

# A STUDY OF THE FACTORS INFLUENCING MORTALITY AND MORBIDITY FOLLOWING GYNECOLOGIC LAPAROTOMIES

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THE quality of an operator was formerly, and is to some extent even at present, judged by the complexity of detail in his procedures. It was a matter of pride for the operator to build up an elaborate program of treatment, every detail of which must be executed at an exact time and in an exact manner. Such a program defeated its own ends in that time was wasted, the energy of attendants misspent, and the patient's morale and actual physical condition seriously undermined. Observing these things, the writer undertook to evaluate, by use and omission, various procedures: with a view to eliminating non-essentials, and simplifying, to the greatest extent compatible with maximum efficiency, the management of gynecologic operative cases. These experiments were carried out on the private and personally operated clinic patients of the writer. A basis of comparison was afforded in the patients of other operators, whose cases were conducted in the orthodox manner of the time. It was very easy to discard many traditional details at once; other details required much study before they could be evaluated; and a few procedures of obvious practical value seem even now actually illogical. In the course of time a set of principles was evolved. The application of these principles has been attended by a marked reduction, and their violation by an immediate increase, of postoperative morbidity and mortality. The present study was undertaken for two purposes: first, to check statistically the accuracy of observations in regard to the various

factors involved; and second, to attempt to classify the causes of mortality as avoidable and unavoidable with a view to eliminating the former as far as possible. The charts of 4500 consecutive patients subjected to laparotomy for gynecologic lesions was reviewed, and the cases of postoperative morbidity and mortality carefully studied. All gynecologic laparotomies of the period were included, and the lesions comprise almost the whole range of gynecologic disease; except that laparotomies for cancer of the cervix were omitted on account of the gradual substitution of radium treatment for the Wertheim operation and the Percy heat treatment. To include these would obscure to some extent the real objects of the study. The great majority of the patients were charity clinic patients, in most of whom advanced and neglected conditions existed. In cases of this sort the disorganization of the pelvic structures, the involvement of intestine, and the reduced resistance of the patient tend to make the mortality much higher than in the case of private patients, who come to operation with much less advanced lesions and in better general condition. The writer has been fortunate in that he has had ample opportunity to assist and to observe the technique of every major operator whose work is included; of having acted as principal or as assistant in all but a relatively small number of operations in the last 3500 laparotomies of the series; and of having been in direct charge of the preoperative and postoperative care of all the patients involved during the same period, except

the relatively small number of private cases of other operators.

Taking asepsis for granted, the factors found to be of major importance in reducing mortality and morbidity may be listed as follows:

- I. Selection of cases for operation.
  - A. Avoidance of laparotomy in the active stage of infection of the genital tract.
  - B. Rigidly thorough general examination of the patient for temporary or permanent contraindications to operation, with appropriate consultation in regard to doubtful points.
- II. Preoperative care.
  - A. Avoidance of preoperative purgation.
  - B. Maintenance of a normal supply of nutrition and water as nearly up to the time of operation as possible.
  - C. Psychologic management, rest, and the reduction of emotional elements, especially of fear.
- III. The operation.
  - A. Selection of the anesthetic: Will the risk from the particular morbid conditions in this case plus the risk from the anesthetic be least with ether, with the gases, or with local or spinal novocaine?
  - B. Technique.
    1. Elimination of wasted time.
    2. Gentleness.
    3. Thoroughness.
    4. Protection of uncontaminated areas from infection.
    5. Completion of essential procedures as they arise.
    6. Conservation of warmth.
- IV. Postoperative care.
  - A. Rest.
  - B. Adequate supply of fluid (water).
  - C. Rational supply of food substances.

After careful consideration the writer has classified the causes of postoperative death as represented in this series as follows:

CONDITION	AVOIDABLE	UNAVOIDABLE
Ureteral occlusion	All cases	
Peritonitis and sepsis	Nearly all cases	A few cases
Shock		
Hemorrhage		
Adynamic ileus		
Cardiac failure		
Uremia		
Infection of respiratory tract (except embolic infection)		
Hyperthyroidism		
Diabetes		
Acute gastrectasis	Most cases	Some cases
Mechanical ileus		
Perforation of intestine		
Thrombosis	A few cases	Nearly all cases
Embolicism		
Acute yellow atrophy of liver		All cases
Sporadic cryptogenic infection (gas bacillus, etc.)		
Encephalitis		
Bacillary dysentery		

Five deaths occurred without cause discoverable at autopsy. In 3 of these the Wassermann reaction was 4 plus with both antigens; the other 2 occurred before the institution of the routine Wassermann. On this account we no longer operate upon patients with 4 plus Wassermann reaction (except when urgently necessary) until after thorough antiluetic treatment has been carried out.

