GILBERT H. FLETCHER, M.D.
JANEWAY LECTURER, 1970
Cancer of the Uterine Cervix*

Janeway Lecture, 1970

By Gilbert H. Fletcher, M.D.

Houston, Texas

Cancer of the uterine cervix is a fitting subject to honor Henry H. Janeway who, appointed Chief of Surgery at Memorial Hospital of New York City in 1915, was instrumental in promoting intracavitary radium therapy for the treatment of cervical cancer.

In 1919, Janeway published a comprehensive review of the results of surgery in 5,027 patients presenting with cancer of the cervix, with an 11.7 per cent salvage rate.24 Janeway was greatly impressed with the effectiveness of intracavitary radium therapy to control the local lesion, and considered it to be superior to surgical removal for borderline resectable tumors. However, he stated that a strong argument in favor of the radical abdominal operation was to provide the only approach by which lymphatic metastases could be removed, and he added that very few patients with involved lymph nodes had ever been cured. This separate evaluation of the effectiveness of methods of treatment for the primary lesion and for the regional lymphatics is a central concept in cancer management.

Effective intracavitary radium therapy techniques, primarily those designed at the Curie Foundation and at the Radiumhemmet, resulted in improved survival rates by the mid 1920s. In 1927, Heyman22 reported from several series of patients treated either surgically or by irradiation that the results in operable cases were 35 per cent either with surgery or with irradiation. Heyman commented that the surgical series included only patients whose disease had been resected, whereas the irradiated series included patients with undetected nonresectable disease because they had not had an abdominal exploration. This lack of comparability is still with us when we attempt to assess the results of surgery or radiation therapy in series of patients placed in the same clinical stages.

* Presented at the Fifty-second Annual Meeting of the American Radium Society, Coronado Island, San Diego, California, March 1-5, 1970.

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This investigation was supported by Public Health Service Research Grants Nos. CA-06594 and CA-03654 from the National Cancer Institute and Grant 2 G03 RM-00007-02 from RMP of Texas.
The French gynecologic surgeon, Jean-Louis Faure, conceded in 1928 that treatment for cancer of the uterine cervix was primarily radiotherapeutic. There was, however, continued use of the radical hysterectomy, the best known series being that of Victor Bonney who obtained a 40 per cent 5 year NED (no evidence of disease) rate in 500 patients undergoing surgical resection out of a total of 800 patients. The challenge of radiation treatment for uterine cervical cancer increased in the 1940s and the 1950s. Today the opinion is that either treatment is acceptable, and that one should individualize to suit the patient's situation.

In analyzing survival and control rates, we have the opportunity to review the progress made since 1919. On the basis of clinical tumor biology and radiobiology established from quantitative clinical data, we can re-assess the fundamental concepts of radiation response, dosimetry, and combined irradiation and surgery.

RADIORESISTANCE OF CANCERS OF THE UTERINE CERVIX

Sherman, reviewing 21 central irradiation failures in patients treated at Washington University in St. Louis, showed that in 18 patients for whom radium localization roentgenograms were available, the radium geometry was extremely poor. One of his cases (Fig. 1) shows the vaginal radium lying anterior to the cervix, which results in areas of underdosage. Parenthetically, the dose at Point A might be optimal. With areas of underdosage in and around the cervix, failure to control the central disease can be anticipated, just as one would expect lack of surgical control of a lesion if there was a gross cut-through. Cold spots are sufficient to explain failures without seeking a biologic explanation. As in a surgical procedure, care must be applied to every detail of intracavitary radium therapy (Fig. 2, A and B).

