# Staff Meeting Bulletin
# Hospitals of the » » »
# University of Minnesota



# Preoperative Dietary Management for Surgical Patients

Volume XV | Friday, January 14, 1944 | Number 12

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

Volume XV | Friday, January 14, 1944 | Number 12

INDEX



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William A. O'Brien, M.D.

I.

# UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
## CALENDAR OF EVENTS
## January 17 - 22, 1944

Visitors Welcome

Monday, January 17

9:00 - 10:00 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff, Todd Amphitheater, U. H.

9:00 - 11:00 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff, Interns Quarters, U. H.

12:30 - 1:30 Pediatrics Seminar; Treatment of Burns; R. O. Bergan; W-205 U. H.

12:30 - 1:30 Pathology Seminar; Libman-Sacks Disease; B. J. Clawson; 104 I. A.

Tuesday, January 18

8:00 - 9:00 Surgery Journal Club; O. H. Wangensteen and Staff, Main 515, U. H.

9:00 - 10:00 Roentgenology-Pediatrics Conference; L. G. Rigler, I. McQuarrie and Staff, Eustis Amphitheater, U. H.

11:00 - 12:00 Urology Conference; C. D. Creevy and Staff, Main 515, U. H.

12:30 - 1:30 Pathology Conference; Autopsies. Pathology Staff, 104 I. A.

12:30 - 1:30 Physiology-Pharmacology Seminar; Parental Use of Amino Acids; C. P. Barnum; 214 M. H.

4:30 - 5:30 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff, Station 54, U. H.

4:00 - 5:00 Pediatrics; Grand Rounds; I. McQuarrie and Staff; W-205 U. H.

5:00 - 6:00 Roentgen Diagnosis Conference; C. L. Ould and H. S. Kaplan, M-515 U. H.

8:00 - Minnesota Pathological Society--Symposium, Carcinoma of Stomach, The Problem of Gastric Carcinoma; O. H. Wangensteen; Roentgenological Features of the Early Stages of the Disease; L. G. Rigler; Gastroscopic Features; J. B. Carey; 15 M.S.

Wednesday, January 19

11:00 - 12:00 Pathology-Medicine- Surgery Conference; Pernicious Anemia, Pulmonary Tuberculosis; E. T. Bell, C. J. Watson, O. H. Wangensteen and Staff, Todd Amphitheater, U. H.

12:30 - 1:30 Pharmacology Seminar; Bartonelliasis; H. N. Wright; 105 M. H.

4:15 - 6:00 Obstetrics and Gynecology Journal Club; J. L. McKelvey and Staff; Station 54, U. H.

4:30 - 5:30 Neurophysiology Seminar; The Chemical Transmission of Nervous Impulses to the Intestine and the Sweat Glands; Nathan Lifson; 129 M. H.

Thursday, January 20

9:00 - 10:00 Medicine Case Presentation; C. J. Watson and Staff, Todd Amphitheater, U. H.

10:00 - 12:00 Medicine Rounds; R. J. Watson and Staff, East 214 U. H.

12:30 - 1:30 Physiological Chemistry Seminar; Introduction to Oral and Dental Biochemistry; W. D. Armstrong; 116 M. H.

5:00 - 6:00 Roentgenology Seminar; Presentation of Cases; T. B. Merner; M-515 U.H.

4:30 - 5:30 Bacteriology Seminar; Equine Encephalomyelitis and Related Virus Diseases; Mary Elizabeth Russell; 129 M. H.

Friday, January 21

9:00 - 10:00 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U.H.

8:30 - 10:00 Grand Rounds; I. McQuarrie and Staff.

10:00 - 12:00 Medicine Ward Rounds; C. J. Watson and Staff; East 214 U. H.

11:45 - 1:15 University of Minnesota Hospitals General Staff Meeting: Some Aspects of Aviation Medicine; G. N. Aagaard; Powell Hall Recreation Room.

1:00 - 2:00 Medicine Case Presentation; C. J. Watson and Staff; Main 515, U. H.

1:00 - 2:30 Dermatology and Syphilology; Presentation of selected Cases of the Week; Henry E. Michelson and Staff; W-306 U. H.

1:30 - 3:00 Roentgenology-Neurosurgery Conference; H. O. Peterson, W. T. Peyton, and Staff, Todd Amphitheater, U. H.

Saturday, January 22

9:00 - 11:30 Surgery-Roentgenology Conference; O. H. Wangensteen, L. G. Rigler, and Staff; Todd Amphitheater, U. H.

9:00 - 10:00 Medicine Case Presentation; C. J. Watson and Staff; Main 515, U. H.

