Surgical Treatment of Advanced and Recurrent Cancer of the Pelvic Viscera: *

An Evaluation of Ten Years Experience

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THIS STUDY was undertaken to determine the efficacy of total exenteration of the pelvic organs as treatment of patients with advanced pelvic cancer. The *en masse* removal of the rectum, distal sigmoid colon, the urinary bladder and distal ureters, the internal iliac vascular bundle, all pelvic reproductive organs and lymph nodes, and the entire pelvic floor with the accompanying pelvic peritoneum, levator muscles and perineum, constitutes total pelvic exenteration.[2] This operation is an "extended operation" or one which not only removes the tumor and its organ of origin but attempts to circumscribe the extensions of the tumor into contiguous organs and tissues. With a few exceptions, the operation has been used in the manner just defined in the patients of this study. Rarely was it possible to preserve the levator muscles and re-establish colo-anal continuity; in a few women the operation removed the iliac artery and vein on one side of the pelvis or other intra-abdominal viscera attached to the tumor. The ureters were implanted into an isolated segment of small intestine which conveyed the urine to an external appliance glued to the abdominal wall.[3, 4]

Two hundred eighteen exenterations of the pelvic organs were performed for advanced pelvic cancer or for complicaitons resulting from irradiation (9 patients) in the last ten years (March 1, 1950 to January 1, 1960). These are listed by indication for the operation in Table 1. Persistent post-irradiational carcinoma of the cervix was by far the most frequent indication for the operation.

Operative Mortality

The operative mortality (hospital mortality) was 11 per cent (25 of 218 patients undergoing pelvic exenteration). There were 15 operative deaths among the 150 women having the operation for carcinoma of the cervix (Table 2). The gradual reduction in operative mortality from 25 per cent during 1950 and 1951 to seven per cent (5 deaths in 75 operations in the cervix group) during the past five years has been the result of improved technical performance of the operation and improvement in the selection of patients (Table 3). Operating time and blood replacement requirements also have diminished, four hours and 2,000 to 2,500 ml. of blood are now the average operative requirement.

Complications

Exenteration of the pelvis is attended by a high incidence of complications. Tables 2 and 4 list the complications that resulted from pelvic exenteration in the 150 patients with carcinoma of the cervix. Complications in the remaining 68 patients having exen-

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TABLE 1. *Exenteration of the Pelvic Organs for Advanced Pelvic Cancers, 1950 to 1960*

Indications	No. of Patients	Operative Mortality	Five-Year Survival Rate (Based on Those at Risk Five Years)
A. Postirradiational carcinoma of the cervix*	150	15 (10%)	25%
B. Carcinoma of the:			
1) Rectum or sigmoid	31	6	31%
2) Endometrium	10	1	33%
3) Vagina (melanoma in 1)	8	1	0
4) Bladder or urethra	3	0	0
5) Ovary	3	0	0
6) Vulva or anus	2	0	0
7) Sarcoma prostate	1	1	0
C. Palliative operations for cancer of the cervix	2	1	0
D. Irradiation necrosis	9	1	75%
Total	218	25 (11%)	

* Three had exenteration of the pelvis as the initial treatment for advanced cervical cancer.

teration for other lesions were comparable. Sixty-nine of the 150 patients had 94 postoperative complications and 15 of them were fatal. Twenty-five of the 31 wound infections listed occurred in the residual pelvic defect. These defects were drained through the perineum so that the secondary infection was usually of minor consequence. Intestinal obstruction was by far the most serious postoperative complication. Five of the nine patients with intestinal obstruction who required re-operation did not survive. It is of interest that abdominal wound disruption has not occurred in any of the 218 patients who underwent pelvic exenteration. Stainless steel wire was always used to close the abdomen.

There were 59 complications in 40 of the 135 women who left the hospital after pelvic exenteration for carcinoma of the cervix (Table 4). Twenty-one other patients underwent further operations for the complications of recurrent cancer (i.e., intestinal obstruction or fistula formation).

Tables 5 and 6 list the complications attributable to urinary diversion. Three of the 15 post operative deaths in the 150 cervix patients appear to have resulted from complications involving this part of the operation. Two of the 135 survivors of the operation subsequently died of urinary tract complications, one of pyelonephritis and the other following ileal segment revision for progressive hydronephrosis and pyelonephritis.

Indications and Survival Results

Carcinoma of the Cervix: The most clearly defined indication for exenteration of the pelvic organs is cervical carcinoma persistent or recurrent after irradiation. Only three of the 150 women who underwent pelvic exenteration for carcinoma of the cervix had not had irradiational therapy; a few others had been previously treated by both irradiation and operation. Some of the 150 women had received inadequate initial irraditional therapy but were not considered for further irradiation because of the extent of the lesion and the presence of some persistent tissue irradiational changes. On the other hand, many patients had been treated unsuccessfully for their recurrence by further irradiation and were referred for possible pelvic exenteration in the final stages of their disease.

