CANCER OF THE COLON

The five- and ten-year survival rates following resection utilizing the isolation technique

Moynihan Lecture delivered at the Royal College of Surgeons of England
on
23rd June 1969
by

Rupert B. Turnbull, Jnr., M.D., F.A.C.S.

Department of Colon and Rectal Surgery, The Cleveland Clinic Foundation, Cleveland, Ohio, U.S.A.

LIKE ALL SURGEONS I feel a certain kinship to Lord Moynihan, through our late chief of surgery, Doctor Robert Dinsmore of The Cleveland Clinic Foundation. Dr. Dinsmore visited him at Leeds many years ago and came away with a wealth of knowledge and with a surgical philosophy that he passed on to us.

The title of my presentation would suggest that something new in cancer surgery has been brought forward. In truth, the idea that cancer could be spread by surgical manipulation is now more than 55 years old. What is new, is the presentation of clinical evidence that operative handling of a cancer-bearing organ (colon) may explain the continuing and constantly poor survival rates following resection.

Historical aspects

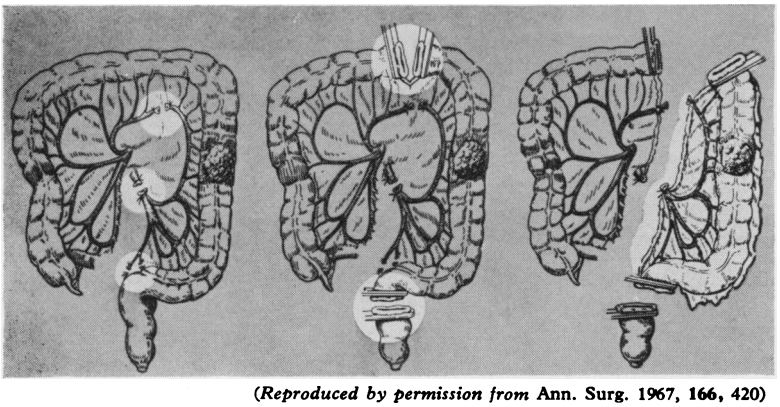
In 1913 Tyzzer,[1] working in the laboratory of the Cancer Commission at Harvard University, suggested that local trauma to cancers resulted in metastases. As an experimental model, he used Japanese waltzing mice and a spontaneously occurring cancer in that strain. The tumour was implanted in the chest wall. Digital trauma of these growing tumours produced extensive metastases as compared with control animals. Tyzzer concluded:

> 'Do the procedures followed in the course of physical examinations or surgical operations increase or diminish the incidence of metastases?... every physician should realize the irreparable harm which may result from the manipulation of malignant tumours.... I have repeatedly observed the palpation of the mass in question in repeated physical examinations, the violent scrubbing often employed in preparing the field of operation. It is almost identical with that which I have employed for the experimental production of metastases. It would be of advantage to the patient if each questionable tumour of the breast, for example, could be regarded as highly explosive, the least manipulation of which should be absolutely avoided both prior to and during the operation. It is not improbable that by this means metastasis and extension beyond the field of operation could be prevented and the percentage of cases cured by operation increased.'

In 1952 Barnes[2] described a 'physiologic' method for resecting the right side of the colon for cancer. He advocated ligation of the vascular pedicles and division of the bowel before handling the cancer-bearing segment to prevent traumatic spread of cancer through the veins and lymphatics.

In 1954 Cole, Packard and Southwick[3] reported finding cancer cells in the portal venous blood of a perfused resected cancer-bearing segment of human colon. This observation gave rise to their suggestion that the mesenteric veins draining the cancer-bearing segment should be ligated before significant operative manipulation.

In 1955 Dr. Edwin Fisher and I[4] reported cancer cells in the portal venous blood of 8 of 25 resected segments (for cancer) of the colon, and suggested that the cells had been scattered by operative manipulation. We had previously been so interested in this problem and its possible significance that in 1953 I altered my standard method of resection of the colon to one wherein the cancer-bearing segment was not manipulated or handled in any manner until after the lymphovascular pedicles were ligated and the colon divided at the elected sites for resection (Fig. 1).