10:00 - 12:00 Medicine Ward Rounds: C. J. Watson and Staff; E-214, U. H.

11:30 - 12:30 Anatomy Seminar; Recent Studies on the Induction of Leukemia; Arthur Kirschbaum; 226 I. A.

## II. PREOPERATIVE DIETARY MANAGEMENT FOR SURGICAL PATIENTS

Richard L. Varco
Fred Kolouch, Jr.

A review of modern contributions to surgical knowledge record many achievements but suggest that progress in certain fields has been disproportionately advanced compared to the accomplishments in the dietary care of surgical patients. The laudable lowering of mortality and shortening of morbidity following gastrointestinal surgical procedures during recent years represents the summation of several individual contributions. We are indebted to many for promoting a more intelligent awareness of the problems of hydration, electrolyte balance, adequate vitamin intakes; a wide spread knowledge of new and more effective sulfonamides generally, topically about suture lines, and enterally as bacteriostatics, and an appreciation of the advantages and applicability of improved anastomatic techniques.

Now, whereas, a number of investigators have been concerned with these complex tasks, a distinctly smaller group has studied the problem of providing an abundant and proper caloric intake to surgical patients.

Individuals requiring surgery upon the gastrointestinal tract frequently present mild to severe states of starvation or malnutrition. A state of marginal nutritional imbalance, it would appear, may exist in an individual for a rather prolonged period before the onset of a secondary illness augments the body requirements above his limited intake, thereby making the real need apparently manifest for the first time. There is a broad zone existing between optimal nutrition and classical deficiency states, in which abide many borderline cases of unsatisfactory dietary management and/or inadequate food intake. The problem includes therefore not only the treatment of those who have grossly deficient diets but as well those with occult inanition.

The story of protein metabolism is so important a phase of this dietary problem, a brief recapitulation of a few of its broader aspects appears worthwhile. Protein in our food, after being acted upon by digestive enzymes is slowly broken down to amino acids (and occasionally more complex aggregates) which are absorbed into the portal blood stream, transported to the liver and there serve as building blocks in the synthesis of the plasma proteins. This statement is probably accurate for the albumin, prothrombin, and fibrinogen fractions, but globulin may be formed by constituents outside the liver. Synchronously with this fabrication, progresses the catanolism of our protein stores, for our protoplasm exists in an equilibrium state of protein synthesis and also proteolysis. Under normal dietary conditions protein is supplied continuously by the exogenous diet to repair endogenous destruction, however, during starvation states with protein deficiency, appear morphological changes resembling necrosis and/or atrophy. Related phenomena and associated functional changes have been noted by numerous investigators through the years.

Histologists probably were the first to recognize that intra-cellular glycogen is rapidly lost from the tissues during starvation and is replaced by deposits of fat. The significance of these facts was long overlooked alike by clinicians and investigators. About thirty years ago Opie and Alfred reported that the occurrence of liver necrosis, following the inhalation of chloroform, could be greatly reduced if a diet high in carbohydrate was administered to dogs for several days prior to such anesthetization. They also stated an increased susceptibility occurred if the diet was high in fat. Data subsequently published by Davis, Hall, and Whipple, and independently Graham, confirmed these conclusions. Experimental evidence submitted by Goldschmidt, Vars, and Ravdin suggested that a liver high in lipid content and low in protein was maximally susceptible to necrosis after chloroform anesthesia. Such a situation may well exist during starvation states since as Addis Poo, and Lew have pointed out, the percentage loss of total protein from the liver developes rapidly and is great during

periods of food deprivation. Conversely it has also been shown that when liver protein content is high and fat content low the liver is maximally protected from this form of injury. Of particular interest was the finding of a partial degree of hepatic protection by Goldschmidt, Vars, Ravdin against necrosis even in cases with high liver lipid content if such animals were first fed a high protein diet several days prior to the chloroform anesthesia. The impression arises therefore that such pathological states are likewise reversible and may represent no more than exaggerated expressions of a dynamic equilibrium. In agreement with this concept is the work of Hough, Monahon, Li, and Freeman indicating a depressing of hepatic dye clearance and an elevation of serum phosphatase values on protein deficient diets, deviations correctable with alterations in the diet.