The factor common to all 150 patients was the presence of carcinoma of the cervix, either persistent after adequate irradiational therapy or of such advanced degree that the chance of cure without pelvic exenteration was considered negligible. An examination of Table 7 shows that the lesions frequently invaded the bladder, rectum, pelvic soft tissues, blood vessels and nerve sheaths. Lymph nodal metastases were less frequent. Sixty-eight of the patients had hydronephrosis of one or both kidneys before the operation. In view of the extent of the lesions found by pathological examination and the uncertainty of determining the extent by physical examination, total pelvic exenteration has become the procedure of choice. Only in the occasional patient is the lesion sufficiently high and anterior in the pelvis to allow the rectal stump and levator muscles to be preserved safely. Lesions suitable for posterior exenteration with preservation of ureters and bladder function are not seen in patients with advanced persistent cervical carcinoma.

TABLE 2. *Postoperative Complications in 69 of 150 Women after Pelvic Exenteration for Persistent Cancer of the Cervix**

Complication (Postoperative)	No. of Patients Having Each Complication		No. of Patients Dying Postoperatively**	
Wound infection	31			
Thrombophlebitis	5			
Hemorrhage	7		3	
Intestinal obstruction	21		6	
Treated by laparotomy		9		5
Treated without laparotomy		12		1
Convulsions	5		1	
Postoperative psychosis	4		1	
Acute pyelonephritis	5		1	
Ileal stomal separation	3		1	
Ureteral obstruction or necrosis (uretero-ileal revision required)	3		1	
Heart failure	1		1	
Fecal or urinary fistula	3			
Acoustic nerve damage	2			
Miscellaneous (tracheostomy, atelectasis, osteitis pubis, skin graft to thigh)	4			
Number of complications (total)	94		15 (10%)	

* Eighty-one patients had none, 50 had one, and 19 had more than one complication.

** The number of patients is listed opposite the primary cause of postoperative death.

Inoperability is determined by the demonstration of tumor outside the pelvis on physical and x-ray examinations. These findings are confirmed by biopsy when it can be done simply. The most frequently demonstrable sites of remote metastases are the lungs, and the cervical and inguinal lymph nodes. The presence of physical signs of advanced disease on one side of the pelvis associated with sciatic nerve pain and swelling of the leg on the same side has proved to be a sign of inoperability. Ipsilateral ureteral obstruction at the pelvic brim is further indication of the hopelessness of the situation.

The intra-abdominal findings indicating inoperability are metastases to the liver, periaortic lymph nodes or extrapelvic peritoneum, and such extension of the cancer within the pelvis that its complete removal is considered impossible. Deliberate palliative operations in which gross tumor is left in the pelvis are rarely indicated, having been done only twice in the patients reported here (Table 1). Determination of operability within the pelvis may be very difficult because radiation fibrosis and necrosis often cannot be differentiated from carcinoma by inspection and palpation. Apparent total fixation to the lateral pelvic wall does not indicate inoperability unless the fixation is due to direct carcinomatous invasion. Extent of this nature may be impossible to determine with certainty at the operating table; it may become apparent only after subsequent microscopic examina-

TABLE 3. *Patient Survival after Pelvic Exenteration for Carcinoma of the Cervix**

Time	No. of Patients	Postoperative Deaths	No. of Patients Dead of Cancer	No. of Patients Dead of Other Cause	Patients Alive
April 1950 to April 1955	75	10 (13%)	44	2	19 (25%)
April 1955 to April 1957	33	2	13	1	17
Totals	108	12 (11%)	57	3	36 (34%)
April 1957 to December 1959	42	3	7	0	32
Totals	150	15 (10%)	64	3	68

* Those patients alive with known persistent cancer are considered dead. Three of the 150 patients had no irradiational therapy; one had a vesicovaginal fistula, another extension to urethra, and the third patient had invasion of the rectovaginal septum.

tion of the excised specimen. Diffuse lymphatic permeation over the iliac vessels with thickening of the peritoneum and multiple underlying nodal metastases is easily recognized and is associated frequently with leg swelling and ureteral obstruction at the pelvic brim. Such cancer dissemination is an absolute contra-indication to the operation. However, discrete iliac or hypogastric lymph nodal metastases need not necessarily be inoperable. Several patients with localized nodal metastases attached to the iliac blood vessels have benefited significantly by resection; one such patient has lived without symptoms more than five years since operation. Decisions concerning the operability of extensive lesions that appear still limited to the pelvis will be reflected in the mortality and survival statistics. The operability or inoperability of such lesions becomes a matter of judgment, supplemented by the frozen section examination of biopsies. Proof of inoperability is essential. Two general principles have evolved which should not be violated: 1) If persistent cancer has been proven by biopsy to exist, pelvic exenteration is not performed if it is apparent that the operation cannot remove all gross cancer. 2) In the absence of biopsies containing cancer the operation is not performed unless the disability of the patient from

