

## NEWER POSTOPERATIVE TRENDS\*

DEWITT C. DAUGHTRY, M.D.

Instructor in Surgery, Medical College of Virginia

RICHMOND, VIRGINIA

IN discussing a topic of such broad scope only the more important advances can be given due consideration. There have been a great number of recent new and improved conceptions. It is difficult to discuss postoperative care without mentioning preoperative care, as it is usually a continuation of the latter. At the outset the uncomplicated postoperative course will be considered.

### NUTRITIONAL CONSIDERATIONS

One is so often preoccupied with the primary or specific treatment of the disease that details such as dietary management are entirely forgotten.<sup>1</sup> Regardless of all other factors involved, the patient cannot be expected to have a smooth and uneventful convalescence unless proper nutrition is maintained. Food, water, minerals and vitamins are indispensables.

Food in order to be of value must be ingested, absorbed and metabolized. Often large meals are offered the patient but one seldom takes the trouble to note how little is ingested. Failure to take food may be due to weakness, anorexia, nausea or discomfort. The reason should be ascertained and analyzed. Adequate calories, minerals, vitamins and proteins can be given in the form of a fluid diet.<sup>1</sup> Practically all foods with the exception of milk are transformed into fluids upon reaching the stomach. Solid foods may be tolerated much earlier than usually prescribed and, in fact, will often help relieve distention and cramps. They should be given as early as possible. In other words, food should be taken in the usual manner as early as possible. Fruit juices and milk are not often well tolerated

during the early postoperative course as both have a tendency to be gas forming. Fluids given should be warm or at room temperature. Mild alcoholic beverages are often well tolerated by chronic alcoholic patients. It is good psychology to give small feedings and let the patient ask for more. It makes them think they are really improving.

Water requirement varies a great deal and is dependent on many factors such as the nature and severity of the illness, body temperature, atmospheric temperature, and whether there is vomiting or increased loss of fluids.<sup>1</sup> The required fluid intake of an ill person varies from 3,000 to 7,000 cc. daily.<sup>1</sup> A moderately ill individual not losing a large quantity of fluids may need only 3,000 cc., while another with a high fever, vomiting or losing large quantities of fluids, or one who is dehydrated may require a much larger fluid intake.

The urinary output is a good index as to whether the fluid intake is sufficient. The urinary output should be sufficient to excrete the waste products without depleting the water stores in the body. The daily urinary output should be at least 1,000 cc. and preferably 1,500 cc. The specific gravity for the twenty-four-hour specimen should not exceed 1.020.<sup>1</sup>

Mineral metabolism is of importance in the management of the postoperative patient; however, in this paper the discussion will be confined to sodium chloride. When the salt intake is insufficient, water is not retained in the body because of salt depletion and dehydration ensues.<sup>1</sup> It is fairly well established that a sodium ion

\* From the Surgical Department of St. Mary's Hospital, Duluth, Minnesota. Presented before the Duluth Surgical Society on April 27, 1944.

depletion predisposes to circulatory failure. There is also decreased thirst, appetite and general vigor of the individual.<sup>1</sup> The normally functioning kidneys selectively retain sodium and chloride ions, while the poorly or abnormally functioning kidneys continue to excrete both regardless of salt intake. Salt depletion may result from persistent vomiting, diarrhea or excessive perspiration. The normal salt intake should approximate 5 Gm. but this should be almost doubled in a sick individual because of the increased amount of fluids lost. Salt may be easily given in the diet and fluids ingested. If in doubt as to the salt intake or retention, a blood chloride determination will give the answer.

Vitamins are essential to the maintenance of health and it is obvious that they are likewise essential for smooth convalescence. It should be remembered that certain diseases decrease vitamin absorption and increase their excretion as well as requiring increased amounts for tissue repair. The best preventative against vitamin deficiencies is a generous, well balanced diet.<sup>1</sup> In many postoperatives that is not possible, therefore, vitamins must be furnished by other means. Various forms of vitamins may be given by mouth early in the postoperative course but it should not be forgotten that often the purpose is defeated by destroying or decreasing the already inadequate 'appetite. Vitamins are probably better given parenterally during the early postoperative course.<sup>1</sup>