The association of hepatic damage and deficient diets has not been limited to the experimental animal. In a series of metabolic studies on patients with gastrointestinal cancer Abels, Rekers, Gorham, Pack and Rhoads concluded there was strong evidence of hepatic dysfunction in 86% of the cases studied. Webster recorded the occurrence of cirrhotic livers in rats fed a low protein, low choline, high fat diet. These pathological changes did not supervene if this ratio was reversed or the fat content materially reduced. An increase in the casein content of the diet, in the former instance, was uniformly successful in preventing hepatic damage. This effectiveness of casein merits additional comment later in this discussion. The conclusion is probably justifiable therefore from the evidence just cited, that the effects of high or low protein diets can be represented as cellular and functional states often reversible, and whereas the intake of a high protein diet is capable of shifting this reaction in the direction of intracellular synthesis and a normally functioning non-pathologically involved cellular mechanism, unfortunately quite the opposite obtains in semi- or starvation states. Here, in both man and animals, a condition of auto-cannabolism exists. Man may survive for prolonged periods deriving his caloric needs partially or wholly from his own body tissues. During this interval though sustained, he suffers from the compound evils of a diet low in protein content and with the majority of his available calories derived from body fat. If prolonged this utilization of a high fat diet, simulating as it does so closely experimental conditions in animals, in a similar fashion in man evokes detectable evidence of hepatic dysfunction.

Experience has shown that such individuals tolerate poorly extensive prolonged surgical manipulations. Unfortunately, this description often closely records the dietary case history of the individual with gastrointestinal neoplastic disease, precisely the person requiring a very major type of surgery. The fatty liver of dietary origin is a problem whose development, significance, and remedy is unquestionably of great surgical consequence, but an equivalent interest is aroused by the problem of hypoproteinemia developing during these same conditions. Almost a prerequisite for an orientation in the latter dietary problem is some general knowledge of all the causative mechanisms of hypoproteinemia. For example, low plasma protein values related to an inadequate caloric intake may be secondarily reduced through ulceration, sepsis, and hemorrhage. An outline is therefore proposed for the several fashions by which hypoproteinemia can develop and it is emphasized that one or more causes for depletion may coexist and simultaneously effect unfavorably the plasma protein values.

A. Hypoproteinemia may result from an increased rate of catabolism; that is, the combustion of body protein has been speeded up at the expense of protein stores. Hyperthyroidism and hyperthermias can be cited as examples of such a process. The feeding problem posed by the severely thyrotoxic individuals is worthy of more interest than has been accorded him in the past by those in charge of such cases. A closer scrutiny into the actual metabolic requirements and more precise knowledge of the quality of diet best providing reserves upon which the individual can draw in the

postoperative period might help avoid the development of a thyroid crisis, since evidence has accumulated to indicate that this complication may arise as a result of inadequate hepatic stores.

B. Hypoproteinemia may result from an augmented rate of protein loss. Early, for example, from burns protein is lost in the fluid weeping from myriads of injured capillary walls no longer impervious to protein seepage. Late protein is lost from unepithelialized burned areas due to the extensive granulating surface presented. Other obvious examples of abnormal protein loss are following hemorrhage, during peritonitis, with small bowel intestinal obstruction, particularly the strangulating varieties, and all forms of chronic ulceration. Less obvious examples are found in the protein character of exudates from abscesses and empyemas. The purulent discharge from an extensive suppurative pleuritic cavity may commandeer protein from the circulating stores that a patient febrile and anorexic can ill afford, in terms of his dietary intake.

C. Hypoproteinemia may result from a clear cut nutritional protein deficiency either through poor selection, unavailability, or a frank reluctance and disinclination to partake of food.

D. Hypoproteinemia may result from a reduced capacity, or actual failure of protein fabrication by the liver. The dietary management of this form of hepatic dysfunction would seem to present many intriguing possibilities. A very limited experience suggests that favorable results can be anticipated in certain cases, through dietary management.

Of many ills said to result from hypoproteinemic states, the following are more clearly ascribable to such a protein deficiency. There may be impaired would healing or even disruption, delayed intestinal motility or even an intestinal obstruction. Anastomotic stomal difficulties have been noted. Edema formation may develop and, related to this, are probably some of the postoperative bronchopneumonias.

The dual problem of fatty livers and hypoproteinemia in surgical patients presented therefore a challenge. This invitation was accepted and for almost two years now the surgical staff has been concerned with the acquisition of a general orientation in this field. During this interval, several diets has been proposed and placed in practical usage upon the surgical service in the preoperative preparation of patients needing gastrointestinal surgery. Miss Gertrude Thomas and her dietetic staff have always been kind and helpful with many wise suggestions. Miss Charline Stuebe has been most generous in her wholehearted collaboration and willingness to supervise the preparation of these several diets.* The two diets more commonly employed are known as University Hospitals Gastric Diets Number I and Number II.