TABLE 4. *The Complications in 49 of 135 Women Who Left the Hospital after Having Had Pelvic Exenteration**

Complication (Late)	No. of Patients Having Each Complication
Pyelonephritis	11
Terminal pyelonephritis only	5
Ileal stoma revision	12
Colostomy revision	11
Intestinal obstruction	5
Operation	4
Tube only	1
Progressive hydronephrosis requiring ileal bladder revision	2
Autonephrectomy	1
Renal death	1
Perineal sinus	5
Perineal hernia	2
Renal calculus**	2
Serum hepatitis	1
Thrombophlebitis	1
Number of complications (total)	59
Number of patients undergoing further operations for complications of recurrent cancer	21

* Eighty-six had no further complications referable to the operation, 34 had a single late complication and 15 had multiple ones.

** One patient passed the stone, the other required nephrectomy for pyelonephritis.

TABLE 5. *The Complications Attributable to Uretero-Ileal Urinary Diversion Occurring in 30 of 150 Women Who Underwent Pelvic Exenteration*

	Postoperative Complications No. of Patients	Complications after Leaving Hospital No. of Patients	No. of Patients Having Each Complication
Pyelonephritis	5	11*	16
Ileal stomal separation	3	0	3
Uretero-ileal revision required for ureteral obstruction or necrosis	3	3**	5
Ileal stoma revisions for stenosis	0	12***	12
Autonephrectomy	0	1	1
Late renal death (following nephrectomy)	0	1†	1
Renal stone (nephrectomy in 1)	0	2	2

* Five other patients dying of cancer developed pyelonephritis terminally and are not included.
** One patient had postoperative uretero-ileal revision and subsequently had a second such revision for late progressive hydronephrosis.
*** One had ileal retraction resulting in late ileal stenosis.
† This patient also had pyelonephritis.

radiation fibrosis and necrosis alone warrants the procedure. For example, pelvic exenteration is justified if the lesion is associated with extensive pain, sloughing and fistula formation even though no cancer is found in the operative specimen.

Factors other than those directly related to the pathology of the neoplasm may influence operability. The general condition, age and mental status of the patient should be considered carefully. The patient must have a reasonable chance of surviving the operation and must subsequently be capable of enjoying a comfortable and useful life. Such requirements will rule out the senile and mentally deficient. Fortunately the patients who cannot emotionally adjust to such operative mutilation usually refuse pelvic exenteration when it is explained and recommended to them.

TABLE 6. *Deaths Attributable at Least in Part to the Complications of Uretero-Ileal Urinary Diversion among 150 Women Treated by Pelvic Exenteration*

	No. of Patients	No. of Patients Dying
Pyelonephritis	16	2
Ileal retraction	3	1
Progressive hydronephrosis requiring uretero-ileal revision	5*	2
Totals	24	5**

* Two patients had two operations directed toward improving uretero-ileal drainage.
** Three patients died postoperatively, two after leaving the hospital.

The survival of women who have been treated by pelvic exenteration for persistent postirradiational cancer of the uterine cervix is shown in Tables 3 and 8. Nineteen of 75 operated upon five to nine years ago have remained alive without signs of persistent cancer. The five-year accumulative survival rate for the entire group of women who underwent the operation was 34 per cent. Whether this survival was the result of patient selection for the operation or represented a significant improvement in the treatment of women with peristent postirradiational cervical carcinoma was investigated by studying the survival of similarly ill women not treated by pelvic exenteration.

The records of all patients with cancer of the cervix seen for the first time in the Barnes Hospital from January 1, 1950 to

TABLE 7. *The Relationship of the Extent of Cancer in the Operative Specimen to the Survival of Patients Undergoing Pelvic Exenteration for Postirradiational Cancer of the Cervix Three or More Years Ago*

		No. of Patients	No. of Patients Dead of Cancer	No. of Patients Living or Died without Cancer	Chi Square	P a = b
Carcinoma in the	Total	88*	50	38		
Lymph nodes	Yes a)	20	17	3		
	No b)	68	33	35	8.40	.005
Blood vessels	Yes a)	46	33	13		
	No b)	42	17	25	8.74	.005
Nerve sheaths	Yes a)	56	37	19		
	No b)	32	13	19	5.39	.02
Rectum or colon	Yes a)	31	24	7		
	No b)	57	26	31	8.29	.005
Pelvic soft tissue	Yes a)	79	49	30		
	No b)	9	1	8	8.55	.005
Uterus	Yes a)	40	27	13		
	No b)	48	23	25	3.42	.07
Urinary bladder	Yes a)	48	31	17		
	No b)	40	19	21	2.60	.11
Vagina	Yes a)	68	41	27		
	No b)	20	9	11	1.47	.23
Cervix	Yes a)	69	41	28		
	No b)	19	9	10	.88	.45

* Of 108 patients operated upon three or more years ago 12 were operative deaths and the specimens of eight were not examined in the Barnes Hospital (six of these patients are dead). Eighty-eight were available for analysis.