The radiobiologic data established in the last 10 to 15 years have shown that biologic radioresistance per se does not exist for epithelial tumors. Two factors which determine the potential for eradication of the disease are: (1) the number of tumor cells, and (2) the oxygenation of the tumor bed. A small fraction of hypoxic cells in a large population of cancer cells necessitates an enormous increase in tumor dose to eradicate the disease. There are data for squamous cell carcinoma of the upper respiratory and digestive tracts and for adenocarcinoma of the breast indicating that a high percentage of subclinical disease in the regional lymphatics can be eradicated, with doses of 4,500 to 5,000 rads in 5 weeks, whereas large masses at the primary site or in lymph nodes have a lower control rate with much higher doses. In addition to the number of cells and the oxygenation of the tumor bed, there is a sigmoid response curve
for tumors identical in size and composition.\textsuperscript{23}

An absolute cancerocidal dose does not exist. One must establish what dose is needed to eradicate microscopic disease in the lymphatics of the vaginal mucosa or parametria or small foci in regional lymph nodes and establish what dose is needed to control large masses. With intracavitary radium therapy, the distance from the sources to the peripheral extent of the disease is of paramount importance. The so-called radioresistance of adenocarcinoma of the cervix or of the endometrium is caused by invasion of the myometrium with cells at too great a distance from the radioactive sources to receive an adequate dose.

**DOSIMETRY**

Since the early 1920s, intracavitary radium therapy and external irradiation have been used. There have been considerable arguments throughout the years as to which should be applied first—external irradiation or intracavitary radium therapy—and even of whether external irradiation is of any value.\textsuperscript{1,32,33} In Figure 3 is shown an idealized volume distribution of combined external beam and intracavitary radium, expressed in threshold skin erythema doses, for patients treated by Healy in 1924 at Memorial Hospital of New York City.\textsuperscript{21} This idealization of dosimetry on paper has been and remains a fallacy in the dosimetry of intracavitary radium therapy for cancer of the uterine cervix. In Figure 4,
Although the importance of the inverse square law has been recognized from the early days of radiologic physics, it is strange that its consequences in brachy-radium therapy have been and still are overlooked by many. One is bound to have central failures if one first uses intracavitary radium therapy for large central lesions; there must be shrinkage of the volume of disease before radium can be used with effectiveness.

Because the T-shaped or linear arrangement of the radioactive sources results in a precipitous fall-off in dose from the surface of the applicators toward the periphery of the pelvis, there is no point or surface which is representative of an average tissue dose. The doses received by the pelvic organs and the regional lymphatics are dependent upon the length of the uterine cavity and the roominess of the vault, on the type of applicators, on the respective uterine and vaginal

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**Fig. 3.** Idealized combined radium and external roentgen dosage used in 1924 at Memorial Hospital of New York City for cancer of the cervix. The numbers represent threshold erythema doses. (Reproduced by courtesy of W. P. Healy. *Ann. Surg.*, 1931, 93, 451–459.)

(A–F), are shown a number of clinical situations which distort the central geometry.38 Determining dosage at a point in the paracervical area with reference to the radium system43,44 is an illusory and damaging practice.

**Fig. 4.** (A–F) Clinical situations distorting the central geometry. (Reproduced by courtesy of G. Schwarz.39)
loading, and on the location of the radioactive system in the pelvis.\textsuperscript{10}

Two illustrations will be shown of the complexity of the dosimetry for intracavitary radium therapy. When afterloading tandems were first introduced we decided to eliminate separate applications of tandem and colpostats in a narrow, cone-shaped vault by using one application of intravaginal radium with a protruding source in the vagina. We were aware that there was a difference in the dose to the base of the bladder anteriorly and the rectal wall posteriorly, and we hoped that this difference would not matter. Rectal ulcers at the level of the posterior fornix developed in some patients so treated.\textsuperscript{10} Figure 5 shows that there is a considerable difference in the dose delivered to the rectal mucosa between the two arrangements. Parenthetically, there is no difference in the dose at Point A delivered by either system.