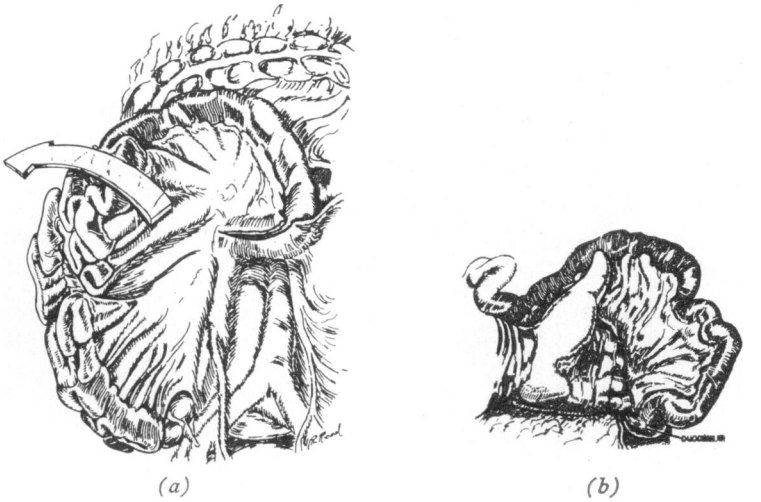
(Reproduced by permission from Ann. Surg. 1967, **166**, 420)

Fig. 1. No-touch isolation technique.

To emphasize the objectives of this method of resection, the name *No-Touch Isolation* was adopted. It was now found necessary to change time-honoured practices. For instance, a palpable abdominal mass discovered pre-operatively was immediately labelled with adhesive tape, DO NOT PALPATE, and the radiologist was asked to avoid manual (lead glove) manipulation during diagnostic barium enema. In the operating room, under anaesthesia, the skin of the abdomen was superficially lavaged, rather than prepared by ' scrubbing ', and when the abdomen was opened members of the operating team were not allowed to palpate the tumour. The question of resectability was settled by determining whether or not the pancreas or duodenum was directly invaded by tumour. Cancers of the right side of the colon deserve special mention since most of the locally incurable tumours occupy this segment. The method of resection of the right colon has been described elsewhere.[5] The small intestine is delivered from the abdomen (wrapped in silastic drapes) to

expose the duodeno-jejunal flexure (Fig. 2*a*). The peritoneum over the terminal duodenum is divided and a finger inserted along the lateral duodenal border from the third portion to the pylorus of the stomach (Fig. 2*b*). Any medial extension or fixation of tumour to the duodenum or pancreas is immediately discovered. At the same time the ileo-colic, right colic, and hepatic flexure mid-colic lymphovascular pedicles are ready for division and ligation as the first step in isolating the cancer-bearing segment (Fig. 3).

Cancers of the left side of the colon present fewer problems in determining resectability. Any attached or invaded organ can be sacrificed with hope for cure as long as the inferior mesenteric artery, the inferior



(*a*) (*b*)

(*Reproduced from Maingot, R.* (1969) Abdominal Operation, *by permission of Appleton-Century-Crofts, publishers*)

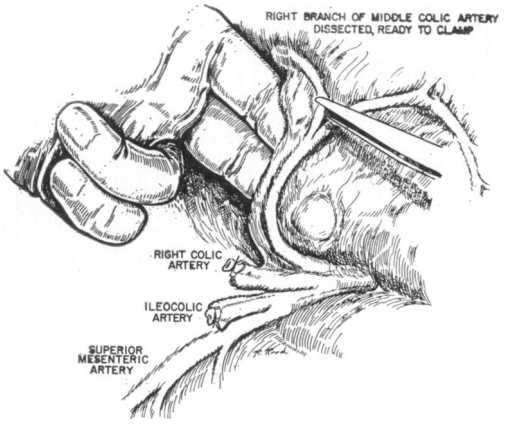
Fig. 2. (*a*) Right colectomy: isolation method. The small intestine is delivered out of the abdomen to expose the retroperitoneal duodenum. The overlying peritoneum is incised. (*b*) The lateral duodenal border is followed by the fingers of the surgeon who stands on the left side of the patient.

mesenteric vein at the ligament of Treitz and the splenic flexure division of the mid-colic artery are not directly invaded or fixed by tumour.