January 1, 1957 were reviewed and the diagnosis confirmed by re-examination of their tissue sections. The initial therapy of these women had been administered in other hospitals or was given during this time in the Barnes Hospital. The irradiational therapy failed to eradicate the cancer in 459 (Fig. 1) of 805 women; 256 of them might have had abdominal exploration for exenteration of the pelvis during their course as treatment for persistent cancer. In other words, their persistent cancer was, for a time, apparently limited to the pelvis. Actually, 138 women had abdominal exploration, 80 of whom had pelvic exenteration performed. The remaining 118 patients consisted of 20 who refused the operation when it was recommended to them and 98 who were not offered the operation by their physician. Further irradiation was used to treat these women for their persistent cancer. Only those patients were included whose records contained sufficient data to indicate that abdominal exploration for possible pelvic exenteration was applicable as therapy for their persistent cancer.

The comparisons of the rates of survival among the 138 women undergoing abdominal exploration for pelvic exenteration (operative series) with those of the 118 women treated for persistent cancer by other means (control series) are summarized in Table 9 and Figure 2. The survival rates for the group explored for possible exenteration were significantly higher than they were for the women not so treated at each "at risk" period. The rates of dying of the pa-

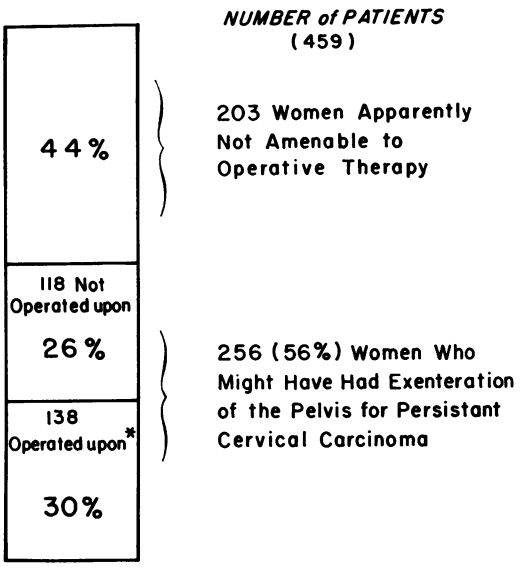

FIG. 1. Women with carcinoma of the cervix, persistent after irradiation therapy. (Barnes Hospital, 1950 to 1957—459 of 805 women treated.)
* Fifty-eight were inoperable; 80 had pelvic exenteration performed.

tients found to have intra-abdominal cancer outside the pelvis were slightly higher than those of the control group but not significantly so (Table 10).

The next question was whether or not the two groups of women were comparable. The women in both groups had a similar incidence of adenocarcinoma of the endocervix, similar durations of symptoms and a like frequency of biopsy proven persistent cancer at the time they were amenable to abdominal exploration for possible pelvic exenteration. However, the age distribution of the two groups differed (Table 11). The women undergoing abdominal exploration for possible pelvic exenteration were younger than those not so treated. This is to be expected; particularly among the earlier cases of the group treated operatively because initially the older women were not considered eligible for pelvic exenteration because the operative risk was thought to be excessive. Since age alone has been shown not to influence the survival of women treated for cancer of the cervix, the effect of the difference in age distribution upon the survival of patients in the two groups can be calculated from statistical tables showing the expected rates of dying of women from all causes. Only 3 per cent more of the women in the control group would be expected to die of all causes during a five-year period than in the group explored for possible pelvic exenteration. In other words, the divergence of the age distribution of the two groups of women does not account for the difference in their survival rates.

The control and operative series also differed in the distribution of women by the initial clinical stage of their cancers (Table 12). The stages of the cancer in women undergoing abdominal exploration for pelvic exenteration were significantly more

TABLE 8. *Survival of Patients after Exenteration of the Pelvic Organs for Postirradiational Carcinoma of the Cervix** (*April 1950 to January 1960*)

Years at Risk	No. of Patients at Risk	No. of Patients Dead	No. of Patients Alive	Accumulative Survival Rate (%)
0–1	150	37**	113	75
1–2	101	23***	78	58
2–3	64	10	54	49
3–4	48	7	41	42
4–5	29	3†	26	37.6
+5	21	2†	19	34

* Three patients had no previous irradiational therapy.
** Fifteen women died postoperatively.
*** One patient died of tuberculosis, without cancer being found postmortem.
† One patient in each risk period died of intestinal obstruction without cancer being found postmortem.