*University Hospitals Gastric Diet Number IIA consists of 1,000 cc. of the Number II diet to which is added the filtered residue remaining from a pound of raw liver after homogenisation in a Waring blender. This mixture was employed in the preoperative preparation of severely jaundiced individuals with biliary disease requiring surgery. Our experience with this diet has been small. However, the daily ingestion of 1,000 cc. of this formula by an individual known to have cirrhosis of the liver and displaying evidence of impaired hepatic function, was followed by a progressive rise in the plasma protein values, permitting excision of a carcinoma of the sigmoid colon and a convalescence without event. On the average, patients tolerate this mixture somewhat poorly so that it is infrequently used at the present. Gastric Diet Number III is a non-residue diet which provides few specific benefits and we have, therefore, almost abandoned its usage. Gastric Diet Number IV contains 100 grams of crystalline albumin with 1,000 cc. of tomato juice for the vehicle. We have only sampled the possibilities extended by this diet. It is felt that by complementing the diet with

such a pure protein with so high a potential capacity to induce plasma protein regeneration, a pyramiding of benefits can be effected. A few preliminary observations have supported this thesis.

Table No. I

UNIVERSITY HOSPITALS GASTRIC DIET NO. I

| | | | | | |
|---|---|---|---|---|---|
| | | | | 2160 | Calories |
| | | | | 145.7 | Protein |
| | | | | 18.25 | Fat |
| | | | | 355.8 | CHO |
| | | P | F | CHO | Calories |
| 7 A.M. | (¼ cup str. oatmeal | 1.4 | 0.75 | 6.8 | 39 |
| | (3/4 cup skimmed milk | 6.6 | 0.6 | 9.0 | 66 |
| | *(Lactose 2 tbsp. | | | 16.4 | 66 |
| 9 A.M. | (Orange juice - 1 cup | 1.0 | | 31.2 | 128 |
| | (1 tbsp. lactose | | | 8.2 | 33 |
| 10 A.M. | (Skimmed milk powder - 4 oz. | 40.4 | 1.2 | 58.8 | 408 |
| | (Skimmed milk, lukewarm - 1 cup | 8.8 | 0.8 | 12.0 | 88 |
| | (Pureed peas - ½ cup | 3.3 | 0.2 | 10.1 | 55 |
| 12 M. | (Orange juice - 1 cup | 1.0 | | 31.2 | 128 |
| | (Lactose - tbsp. | | | 8.2 | 33 |
| 2 P.M. | (Egg nog: | | | | |
| | (1 egg | 6.0 | 6.0 | .0 | 78 |
| | (1 skimmed milk powder - 1 oz. | 10.1 | 0.3 | 14.7 | 102 |
| | (Lactose - 1 tbsp. | | | 8.2 | 33 |
| 4 P.M. | (Skimmed milk powder - 4 oz. | 40.4 | 1.2 | 58.8 | 408 |
| | (1 cup warm skimmed milk | 8.8 | 0.8 | 12.0 | 88 |
| | (Pureed peas - ¼ cup | 1.0 | 0.1 | 3.3 | 18 |
| 6 P.M. | (1 glass grape juice | .8 | | 44. | 176 |
| 8 P.M. | (Egg nog - same as 2 P.M. feeding | 16.1 | 6.3 | 22.9 | 213 |
| | Totals - - - - - - - - - - - | 145.7 | 18.25 | 355.8 | 2160 |

*Beet or cane sugar can be substituted.

Table No. II

UNIVERSITY HOSPITALS GASTRIC DIET NO. II

| | |
|---|---|
| Carbohydrates | 408.8 |
| Protein | 120.4 |
| Fat | 37.2 |
| Calories | 2446 |

| | CHO | P | F |
|---|---|---|---|
| Whole egg -6 | | 36.0 | 36.0 |
| Egg whites 2 | | 8.0 | |
| Skimmed milk powder - 4 oz. | 58.8 | 40.4 | 1.2 |
| *Lactose - 300 gms. | 300.0 | | |
| Skim milk - 1000 gms. | 50.0 | 36.0 | |
| 5 G Salt | 408.8 | 120.4 | 37.2 |