#### PERITONITIS AND SEPSIS

The present rules of the service in regard to acute pelvic infection (streptococcus infection excepted) are as follows:

- I. No case of pelvic infection is to be subjected to laparotomy until the temperature has been normal for seventy-two hours, and does not rise after an examination by an instructor and two students: (a) except when a definite abscess is palpable through the abdominal wall and cannot be reached by posterior colpotomy. In these cases a short incision is made directly over the abscess, as low as possible, and drainage effected without opening into the peritoneal cavity beyond the zone of adhesions if this is possible; if impossible, the free cavity is carefully

walled off with a gauze dam before opening into the abscess proper.

2. Patients whose temperature does not subside within twenty-four hours after the institution of appropriate treatment are examined daily, very gently, by an instructor: if any abscess which can be reached by colpotomy is found, this operation is done at once (see above).

3. If fever does not subside in seventy-two hours, colpotomy is done, with very cautious digital exploration of the pelvic cavity for collections of pus which were not palpable on ordinary examination. In these cases pyosalpinges and infected cysts are opened by Hilton's method if this can be done without entering the abdominal cavity beyond the zone of adhesions.

4. Cases of recently active pelvic infection are drained by broad flat rubber dam drains at the conclusion of laparotomy for removal of diseased structures only when there are large areas of exposed and oozing tissue, when intestine or bladder has been injured, or when the field has been extensively soiled by serous or purulent exudate. In cases remaining within average temperature limits (under 100.6° F.) and without excessive drainage of blood or exudate the drains are removed in toto at the end of twenty-four hours. Otherwise the drains are removed at a rate of an inch a day, beginning seventy-two hours after operation.

Streptococcus and other tissue infections have been very rare, and for this and other reasons no definite value can be attached to our rule, which is as follows:

In known or suspected streptococcus infections operation is not done except after a period of several weeks of freedom from fever and leucocytosis, and in the presence of a normal sedimentation rate: except in the case of definite or incipient abscesses, which are drained by as direct an approach as possible, without attempting removal of diseased tissues.

Laboratory findings have proven disappointing as a guide to the proper time for operation in these cases. Two very high and constant leucocyte counts occurred in cases of uninfected ectopic pregnancy; there was no leucocytosis in many cases of pelvic suppuration in the febrile stage, and in these cases this did not represent a low resistance; there was no regularity at all in the findings in average cases. Polynucleosis varied somewhat more constantly with the severity of the infection. The sedimentation test has been positive in all cases of infection so far; but it was also positive in non-infected cases, the most rapid rate occurring in a case of ruptured pseudomucinous cystadenoma without infection. As a guide to the proper time for operation it was found impractical, as the return to normal requires a hospital residence far in excess of actual necessity and rational economic requirements.

The efficacy of the rules is shown by comparing the mortality rates in the following table:

TABLE I  
DEATH RATES FROM PERITONITIS FOLLOWING  
GYNECOLOGIC LAPAROTOMIES

	Per Cent
Service rate, all operators.	
First 3400 laparotomies (rules partly or not at all observed).....	2.23
Last 1100 laparotomies (effort at universal enforcement).....	0.73
<i>Every death in this last series followed a violation of the rules.</i>	
1215 laparotomies of operator X (rules not observed).....	2.83
400 laparotomies of operator W (rules partly observed).....	1.00
500 laparotomies of operator W (rules not observed).....	3.00
400 laparotomies of operator W (rules observed).....	0.25
<i>The sole death in this last series followed a violation of the rules.</i>	

SHOCK

We believe that the reduction of the incidence and of the severity of shock in our cases has been due to the following factors:

1. Elimination of wasted time in operation.

a. Prompt decision as to the operation required. Best accomplished by freeing and examining all affected structures before beginning any other procedure.

b. Standardization of technique. Steady progress to the completion of what has to be done on one side and then on the other without unnecessary switching from side to side. Observing a definite sequence of procedure. Securing all blood vessels before they are cut.

c. Elimination of lost motion. No gestures. A definite place on the tray for each instrument. Each instrument returned immediately to its place after use. Do all that has to be done with each instrument before laying it down.

d. Team work. Impossible without standardization of technique.

e. Cooperation with anesthetist.

f. Quickness of movement, a frequent source of loss of time unless under perfect control.

The effectiveness of the saving of time in operating is shown by the following.

TABLE II

DEATH RATE FROM SHOCK FOLLOWING GYNECOLOGIC LAPAROTOMIES

	Per Cent
First 800 laparotomies, all operators, average time over two hours.....	1.00
1215 laparotomies of operator X, same general methods, average time gradually reduced from one-hundred to fifty-five minutes.....	0.75

2. Gentleness. The earlier operators were extremely vigorous in their handling of viscera and in the packing-back of intestines with gauze in struggling patients.

The effect of gentleness in operating is shown by the following.