TABLE 9. *A Comparison of (A) the Rates of Survival of Women Treated for Persistent Carcinoma by Abdominal Exploration and Exenteration of the Pelvic Organs when Operable with (B) the Rates of Survival of Those Women Having Similar Disease but Treated by Other Means*

Months at Risk	No. of Patients	No. of Patients Dead	No. of Patients Alive	Chi Square	P A = B
0–12	A) 138	69	69		
	B) 118	73	45	3.64	.07
13–24	A) 68	22	46		
	B) 40	22	18	5.37	.02
25–36	A) 45*	11	34		
	B) 17*	9	8	4.49	.04
37–48	A) 31	4	27		
	B) 8	5	3	8.82	.005
49–60	A) 20	4	16		
	B) 3	1	2	—	—
+60	A) 14	1	13		
	B) 2	1	1	—	—

* Comparing the survival of patients three years after treatment in group A with that in group B, Chi Square = 14.1. Probability less than .001.

advanced than in the women treated by other means (control series). This difference might be expected to reduce the length of the survival of the women undergoing operative therapy. The data are inadequate to allow an estimate of this reduction. Its direction, however, is opposite that resulting from the difference in age distributions of the two groups of women. One then may conclude logically that the survival rates of the women treated operatively for persistent cancer were higher because their treatment was more effective.

The extent of cancer in the operative specimens of the 19 patients surviving five to nine years was representative of the advanced stage of disease that characterized the majority of lesions (Table 13). It is of

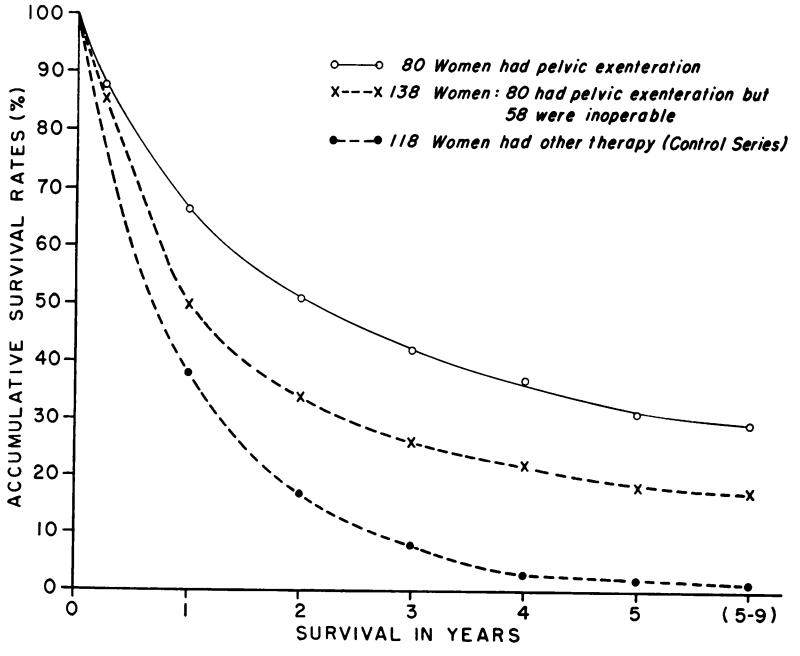

FIG. 2. Accumulative survival rates of women treated for postirradiational cancer of the cervix in the Barnes Hospital—1950 to 1957.

interest that two patients with regional lymph nodal metastases and two patients requiring external iliac vein resection are among these survivors. Of the patients dying of recurrent cancer after exenteration, approximately 75 per cent had recurrence in the pelvis. The remainder died of metastasis to liver, lungs, bone and brain.

Carcinoma of the Rectum: Carcinoma of the rectum and lower sigmoid colon in men may invade the lower urinary tract directly but still be limited to the pelvis. In women, the lower urinary tract is usually protected from similar lesions by the imposition of the vagina and uterus so that total pelvic exenteration for removal of such lesions is seldom necessary. Only six women have had exenteration of the pelvic organs for carcinoma of the rectum.[7] Total pelvic exenteration is indicated in patients

TABLE 10. *The Survival of Patients Admitted to the Barnes Hospital for the First Time from January 1, 1950 to January 1, 1957 Who Had Abdominal Exploration for Persistent Carcinoma of the Cervix and Exenteration of Pelvic Organs when Cancer Was Confined to the Pelvis*

A. Patients in whom pelvic exenteration was performed. (Twenty-two patients had primary irradiational therapy in the Barnes Hospital, 58 were treated initially at another hospital.)

Months	No. of Patients at Risk	No. of Patients Dead	No. of Patients Alive	Accumulative Survival Rate (%)
0–12	80	27*	53	66
13–24	53	12**	41	51
25–36	40	7	33	42
37–48	30	4**	26	37
49–60	19	3	16	31
+60	14	1	13	29

* Ten operative deaths.
** Two died without cancer; one of intestinal obstruction, one of tuberculosis.

B. Patients in whom abdominal exploration showed cancer outside the pelvis.

Months	No. of Patients at Risk	No. of Patients Dead	No. of Patients Alive	Accumulative Survival Rate (%)
0–12	58	42*	16	28
13–24	15	10	5	9
25–36	5	4	1	2
37–48	1	0	1	2
49–60	1	1	0	0

* Two had pelvic exenteration despite proven distant metastases; one died postoperatively, one died eight months later.