*Beet or cane sugar can be substituted

- - -

These diets, it is readily noted, are essentially of a high protein, carbohydrate, caloric low fat composition. In order to attain this standard it was appreciated that fortifying substances must needs be added to the orginary vehicles of fruit juices, soups, and eggnogs. Lactose was originally selected to augment the carbohydrate content, since there was evidence in the literature suggesting that it was less liable to induce a diarrhea than were other sugars. This finding has not been confirmed, and it is our impression that this problem is minimal where the dispensing apparatus is maintained thoroughly clean and properly sterilized at all times. In addition, the cost and lack of availability of lactose discriminate against its routine employment. When diarrhea has occurred it has been remedied, usually satisfactorily, and promptly by adoption of the above precautions and by the coincidental administration of paregoric in modest amounts. Casein has been selected to fortify the protein content, both because of its particular qualifications and due to its availability in quantity and at a reasonable cost. As noted earlier, the ingestion of this protein in quantity has the capacity to prevent the development of cirrhotic fatty liver in rats. Casein belongs to the class of complete proteins, i.e., those containing all of the essential amino acids. This becomes distinctly important when one recalls that all proteins are not equally effective nutritionally, since each contains varying amounts of the known twenty-three amino acids. Only the following ten of these are believed to be essential for growth and maintenance according to Rose: arginine, methionine, isoleucine, leucine, valine, phenylalanine, tryptophane, threoline, histidine. Since these ten amino acids are essential for normal cellular growth they probably also are a limiting factor in plasma protein regeneration. Although unequivocal evidence in support of this conclusion is still lacking, certain experiments of Madden and Whipple where basal diets were augmented with various combinations of essential amino acids, are strongly suggestive. Casein is also a very ample source of methionine which has been characterized by Miller, Ross and Whipple as the active fraction of the protein molecule effecting protection of the hepatic cell during chloroform anesthesia. This may be related to the provision of methyl groups from methionine for the synthesis of choline, a lack of which leads to fatty livers, hepatic dysfunction and even death.* Per 100 grams of fed protein, casein, however, according

*Derived from Table III

to plasmapharesis studies of Madden and Whipple potency or valence, only one third that of the most superior substance, beef serum, with regard to capacity to induce regeneration of plasma proteins. Weech obtained values for these same two substances which correspond rather well in view of his employing a wholly dissimilar experimental approach to this problem.

Table No. III

The Potencies of Various Food Proteins in Forming Blood Plasma Protein

| Reference | High Potency | Medium Potency | Low Potency |
|---|---|---|---|
| Rochester (Whipple and associates) | Serum, beef, 38 *<br>Serum, beef, dried, 28+ | Salmon bread, 24 *<br>Yeast, fresh, autoclaved, 23<br>Bran Flakes, 23<br>Kidney, pork, cooked, 22<br>Liver, pork, raw, 17-33<br>Kidney, pork, cooked, 19<br>Rice polishings, 19<br>Gizzard, 19<br>Thyroid, powdered, 19<br>Rice, polished, 19<br>Lactalbumin, 18<br>Skeletal muscle, beef, 18<br>Egg white, 17<br>Irish potato, powdered, 16<br>Salmon, 16<br>Liver, pork, raw or cooked, 15<br>Soy bean, 14, 8<br>Heart, beef, 13<br>Casein, 12<br>Liver extract, 12 | Spleen, 10 *<br>Red blood cells, dog, 10<br>Brain, pork, 8<br>Stomach, beef, 7<br>Salmon, canned, 7<br>Gelatin, 2, 9<br>Pancreas, 6<br>Kidney, pork, cooked, 6<br>Zein, 0 |
| Columbia (Weech and associates) | Serum, beef, 0.801 | Egg white, 0.613<br>Beef chuck, 0.475<br>Beef liver, 0.436<br>Casein, 0.388 | Gelatin, -0.093 |
| Yale (Cowgill and associates) | Serum protein, beef, 0.53<br>Casein, 0.45<br>Lactalbumin, 0.38 | | |

*Figures mean grams of new plasma protein resulting from feeding of 100 grams test protein.
Ratios are expressions of relative effectiveness.

Having adopted sugar and casein as the fortifying substances with which to augment the diets, they were then developed about the general scheme that one should be reasonably palatable, be served in divided portions every few hours daily, and that the other should possess a semblance of tastiness, and be of a consistancy to allow for continuous drip feeding when expeditious. Both were to be high protein, carbohydrate, caloric, low fat diets.

These diets have played an integral role in the nutritional preparation of surgical patients particularly the group with gastrointestinal disease. In general, almost any case of gastric carcinoma or gastric or duodenal ulcer can be segregated into one of the following categories:

1. Those cases exhibiting little or no pyloric obstruction receive the Number I diet by day and the Number II diet at night. These diets are supplied ad libitum and the patient is urged to accept 5000-6000 calories daily. Intakes far in excess of this value generally are well tolerated and frequently patients have averaged 7000-8000 calories per diem for two weeks or more. A few patients have accepted 10,000 calories in a single day without detectable untoward effects. Qualitative four-hour urine glucose determinations upon more than two dozen non-diabetics receiving an average of 5,000 to 6,000 calories daily, have indicated but a single instance of glycosuria. The weight gain in the absence of dehydration is generally small despite this plentiful caloric intake. A few basal metabolism studies upon these patients after just such a period of augmented feeding have yielded no positive evidence of an abnormally increased metabolism. Protein, with its high specific dynamic action, present in large quantitites may influence the total quantity of food substances ultimately to be stored in body depots.

