# Results of the Radical Surgical Treatment of Advanced Pelvic Cancer:

## A Fifteen-Year Study

M. KISELOW, M.D., H. R. BUTCHER, JR., M.D., E. M. BRICKER, M.D.

*From the Department of Surgery, Washington University School of Medicine, St. Louis, Missouri*

SEVENTEEN years have passed since initial reports by Brunschwig [6] and Appleby [1] indicated the possible benefit of exenteration of the pelvic organs in patients with advanced pelvic cancer. The purpose of this study is to present the results achieved with this operation in the Washington University Medical Center during the past 15 years. Other investigators have shown this type of surgical effort to be effective therapy for advanced but biologically favorable neoplasms originating in the pelvis.[5, 8-12] Mortality and survival rates reported vary primarily with the surgical philosophies of the surgeons selecting the patients for operation.

The operation most frequently used has been complete pelvic exenteration with a left sided colostomy and urinary diversion to an ileal segment draining through the right side of the abdomen.[2, 4] In recent years, the operation has been modified on favorable occasions to include preservation of the distal rectum and re-establishment of continuity of the bowel. Also, selected patients have had vaginal reconstruction using a segment of intestine. However, the basic character of all the operations is the same, i.e., the removal *en masse* 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.

The radical surgical attack has been of most significance when applied to those lesions of frequent occurrence which have presented a high incidence of biological suitability. By "biological suitability" we mean the tendency of some lesions to remain localized within the pelvis, without remote lymphatic or vascular spread. Carcinoma of the cervix is by far the most frequently encountered of these lesions. Others are carcinoma of the rectum, endometrium, and vagina.

### Results

Exenteration of the pelvic organs was used to treat 312 patients ill of advanced pelvic cancer or suffering from complications from irradiation between March, 1950, and December, 1965 (Table 1). Persistent postirradiational carcinoma of the cervix constituted the indications for operation in two-thirds of the patients. Data concerning operative mortality (hospital deaths), postoperative complications, complications occurring after leaving the hospital, and survival rates for those women treated by exenteration of the pelvic organs for postirradiational carcinoma of the cervix are presented in Tables 2 through 8.

Presented at the Annual Meeting of the American Surgical Association, May 11–13, 1967, Colorado Springs, Colorado.

TABLE 1. *Exenteration of Pelvic Organs for Advanced Pelvic Carcinoma* 1950 to 1965

| Indications | Number of Patients | Operative Mortality | 5 Year Survival Rate (based on those at risk 5 years) |
|---|---|---|---|
| A. Postirradiational Carcinoma of cervix | 207 | 16 ( 8%) | 35% |
| B. Carcinoma of the: | | | |
| 1) Rectum or sigmoid | 43 | 7 (16%) | 30% |
| 2) Endometrium | 12 | 2 (17%) | |
| 3) Vagina | 13 | 1 ( 8%) | |
| 4) Bladder or urethra | 6 | 0 | |
| 5) Ovary | 8 | 1 (13%) | |
| 6) Vulva or anus | 5 | 0 | |
| 7) Small bowel | 2 | 0 | |
| C. Sarcoma prostate | 1 | 1 | |
| D. Palliative operations for Cancer of cervix | 2 | 1 | |
| E. Irradiation necrosis | 13 | 3 (23%) | |
| Total | 312 | 32 (10%) | |

Operative mortality among women operated upon for postirradiational carcinoma of the cervix has reached a rate of less than 10% as the technic of operation has improved, as operative time has decreased, and as the volume of required blood replacement has declined incident to less operative blood loss and the liberal use of Ringer's solution with lactate during the operation. Operative mortality rate in the 5-year interval, 1960–1965, was 7%. Ninety patients were treated for advanced lesions of the pelvis during this time; six died postoperatively. Only one was operated upon for carcinoma of the cervix. Despite significant improvement in postoperative hospital mortality rate, the morbidity of the procedure is high (Tables 4 and 5).

TABLE 2. *Operative Mortality Rates Following Pelvic Exenteration for Carcinoma of the Cervix by 5-Year Intervals*

| Years Operations Performed | Number of Patients | Number of Operative Deaths | Operative Mortality Rate |
|---|---|---|---|
| 1950–1954 | 75 | 10 | 13.4% |
| 1955–1959 | 78 | 5 | 6.4% |
| 1960–1965 | 54 | 1 | 1.8% |
| Total | 207 | 16 | 7.8% |

Serious postoperative complications occurred among 92 of the 207 women treated for postirradiational carcinoma of the cervix by pelvic exenteration. Sepsis, most often incident to infection of the pelvic defect, occurred in 19%. Intestinal obstruction was a most serious complication. Of the nine patients requiring operative relief of intestinal obstruction, five died.