TABLE III

DEATH RATE FROM SHOCK FOLLOWING GYNECOLOGIC LAPAROTOMIES

	Per Cent
1215 laparotomies of operator X, a vigorous operator.....	0.75
First 900 laparotomies of operator W, a gentle operator, same average time and general conditions as for operator X.....	0.11
Last 400 laparotomies of operator W, all rules observed, average time thirty-five minutes..	0.00
Last 1100 laparotomies of Service, all operators, all rules observed.....	0.09

3. The elimination of the preoperative purge, the maintenance of a normal level of nutrition and of water in the body before

and after operation, the improved attitude of patients toward operation, and the conservation of warmth, have all contributed to the reduction of morbidity from shock.

HEMORRHAGE

It is a commentary on the thoroughness of all the operators whose work is involved in this study that only 1 death has occurred from postoperative hemorrhage, and that in a patient operated upon by an interne. Only 1 other patient is known to have had internal hemorrhage of a degree requiring treatment, following laparotomy.

CARDIAC FAILURE, UREMIA, INFECTIONS OF THE RESPIRATORY TRACT, DIABETES, HYPERTHYROIDISM, ETC.

These "medical" conditions are best avoided as postoperative complications by a thorough examination of the patient before operating; by consultation with appropriate specialists in doubtful cases; and by the judicious employment of laboratory and roentgen-ray aids to diagnosis and estimation of functional capacities. Neglect of these things is a very widespread fault; and a death from any of these conditions should call for a serious investigation of the case by the hospital staff. Errors of judgment will of course occur; and for this there is no remedy except such as lies in the continuous effort on the part of the operator to improve his knowledge, and his powers of observation and reasoning. It will be found that many cases, apparently inoperable on account of medical disease, may be converted into fair risks by proper preliminary treatment; and the medical condition much benefited by the removal of neoplasms, foci of infection, etc.

We have found spinal novocaine anesthesia an invaluable aid when operation must be done in cases with cardiac decompensation, acute or chronic infection of the respiratory tract, hepatic necroses, or advanced renal lesions. Its efficacy may be judged by the fact that no deaths occurred in the series of well over 200 laparotomies in which it was employed on the

ground that the cases were bad (often exceedingly bad) risks under inhalation anesthesia.

#### THROMBOSIS AND EMBOLISM

Thrombosis is less apt to occur if operation is postponed until after the subsidence of the active stage of pelvic infection; and, apparently, if the venous circulation is kept active by gentle exercises in bed; tensing the muscles, turning from side to side, etc. When thrombosis is established, it is probably better to maintain the part at rest, in order to lessen the danger of detaching emboli. In the case of enormous distention of veins (as in cases of fibromyoma uteri) ligation should be done well above the distended portion of the veins; in the rare instance of greatly dilated uterine veins, ligation of the hypogastric (internal iliac) veins may prevent an occasional death.

#### ADYNAMIC ILEUS

Our rule in regard to postoperative ileus which presents any serious difficulty of diagnosis between the adynamic and mechanical varieties, is to explore the abdomen promptly under spinal novocaine anesthesia. Very often after the spinal anesthesia is fully established the necessity for opening the abdomen disappears: large quantities of flatus and fluid are expelled, the distention subsides, and the absence of mechanical ileus is made evident. The apparent explanation for this is as follows: our method of giving spinal anesthesia produces a complete splanchnic block (the abdomen is never opened until anesthesia is complete to the sixth dorsal level); this blocking of the sympathetic nerves (which inhibit peristalsis) leaves the parasympathetics (which stimulate peristalsis) unopposed, and hyperperistalsis ensues, to last until the anesthesia wears off.

Adynamic ileus has virtually disappeared from the morbidity (except in the trifling form of gas pains without distention) since the discontinuance of

the preoperative purge and of rough handling and gauze packing of the intestines. Most fatal adynamic ileus will be found at autopsy to be due to diffuse peritonitis; but 2 deaths occurred from this cause in our series in which cases no peritonitis could be found at autopsy. In 1 of these cases the ileus had existed for several days prior to operation, in a patient with cerebellar tumor in whom the operation was done to check serious and intractable metrorrhagia from fibromyoma. This case would have received radium treatment if radium had been available at the time.

#### MECHANICAL ILEUS

All known fatal cases of intestinal obstruction following gynecologic laparotomy are included in this study, no matter how long after the operation the obstruction may have occurred, unless the obstruction could be shown to be due to some cause not connected with the previous operation or pelvic lesion. The majority of the 13 fatal cases occurred in patients who had left the hospital after an operative recovery and returned in advanced stages of obstruction. In such cases the mortality has been greatly reduced by the employment of jejunostomy or ileostomy under local anesthesia, followed by any necessary reparative work under spinal anesthesia after the subsidence of toxemia. Of 7 cases so treated, adjudged by all of us to be beyond any reasonable hope, 6 survived. The major operation in these cases is done under spinal anesthesia in order to prevent the superadding of a new adynamic ileus to inhalation anesthesia. The supply of an excess of sodium chloride seems to be a valuable adjuvant treatment.