The specific complication in whole pelvis irradiation alone or when combined with intracavitary gamma ray therapy is sigmoiditis.\textsuperscript{6,40} Figure 6 shows a typical lesion in a patient who received 4,000 rads whole pelvis irradiation and 5,580 mg.-hr. in 2 applications. The radium system in both applications was located in the hollow of the sacrum against the loops of sigmoid. It would seem logical to use as an adequate approximation of dose to the sigmoid loops, the dose on the surface of a sphere 10 cm. in diameter, centered over the weighted geometric center of the radioactive sources, as shown in Figure 7. The dose on that sphere is the number of milligram hours multiplied by 8.25 and divided by 25. The only variable is the number of milligram hours and, as retrogressive as it may sound, one might as well retain milligram hours as
the yardstick of radium dosage. A set of maxima of milligram hours was established for combination with external irradiation. Catastrophic complications developed in a few patients who, because of a short uterine cavity and a narrow vault, had a compact

Fig. 6. Typical location of constrictive sigmoiditis after 4,000 rads to the whole pelvis and 5,580 mg.-hr. in 2 applications. The tracings of the 2 radium applications, taken from the radium application roentgenograms, were superimposed on the barium enema roentgenogram showing the vicinity of the radium system to the damaged loops of sigmoid in the hollow of the sacrum. (Reproduced by courtesy of M. F. Strockbine, J. E. Hancock, and G. H. Fletcher.)

Fig. 7. Sigmoiditis should be related to the total dose from external irradiation and the dose from intracavitary radium in the hollow of the sacrum obtained with computer dosimetry. The dose calculated on a sphere 10 cm. in diameter centered over the weighted geometric center of the radium system would be an adequate approximation. For the same number of rads on that sphere, the doses to tissues in the immediate vicinity of the cervical canal and fornices are much greater with a small radium system than with a large radium system.

For instance:

with 15-10-10

- 20 cm. from midcervix 100 rads/hr.
- 20 cm. from midcervix 21 rads/hr.

with 15-15

- 1 cm. from midcervix 120 rads/hr.
- 25 cm. from midcervix 12.5 rads/hr.

(Reproduced by courtesy of G. H. Fletcher. J. de radiol., d'électrol. et de méd. nucléaire, 1968, 49, 625-639.)
radium system resulting in too high a central dose. Following this experience, 2 sets of maxima were established to take into consideration the compactness of the radium system (Table I). There is no simple formula which can be used for dosage determination of intracavitary radium therapy.

**Analysis of Results**

Five year survival rates are important, but it is equally important, or perhaps more important, to know the causes of death; i.e., central disease in or around the cervix, disease in the parametria or in the regional lymphatics, or distant metastases, or intercurrent disease. Until recently, only survival rates were reported in the literature. I am aware of only one old publication by Juliette Baud who, in 1954, reported the sites of failures in patients with Stage I disease treated at the Curie Foundation from 1919 to 1947.

Attention must be directed separately to central failures and failures in regional lymphatics, since the solution of these problems is not the same. Table II analyzes central failures alone or in association with other sites in patients treated from 1954 through 1963. In patients with Stage I and II_A disease, the incidence of central failures is negligible. If one closely analyzes the central failures in Stage II, one sees that they essentially occur in the large central lesions (Table III). With megavoltage the incidence of central failures in the bulky lesions was diminished by half because whole pelvis irradiation given first produces sufficient shrinkage to make the subsequent intracavitary radium therapy effective. Even in those patients with distorted anatomy, central failures are rare. A small

<table>
<thead>
<tr>
<th>Stage</th>
<th>Whole Pelvis (rads)</th>
<th>Maximum Hours (1)</th>
<th>Maximum mg.-hr. (1) (2)</th>
<th>Parametrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>I ≤ 1 cm.</td>
<td></td>
<td>72—2 weeks—72</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>I &gt; 1 cm. and II_A</td>
<td>2,000</td>
<td>48—2 weeks—72 (3)</td>
<td>9,000</td>
<td>1,000—2,000 rads</td>
</tr>
<tr>
<td></td>
<td>4,000</td>
<td>48—2 weeks—48</td>
<td>6,500</td>
<td></td>
</tr>
<tr>
<td>II_B*</td>
<td>4,000</td>
<td>48—2 weeks—48</td>
<td>6,500</td>
<td></td>
</tr>
<tr>
<td>III_A</td>
<td>4,000</td>
<td>48—2 weeks—48</td>
<td>6,500</td>
<td>1,000—1,500 rads on side involved</td>
</tr>
<tr>
<td></td>
<td>5,000</td>
<td>72 (4) or 48—2 weeks—24—48 (3)</td>
<td>5,000</td>
<td>Possibly 1,000 rads on side involved</td>
</tr>
<tr>
<td>III_B and IV</td>
<td>6,000</td>
<td>72 (4)</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Use whichever maximum occurs first, either the time or the mg.-hr.
(2) May be exceeded in large radium systems if there is too large a separation or for unusual tumor size or location (e.g., posterior or anterior lip, etc.).
(3) May use the longer time first if the first application is unusually good and the second application may not be as good.
(4) If the status of central disease indicates it, the time may be increased beyond 72 hours or above 5,000 mg.-hr. Then split into 48 hours—2 weeks—24 to 48 hours.