The continued occurrence of complications months and years after pelvic exenteration makes it essential that individuals performing this operation be willing to assume long-term responsibility for these patients. Serious illness incident to the operation occurred in 75 of the 191 women who survived the operation. As in the early postoperative period, intestinal obstruction and related enteroperineal fistula remained the most serious complication. Nine of the 14 perineal fistulae were small intestinal, five were incident to colo-anal anastomoses. Late complications referable to the ureteroileal conduit have been infrequent.

TABLE 3. *Operative Mortality Rates Following Pelvic Exenteration for All Lesions*

| Interval | Number of Patients | Number of Operative Deaths | Operative Mortality Rate |
|---|---|---|---|
| 1950 to 1960 | 222 | 26 | 12% |
| 1960 to 1965 | 90 | 6 | 7% |
| Total | 312 | 32 | 10% |

TABLE 4. *Postoperative Complications in 92 of 207 Women After Pelvic Exenteration for Persistent Carcinoma of the Cervix**

| Complication (Postoperative) | Number of Patients Having Each Complication | Number of Patients Dying Post-operatively |
|---|---|---|
| 1. Intestinal obstruction | 24 | 6 |
| Treated by laparotomy | 9 | 5 |
| Treated without laparotomy | 15 | 1 |
| 2. Hemorrhage | 8 | 3 |
| 3. Ileal stoma separation | 4 | 1 |
| 4. Colostomy stoma separation | 2 | |
| 5. Ureteral obstruction or necrosis | 3 | 1 |
| 6. Fecal or urinary fistula | 6 | |
| 7. Acute pyelonephritis | 8 | 1 |
| 8. Postoperative psychosis | 4 | 1 |
| 9. Wound infection, pelvic abscess, peritonitis | 39 | |
| 10. Convulsions | 5 | 1 |
| 11. Thrombosis of iliac artery | 1 | |
| 12. Thrombophlebitis | 8 | |
| 13. Heart failure | 2 | 1 |
| 14. Cerebrovascular accident | 1 | 1 |
| 15. Acoustic nerve damage | 2 | |
| 16. Miscellaneous (tracheostomy, atelectasis, osteitis pubis, parotitis) | 6 | |
| Total complications | 123 | 16 |

* 115 Patients had none, 67 had one, and 25 had more than one complication.

TABLE 5. *Complications in 75 of 191 Women Who Left the Hospital After Having had Pelvic Exenteration for Carcinoma of the Cervix**

| Complication (Late) | Number of Patients Having Each Complication |
|---|---|
| 1. Intestinal obstruction | 12 |
| Operation | 10 |
| Tube only | 2 |
| 2. Progressive hydronephrosis requiring ileal bladder revision | 3 |
| 3. Enteroperineal fistula | 9 |
| Due to recurrent carcinoma | 2 |
| Without recurrent carcinoma | 7 |
| 4. Rectoperineal fistula | 5** |
| Due to recurrent carcinoma | 1 |
| Without recurrent carcinoma | 4 |
| 5. Pyelonephritis | 12 |
| 6. Ileal stoma revision | 14 |
| 7. Colostomy revision | 16 |
| 8. Perineal sinus or abscess | 7 |
| 9. Perineal hernia | 4 |
| 10. Renal calculus | 2 |
| 11. Serum hepatitis | 1 |
| 12. Thrombophlebitis | 1 |
| 13. Incisional hernia | 1 |
| 14. Osteitis pubis | 1 |
| Total complications*** | 88 |

* 116 had no further complications referable to the operation.

** Rectoperineal fistulae occurred in 5 of 9 women having coloanal anastomoses.

*** Complications incident to recurrent cancer not included except as noted (3 and 4).

Survival rates from postirradiational persistent carcinoma of the cervix are similar to those reported from Washington University 7 year ago (Table 6).[3] The frequency with which the operation was completed after abdominal exploration has remained approximately 60%. The relationships of the extent of carcinoma of the cervix in the operative specimens to survival rates differ little from those previously reported. Adverse survival rates were associated with lymph node metastases, neoplastic invasion of blood vessels and nerve sheaths, and extension of the carcinoma into the rectum, urinary bladder and pelvic soft tissues (Table 9).