#### ACUTE GASTRECTASIS

The best preventive of death from acute dilatation of the stomach lies in its early recognition and the prompt institution of curative measures. We do not consider that the routine use of gastric lavage immediately after operation is of much

service as a prophylactic. Lavage twelve and twenty-four hours after operation has seemed more effective. When the shock is marked strychnine and adrenalin or pituitrin should be given and hypodermoclysis started before passing the tube, and the contents of the stomach allowed to escape in small quantities with a rest between each. Two deaths occurred in cases in which this principle was not observed.

#### URETERAL OCCLUSION

This should virtually never appear as a cause of death and should be one of the rarest of accidents. It has occurred in the work of only 1 operator in this series. Immediate catheterization of the ureters in every case of postoperative anuria will clear the diagnosis, and measures to drain the urine should be taken before serious kidney damage has had time to occur. The condition constitutes a real emergency, and treatment must be undertaken at once. In neglected cases pyelotomy under spinal or local anesthesia is probably the best immediate treatment, relief of the occlusion or implantation of the ureters being done later when the patient is in better local and general condition.

#### MORBIDITY

No attempt has been made to tabulate statistics in regard to morbidity: the improvement was self-evident after the adoption of the principles of this paper. Peritonitis, shock, and adynamic ileus, except in the mildest forms, have virtually disappeared, the only serious exceptions occurring after violation of the principles. Superficial wound infection has been our greatest problem, but conditions in this respect have been very much improved with the abandonment of violent prolonged retraction; efforts to protect the wound from soiling have had very little demonstrable effect.

As regards the general well-being of the patient, the elimination of the ancient treatment-schedules which required "doing

something for" the patient every half hour or less, has been the greatest factor. The writer is convinced that he has seen patients die of sheer exhaustion from this cause who might otherwise have survived their shock or peritonitis or other morbid condition. The comparative status of patients operated upon under spinal anesthesia and under inhalation anesthesia is so noticeably in favor of the former that ward patients who have had opportunity to make comparisons invariably ask for the "needle in the back." This, with the infinite superiority of spinal anesthesia as regards mechanical conditions at operation, has almost persuaded us to adopt spinal as the routine anesthetic. We are deterred solely by the fact that no idea of its comparative safety can be obtained from individual experience, and, so far, the collated statistics are not conclusive. There have been no deaths in our series, and the only alarming symptoms have occurred when the rule of waiting for splanchnic block before opening the abdomen was disregarded.

The noticeably smooth convalescence of patients receiving large doses of morphine after injury to the intestine has led us to use morphine more freely and in larger doses than formerly. This is still under observation and no definite statement can as yet be made.

Attempts to feed the patient by mouth before peristalsis is normal, is a failure, and gives rise to much distention and toxemia. If sufficient food has been stored up prior to operation, none will be needed until a practically normal status as regards peristalsis has been regained; if this is delayed food may be supplied by intravenous or intrarectal injections of glucose solution.

Our whole system of postoperative treatment hinges on 2 essentials: rest, with which no non-essential is allowed to interfere; and an adequate supply of water by rectum, by mouth, and, if necessary, by hypodermoclysis. If these 2 principles are conscientiously effected the patient's resistive and recuperative powers are kept at a maximum.

## CONCLUSIONS

The death rate after gynecologic laparotomies should not exceed 1.0 per cent or 1.5 per cent in any considerable series of cases, and should be less in series of private cases. In the last 1100 laparotomies of this series, in which the attempt was made to enforce the principles stated in this paper,

the gross mortality for all operators was 1.8 per cent. For the laparotomies in which the principles were actually observed the mortality was 0.82 per cent.

Much unnecessary suffering and lasting injury after operation can be prevented by the observance of the simple principles enunciated in this paper.



It is interesting to note that birth-omens, which have been specially studied by Dennefeld and Jastrow, led to the pseudo-sciences of physiognomy and palmistry. They also stimulated the study of fetal and adult abnormalities, for all possible phases of parturition and abnormalities of the fetus were regarded as signs and tokens of the individual's future fate, as being the attendant phenomena of a new life issuing from another. . . .

Chloroform in obstetrics and labor was first employed by Sir James Young Simpson (1811-70) of Bathgate, Scotland, Professor of Obstetrics at Edinburgh in 1840. He also introduced the use of iron wire sutures (1858), the long obstetric forceps, acupressure (1850-64), the uterine sound (1843), the sponge tent, dilatation of the cervix uteri in diagnosis, "Simpson's pains" in uterine cancer (1863), and version in deformed pelvis.