Note: A tandem with a protruding source and a 3 cm. diameter vaginal cylinder should have a 20 mg. source in the cylinder with one and a half sources protruding. The loading is 15-10-20; 15-10-10-20, etc.

*Whole pelvis irradiation may be carried to 5,000 rads if there is slow regression.
TABLE II
CENTRAL ACTIVE DISEASE ALONE OR CONCOMITANT IN OTHER SITES APPEARING WITHIN FIVE YEARS
MEGAVOLTAGE SERIES
September 1954–December 1963

<table>
<thead>
<tr>
<th>Stage</th>
<th>Total Number of Patients Treated</th>
<th>Patients with Central Active Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>734</td>
<td>12 (1.5%)</td>
</tr>
<tr>
<td>II, B</td>
<td>291</td>
<td>15 (5.0%)</td>
</tr>
<tr>
<td>III, A</td>
<td>324</td>
<td>24 (7.5%)</td>
</tr>
<tr>
<td>III, B</td>
<td>275</td>
<td>49 (17.0%)</td>
</tr>
<tr>
<td>IV</td>
<td>81</td>
<td>32 (39.0%)</td>
</tr>
</tbody>
</table>

The percentage of patients treated with 4,000 rads to the whole pelvis followed by radium develop severe complications.\textsuperscript{9,40} One can choose to have fewer complications with more central failures.\textsuperscript{26}

The analysis of failures in the regional lymphatics is complex because of the ignorance of the extent of lymph node involvement at the initial and follow-up examinations. Fingers can detect only greatly enlarged obturator, uterosacral or low hypogastric lymph nodes. This ignorance of the lymphatic spread of the disease has been one of the main reasons for the mythical theories regarding the radiosensitivity of lymph node metastases of squamous cell carcinoma of the uterine cervix.

The importance of the spread of the disease to the regional lymphatics was recognized by Wertheim who, in practicing the extended hysterectomy, removed enlarged and hard lymph nodes.\textsuperscript{45,46} Wertheim was of the opinion that only large or hard lymph nodes contained cancer. A few of the patients who had positive lymph nodes treated by this partial lymphadenectomy were alive at 5 years.\textsuperscript{46} As stated at the beginning of the lecture, Janeway recognized the necessity of treating the lymph nodes and considered this the advantage of the radical abdominal operation. Leveuf and Godard in 1927 tried to combine the effectiveness of intracavitary radium for the primary lesion with a transperitoneal lymphadenectomy. They published only preliminary results and apparently did not pursue the matter.\textsuperscript{28} Bonney\textsuperscript{9} obtained a 20 per cent NED rate at 5 years when the lymph nodes were positive; this figure is essentially unchanged in all surgical series since reported. Primarily in this country a comparison has been made of the percent

 TABLE III
STAGE II CENTRAL RECURRENCES SEPARATED BY TYPE OF LESION AND TIME OF RECURRENCE

<table>
<thead>
<tr>
<th>Time of Recurrence</th>
<th>Fornical or Parametrical Involvement</th>
<th>Bulky, Everting Exophytic Mass without Lower Uterine Segment Involvement</th>
<th>Barrel-Shaped Endocervical Lesion and/or Positive Endometrial Biopsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 Yr. (45)</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>&gt;5 Yr. (7)</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

Cent. = central; Reg. = regional; DM = distant metastases.