## Discussion

*Indications.* The indications for ultraradical pelvic surgery remain essentially as indicated previously.[3] We believe strongly

TABLE 6. *Cumulative Survival Rates Following Pelvic Exenteration for Postirradiational Carcinoma of the Cervix 1950 to 1965*[7]

| Interval After Operation (years) | Alive at Beginning of Interval | Died During Interval | Lost or Withdrawn During Interval | Number Exposed to Risk of Dying | Proportion Dying | Proportion Surviving | Cumulative Percent Survival Rates |
|---|---|---|---|---|---|---|---|
| 0–1 | 207 | 45 | 5 | 204 | 0.221 | 0.779 | 78% |
| 1–2 | 153 | 35 | 10 | 148 | 0.236 | 0.764 | 60% |
| 2–3 | 109 | 15 | 5 | 106 | 0.142 | 0.858 | 51% |
| 3–4 | 88 | 12 | 7 | 84 | 0.143 | 0.857 | 44% |
| 4–5 | 68 | 7 | 3 | 66 | 0.106 | 0.894 | 39% |
| 5–6 | 59 | 2 | 6 | 56 | 0.036 | 0.964 | 38% |
| 6–7 | 51 | 1 | 10 | 46 | 0.022 | 0.978 | 37% |
| 7–8 | 40 | 1 | 8 | 36 | 0.028 | 0.972 | 36% |
| 8–9 | 31 | 0 | 2 | 30 | 0.0 | 1.000 | 36% |
| 9–10 | 29 | 0 | 6 | 26 | 0.0 | 1.000 | 36% |
| 10–11 | 21 | 2 | 6 | 20 | 0.100 | 0.900 | 32% |
| 11–12 | 15 | 0 | 3 | 13 | 0.0 | 1.000 | 32% |
| 12–13 | 12 | 0 | 4 | 10 | 0.0 | 1.000 | 32% |
| 13–14 | 8 | 0 | 5 | 5 | 0.0 | 1.000 | 32% |
| 14–15 | 3 | 0 | 2 | 2 | 0.0 | 1.000 | 32% |

that the patient should not be subjected to this degree of surgical effort unless the nature and extent of the lesion seem to offer a chance for cure. Only under rare circumstances do we do the operation for palliation in a patient who is not curable because of remote metastases. It is true that occasionally a lesion, too far advanced for cure, is discovered after the operation has started. However, these errors in judgment occur less frequently now than at the beginning of this experience. The most simple and clearly defined indication for the operation is postirradiational carcinoma of the cervix, confined to the central pelvis, in a patient whose age, physical and mental status do not preclude the operation.

TABLE 7. *Absolute Survival Rates of 153 Patients Following Exenteration for Carcinoma of the Cervix 1950 to 1960*

| Years After Operation | Number of Patients | Number Dying | Lost To Follow Up | Number Alive | Absolute Survival Rate |
|---|---|---|---|---|---|
| 2 | 153 | 66* | 1** | 86 | 56% |
| 5 | 153 | 93* | 7** | 53 | 35% |

* These figures include 15 operative deaths.
** Counted as dead.

TABLE 8. *Sites of Primary Tumors for Exenteration 1960 to 1965*

| | | Operative Mortality |
|---|---|---|
| Cervix | 54 | 1 |
| Endometrium | 2 | 1 |
| Rectosigmoid | 12 | 1 |
| Ovary | 5 | 1 |
| Vagina | 5 | |
| Small bowel | 2 | |
| Urethra | 2 | |
| Bladder | 1 | |
| Vulva | 3 | |
| Irradiation necrosis | 4 | 2 |
| Total | 90 | 6 |

Carcinoma of the rectum, involving the lower urinary tract in a man, is another clear indication. We have found recurrent carcinoma of the rectum following an abdominoperineal resection unsuitable for radical reoperation. The same is true of recurrent carcinoma of the cervix following a Wertheim type hysterectomy, unless the recurrence is limited to the vaginal cuff. Such postoperative recurrences nearly always involve planes of dissection of the previous operation in such a way as to be inoperable. However, recurrent carcinoma of the cervix or endometrium following