The problem of food intake should be further analyzed. It is well known that protein is indispensable and cannot be replaced by other foods. The normal individual requires a protein intake of approximately 1 Gm. per kilogram of body weight per day. In a well person the protein intake can be reduced somewhat if a high caloric diet is administered. When it comes to seriously ill individuals the protein requirement often rises to three or four times the normal, of which very little can be replaced by other foods.<sup>1</sup> Thus, the neces-

sity arises for giving proteins in large enough quantities to prevent protein depletion. If protein depletion takes place, liver damage is sure to follow with resulting depletion of serum proteins, and this in turn produces nutritional edema. Those who are familiar with the Japanese atrocity stories will remember that most of the prisoners of war are reported as being edematous. Their diet is chiefly rice and proteins are nil. Every effort should be made to administer high protein diets in seriously ill patients and in patients who are expected to have a prolonged convalescence. It is suggested by one investigator that the anti-body reaction may be closely associated with protein metabolism.<sup>2</sup> We realize now that solid foods may be tolerated much earlier than ordinarily prescribed. Patients unable to take solid foods will often tolerate milk and eggs in their various forms. If there is a limitation to the amount and variety of food that can be ingested, the choice should be proteins.

Carbohydrates are necessary, but for a short period the body may subsist on an intake of 100 Gm. daily. This amount is probably sufficient to prevent ketosis. The remainder of the calories may be derived from protein breakdown and from fat stores in the body.<sup>1</sup> However, in serious illnesses such a gamble should not be taken, and the intake should approximate 300 Gm. of carbohydrates daily. It is important to remember that vitamin B<sub>1</sub> is necessary for proper carbohydrate metabolism.

The required fat intake is variable depending upon the amounts of proteins and carbohydrates taken. If the above are taken in sufficient quantities, fat can be regarded as almost dispensable. Let it not be forgotten, that fat may be advantageously given under certain circumstances for it is high in calories and may be useful when the amount of intake is limited.<sup>1</sup>

Oral feeding is often impossible or it may be unwise to attempt to maintain

proper nutrition without resorting to other routes. One's ingenuity may be taxed in attempting to maintain the nutritional state in certain postoperative cases such as peritonitis, paralytic ileus, intestinal obstruction and many others. Parenteral feeding, including tube feeding, is gaining a great deal of recognition. Tube feeding should not be resorted to until all other means or attempts at getting the patient to take the necessary food have failed. Patients will often begin eating if told that tube feeding will be discontinued when adequate food is taken by mouth. If gavage be necessary, the feedings should be small, nutritious, warm and injected very slowly. Amigen,\* an hydrolysate of casein, is a good form of protein and is usually well tolerated. This form of food may be given by mouth, by gavage, intramuscularly and intravenously. It should be added that there are other parenteral protein products on the market. Parenteral feedings are substitutes and only substitutes for normal eating.<sup>1</sup> They should be given only when definitely indicated. All surgeons realize that parenteral feedings are absolutely necessary in certain cases and should be begun early and before serious dietary depletions have resulted. This method of feeding should be cautiously prescribed and administered with the greatest of care. The speed of administration depends upon the route used and the substance being given. If administered too rapidly, serious reactions may result and if given too slowly, undue fatigue and exhaustion may result. The fluid intake should be sufficient to replace water lost by breathing, from the skin, vomiting, diarrhea, urine, exudation and transudation.<sup>1</sup> Parenteral fluids administered should contain enough salt to take care of the normal excretion plus any unusual loss, such as by vomiting or excessive perspiration. Isotonic saline may readily be administered subcutaneously and intravenously.

\* Amigen is an enzymic digest of casein and pancreas, containing amino acids and polypeptides. Mead Johnson & Co., Evansville, Ind.