Note: (1) The majority of the central recurrences appearing early are in the central bulky lesions and the barrel-shaped or endocervical lesions and are associated with pelvic disease and distant metastases.
(2) The late vault recurrences occur in the nonbulky lesions, and are isolated failures.
age of lymph nodes involved when patients had primary surgery versus irradiation followed by lymphadenectomy, first by Taussig14,46 and shortly after by Morton.20 Both authors showed that the percentage of involved regional lymph nodes was clearly less in those patients having had previous irradiation than in those treated surgically. Despite this information, the general belief of gynecologic surgeons in the 1940s was that squamous cell carcinoma in lymph nodes could not be sterilized by irradiation. Several other series of combined treatment were reported later by Gorton from Sweden18 and by Gray, Gusberg, and Guttmann from Delafield-Columbia.20 They confirmed that positive lymph nodes were found far less frequently after irradiation than after primary surgical treatment.

Kottmeier and Forssner27 have published invaluable information from a small series of patients who had a laparotomy for various reasons and were found by biopsy to have positive lymph nodes. They were treated with the old Radiumhemmet technique which did not give more than 4000 roentgens to the lymph nodes by combined intracavitary radium and external irradiation. Thirty per cent of the patients were alive and well 5 years or longer.

In order to obtain quantitative information on the radiation response of infested lymph nodes, Felix Rutledge and we undertook systematic studies. Initially, a trans-

Table IV
LYMPHADENECTOMY SERIES IN SQUAMOUS CELL CARCINOMA OF THE CERVIX: RANDOMIZED STUDY OF PATIENTS WITH POSITIVE LYMPH NODES26 STAGE I-STAGE III February 1957 through February 1960

<table>
<thead>
<tr>
<th>Stage</th>
<th>No. of Patients</th>
<th>No. of Positive Lymph Nodes</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>30</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>IIa</td>
<td>39</td>
<td>4</td>
<td>10.3</td>
</tr>
<tr>
<td>IIb</td>
<td>25</td>
<td>5</td>
<td>20.0</td>
</tr>
<tr>
<td>IIIa</td>
<td>23</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>IIIb</td>
<td>25</td>
<td>2</td>
<td>8.0</td>
</tr>
</tbody>
</table>

peritoneal lymphadenectomy was performed 3 months after completion of irradiation in 100 consecutive Stage III patients who were medically suitable for the operation. The incidence of positive lymph nodes in the regional lymphatics up to the bifurcation of the aorta was found to be 19 per cent.28 After this, a program of randomization of lymphadenectomy 3 months after completion of radiation was initiated in patients with Stages I, II and III disease. Table IV shows by stages the incidence of positive lymph nodes.26 The incidence of positive lymph nodes is low in all stages, particularly in the Stage III patients, when compared with published data.19 Few patients with positive lymph nodes were cured of their disease. At operation the positive lymph nodes were matted and wrapped around the vessels. It is, therefore, not surprising that no benefit could be obtained with such advanced disease.

A retrospective study using the roentgenograms of radium applications showed that the obturator, external iliac and hypogastric lymph nodes had received between 5000 and 6000 rads from combined radium and external irradiation.

Extended Irradiation of Lymphatics

Table V shows the location of the positive lymph nodes along the regional lymphatics.
in the Stage III patients. One sees that of 28 patients, only 7 had disease limited to the irradiated area included in the 15 cm. high portals. We were aware that this portal size was not adequate to cover the common iliac lymph nodes, particularly when vaginal disease was extensive and the lower margin of the portals had to be low. This is the maximum practical field size with the 22 mev. betatron; furthermore, complications increase with volume. High doses to the whole pelvis were risky enough and baseline information had to be obtained. With the coming of a new generation of megavoltage generators which will permit large fields with 25 to 30 mev. optimal energy for parallel opposing portals, one can conceive of irradiating up to the level of L-4 when the obturator, hypogastric, and/or external iliac lymph nodes are positive and up to the diaphragm if the common iliac and/or paraaortic lymph nodes are positive (Fig. 8, A and B).

