The Diagnosis and Treatment of Primary Ovarian Carcinoma
With Special Reference to Radiation Therapy

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The early diagnosis and treatment of ovarian carcinoma still remains a difficult problem due to the fact that the patient is often not seen until the neoplasm has spread beyond the ovary. Early surgical treatment has frequently proved effective when the lesion is confined to one ovary and there are no adhesions to interfere with its complete removal. The survival rate is low, however, in patients with local extension, ascites, or peritoneal implants. Roentgen therapy has proven to be of value in the relief of symptoms and prolongation of life, but there is still considerable doubt among surgeons as to whether the absolute five year "cure rate" is ever improved by radiation.

Many problems arise during the radiation treatment of these patients making it difficult and often impossible to deliver heavy dosages to the tumor-bearing areas. Radiation sickness frequently results before a course of treatment is completed due to the low tolerance of the surrounding organs. The necessity of using large fields to cover all tumor-bearing areas limits the amount that can be delivered to any single region. Factors such as the general condition of the patient, extent of the disease, presence or absence of infection, and individual sensitivity to radiation must all be considered in planning the treatment. The value of the roentgen treatment must then be determined by an analysis of the palliative effects and survival rate in the treated patients.

The records of 101 consecutive patients with ovarian carcinoma who received radiation therapy at the Hospital of the University of Pennsylvania from 1930 to 1941 have been reviewed in order to try to answer some of the problems which have arisen during their treatment and perhaps thereby improve on our methods and results in the future. Fourteen of these patients with a clinical diagnosis of ovarian carcinoma had no biopsy and are therefore excluded from this series.

**Age incidence.**—The age incidence parallels that reported by others (9, 22) and is shown in Table I. Seventy-two per cent of the patients are in the fourth, fifth, and sixth decades.

<table>
<thead>
<tr>
<th>Years</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
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<td>20-29</td>
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<td>50-59</td>
<td>33</td>
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<tr>
<td>60-69</td>
<td>10</td>
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<tr>
<td>70-79</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>87</strong></td>
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Cancer history.—The question of inheritance of cancer susceptibility is becoming more important in view of the increased interest of both the layman and the physician in cancer prevention. Routine cancer studies seem somewhat impractical on a nation-wide basis at the present time. However, if cancer susceptibility, age incidence, and other factors are considered, it might become possible to carry out such survey studies in at least that group of individuals in which statistical evidence suggests the highest incidence of ovarian neoplasms. A carefully taken cancer history should become a part of every patient's record. In our group of cases, a history of cancer in the family was recorded in 20 or 35.7 per cent of 56 patients where such information was obtained, and in 16 of these 20 patients, one or more members of the immediate family had died of cancer. Lynch (10) obtained a positive history of cancer in the family in 42 of 110 ovarian carcinoma patients (40 per cent). The incidence of cancer in the family of patients with ovarian carcinoma is higher than that noted by Lynch in patients of a somewhat similar age group operated on in his clinic for non-cancerous conditions. He found a positive family history in 25.3 per cent of 1,235 women from 35 to 75 years, and 28.6 per cent of 600 women between 45 and 75 years. However, both his and our series are far too small to provide any significant data.

The development of multiple primary carcinomas...
in two of our series of cases with a positive history of cancer in the immediate family further suggests a possible inherited susceptibility and emphasizes the importance of adequate follow-up examinations in such individuals. One patient developed a small lump in her left breast which was discovered during a check-up examination following her treatment for bilateral ovarian neoplasms. A simple mastectomy was performed and the pathological diagnosis was scirrhous carcinoma. A year later she detected a small lump in her right breast. This was treated by simple mastectomy and the microscopic sections revealed a small-celled carcinoma. This patient was still living and well 5 years after treatment for 3 primary carcinomas. Her sister died of carcinoma of the bowel. Another patient had treatment for breast carcinoma 2 years prior to the development of an ovarian neoplasm and is still living and well 10 years later. The ovarian lesion was discovered during a routine visit to the follow-up clinic. Her mother died of carcinoma of the breast.