Isotonic (5 per cent) glucose may be given subcutaneously but higher percentages can be given only intravenously. Let it be remembered that 5 per cent glucose in physiological saline cannot be given subcutaneously without untoward reactions because the combination of the two forms a hypertonic solution. Hypertonic glucose should be given slowly in order to prevent unnecessary damage to the vein walls, resulting in thrombosis. Furthermore, some patients complain of an uncomfortable fullness in the abdomen when hypertonic fluids are given rapidly. If large amounts of glucose are given by vein, they should be given in divided doses to maintain continuous utilization and to prevent undue excretion of glucose in the urine. Until recently, the only forms of protein that could be given parenterally were whole blood, plasma and serum. Great strides have been made and are in the process of being made along this line. Now, hydrolyzed proteins and mixtures of amino acids are available for parenteral use. The writer has used them in a number of cases and the results have been satisfactory. If given in sufficient quantities, nitrogen equilibrium may be maintained. Vitamins may likewise be given parenterally for prophylactic and therapeutic purposes.

#### GENERAL PRINCIPLES

Miscellaneous considerations should receive some mention. The abdominal cavity should not be irrigated. On the other hand, all blood and foreign material should be aspirated or removed by sponging. Peritoneal drainage is, as a rule, contraindicated.<sup>3</sup> Dressings should not be too large. They should be snugly applied but not tight, especially is that true of the upper abdomen. Cold applied to postoperative wounds often adds to the comfort of the patient.<sup>4</sup>

The position of the postoperative patient has received considerable comment recently. The trend is toward the Trendelenburg position, but each case should be individualized. Some surgeons believe that

fewer headaches follow spinal anesthesia when the semi-Fowler's position is utilized immediately postoperatively.

Wounds in vitamin c deficiency individuals heal slowly and with poor tensile strength.<sup>5</sup> Cod liver oil ointment applied locally to wounds is thought to stimulate granulation and epithelization.<sup>6,7</sup> It is not at all confirmed that the vitamin content is responsible for the healing qualities. Antiseptic, including alcohol, should not be placed in open wounds as wound healing is definitely prolonged. Normal saline solution is the most satisfactory agent to use for warm moist compresses. However, such applications should not be applied continuously because of maceration of the skin. X-ray therapy is often a valuable adjunct in the treatment of infections. Do not redress clean wounds until time for the sutures to be removed. Sutures should be removed on or about the seventh day and clips a day or two earlier.

Patients should be gotten up as soon as practicable. Following uncomplicated appendectomy, the patient may be allowed up in two to five days. An effort should be made to keep the patient's morale at a high ebb. Visitors should be few and the visits short. Visitors should not come to the hospital to tell their troubles or to be entertained.

The physician should see seriously ill patients at least twice daily. Sedatives should be given cautiously. Joints should not be immobilized longer than definitely indicated. The tendency is toward early motion following tendon repairs. Splinting of infected and injured extremities is an important surgical principle. Most deeply imbedded metallic foreign bodies should be treated conservatively.

The anesthetist should accompany the patient to his bed and should not leave him until a nurse has been detailed to remain until the patient is completely conscious. Often there are instructions which the anesthetist should pass on to the responsible nurse. Too many times a shy, inexperienced, student nurse, a nurse's

aid or an orderly is left in charge of an anesthetized patient. For practical purposes the patient might as well be left alone. It is desirable to have anesthetic recovery rooms in hospitals accommodating surgical patients. The patient should not be kept too warm because metabolism and fluid loss are thus increased. An electric aspirator should be by the bed of any anesthetized patient and should be used for aspiration of mucus or vomitus from the nose, mouth and throat.

Tracheotomy trays should be on all floors where postoperative thyroid patients are assigned. In fact, if complications are anticipated, the tray should remain in the patient's room for two or three days. Thyroidectomy wounds developing hematomas should be explored early. Lugol's solution is being given intravenously in an increasing number of postoperative thyroidectomy cases. Contrary to past opinion, sedatives should be used cautiously in these patients. Mild parathyroid tetany may be controlled by calcium lactate and ammonium chloride by mouth. If this treatment is unsatisfactory, resort to dihydrotachysterol. Stone and associates<sup>8</sup> claim some success with the use of parathyroid gland transplants.

Hand surgery is gaining its deserved place in the field of major surgery. The trend is toward guillotine amputation of extremities with application of skin traction by means of adhesive strips. In this manner less of the extremity is sacrificed. Local heat is contraindicated in most vascular lesions of the extremities.