C. All patients explored whether or not exenteration was completed (A + B).

Months	No. of Patients at Risk	No. of Patients Dead	No. of Patients Alive	Accumulative Survival Rate (%)
0–12	138*	69	69	50
13–24	68	22**	46	34
25–36	45	11	34	26
37–48	31	4**	27	22
49–60	20	4	16	18
+60	14	1	13	17

* Two patients having pelvic exenteration had no cancer in their operative specimens but are included because one died of brain metastases, one died postoperatively.
** Two died without cancer; one of intestinal obstruction, one of tuberculosis.

TABLE 11. *Age Distributions of Patients with Persistent Carcinoma of the Cervix Who Were or Might Have Been Treated by Pelvic Exenteration*

Age	Exenteration Series Patients Having Abdominal Exploration			Control Series Patients Receiving Further Irradiation Therapy for Palliation
	Patients Operable	Patients Inoperable	Total (a)	Total (b)
20–29	1	0	1	2
30–39	15	17	32	15
40–49	30	27	57	38
50–59	28	9	37	34
60–69	5	5	10	21
70+	1	0	1	8
Total	80	58	138	118

(Comparing (a) with (b). Chi Square = 19.4. Probability (N = 5) = .003.)

Three per cent more of the patients in the control series would be expected to die of all causes in a five-year period than would be expected to die in the exenteration series. (Calculated from United States Statistical Tables for white women 1950.)

with carcinoma of the rectum apparently confined in the pelvis when the local extent of the lesion requires sacrifice of the lower urinary tract in order to excise the cancer completely. Pelvic exenteration should be employed only rarely when there is no chance of complete excision of the cancer. However, we believe there is more frequent justification for a deliberate palliative resection for this lesion than for carcinoma of the cervix. It is most important that the possibility of involvement of the lower urinary tract be recognized preoperatively so that preparation for exenteration can be carried out. Intravenous pyelograms and cystoscopic examination may establish the necessity of the operation before laparotomy. Experience with the operation, and particularly with the results of ileal segment urinary diversion, has led us to employ exenteration more frequently in the treatment of advanced carcinoma of the rectum, especially in elderly men. So many of these patients have dysfunction of the lower urinary tract following abdominoperineal resection that we have been encouraged to proceed with the radical operation in questionable cases rather than to court a local recurrence of cancer with bladder dysfunction as the result of extensive dissection in the area between the rectum and the urinary tract.

The results of the operation for carcinoma of the rectum among these patients does not vary significantly from the results reported previously.[7] Five of 16 patients op-

TABLE 12. *Distributions by Clinical Stages of the Cervical Cancers of Patients Initially Treated in the Barnes Hospital Who Subsequently Might Have Been Treated by Exenteration for Persistent Cancer*

Stage	No. of Patients Treated by Operation*	No. of Patients Not Treated Operatively (Control Series)
LON I	5	14
LON II	21	41
LON III	21	20
LON IV	5	1
	52**	76**
Patients first treated in another hospital (clinical stage unknown)	86	42
	138	118

* Abdominal exploration and pelvic exenteration if operable.

** The distributions by the initial stage of cancer are not homogeneous. (Chi Square = 17.0, Probability (N = 3) is less than .001.)

TABLE 13. *Pathological Findings in the Operative Specimens of 19 Women Surviving Five or More Years after Pelvic Exenteration*

Carcinoma* Found in	No. of Patients
Soft Tissue (parametrium)	17
Cervix (limited to cervix in 1)	14
Vagina	13
Bladder (preoperative hydronephrosis in 4)	12
Nerve sheaths	12
Uterus	8
Rectum	5
Vein Invasion (two had external iliac vein resection)	4
Lymph nodes	2
Ileum	1

* Epidermoid carcinoma in 15; adenocarcinoma of the cervix in 4.

erated upon five or more years ago are alive without symptoms or signs of cancer.

Re-operation by pelvic exenteration for the locally recurrent carcinoma of the rectum after a standard abdominoperineal resection has been disappointing in our experience, Although an occasional recurrence may be operable, most will involve the soft tissues of the pelvic floor and perineum to such an extent that the lesion cannot be circumscribed. Some of these unfortunate patients can receive remarkable palliation by urinary diversion, irradiational therapy and cordotomy.

Carcinoma of the Endometrium: Only ten patients have been treated by exenteration of the pelvis for advanced persistent carcinoma of the endometrium. Possible reasons for this paucity include the fact that endometrial carcinoma is less frequent than carcinoma of the cervix and that more of the recurrent endometrial cancers are inoperable because of previous operation. In general recurrence of cancer in the pelvis after previous excision is much more likely to be inoperable than the recurrence or persistence after irradiation alone. From an anatomical and pathological standpoint, endomertial carcinoma should be as favorable a lesion for exenteration as is carcinoma of the cervix. Two of six women operated upon five or more years ago remain well.