This report is based on a computer analysis of the results of the surgical treatment of 676 consecutive patients with cancer of the colon, admitted exclusively to the Colon and Rectal Surgery Department from 1950 to 1964. The number is increased by 12 over our original report[6] because of the inclusion of cases of a new departmental surgeon. The final survival rates are increased also because all rates previously reported[6] are here corrected for age. I am indebted to Mr. Kenneth Kyle[6] of Glasgow who, as a cancer scholar in 1966, reviewed the records of and traced 2,225 patients with cancer of the colon and rectum seen at The

Cleveland Clinic during those years. The statistical analysis of our data has been expertly handled by Dr. Frank R. Watson[6] and Dr. John Spratt[6] of the University of Missouri. Without my co-workers, this report would have been impossible.

Because this report is based on survival rates among patients with cancer of the colon treated exclusively at The Cleveland Clinic, the following patients were excluded from the study: patients with cancer in a polyp, with carcinoid tumours of the colon, malignancy other than adenocarcinoma, patients operated upon first at other hospitals, and patients not presenting themselves for treatment at The Cleveland Clinic Hospital. Of these, some were seen in consultation at other hospitals. A few declined to undergo surgical treatment or were operated on elsewhere.



(*Reproduced from Maingot, R.* (1969) Abdominal Operation, *by permission of Appleton-Century-Crofts, publishers*)

Fig. 3. The lymphovascular bundles are selectively ligated and divided. The small intestine has been returned to the abdomen for this manoeuvre.

Patients with cancer of the rectum and anus were excluded from the analysis because we have so far not been able to devise a method of rectal resection utilizing a *No-Touch Isolation* technique.

Cancers of the colon were defined as those tumours located at or above a point 14 cm. above the anus, as recorded at the time of proctosigmoidoscopic examination.

Pathology

Adenocarcinoma of the colon was divided into four clinico-pathological stages or classes.

Stage A—tumour confined to the colon and its coats.

Stage B—tumour extension into pericolic fat. No metastases to lymph nodes or distant spread.

Stage C—tumour metastases to regional lymph nodes but no clinical or radiological evidence of distant spread.

Stage D—tumour metastases to liver, lung, bone, peritoneal seeding of tumour; irremovable because of parietal invasion; adjacent organ invasion.

The histological grade of each tumour was recorded but was not included in the clinico-pathological staging of this report.

Most of the tumours were reported as Grade 3 or moderately undifferentiated. After operation, the pathological specimens were immediately fixed in alcohol-formalin and later were opened through the base of the tumour, and the depth of fat invasion measured and recorded. The mesenteric fat was cut into 3-mm. slices and the lymph nodes were dissected out and sectioned. No attempt was made to record the location of metastatic nodes in relation to the tumour.

The pathological reporting of specimens was consistently performed by the same three pathologists over the 15 years of this study, and I am indebted to John B. Hazard, M.D., Lawrence J. McCormack, M.D., and to William Hawk, M.D., for their diagnoses of the operative material.

Calculation of survival rates

Survival rates were calculated by the actuarial method, and life tables were prepared to show correction for age. The median ages are recorded on each life table for each stage of tumour. The age-corrected survival rates were calculated in the usual manner utilizing the life tables[7] State of ' Ohio ' white males 1959 through 1961.

Results

Six-hundred-and-seventy-six consecutive patients with cancer of the colon were operated upon utilizing the *No-Touch Isolation* method when resection was indicated. The proportions of stages of cancer were as follows:

Stage of tumour	*No. of patients*	*Percentage of patients*
A	103	15.2
B	212	31.4
C	156	23.1
D	205	30.3
Total	676	

All of the patients in Classes A, B and C underwent resection with intent to cure the tumour but, in Class D, only half the patients had resection. The operability rate was 96 per cent. The operative mortality was 2.2 per cent. It is to be noted that almost one-third of the patients operated upon belonged to the incurable category. Of the 676 patients, 21 were lost to follow-up observation and were presumed to be dead of their disease.