2. Those cases with some degree of pyloric obstruction but less than complete are tried with limited quantities of the Number I diet by day and the Number II diet by night. From midnight to 8 a.m. no more feedings are given and the stomach is evacuated by nasal tube and the retention is accurately measured. Patients having aspirates of less than 300-500 cc. are continued upon this limited regime if the caloric intake approximates 3,500 calories daily. Those cases with more voluminous retentions are treated by intranasal drip of the Number II diet throughout the entire twenty four hours. This mixture is allowed to trickle slowly into the stomach and is carefully restricted to very slow flow rate as it passes drop by drop through a Murphey drip set up. In conjunction with this expedient are employed as ancillary measures atropine sulfate and phenobarbital sodium by hypodermoclysis every four hours. Mears has pointed out that atropine sulfate by hypo, materially reduces the quantity of gastric secretion; Merendino and Litow have noted a similar depression of gastric juice flow with phenobarbital sodium administered subcutaneously. These adjuvants we feel reduce the total bulk of fluid seeking an outlet through a stenotic gastro-duodenal aperture and thereby contribute to an adjustment to tolerable limits, the task of a decompensated stomach. In certain instances patients being treated by the Sippy regime have been noted to exhibit large amounts of gastric retention day after day, but following the employment of intragastric drip feeding of diet Number II via a nasal tube, the gastric retention frequently decreases materially in amount and occasionally disappears completely. This phenomenon while admittedly open to alternative explanations permits some interesting speculation. The Sippy regime is essentially a high fat type of feeding. One of the physiological responses noted after a fatty meal is an inhibition of gastric motility. This depression of peristaltic activity scarcely can be believed to promote gastric evacuation. Also in the Sippy method of treating ulcers the patient customarily gulps a two or three ounce mixture approximately every hour. The bolus carries down with it a complement of air and then is presented before the narrowed aperture. In our experience the stomach more efficiently evacuates its contents when called upon to handle a cubic centimeter or two every minute than when it must adjust for 60 to 90 cc. load all at once, periodically repeated.

With high grades of gastric obstruction it is frequently difficult ot even impossible to make a categorical diagnosius of ulcer or carcinoma by roentgen ray examination. It has been interesting to note in these cases that where the obstruction remains pronounced or complete under the therapy just outlined the lesion has most always been of a neoplastic nature. Given the opportunity ulcers exhibit a real inclination to relent in their obstructive manifestations.

3. Those patients with complete pyloric obstruction are prepared by supplying the nutritional needs, as best one can, through the intravenous and subcutaneous routes. The bulk of the daily caloric intake is provided by hypertonic glucose solutions (10-20%) in distilled water dripped intravenously at the rate of 100-125 cc. per hour through a fine calibre needle. 1500 cc. (yielding 1200 calories) should be injected over a period of about 12 hours and so it is preferable to insert the needle into a forearm vein away from the cubital fossa, and in such a position as to allow the arm a free range of motion. Use of a cubital vein with the arm hyperextended soon becomes acutely distressing for the patient, and in addition with the needle in this location any degree of flexion may readily lead to a paravenous infusion. With strongly hypertonic solutions this is a particularly undesirable complication. The caloric intake is further supplemented by the subcutaneous administration of at least 1,000 cc. of 5% glucose, either in distilled water or saline as determined by the electrolyte need. Protein is provided by the liberal daily intravenous use of plasma. One is frequently confronted with the fact that startlingly larger quantities of plasma than one would calculate are required to elevate depressed blood protein values to normalcy. It is apparent therefore that a very fluid equilibrium exists between plasma protein and the protein stores, so that small deficits in the former, mirror gross debits in the latter. Sachar, Horwitz, and Elman have calculated this ratio from canine experiments, to be 30-1 and the suggestion has been made that a reasonable approximation exists for man. Conversely, in the situation where ample stores exist there is a reservoir capable of replacing 40-60% of the total circulating plasma proteins in 12 hours after a sudden severe loss. Over a longer interval with repeated losses these depots may supply an amount of protein equal to 200-300% of the original total circulating plasma protein. A portion of the nitrogen requirements can be provided through the agency of intravenously administered amino acids. They contribute to the maintenance of a positive nitrogen balance but in the experience of Kremen and Wangensteen it was necessary to supply additional protein in the form of plasma to those patients receiving amino acids before this state could be achieved. Ravdin injected intravenously into man and dogs, acid and enzymatic protein hydrolysates, without correcting an existing hypoproteinemia. Elman has described results suggesting that hypoproteinemia can be corrected solely through the employment of sufficient quantities of amino acids. This finding is lacking of any universal confirmation to date. Despite the obvious handicaps imposed therefore on the individual seeking an adequate surgical preparation through parenteral feeding, it is usually possible to interrupt the patients autocanabalistic tendencies, provide a liver with ample glycogen content yet low in lipid, and correct partially any hypoproteinemic states. Such cases of complete obstruction are fortunately in the minority, for they require an inordinate expenditure of patience and time during the tedium of maintaining a prolonged intravenous feeding schedule.