Irradiational Necrosis: Exenteration for advanced irradiational necrosis and fibrosis was done nine times. Of the eight surviving the operation, seven are well. These patients deserve comment because at operation it was not possible to determine that cancer was not present. Cancer was suspected in all, but multiple biopsies did not show it; subsequent study of the operative specimen showed only the effects of irradiation. Although all of these patients had proved carcinoma prior to irradiation, none had cancer in their exenteration specimens and therefore are not included among the patients having the operation for persistent cancer.

When a patient has irradiational changes without biopsy proof of persistent cancer, the possibility exists that the cancer has been totally eradicated by the irradiation. In such instances, two questions must be answered: 1) Will healing likely occur and the inflammatory process resolve with conservative care? 2) Would an operation such as colostomy or urinary diversion suffice? These questions may be difficult to answer and the borderline lesion may tax surgical judgment to the utmost. At present, we would prefer to err on the side of conservatism rather than do the extended operation on a patient who might not need it.

Miscellaneous Lesions: Pelvic exenteration was done for a few miscellaneous neoplasms (Table 1). Although some of the patients received definite palliative benefit, the lesions generally were unfavorable for operation. The patient who had primary melanoma of the vagina died four years after operation of pulmonary metastasis without local or regional recurrence.

Urinary Diversion

Operations for advanced pelvic cancer have been immeasurably simplified by the

ileal segment method of urinary diversion. Without a means of urinary diversion that resulted in a low incidence of early complications (Table 5) and little threat to long-term survival (Table 6), the surgical effort would have been greatly handicapped. This method of urinary diversion was responsible at least in part for three of the 15 postoperative deaths among the 150 women treated for cervical carcinoma. Two other patients died from renal complications occurring after leaving the hospital. Only 11 of 135 women surviving the operation for carcinoma of the cervix have had recurrent pyelonephritis; five additional patients dying of recurrent cancer developed pyelonephritis terminally.

Palliation

Although the operation has been of definite palliative benefit in many patients who subsequently died of cancer, exenteration of the pelvis is rarely indicated for palliation alone. If the extent of cancer at operation is such that a neoplasm cannot be circumscribed, the operation should not be done. Such procedures as urinary diversion that prolong life but which leave tumor in the pelvis have been found inadvisable. These remarks apply to a less extent to advanced carcinoma of the rectum or sigmoid colon where it has been found a palliative resection may occasionally be indicated. For instance, this may be particularly apparent in the advanced carcinoma of the rectum producing bowel obstruction and severe urinary bladder symptoms and associated with liver metastases. In deciding for or against a palliative resection it is necessary that the prolongation of comfort be considered of greater importance than the prolongation of life.

Fifty per cent of the patients operated upon for persistent carcinoma of the cervix survived for longer than two years after exenteration and received satisfactory palliation. Thirty-four per cent survived for three years or longer. With but few exceptions these patients enjoyed a most gratifying extension of comfortable and useful living. The patients who did not receive satisfactory palliation after the operation include those dying of the operation; those whose lesions were unrecognizable as being unfavorable at the operation; and those patients whose lesions in retrospect should have been recognized as being unfavorable and should not have had the operation at all. The number of patients in the latter group should be reduced as more experience is gained in recognizing the inoperable cancer. Such improvement in surgical judgment is not easily acquired because the borderline between the "operable" and "inoperable" situation may be extremely nebulous. The inclination to proceed with the operation in the hope that the lesion may not be as extensive as it appears must be suppressed. However, a certain amount of error must be accepted as unavoidable if one is to salvage all of the patients with truly operable cancers.

Rehabilitation

Patients subjected to pelvic exenteration can be expected to return to full activity and lead useful contented lives. Aside from complete sexual incapacitation and the inability to do heavy labor, the patients are unrestricted. Because of the weakened pelvic floor, strenuous exertion and heavy lifting is not tolerated well. Patients adjust easily to the colostomy and urinary ileostomy. Men patients return to previous occupations without difficulty. Women return to their positions as housewife, school teachers, stenographers and factory workers. Several patients continue to indulge in their favorite sports such as hunting, fishing, swimming and golf.

There are known to be six women among the 150 operated upon for persistent cervical cancer who suffered a major disruption of the marital life as a result of the operative interference with sexual function. This adverse effect of the procedure, though it

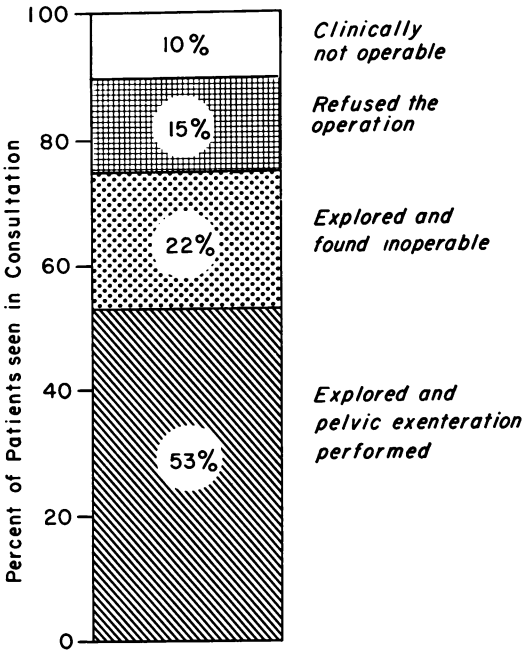

FIG. 3. Pelvic exenteration for cancer of the cervix. (An estimate of a 10-year experience.)