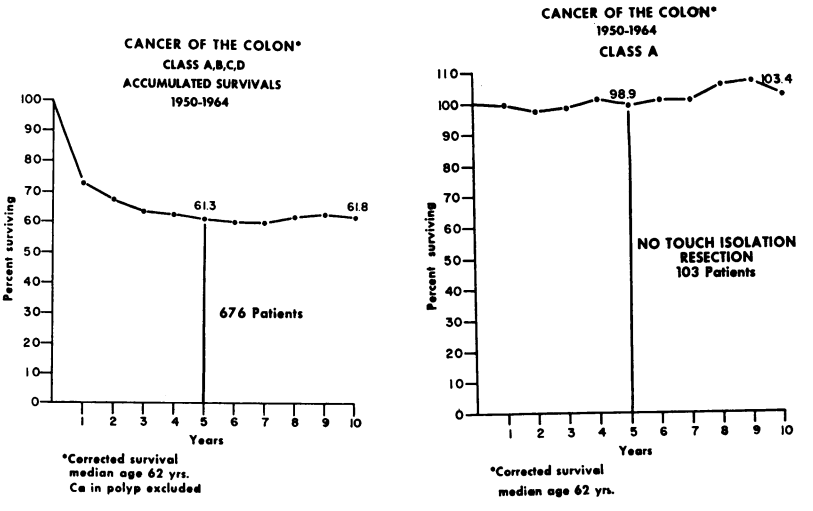


Fig. 4.

Crude survival rates—overview

The life table for Stages A, B, C and D cancers of the colon is shown in Figure 4 (*a*). The cumulative five-year survival rate (corrected for age) for the 676 patients was 61.3 per cent. Of the total, 205 patients, or 30.4 per cent, were judged to belong to Stage D. Nevertheless half of these underwent resection. I have already noted that all of the Stage A, B and C cancers were resected with intent to cure. The median age was 62 years.

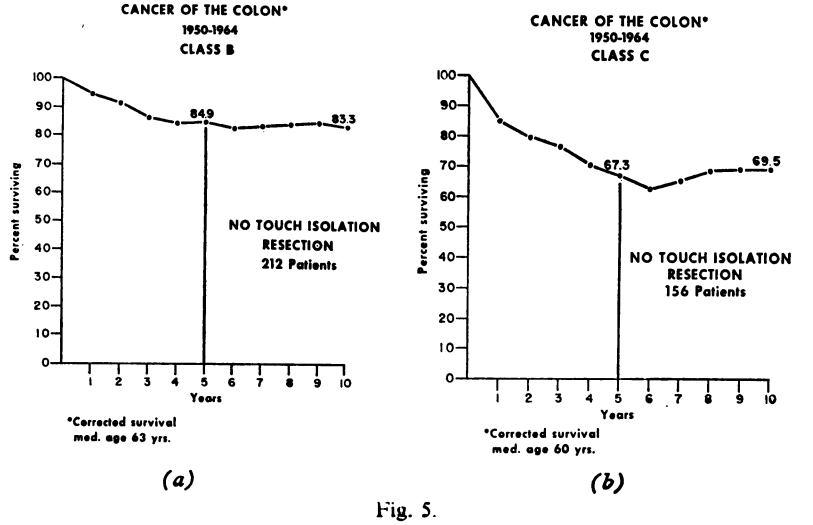


Fig. 5.

Survivals according to clinico-pathological stages of cancer

There were 103 patients with cancer of the colon who were judged to have Stage (Class) A cancers. All were resected with intent to cure. The age-corrected five-year survival rate was 98.9 per cent (Fig. 4*b*). The life table shows a false rise in the ten-year survival rate. This is due to the influence of correction for age on the diminishing number of patients after the fifth year. The median age was 62 years.

The life table for Stage (Class) B cancers of the colon is shown in Figure 5 (*a*). The five-year survival rate for 212 patients was 84.9 per cent. The cancers invaded the pericolic fat for a distance of $\frac{1}{2}$ cm. or less in 133 patients and over $\frac{1}{2}$ cm. in depth in 79 patients. The median age was 63 years.