TABLE 9. *The Relationship of Extent of Carcinoma of the Cervix in Operative Specimens to Survival of Patients Treated by Pelvic Exenteration Three or More Years Ago*

| Carcinoma In | Number of Patients | Number of Patients Dead of Carcinoma | Number of Patients Living or Dead without Carcinoma | Chi Square | Probability (a = b) |
|---|---|---|---|---|---|
| 1. Lymph nodes | | | | | |
| a) Yes | 28 | 22 | 6 | | |
| b) No | 88 | 44 | 44 | 7.07 | 0.01 |
| 2. Blood vessels | | | | | |
| a) Yes | 55 | 38 | 17 | | |
| b) No | 61 | 28 | 33 | 6.34 | 0.01 |
| 3. Rectum or colon | | | | | |
| a) Yes | 35 | 26 | 9 | | |
| b) No | 81 | 40 | 41 | 6.18 | 0.01 |
| 4. Urinary Bladder | | | | | |
| a) Yes | 59 | 40 | 19 | | |
| b) No | 57 | 26 | 31 | 5.82 | 0.02 |
| 5. Pelvic soft tissue | | | | | |
| a) Yes | 97 | 59 | 38 | | |
| b) No | 19 | 7 | 12 | 3.73 | 0.06 |
| 6. Nerve sheaths | | | | | |
| a) Yes | 65 | 42 | 23 | | |
| b) No | 51 | 24 | 27 | 3.59 | 0.06 |
| 7. Uterus | | | | | |
| a) Yes | 49 | 32 | 17 | | |
| b) No | 67 | 34 | 33 | 2.45 | 0.15 |
| 8. Vagina | | | | | |
| a) Yes | 90 | 53 | 37 | | |
| b) No | 26 | 13 | 13 | 0.65 | 0.4 |
| 9. Cervix | | | | | |
| a) Yes | 87 | 51 | 36 | | |
| b) No | 29 | 15 | 14 | 0.42 | 0.5 |
| Total | 116 | 66 | 50 | | |

simple hysterectomy may be very well treated by pelvic exenteration.

The patient treated by irradiation or operation or both, who has a rectovaginal or vesicovaginal fistula, is a separate problem. Usually, irradiation will have been a factor in the development of the fistula; the pelvis often contains a sloughing dirty cavity from which a positive diagnosis of carcinoma cannot be obtained by biopsy. The peripheral pelvic tissues are solidly indurated and fixed to the lateral pelvic walls, and it is practically impossible to determine whether or not the patient has active cancer. Some of these patients have only radionecrosis and can be greatly benefited by pelvic exenteration. However, in doing the operation without a positive histologic diagnosis of cancer, one must be certain that the patient could not be equally benefited by such operations as urinary diversion, colostomy, or both.

*Contraindications.* The factors of age, mental status, possibility of rehabilitation, all have a bearing on operability. The factors directly related to the lesion are concerned with its biological nature and its pathological extent. Carcinoma of the prostate is biologically unfavorable for extended surgical removal. The same has proved true for carcinoma of the urinary bladder since the curability rate is so low if regional lymph nodes are involved. The dissection of such regional lymph nodes cannot be improved upon by pelvic exenteration. Preoperatively, a group of findings and symptoms, if present, are a very reliable indication of inoperability of carcinoma of the cervix. These include palpable evidence of advanced disease on one side of the pelvis, pain on that side of the pelvis, swelling of the leg and obstruction of the ureter on the same side. When all these findings exist, it is quite certain that the lesion is not operable for cure. At the time of laparotomy, a search for metastases in the usual areas of the upper abdomen is made. However, particular attention is paid to the para-aortic lymph nodes and lymph channels. If all of these are negative, the surgeon then must determine operability based on the extent of the disease in the pelvis. This can be difficult and may require a careful partial dissection before the surgeon can make a satisfactory decision for or against continuing the operation.

From the preceding data, as well as the reports of others, it is clearly established that a very appreciable salvage is possible by pelvic exenteration among selected patients with advanced or recurrent pelvic cancer. The surgery necessary is of a radical and mutilating nature but can be done with an acceptable mortality rate and with the expectation that the patient will return to a fully active and worthwhile life if the cancer is controlled. The time has come for the general application of extended surgery for selected patients with pelvic cancer. Certain relevant observations seem indicated:

1) Although lesions other than carcinoma of the cervix may be cured by pelvic exenteration, it is cervical cancer that is numerically of such significance. When uniformly early diagnosis of cervical cancer is attained and excellent primary treat-