cannot be ignored, becomes insignificant when compared with the frequency with which families faced by dissolution from sickness and impending death were restored to unity and happiness by the operation. The patients permanently incapacitated among the 193 survivors of the operations for all lesions were no more than six in number. One patient developed osteomyelitis of the pubis and has remained incapacitated for a year after exenteration and will always have some degree of disability. Another patient was not rehabilitated because of senility and eighth nerve damage from streptomycin; a few other patients had lesser degrees of permanent disability.

Discussion

In 1948, Brunschwig [5] first reported the complete removal of the pelvic viscera for advanced carcinoma. In 1950, Appleby [1] described proctocystectomy and reported several survivors of the operation for carcinoma of the rectum, one patient being a survivor of seven years. Brunschwig was the first to apply the procedure to advanced carcinoma of the cervix. In the past decade, several others have reported experiences on the subject of extended pelvic surgery with pelvic exenteration for carcinoma arising in the female genital tract.[6, 8, 9] Our experience has been, in general, quite similar to that reported, i.e., beneficial results of such surgery depend on 1) the selection of patients for the operation, and 2) the technical proficiency with which the operation is performed.

In order to emphasize further the selected nature of the material presented here, it is pointed out that the authors are general surgeons who see patients with carcinoma of the cervix only on referral. Figure 3 is a diagram of our estimated total experience and presents the 150 patients with carcinoma of the cervix who had pelvic exenteration in relation to the total number seen in consultation for the operaiton. The 150 women having the operation represent approximately one half of the women for whom consultation was requested. The same care and selectivity must be applied to the consideration of other neoplasms of the female generative tract for which pelvic exenteration may be of therapeutic value.

Technically the operation of pelvic exenteration is one that will tax the skill, stamina and aggressiveness of the best trained surgeon. It is best performed in institutions by a few individuals who are suited for it through their interest, temperment and training. This concentration of experience seems necessary if the rates of complications and mortality are to be kept reasonably low.

The questions raised when this type of surgery first was undertaken appear to be answered adequately. Certain advanced pelvic cancers are amenable to extended surgery because of their pathological and anatomical characteristics. They can be removed successfully with survival rates that more than justify the effort. Satisfactory re-

habilitation after recovery from pelvic exenteration is the rule. The high frequency of complications is not enough to detract significantly from the benefit obtained from the operation.

Summary

From March 1950 to January 1960, 218 pelvic exenteration operations were performed. One hundred and fifty of the operations were done for advanced carcinoma of the cervix and 31 for carcinoma of the rectum. The over all hospital mortality has been 11 per cent. The indications for the operation and the complications resulting from it are discussed and tabulated. The survival of patients subjected to operation for advanced and recurrent carcinoma of the cervix is compared to a control group not so treated. A significantly better survival occurred among the patients operated upon. Similar survival results were obtained for advanced carcinoma of the rectum involving the lower urinary tract. From this study, it is concluded that properly selected patients with advanced carcinoma of the cervix and carcinoma of the rectum can be benefited by the extended operation of pelvic exenteration. The operation has also benefited a few other patients with advanced carcinoma of the endometrium and with radionecrosis of the pelvic viscera.

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Discussion

Dr. Alexander Brunschwig: I certainly want to congratulate Dr. Bricker in emphasizing one aspect of this type of surgery and that is the salvagability of these patients for whom, certainly in his group, nothing else could be done.

(Slide) I must confess that it is difficult to discuss this paper, because I am in complete agreement with everything he has said, and in going over his paper many of the details which he could not present are important and certainly I agree with all that he has said.

He spent his discussion on the operation of total pelvic exenteration and in our series we have had occasion to do quite a few less radical procedures, especially for recurrent cancer of the cervix—that is, the anterior pelvic—exenteration. This is recommended when the patient is seen for disease that has not grossly involved the rectum but does involve the bladder. In a number of these cases we have done anterior exenteration and then regretted, because of later recurrence, not having done a total exenteration. Really, at one time I thought of giving up anterior exenteration, doing only total exenterations. But as time went on we persisted in doing anterior exenterations. Many other patients with recurrent cancer of the cervix have been salvaged with lesser procedures that did not entail removal of the bladder or the rectum.

(Slide) This is a review of our series of 640 pelvic exenterations, both anterior and total, from September, 1947 to January, 1960, and the lesions for which the operation were carried out parallel quite closely Dr. Bricker's, except perhaps relatively fewer carcinomas of the rectum. But, as he