With interest in intensive irradiation of the regional lymphatics, the knowledge of the dose delivered is important. With a computer program, the dose to points representative of the external iliac, common iliac, and low paraaortic lymph nodes can be obtained routinely (Fig. 9, A-D; and 10, A-D). The number of milligram hours in the radium system and the respective amounts of intrauterine and vaginal radium are separate factors in the contribution of dose to the regional lymphatics. The intrauterine radium is primarily contributory to the external iliac, hypogastric, and common iliac lymph nodes, whereas the obturator lymph nodes receive a significant contribution from the vaginal radium. The location of the radium system within the pelvis is another important factor. The intrauterine radium should be back and high between the common iliac lymph node chains. In the case shown (Fig. 10, A-D), the tandem has too much curvature. Kottmeier and ourselves became aware of this by direct measurement at laparotomy.
Fig. 9. (A) Anteroposterior and (B) cross-table lateral orthogonal roentgenograms of a patient with a normal lower extremity lymphangiogram. (C and D) The adjacent line drawings illustrate the regional lymphatics of the pelvis and lower lumbar area and the terminology used. With the exception of the obturator lymph nodes located inside of the acetabula, uterosacral lymph nodes and some of the hypogastric lymph nodes, the lymph nodes are not on the pelvic walls. (Reproduced by courtesy of F. Y. Durrance and G. H. Fletcher. Radiology, 1968, 91, 140-148.)
Fig. 10. (A–D) Intracavitary radium computer dosimetry for the external iliac, common iliac, and low paraaortic lymph nodes. The tandem has too much curvature and should be farther back for maximum contribution to the distant external iliac and common iliac lymph nodes. (Reproduced by courtesy of F. Y. Durrance and G. H. Fletcher. Radiology, 1968, 91, 140–148.)
of the dose to the lymph node areas with the radium in situ.

If one uses computer data to give a combined minimum dose of 5,500 rads to the external iliac and low common iliac lymph nodes, one must be aware of the location of the radium system. If it is in the hollow of the sacrum, as shown in Figure 11, then constrictive sigmoiditis can develop if excessive milligram hours are given to compensate for the increased distance from the radioactive sources to the lymph nodes.

Through the years a few patients without massive pelvic disease were found at laparotomy, performed for various reasons, to have positive paraaortic lymph nodes and were treated with portals to the diaphragm; 2 of these were NED more than 5 years. Furthermore, even if patients die from distant metastases, eradication of disease in the regional lymphatics diminishes the possibility of intractable pain from nerve involvement for which methods of alleviation are inefficient. Approximately 100 patients have had extended field treatment; a few have developed terminal ileitis in addition to constrictive sigmoiditis. This is to be expected with more ileum in the irradiated area. More time will be required to determine the incidence of ileitis, but it is probable that extended fields should not be used routinely, but only when lymphatic spread is demonstrated. Lymphangiograms are of value when positive and are indicated when there is a bulky lesion, be it Stage I or Stage II. I believe that the time has come, with the current negligible morbidity in exploratory laparotomy, to examine the lymphatics and remove palpable lymph node(s) without doing a true lymphadenectomy. Five thousand rads given in 5 weeks after the removal of large masses has a high chance to eradicate subclinical disease.

REDEFINITION OF CONCEPTS

I would like now to discuss with you some concepts which, I consider, are essential to the management of cancers of the uterine cervix.

Fig. 11. Location of the radium system in the hollow of the sacrum in a patient who developed a constrictive sigmoiditis after 10,800 mg.-hr. and 4,000 rads to the parametria to deliver 5,500 rads to the distal external iliac and low common iliac lymph nodes.

First, staging of cervical cancer needs to be rethought. Stage I cases range from a subclinical lesion, discovered at cone biopsy to be unquestionably invasive squamous cell carcinoma, to a lesion measuring 5 to 7 cm. in diameter with intact fornices and no palpatory evidence of disease in the parametria. This latter lesion would be staged T3 or T4, if it were a squamous cell carcinoma of the oral cavity. A lesion minimally invading one fornix or with moderate parametrial infiltration should not be therapeutically grouped with a lesion which almost extends to one or both pelvic walls but is not fixed and therefore cannot be placed in Stage III.