4. Those patients with a bleeding ulcer: This category can be further subdivided into those cases with and without obstruction. In the former, our plan has been to start a continuous intra-gastric feeding of the Number II diet through an indwelling nasal tube. Objections have been raised of almost a hypothetical nature, inferring that the presence of a soft rubber catheter may provoke additional hemorrhage by prodding the clot from an eroded, but temporarily sealed, blood vessel. This aversion seems more chimerical than real. The presence of a nasal tube provides a feed-

ing schedule every minute, every hour, twenty four hours a day. This is of extreme importance for two reasons. By bathing the gastric mucosa with a protein mixture the resultant pH of the gastric contents is buffered to values where the acid and peptic effects are appreciably reduced. Kolouch has noted significant elevation of the pH of stomach contents with the continuous intragastric drip of Number II diet. Under such circumstances an initiation of the healing processes is conceivable and clinical experience has shown that in the absence of obstruction a gratifying number of bleeding ulcer cases can be deferred (days if necessary) until the judgment of the surgeon defines the moment for surgery, rather than a compelling mandate from uncontrolled bleeding. Secondly, and probably of co-equal importance, are the advantages accruing from a very adequate dietary intake. Persons so prepared who must be subjected to an emergency procedure exhibit a greater capacity to withstand both the effects of bleeding and the operation, than do those individuals starved as a part of the management of a bleeding ulcer. Blood transfusions are performed as frequently as is necessary to maintain the hemoglobin level at 10 grams or over in all cases. The problem presented by a bleeding ulcer with obstruction at times in any one individual case may seem almost insoluble. Because of the obstruction, feeding by this route may avail little or even be impossible and bleeding in such circumstances has been very difficult to control. We have employed a saline solution of human thrombin instilled into the stomach and allowed it to remain in place for 20 minutes, repeated every six hours in a recent case of gastric hemorrhage. Coincidentally, and for the first time, there was an abatement in the bleeding. Conclucions are not justified from a single circumstance which may be merely fortuitous, yet it merits repetition. In conclusion one can affirm that the decision whether and when to operate on certain patients in this category comes close to divine reckoning.

The University Hospitals gastric diets Numbers I and II have been found applicable for the preparation of patients with neoplasms of the large bowel. Entirely without foresight or deliberate selection these diets possess a relatively low residue, but definitely are not non-residue diets. The stool bulk, even after the ingestion of large quantities of diets Numbers I and II, is moderate and usually can be satisfactorily evacuated with cleansing enemas in the final preoperative preparation of the bowel. In general, a caloric intake of 5,000-6,000 calories daily is sought, with the patient taking whatever reasonable proportions of the diets Numbers I and II have the greatest personal appeal.

Unfortunately, no precision measurements are available to guide the surgeon in deciding on the length of time each case should be fed these diets. However, it can be readily appreciated from the foregoing discussions that the loss of body weight is of paramount importance in this calculation and specifically the percentage of body weight is the greatest single determining item we know of to date. It is appreciated that the following are quite empirically selected temporal estimates, but experience gained with the application of these time intervals suggest they are at least long enough to permit an adequate dietary preparation for the most extensive types of surgery.

1. Where the percentage body weight loss is 5-10%, three to five days of feeding is sufficient.

2. Where the percentage body weight loss approaches 20%, 10 to 12 days of feeding are necessary.

3. Where the percentage body weight loss approximately 25-30% nearly three weeks of adequate feeding are required.

4. Percentage weight losses in excess of 35% enjoin at least a one-month interval of thorough feeding. Patients with very large percentage weight losses prepared according to this schedule customarily are discharged from the hospital after about the same length postoperative sojourn as those without such a

handicap to overcome. Days spent in insuring a proper preoperative feeding period, where indicated, culminate in more therapeutic successes than if similar periods were spent on a prolonged postoperative convalescence.

## Summary

In summary, it can be stated that the application of well known and carefully acquired biological information on nutrition to the preoperative preparation of surgical patients has been woefully neglected.

