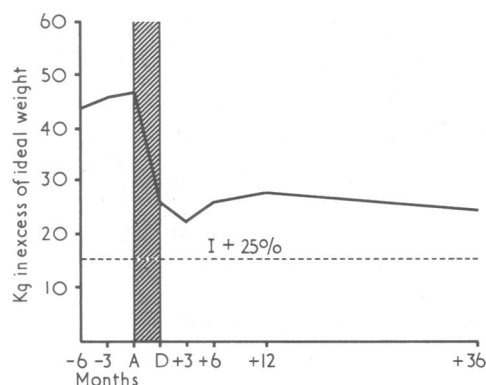


FIG. 6—Mean weight change of follow-up successes who failed to reduce to within 25% in excess of their ideal weight (six episodes). I=Ideal. A=Admission. D=Discharge.

Discussion

Analysis of reports of follow-up results suggests that therapeutic starvation for four weeks or less does not produce lasting weight loss superior to that obtained with conventional treatment either in patients with refractory obesity (MacCuish *et al.*, 1968) or at time of initial referral to hospital (Bloom, 1959; Harrison and Harden, 1966; Gilliland, 1968; Hermann and Iversen, 1968; Maagoe and Mogensen, 1970). After prolonged fasting a massive regain of weight is common (Kollar *et al.*, 1968; Swanson and Dinello, 1970) but a proportion of patients do not regain weight during a follow-up of 2 to 24 months (Karns, 1966; Munro *et al.*, 1970; Rooth and Carlstrom, 1970).

The overall results of follow-up for 12 months or more were clearly disappointing in that two-thirds of the patients

were "failures" and more than one-third actually regained all the weight lost. Moreover, though most of the "successes" or "modified successes" continued to maintain a steady weight the incidence of failure increased with the length of follow-up. This was especially true during the first 12 months, and follow-up reports for such short periods are of limited value. The results for the male and female patients appeared to be similar and suggest that those most overweight are least likely to succeed; however, the initial percentage excess weight was of no clear predictive value. We failed to substantiate the previous impression that the ability to reduce to within 25% in excess of the ideal weight is associated with increased prospects of long-term success. Long-term success, however, is closely correlated with regular attendance at the follow-up clinic, and only two patients were known to have kept their weight down despite a lengthy lapse of follow-up. Some of the patients who regained weight rapidly admitted that though superficially their eating habits had been reformed they continued to eat excessively but in secret.

All the patients were "failures" before admission and the primary reason for selection was their inability to respond satisfactorily to conventional treatment despite regular supervision at an obesity clinic for at least a year. All were suffering either physically or psychologically from their morbid obesity. Thus for the small proportion of successes a mean weight loss of 27 kg at a mean follow-up of 27 months represents a worthwhile achievement. Success, however, cannot be gauged solely in terms of weight reduction. Ten patients had 12 elective operations, including hiatus hernia repair, cholecystectomy, and total hip replacement. Nine married,

and among the women there were six pregnancies, including one full-term delivery in a previous habitual aborter. Eleven patients held jobs which previously they could not have obtained. It follows that the distinction between success and failure is necessarily arbitrary, and many who regained weight did not regret the time spent in hospital.

Therapeutic starvation could be better justified if patient selection were improved, but at present the long-term sequelae of the other form of radical therapy, bypass surgery, are uncertain. The current policy is to offer surgery only to selected patients who have regained weight after starvation.

We wish to thank the many doctors, the nursing staff, and the other staff who were concerned in the care of these patients, and are grateful to Servier Laboratories for their very generous financial support.

References

- Bloom, W. L. (1959). *Metabolism*, 8, 214.
 Gilliland, I. C. (1968). *Postgraduate Medical Journal*, 44, 58.
 Harrison, M. T., and Harden, R. M. (1966). *Lancet*, 2, 1340.
 Hermann, L. S., and Iversen, M. (1968). *Lancet*, 2, 217.
 Karns, R. M. (1966). *Journal of the American Medical Association*, 197, 22.
 Kollar, E. J., Atkinson, R. M., and Albin, D. L. (1968). *Psychosomatics*, 10, 125.
 Maague, H., and Mogensen, E. F. (1970). *Danish Medical Bulletin*, 17, 206.
 MacCuish, A. C., Munro, J. F., and Duncan, L. J. P. (1968). *British Medical Journal*, 1, 91.
 Munro, J. F., MacCuish, A. C., Goodall, J. A. D., Fraser, J., and Duncan, L. J. P. (1970). *British Medical Journal*, 4, 712.
 Rooth, G., and Carlström, S. (1970). *Acta Medica Scandinavica*, 187, 455.
 Swanson, D. W., and Dinello, K. (1970). *Psychosomatic Medicine*, 32, 209.

Secondary Respiratory Infection in Hospital Patients: Effect of Antimicrobial Agents and Environment

J. R. PHILP, R. C. SPENCER

British Medical Journal, 1974, 2, 359-362

Summary

A prospective study of 358 medical and 234 postoperative patients with clinical evidence of secondary chest infection showed that previous administration of antimicrobial agents greatly reduced the chance of obtaining a clear-cut laboratory report. In patients with radiographical evidence of pneumonia this led to a fourfold decrease in the overall rate of isolation of potential pathogens. Furthermore, 81 diverse "coliforms" were isolated from 258 medical and surgical patients who had received previous antimicrobial therapy while only four coliforms (all *Escherichia coli*) were isolated from 334 untreated patients. Thus the general hospital environment on its own seemed to have a negligible influence

in promoting the growth of coliform flora in sputum. Any unique effect of underlying disease in this regard was masked by that of previous therapy. Finally, the results raised the possibility that previous antimicrobial therapy might have increased the risk of secondary pneumonia in hospital patients.

Introduction

In the six months before this study a pilot study showed that potential bacterial pathogens were isolated from less than a third of 1,560 sputa investigated in this laboratory. Of these isolates 56% were Gram-negative "coliform" bacilli whose significance was often difficult to assess. Consequently this study was carried out in an attempt to correlate bacteriological findings in sputum with radiographical appearances, underlying disease (Stratford *et al.*, 1968; Johansen *et al.*, 1969), residence in the hospital environment (Johansen *et al.*, 1972), and previous administration of antimicrobial agents (Lipman *et al.*, 1946; Ory *et al.*, 1946; Long, 1947; Meads *et al.*, 1951; McCurdy and Neter, 1952; Elmes *et al.*, 1953; Petersdorf *et al.*, 1957; Louria and Kaminski, 1962; Tillotson and Finland, 1969; Price and Sleigh, 1970). It was hoped to define more clearly the clinical significance of various potential pathogens with a view to more rational therapy in individual patients.

Department of Bacteriology, Wright-Fleming Institute, St. Mary's Hospital, London W.2

J. R. PHILP, M.D., M.R.C.P., Associate Professor of Medicine (Present address: Department of Medicine, Bowman Gray School of Medicine, Winston-Salem, North Carolina 27103)
 R. C. SPENCER, M.B., B.S., Senior Registrar