#### SULFONAMIDES

Something should be said regarding the use of sulfonamides both prophylactically and therapeutically. The use of sulfonamides by mouth, parenterally and especially locally in wounds and in the peritoneal cavity for prophylactic purposes has gained much in popularity. Its value is not to be doubted in the treatment of certain types of lesions<sup>9,10,11</sup> especially war injuries. Sulfonamides are of proven

value in the treatment of many postoperative complications. The trend in civilian practice is away from the use of sulfonamides locally, including intraperitoneal use. Despite its use no surgical "short cuts" should be taken nor any additional daring procedures undertaken.

Well established surgical principles should be observed. In the past, sulfadiazine administered by mouth or parenterally seems to have been more effective than other sulfonamides. At present sulfamerazine is being used in an increasing number of cases. Sulfanilamide is still considered by many to be the best preparation for local use. It is absorbed fairly rapidly and produces little foreign body reaction.

#### BLOOD AND BLOOD SUBSTITUTES

Much has been said recently concerning the use of blood and blood substitutes in surgery.<sup>12</sup> Whole blood and plasma are of undisputed value in postoperative care. The former is of greatest value in blood replacement whether due to blood loss or anemia. Many speak of its tonic effect upon seriously ill patients. To be of greatest value, whole blood should not be more than ten days old when used. Plasma is used in cases of acute blood loss when whole blood is not immediately available. Otherwise, plasma is of great value in: (1) prevention and treatment of shock; (2) in burns, as a prophylactic measure against hemoconcentration, and (3) in protein replacement and in the building of protein stores. Whole blood and plasma are often not given in sufficient quantities to gain the desired result; this is particularly true of plasma. When plasma is really indicated several units are usually needed. Hydrolysates of casein and mixtures of aminoacids are being used to a limited extent.

#### COMPLICATIONS AND TREATMENT

Postoperative complications, their treatment and prevention deserve due consideration. Despite the use of sulfonamides, blood transfusions, improved anesthesia,

improved surgical technic, penicillin and scores of other advances, complications are ever present and must be dealt with as real surgical problems.

One of the most common postoperative complications is atelectasis. Patients with upper respiratory infections should not be subjected to elective surgical procedures. In the majority of cases of atelectasis the amount of lung involved is small and the only proof is the x-ray evidence. The first indication that the patient has atelectasis is a sharp rise in the temperature and pulse rate during the first or second postoperative day. The patient often expectorates a plug of mucus and proceeds to an uneventful recovery without anyone suspecting what has really taken place. In patients with massive pulmonary collapse the temperature rises suddenly to 104° or 105°F. and sometimes much higher. The pulse rate increases correspondingly and the patient becomes cyanotic and dyspneic. These cases require immediate active treatment. In the conservative treatment, steam inhalation and expectorants are thought to be of value. The least that should be done is to support the wound and have the patient cough frequently. The patient's position should be changed frequently. The best position is on the uninvolved side, which is more often the left. As a rule, the patient cannot tolerate this position for any length of time. The treatment of choice is immediate bronchoscopic aspiration and repeatedly in some cases. Tracheal and bronchial aspiration before leaving the operating table, less sedation, frequent change of position, breathing exercises and the use of carbon dioxide inhalations will prevent atelectasis in the majority of cases. Casually written orders are not sufficient. The situation must be adequately explained to the nurse in charge of the patient.

Pneumonia will not be discussed in this paper because it is, without doubt, a product of atelectasis in the majority of instances. In other words, primary postoperative pneumonia is uncommon.



One of the most important problems in surgery is the prevention and treatment of paralytic ileus. Its presence to a variable extent is almost 100 per cent following intra-abdominal and renal operations. The cause is probably reflex. Gentle manipulation of the viscera is a great factor in its prevention. The careful use of retractors should be stressed. This complication should be anticipated in many cases and prophylactic measures instituted. The prophylactic and early use of intestinal suction is an important factor in preventing or minimizing this frequent and troublesome complication. It should be added that gastroduodenal suction is of very little value. No drugs are of proven value. Prostigmine is of questionable value as a prophylactic measure and appears to have no beneficial effect after ileus has manifested itself. The present treatment consists of maintaining fluid and nutritional balance plus instituting intestinal suction. The latter is a life saving measure in many cases and should be instituted early. The tube of preference for intestinal suction is a double tube<sup>13</sup> rather than a double lumen tube. Eight to ten feet of tubing will usually traverse the entire small intestinal tract. The tube should be placed into the duodenum under direct fluoroscopic vision and then advanced at least two or three inches every hour until the lower ileum is reached. It should be added that this procedure is tedious and time consuming but can practically always be accomplished. Recovery is usually rapid and uneventful if proper treatment is used.