TABLE 10. *Patients Treated for Advanced Pelvic Cancer by Exenteration of the Pelvic Organs Reported in the Past Ten Years*

| First Author | Institution | Number of Patients Treated | Number of Operative Deaths | Number Surviving Five Years |
|---|---|---|---|---|
| Dargent, M.[8] (1957) | Lyon, France | 83 | 26 | 13 |
| Douglas, R.[9] (1957) | New York Hospital | 23 | 1 | 5 |
| Smith, R.[12] (1963) | National Cancer Institute | 71 | 6 | 11 |
| Parsons, L.[10] (1964) | Boston | 112 | 24 | 24 |
| Rutledge, F.[11] (1965) | M. D. Anderson | 108 | 18 | 31 |
| Brunschwig, A.[5] (1965) | Memorial Hospital | 535 | 86 | 108 |
| Total | | 932 | 161 (17%) | 192 (21%) |

ment is universal, the number of patients for whom this type of surgery might be beneficial should be very few. Until such a time is reached, many more patients might be benefited. Of less than 1,000 cases reported from other institutions in the past 10 years, over half are those of Brunschwig (Table 10).

2) In order for the mortality and morbidity to be acceptable, and for the results to be significant, the surgery should preferably be done only in those areas or hospitals where the volume may be expected to provide the experience necessary for the proper selection of patients and the performance of the operation.

3) The surgery should be done only by those individuals with adequate training and background who are willing to take on the responsibility of these patients as a long-term project and to give special attention to postoperative care and rehabilitation.

4) "Adequate training and background" implies adequate training in the basic principles of abdominal, pelvic, and intestinal surgery. Although there are a few notable exceptions, the majority of gynecologic training services in this country do not provide adequate training for the performance of the type of surgery under discussion. Furthermore, the requirements of the Board of Obstetrics and Gynecology are inadequate for this purpose, or for that matter, for the handling of many of the surgical conditions in the pelvis which may be encountered in the course of gynecologic surgery. This is important since it is the gynecologists who first see and treat the patients and who should first recognize the therapeutic failures. In all fairness, it also must be stated that the average general surgical training program provides an inadequate exposure to gynecologic pathology, and to the technical problems attendant upon operations in the female pelvis. There is little assurance that an individual who has become a "qualified" surgeon is in any way competent to operate on the female pelvis.

In view of the dilemma presented by the preceding paragraphs, it seems timely to ask the question—what can the surgeons who direct American surgery do to insure the proper application of exenterative pelvic surgery to the patients who would be benefited by it?

## References

1. Appleby, L. H.: Proctocystectomy; Management of Colostomy with Ureteral Transplants. Amer. J. Surg., **79**:57, 1950.
2. Bricker, E. M.: The Technique of Ileal Segment Bladder Substitution. In Progress in Gynecology, J. V. Meigs (Ed.), Vol. III. New York, Grune and Stratton, 1957.
3. Bricker, E. M., Butcher, H. R., Jr., Lawler, W. H., Jr. and McAfee, C. A.: Surgical Treatment of Advanced and Recurrent Cancer of the Pelvic Viscera: An Evaluation of Ten Years Experience. Ann. Surg., **152**:388, 1960.
4. Bricker, E. M., Butcher, H. R., Jr. and McAfee, C. A.: Late Results of Bladder Substitution with Isolated Ileal Segments. Surg. Gynec. Obstet., **99**:469, 1954.
5. Brunschwig, A.: What Are the Indications and Results of Pelvic Exenteration. JAMA, **194**:274, 1965 (and personal communication, 1966).
6. Brunschwig, A. and Pierce, V. K.: Partial and Complete Pelvic Exenteration: Progress Report Based upon the First 100 Operations. Cancer, **3**:972, 1950.
7. Cutler, S. J. and Ederer, F.: Maximum Utilization of the Life Table Method in Analyzing Survival. J. Chron. Dis., **8**:699, 1958.
8. Dargent, M., Mayer, M. and Colon, J.: Limits and Indications for Pelvic Exenteration in Advanced Phases of Gynecologic Cancers. C. R. Soc. Franc. Gyn., **27**:293, 1957.
9. Douglas, R. G. and Sweeney, W. J.: Exenteration Operations in Treatment of Advanced Pelvic Cancers. Amer. J. Obstet. Gynec., **73**:1169, 1957.
10. Parsons, L. and Friedell, G. J.: Radical Surgical Treatment of Cancer of Cervix. Proc. Nat. Cancer Conf., **5**:241, 1964.
11. Rutledge, F. N. and Burns, B. S.: Pelvic Exenteration. Amer. J. Obstet. Gynec., **91**:692, 1965.
12. Smith, R. R., Ketcham, A. S. and Thomas, L. B.: Cancer of Uterine Cervix. Cancer, **16**:1105, 1963.