Lynch (10), Meigs (14), and others (2, 18) report a lower incidence of fertility in the married women in their series. Lynch noted sterility in 31 per cent of the married women in 110 patients with ovarian carcinoma; Meigs in approximately 40 per cent of his married patients with ovarian carcinoma. Forty-two per cent of the married women in our series had never been pregnant. This is a high incidence of sterility since 10 per cent is usually considered as normal incidence (23). Many gynecologists, therefore, feel that this lack of fertility may indicate some congenital developmental abnormality of the ovary and thereby an increased chance for abnormal growth.

**Symptoms and signs and diagnosis.**—Ovarian cancer frequently gives no symptoms until it is well advanced. The duration of symptoms is usually from 6 months to a year before the patient consults a physician or the diagnosis is made. Pain, a sense of fullness, or a mass in the abdomen is usually the presenting symptom. Abdominal pain was present in 56 or 64 per cent of our 87 patients, while a mass or abdominal swelling was noted in 69 or 79 per cent. Twenty-one patients had noted an irregularity in their menstrual cycle and 10 had post-menopausal bleeding.

Ascites was present in 34 of the patients, though due to the large size of the tumor in some cases, this was not discovered until operation. Pleural effusion was present in 4 of these patients when they were first seen and developed later in the course of the disease in an additional 4 patients. In only 1 of these cases was there any evidence of pleural or parenchymal metastasis on repeated chest roentgenograms. The pleural effusion was apparently cured by removal of the primary tumor in 2 patients. Another patient with a bilateral pleural effusion for seven months before death had no evidence of metastasis in the chest at post-mortem examination. The pathologist was unable to explain the cause of the hydrothorax. The presence of a pleural effusion in patients with ovarian carcinoma therefore does not necessarily indicate parenchymal or pleural metastasis. The mechanism of the hydrothorax in such cases may be similar to that noted by Meigs and Cass (13) in cases of ovarian fibroma. It is interesting to note that in the 6 patients with a unilateral hydrothorax, it was present on the right side in 5, and on the left side in one patient. There was no correlation between the location of the tumor and the pleural effusion since, in the 5 patients with a right pleural effusion, the tumor was located on the right side in 2, on the left side in 2, and was bilateral in one patient. The patient with a left pleural effusion had a unilateral ovarian tumor. A greater frequency of a right pleural effusion was observed by Meigs, Armstrong, and Hamilton (15) in a report of 27 cases of ovarian fibroma. Eighteen of this group had a pleural effusion on the right side, 4 on the left, and 4 were bilateral. In one case, the location of the effusion was not stated. The effusion disappeared in all cases after removal of the ovarian fibroma.

Since the true character and extent of the lesion cannot always be ascertained from the history and physical examination alone, we believe a roentgenogram of the chest and abdomen should be obtained routinely on these patients to aid in the differential diagnosis. A program and gastrointestinal examination is often of value in determining the true extent of the disease and may be helpful in the future management.

**Classification.**—The study of pathological material has proven to be of little or no value either in predicting the radiosensitivity of the tumor or the ultimate prognosis of the patient. Harris and Payne (3), Meigs (14), Lynch (10), and others could find no real correlation between the pathological type or grading and radiosensitivity. Most authors have therefore classified their cases into groups based on the extent of the tumor at operation. We have adopted a classification similar to that of Walter, Bachman, and Harris (27), grouping the cases in four stages:

Stage I: Primary tumor completely removable,
no visible metastases.

Stage II: Extension or local metastasis present, but completely removable with primary tumor so that no visible disease remains.

Stage III: Local metastases present, but only partially removable with primary tumor.

Stage IV: Inoperable tumor; exploratory operation or removal of large tumor masses only; distant metastasis.

Using this method, our series was classified as shown in Table II.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Patients</th>
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<tbody>
<tr>
<td>I</td>
<td>21</td>
</tr>
<tr>
<td>II</td>
<td>12</td>
</tr>
<tr>
<td>III</td>
<td>35</td>
</tr>
<tr>
<td>IV</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
</tr>
</tbody>
</table>

Pathology.—Only those cases in whom a positive biopsy was obtained are included in this report. The pathological diagnosis made in these 87 patients is shown in Table III.