Acute gastric dilatation is closely related to ileus and is treated by gastric lavage and by continuous suction if the condition recurs. Often gastric suction is necessary in addition to small bowel decompression. Local heat to the abdomen is of no proven value in stimulating peristaltic activity or in any way decreasing distention.

Peritonitis is a serious complication and requires judicious treatment. Acute bacterial peritonitis should be treated as described above and with a few additional

measures. Sulfonamides should be administered parenterally in large doses. The patient should be well sedated, in fact, almost to the stage of somnolence. It is imperative to maintain proper fluid and nutritional balance. Frequent small whole blood transfusions are indicated. The semi-Fowler's position is the most desirable. If the patient recovers, localization as a rule takes place. The most common site of localization is in the pelvis. Pelvic abscesses in the female should be drained through the posterior vaginal fornix. Drainage in the male should be through the rectum. Other abscesses should likewise be drained extraperitoneally. An exploratory aspiration should not be performed when a subdiaphragmatic abscess is suspected because of the danger of contaminating the pleural cavities and spreading the infection to uninvolved portions of the peritoneal cavity. Simple, early postoperative intestinal obstruction is usually caused by some inflammatory process or plastic adhesions. Practically all of the inflammatory ones and a large percentage of the early adhesive ones will be completely relieved by intestinal suction. Very little time will be lost if the above treatment does not relieve the symptoms. Patients should be followed with frequent x-rays to help determine whether a closed loop exists. If the above treatment does not relieve the symptoms, it should be assumed that a closed loop exists and an exploration should be performed through another incision. It is poor judgment to believe that the risk of a few hours of properly directed conservative treatment is too great. Intestinal decompression by continuous suction, as a rule, simplifies operations for intestinal obstruction. Careful surgery, including peritonealizing raw surfaces, will eliminate many cases of postoperative intestinal obstruction. The above may not be the treatment of choice in intestinal obstruction occurring several weeks postoperatively.

No discussion of postoperative treatment would be complete without some

mention of dicumarol and its clinical evaluation. A great deal has been said and written concerning the use of dicumarol in the prevention and treatment of thrombophlebitis and phlebothrombosis. It is thought that some biochemical or physiochemical change takes place in the blood on or about the sixth postoperative day causing increased blood clotting; however, venous stasis is the most logical etiological factor in the production of the thrombo-embolization. Phlebothrombosis and thrombophlebitis are serious complications and the consequences may be fatal. It is estimated that 1 per cent of major surgical cases develop pulmonary embolism, having its origin in the above mentioned conditions. Embolism is more common following phlebothrombosis than thrombophlebitis because the clot is not as firmly adherent to the vein wall, thus becoming more easily dislodged.<sup>14</sup> Before proceeding to the treatment of the venous complications, something should be said about their prevention. It is a proven fact that such complications are usually due to an improperly managed postoperative course. Until comparatively recently patients upon returning from the operating room were told to remain perfectly quiet in bed and were "snowed under," so to speak, with sedatives for three to seven days. All surgeons realize now that this was ill advised. It is realized that venous stasis and dehydration are important factors in the production of venous complications. It should be stated that thrombosis probably precedes any change in the vein wall.<sup>15</sup> After the thrombus forms secondary inflammatory changes occur. We must take active steps toward the elimination of the known etiological factors. Deep breathing and leg exercises are of indisputed value. However, this complication still occurs in some postoperative patients despite the usual preventative measures. Here dicumarol has come to our rescue. The writer's<sup>16</sup> experience has not been so wide, but from his observations and from the wide acclaim in the literature,

it should be prescribed when trouble is to be expected. It is not without dangers and, therefore, should not be used indiscriminately. It is indicated in patients who have had extensive pelvic operations, operations in which there was probable trauma to large veins, cesarean sections, patients who have had previous venous or allied complications and following any other surgical procedure which might predispose to such complications.<sup>17</sup> The drug should be started on the third postoperative day using an initial oral dose of 200 mg. followed by 100 mg. the next day, but no more dicumarol should be given until after forty-eight hours, at which time an additional 100 mg. daily may be administered until the prothrombin time reaches 60 per cent of normal. The desired prothrombin time is 60 to 30 per cent of normal. It must be emphasized that daily prothrombin determination must be performed and the drug given accordingly. Prothrombin time should remain elevated until the patient becomes ambulatory and then it should be allowed to return gradually to normal.