The therapeutic problems presented by starvation states with the attendant fatty livers and hypoproteinemia have been the concern of the surgeons working on the gastrointestinal surgical service of the University of Minnesota Hospitals for nearly the past two years. High protein, carbohydrate, caloric, low fat diets have been developed with the collaboration of the dietetic staff. Routine use of these diets has appeared to exert very beneficial effects in correcting the pathological changes secondary to an inadequate, poorly selected caloric intake. In addition, information has been acquired in the fields of protein metabolism and hepatic function. Many new problems inviting a closer experimental scrutiny and future consideration have arisen. We are particularly anxious to secure more precise measurements on the rate of reversal of pathological cellular changes in the liver, and on factors most intimately accelerating protein anabolism.

## Conclusions

1. Patients with gastrointestinal disease frequently show clinical signs of malnutrition. The employment of high protein, carbohydrate, caloric, and low fat diets has proved to be of therapeutic value in the preoperative care of these individuals.

2. In cases with complete pyloric obstruction an adequate preoperative care can often be satisfactorily effected by means of parenteral feedings of glucose and protein.

3. The employment of a continuous intragastric drip of the Number II diet has been particularly worthwhile in the management of bleeding ulcers.

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III. GOSSIP

Good News for all! The Center for Continuation Study will be vacated by the Army group, Wednesday, January 19th. The move has been contemplated for the past six weeks and plans are already under way for restoring the interior for civilian use. Winter programs which have been scheduled for hotels will be given off-campus until such time as the remodeling is complete. It is expected that courses will be resumed in the latter part of February. The army unit which has occupied the building for the past six months will move to Shevlin Hall. Watch for announcement of many new courses. There is much talk these days of post-war plans, but until such time as large numbers of physicians return from service, the program of Continuation Study will adequately take care of the situation. In this way we will also learn something of the techniques required -- War-Time graduate Medical Meetings are held every two weeks in Minneapolis (Fort Snelling and Wold-Chamberlain, Des Moines, (Fort Des Moines and Camp Dodge) Clinton, (Schick General Hospital). Faculty is selected from University of Minnesota Medical School, Mayo Foundation, and State University of Iowa College of Medicine. Speakers to date include O. H. Wangensteen, C. J. Watson, Wilbur R. Miller, Arlie R. Barnes, C. D. Creevy, William F. Braasch, H. E. Michelson, Paul A. O'Leary, Frank H. Krusen, M. E. Knapp, S. A. Weisman, Leo G. Rigler, Charles A. Slocumb, P. S. Pelouze. The usual plan is to send one or two speakers who spend the day on the service involved, and who speak to the general staff in the evening. The plan seems to be working very well....The Division of Dermatology has just received a grant from Minneapolis Honeywell to study Industrial Dermatoses. Congratulations! ...The Center for Continuation Study announces a course in Otolaryngology for physicians who limit their practice to ophthalmology and otolaryngology. February 7-11, 1944. Registration limited to 50 physicians. The faculty will include: Oscar V. Battson, Instructor in Laryngology, University of Pennsylvania, School of Medicine, Professor of Anatomy, Graduate School, University of Pennsylvania. Paul H. Holinger, Associate in Bronchoscopy, Department of Otolaryngology, University of Illinois, College of Medicine. John R. Lindsay, Associate Professor of Otolaryngology, Head, Division of Otolaryngology, University of Chicago Clinics. Theodore E. Walsh, Professor of Otolaryngology, Washington University, School of Medicine. Lawrence A. Boies, Professor of Otolaryngology, University of Minnesota Medical School, and associates in the Medical School and the Graduate School...Word was received in December from the "Gopher Hole" in Tennessee, otherwise known as the Southern Branch of the University of Minnesota, that our men on duty there have received commissions in the army. From now on they should be addressed as follows: Major C. E. Rea, Major F. L. Bryant, Major A. A. White, Major J. M. Ryan, Captain E. G. Olson, Captain W. C. Bernstein, Captain John Enoboe, 1st Lt. A. T. Hays, 1st. Lt. L. L. Kallestad, 1st Lt. W. C. Keettel, 1st Lt. B. J. Mears.....This week to speak at the Skylight Club. Founded in 1890, it has had an interesting existence. In the beginning it met in an artist's loft. In later years it has met in it's own building at 123 So. 12th St. It's roster includes most of the names of our first families, plus a liberal representation of physicians and University Staff members. A man's meal is served in their dining hall following which the doors are locked as the Treasurer collects. When the books are audited, the doors are opened and they take comfortable chairs around the fireplace as they yield to their guest speaker. A delightful spirit of informatlity prevails and much good discussion is provoked.

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