<table>
<thead>
<tr>
<th>Pathological Diagnosis</th>
<th>Patients</th>
</tr>
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<tbody>
<tr>
<td>Adenocarcinoma unclassified</td>
<td>6</td>
</tr>
<tr>
<td>Pseudomucinous cystadenocarcinoma</td>
<td>9</td>
</tr>
<tr>
<td>Serous papillary cystadenocarcinoma</td>
<td>36</td>
</tr>
<tr>
<td>Serous non-papillary cystadenocarcinoma</td>
<td>30</td>
</tr>
<tr>
<td>Carcinoma arising in a dermoid</td>
<td>3</td>
</tr>
<tr>
<td>Granulosa cell tumor</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>87</strong></td>
</tr>
</tbody>
</table>

The tumor was unilateral in 43 and bilateral in 34 patients. It was located in the right ovary in 19 and in the left ovary in 24. Two patients with unilateral involvement subsequently developed a tumor in the opposite ovary 14 and 16 months later.

The extent of the tumor at the time of operation is shown in Table IV.

<table>
<thead>
<tr>
<th>Extent of Tumor</th>
<th>Patients</th>
</tr>
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<tbody>
<tr>
<td>Generalized peritoneal metastasis with ascites</td>
<td>21</td>
</tr>
<tr>
<td>Generalized peritoneal metastasis without ascites</td>
<td>15</td>
</tr>
<tr>
<td>Pelvic extension or metastasis with ascites</td>
<td>13</td>
</tr>
<tr>
<td>Pelvic extension or metastasis without ascites</td>
<td>16</td>
</tr>
<tr>
<td>Far extension</td>
<td>1</td>
</tr>
<tr>
<td>No metastasis seen</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>87</strong></td>
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**Treatment.**—All of the patients had at least an exploratory operation and whenever possible those operated on at our hospital and referred to the Department of Radiology from the Department of Obstetrics and Gynecology had a bilateral salpingo-oophorectomy and hysterectomy. Some of the patients referred for treatment after operation elsewhere had only a unilateral oophorectomy. The type of operation performed in this series is shown in Table V.

<table>
<thead>
<tr>
<th>Type of Operation</th>
<th>Patients</th>
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<tbody>
<tr>
<td>Bilateral salpingo-oophorectomy and hysterectomy</td>
<td>51</td>
</tr>
<tr>
<td>Bilateral salpingo-oophorectomy</td>
<td>6</td>
</tr>
<tr>
<td>Unilateral salpingo-oophorectomy</td>
<td>11</td>
</tr>
<tr>
<td>Exploratory or removal of large tumors only</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>87</strong></td>
</tr>
</tbody>
</table>

All of the 87 cases reported here received postoperative radiation. Two cases were found to be inoperable at the first operation but after a full course of roentgen therapy, the tumor was markedly reduced in size so as to be removable at a second operation. One of these patients with widespread peritoneal implants at the first operation, showed complete regression of the metastatic lesions upon re-operation, after receiving a tumor dose of 1,500 tissue r to the abdomen and pelvis. The second patient showed a marked regression of the tumor mass after receiving a tumor dose of 1,500 tissue r to the pelvis, but the abdomen was not irradiated and the peritoneal transplants were still present. A third patient was found to be inoperable at the first operation and at a second exploratory operation two weeks after receiving 1,000 tissue r to the abdomen and 2,000 tissue r to the pelvis. Two months later, she was again operated on and the tumor growths were completely removed. No metastases were present at the third operation.

The two patients in whom only one ovary was removed subsequently developed a carcinoma in the opposite ovary fourteen and sixteen months later. In both cases, the opposite ovary showed no gross involvement at the first operation. One patient received no radiotherapy but the second patient had a full course of treatment following the first surgical procedure.