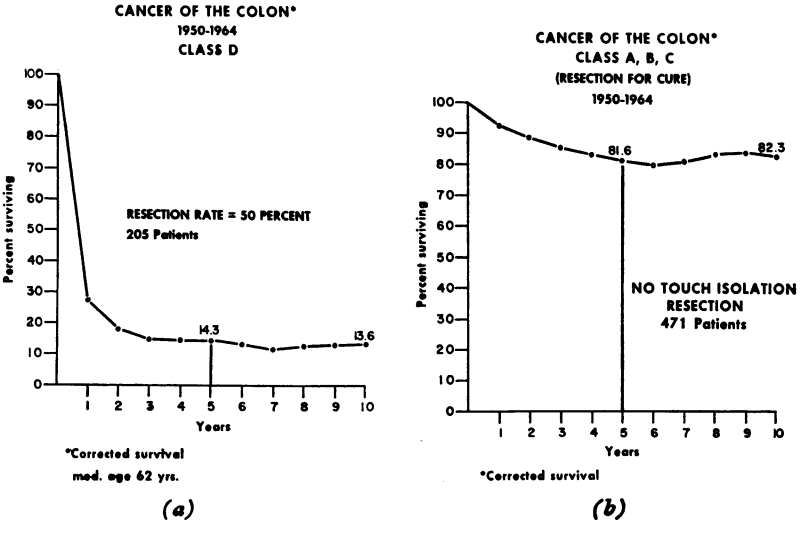


Fig. 6.

The life table for Stage (Class) C cancers of the colon is shown in Figure 5 (*b*). There were 156 patients who had one or more lymph nodes in the mesentery containing metastatic cancer. The five-year survival rate was 67.3 per cent. The median age was 60 years.

It is in Stage C cancers of the colon that we have most improved our survival rates by the *No-Touch Isolation* method of resection.[5] One might expect that cancers that have invaded the pericolic fat and spread to the regional lymph nodes are more easily spread through the veins and lymphatics by surgical manipulation than those tumours that are well localized.

The life table for Stage (Class) D cancers of the colon is shown in Figure 6 (*a*). There were 205 patients or 30.4 per cent of the total number

of patients that comprise this report. Half of these patients had resection on a palliative basis or with intent to cure whenever an adjacent organ was invaded by the tumour. The five-year survival was 14.3 per cent. The median age was 62 years.

Resection for cure

Figure 6 (*b*) shows the five- and ten-year survival rates for 471 patients having resection for Stage A, B and C cancers of the colon. In each instance, a *No-Touch Isolation* method of resection was used. The five-year survival rate was 81.6 per cent.

SUMMARY

It has been suggested that operative manipulation of a cancer-bearing segment of colon will increase the incidence of fatal metastasis. Since 1953, I have carefully avoided manipulation until the lymphovascular pedicles have been defined, ligated and divided, and the colon divided at the elected sites of resection.

We have modified the old pathological classification of cancer of the colon to include clinical components having to do with survival—thus a *clinico-pathological* classification: A, B, C and D.

The five- and ten-year survival rates following resection of colon cancer utilizing a *No-Touch Isolation* method are considerably increased (doubled), particularly Stage C cancers of the colon.

The *No-Touch Isolation* method of resection was utilized in patients with Stage A, B and C cancers of the colon from 1953 to 1964, with an age-corrected survival rate of 81.6 per cent. The evidence presented in this retrospective analysis suggests that the greatly improved survival rates, particularly in Stage C cancers, are due to the *non-manipulative* method of resection. It is suggested that the heretofore conventional *manipulative* resection techniques for cancer of the colon be abandoned.

REFERENCES

1. TYZZER, E. E. (1913) *J. med. Res.* **28,** 309.
2. BARNES, J. P. (1952) *Surg. Gynec. Obstet.* **94,** 723.
3. COLE, W. H., PACKARD, D., and SOUTHWICK, H. W. (1954) *J. Amer. med. Ass.* **155,** 1549.
4. FISHER, E. R., and TURNBULL, R. B., JNR. (1955) *Surg. Gynec. Obstet.* **100,** 102.
5. MAINGOT, R. (1969) *Abdominal Operations*, **2,** pp. 1660–1674. New York, Appleton-Century-Crofts, Meredith Corporation.
6. TURNBULL, R. B., JNR., KYLE, K., WATSON, F. R., and SPRATT, J. (1967) *Ann. Surg.* **166,** 420.
7. *Life Table for Ohio White Males* (1959–1961) No. 1252, vol. 2, no. 36, p. 500. U.S. Dept. of Health, Education and Welfare.