I do not advocate changing the International Staging, but would favor adding
hysterectomy had been associated with prohibitive complications after intensive irradiation. Table VII shows the indications for which the extrafascial hysterectomy was performed; local control is excellent with central failure in only 2 of 87 patients with unfavorable bulky or endocervical barrel-shaped lesions. Theoretically, this combination may not be an accepted cancer procedure, but it has been successful in practice.

A close look shows that this approach is not actually a combination of two half measures but combines one method effective against certain areas of spread of the disease and the other method effective for another direction of spread. Four thousand rads to the whole pelvis, even if followed by diminished intracavitary radium, gives 8,000 to 10,000 rads to the vaginal mucosa and delivers to the lateral parametria, obturator, and external iliac lymph nodes at least 5,000 rads, which is effective for
small aggregates of cancer cells in these areas. The extrafascial hysterectomy removes disease in the myometrium which, despite some shrinkage after 4,000 rads to the whole pelvis, is still at too great a distance from the radium source to receive an effective dose (Fig. 13). This combination of the effectiveness of irradiation for subclinical disease with a conservative surgical procedure for removal of gross masses will, I believe, have many applications in the management of other cancers in the coming decade.

From a 5 year survival rate of 11.7 per cent, as reported by Janeway in 1919, to the present 5 and 10 year survival rates (Table VIII), significant progress has been made. As shown in Maryland by our President, Fernando Bloedorn, a network of cooperating clinics can make available highly effective modern radiotherapy to every woman with carcinoma of the cervix.4

The 2 previous Janeway lectures devoted to cancer of the uterine cervix, by Henry Schmitz in 19387 and by Frederick O'Brien in 1946,31 brought up to date the progress made at those 2 points in time. Since then there has been not only technologic improvement but clarification of the fundamentals underlying the radiation therapy of cancer of the uterine cervix. We understand better the effect of size, growth pattern, and mode of spread on the control rates.

The quality of survival should be given

**Table VIII**

SURVIVAL RATES FOR SQUAMOUS CELL CARCINOMA ON INTACT UTERUS

1,705 PATIENTS*  
September 1954 through December 1967

<table>
<thead>
<tr>
<th>Stage</th>
<th>Five Year Survival Rate†</th>
<th>Ten Year Survival Rate†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Cent Megavoltage</td>
<td>Per Cent Megavoltage</td>
</tr>
<tr>
<td>I</td>
<td>91.5</td>
<td>90.0</td>
</tr>
<tr>
<td>II A</td>
<td>83.5</td>
<td>79.0</td>
</tr>
<tr>
<td>II B</td>
<td>66.5</td>
<td>52.0</td>
</tr>
<tr>
<td>III A</td>
<td>45.0</td>
<td>39.5</td>
</tr>
<tr>
<td>III B</td>
<td>36.0</td>
<td>30.0</td>
</tr>
<tr>
<td>IV</td>
<td>14.0</td>
<td>14.0</td>
</tr>
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</table>

**Carcinoma of Cervical Stump**  
189 Patients

<table>
<thead>
<tr>
<th>Stage</th>
<th>Five Year Survival Rate†</th>
<th>Ten Year Survival Rate†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Cent Megavoltage</td>
<td>Per Cent Megavoltage</td>
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<td>97.0</td>
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<tr>
<td>II A</td>
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<td>II B</td>
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</tr>
<tr>
<td>IV</td>
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</table>

* Includes patients treated incompletely or for palliation.  
† Modified life table method.  
Patients dying from intercurrent disease are excluded.
increased emphasis. Early cancers of the uterine cervix are probably overtreated either surgically or by irradiation in the attempt to obtain the highest possible survival rates; it is at the expense of increased morbidity and some measure of sequelae to all patients. This is true in several areas of cancer management today. Increased communication between the surgeon and the radiotherapist will bring the controversy over the treatment of choice to an intellectual level, with both members of the team taking an ecumenical approach to eliminate barriers and prejudices.

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REFERENCES