Radiation was given using factors of 160 to 200 kv. (constant potential), 5 to 15 ma., half-value-layer .95 to 1.1 mm. Cu, 50 to 80 cm. distance. The pelvis was irradiated through 2 anterior and 2 posterior 15 by 15 cm. or 17 by 17 cm. portals until 1941 when the technic was changed to a single anterior and posterior 15 by 20 cm. portal. Those cases with evidence of widespread peritoneal transplants were given radiation over the upper
abdomen using a single 20 by 20 cm. anterior and posterior portal. Four patients with a pleural effusion who were thought to have metastatic lesions in the chest were given palliative treatment over this region using a 15 by 15 cm. anterior and posterior portal. Patients with a large localized recurrence in the pelvis occasionally were given additional treatment over this area. Two patients with a localized lesion in the cul-de-sac received treatment through intravaginal portals in addition to the external treatment.

With the use of two anterior and posterior portals, a dose of 200 (air) r was delivered to each of two portals daily or on alternate days depending upon the tolerance of the patient. The majority of our cases were treated as outpatients and occasionally 3 or 4 portals were treated with 200 (air) r twice weekly when the patient lived some distance from the hospital. When the single large anterior and posterior portal was used, 1 portal was given 200 (air) r daily. The cyclic method was used on 10 of this group between 1937 to 1939 treating 2 portals daily for 8 to 10 days with a rest period of from 1 to 2 weeks between each cycle. There was no evidence that this method was producing any better results and it was therefore abandoned in favor of the serial method. Most patients received from 1,500 to 3,000 (air) r at each series with a rest period of from 1 to 4 months or longer between series. Those who were in good general condition and tolerated treatment well were sometimes given a full course of therapy in a single series. In some cases the total treatment was spread over 2, 3, or 4 series.

The tumor dose delivered to the mid-anteroposterior region of the pelvis and abdomen was calculated in all these patients using the depth dose charts published by Quimby (24) or Mayneord and Lamerton (12). The ovarian tumor dose and the abdominal tissue dose were taken as that delivered to the mid-anteroposterior region of the pelvis and abdomen respectively. In several patients, depth dose calculations were made in planning the treatment. In most cases, the anteroposterior dimension of the abdomen and pelvis was recorded before the start of the treatment. In a few cases, where this information was not available, on the charts, the anteroposterior dimension was determined from that recorded on the x-ray diagnostic sheets, since the majority of the patients had either a flatplate of the abdomen, urographic study or both at sometime during their treatment. Variations in the anteroposterior dimension due to reaccumulation of abdominal fluid were not considered and necessarily introduce some error in the depth dose calculations. However, when large amounts of fluid were present, this was removed by paracentesis both before and whenever necessary during the treatment. The 84 patients, in whom complete follow-ups were obtained, were grouped according to the tumor dose delivered to the pelvis as shown in Table VI.

Fifty-five patients were given abdominal radiation as well with doses varying from 200 to 2,500 tissue r, and of these 28 were given from 200 to 1,000 tissue r and 27 received from 1,000 to 2,500 tissue r. Of the patients with abdominal carcinomatosis at operation, 14 received less than 500 tissue r and only 2 of these survived more than two years, 4 received from 500 to 1,000 tissue r, 17 were given from 1,000 to 2,500 tissue r.

Results—The results of roentgen treatment are evaluated first as to relief of symptoms and second as to prolongation of life.

Symptomatic benefit was recorded in 48 of 64 patients in whom symptoms were present at the time of roentgen treatment. Fourteen patients, nearly all of whom were in very poor condition at the start of therapy received no benefit and in some instances were probably made worse. There was a noticeable reduction or complete disappearance of the mass in 27, pain was partially or completely relieved in 32, and the reaccumulation of ascites was either prevented or considerably retarded in 15 patients. A tabulation of these results are shown in Table VII.

In 7 patients the tumor recurred while the patient was still under treatment. In 2 patients the mass increased in size in spite of treatment.