Therapeutically dicumarol should be given in the same manner, observing the above mentioned precautions. When an unexplained fever develops during the postoperative course thrombophlebitis or phlebothrombosis should be suspected and a diligent search made for its detection. Treatment should be instituted immediately upon making the diagnosis. The course of the complication may be greatly shortened and the patient be made more comfortable. Dicumarol is, of course, to be used only as an adjunct to other therapeutic measures known to be of value. The only serious untoward reaction reported from its use is a bleeding tendency, which is chiefly into the operative wound. This is not common and does not present a major problem. The bleeding tendency which develops in a small percentage of cases can be effectively combatted by fresh whole blood transfusions and accord-

ing to some recent writers, by the use of large doses of vitamin K.<sup>18,19</sup>

Wound disruption is a serious but uncommon complication of the postoperative course. Prophylactic measures are of utmost importance. Dietary deficiencies should be corrected to the greatest possible extent preoperatively. Special attention should be given to the replacement of proteins and vitamin C. Vitamin A is also thought to be a factor in the proper healing and tensile strength of wounds. Often it is not possible to postpone operations until the various deficiencies have been corrected, and in such cases special postoperative measures are indicated. Nitrogen balance may be properly maintained and vitamin deficiencies corrected by parenteral feedings. Other important factors which may be responsible for the production of eviscerations are: (1) hematomas in the wound; (2) wound infection; (3) sensitivity to catgut;<sup>20</sup> (4) use of continuous suturing; (5) abdominal distention; (6) persistent coughing or vomiting, and (7) improper approximation of tissues.

When wound disruption occurs it is truly a surgical emergency. The patient should be immediately taken to the operating room and a secondary closure performed. In many cases it can be satisfactorily accomplished under local anesthesia. The closure of choice is accomplished by the use of interrupted through-and-through non-absorbable sutures. The sutures should be placed close together.

Urinary tract complications are too commonly seen. In all probability most of these could be prevented by the proper use of the catheter. According to some recent investigations in the Navy, a great deal of urinary retention is psychic in origin and may be prevented by conscientious and properly trained hospital personnel.<sup>21</sup> Any postoperative patient who does not void every six hours or who voids only small quantities frequently should be catheterized. Overdistention of the bladder further depresses its ability to empty and opens the way for infection.<sup>22</sup> After infec-

tion is present it may be rather difficult to control, despite the most judicious treatment. Sulfonamides and other urinary antiseptics are of value.

#### SUMMARY AND CONCLUSIONS

An attempt has been made to correlate and summarize the newer postoperative advances into a readable thesis. The writer is not presenting these newer trends as original ideas, for a large percentage of them have appeared elsewhere.

Great emphasis has been placed upon the importance of nutrition and fluid balance in the smooth convalescence of postoperative patients. The treatment must be individualized to meet the presenting needs. The body metabolism should be disturbed as little as possible. Protein intake should receive precedence.

Emphasis should be placed upon the free use of blood and blood substitutes. Too often the amounts given are inadequate.

Unfortunately, since the advent of sulfonamides, blood plasma and many other additions to our armamentarium, the tendency is to forget many minor details which in a great part would prevent many of the common postoperative complications. Proper management of the postoperative course is at least as important as surgical technic. The frequent and early use of intestinal suction will go a long way toward shortening the convalescent period in many cases and is actually a life saving procedure in some.

Dicumarol, while still in the experimental stage, appears to have a promising future in the prevention and treatment of thrombo-embolization. It is presented as an adjunct to other therapeutic and preventative measures.

The author is greatly indebted to Drs. A. N. Collins, M. G. Gillespie and W. G. Strobel, Duluth, Minnesota, for assistance in the preparation of this paper.

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