The survival rate of the 84 patients in whom complete follow-ups were obtained is shown by means of a curve in Fig. 1. The general shape of

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<td>Total</td>
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<td>9</td>
<td>12</td>
<td>13</td>
<td>15</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>84</td>
</tr>
</tbody>
</table>
the curve of survival in our series and our five
year cure rate is similar to that obtained from the
results reported by Kerr and Einstein (9), and
Lynch (10).

Forty-five patients (53.6 per cent) died within
the first 3 years and 10 of these failed to survive 6
months. Only 4 patients died between 3 and 5
years. This seems to indicate that patients who
are alive at the end of 3 years have a good chance
of surviving 5 years or longer.

DISCUSSION

Due to the insidious onset of ovarian tumors,
the majority of the patients, 75 per cent in this
series, were not seen until the disease had spread
beyond the ovary. Adequate surgery is of first
importance in the proper management of ovarian
carcinoma. Surgery to be adequate must include
the removal of both Fallopian tubes and ovaries,
and uterus. In 11 of our patients only the in-
volved ovary was removed. Two developed car-
cinoma in the opposite ovary 14 and 16 months
later. Whether this represented a metastatic growth
from the other ovary not detectable grossly at the
first operation, or a new tumor, cannot be stated.
Nevertheless, postoperative radiation did not ap-
pear to be as effective in this group and only 2
were living, 1 with disease, at the end of 5 years.

Norris and Murphy (19) found microscopic
evidence of malignancy in an otherwise grossly
normal appearing second ovary in 7 (17.5 per
cent) of 40 patients who had a bilateral oophorec-
tomy for ovarian carcinoma. In the other 33 of
their cases both ovaries were microscopically
and macroscopically malignant. Our observations serve

![Five year survival curve in our 84 completely followed-up cases of primary ovarian carcinoma after combined surgical and postoperative radiation treatment as compared with the results reported by Kerr and Einstein (9) in 100 cases and by Lynch (10) in 69 cases.](image-url)
to re-emphasize their belief that patients with an ovarian malignancy in whom only the involved ovary is removed, should have a second operation with removal of the opposite ovary even though it appeared grossly normal during the first operative procedure.

The 3 and 5 year survival rate according to the stage of the disease is shown in Table VIII.

A five year survival of 39.2 per cent in our series compares favorably with that reported by other authors (5, 7, 10, 11, 16, 17, 18, 20, 27) in patients treated by surgery and postoperative radiation.

When the tumor was confined to the ovaries and completely removed, the five year survival rate was found to be 71.4 per cent. Harris and Payne (3), however, reported an 85 per cent five year cure in 23 patients in whom the entire malignant process was removed without postoperative radiation. These patients would be comparable to our Stages I and II in which our survival rate is only 63.6 per cent. This suggests that it might be better to defer radiation in those patients in whom the tumor is confined to the ovaries and completely removed until there is clinical evidence of possible recurrence. Because of the difficulty in determining whether or not all metastatic disease is removed at operation, we believe patients in Stage II should receive radiation as well as those in Stages III and IV. This treatment must be carried to the maximum allowable depending on the tolerance of the skin and surrounding organs. Where there is evidence of peritoneal transplants the upper abdomen should also be irradiated.

In clinically inoperable patients, many authors (4-6) believe that the results might be improved if preoperative radiation were given before surgery is attempted. Meigs (14) and Pemberton (22) believe that peritoneoscopy might be used in such patients to determine the extent of the disease. If there is evidence of widespread abdominal carcinomatosis, the patient might thereby be saved a needless operative procedure. That radiation will sometimes convert an inoperable tumor into one which is removable surgically has been shown in 3 of our patients and in several cases reported by other authors (1, 21). Parks (21) recently reported 3 patients in which preoperative radiation was effective in reducing the size of the tumor so that it could be removed at operation. In our clinic, as in others (8, 11, 25, 26), it is considered that even in advanced disease an exploration with biopsy is justifiable since it affords an opportunity for more accurate diagnosis and thorough evacuation of abdominal fluid. The small incision is of little more significance than the puncture wound required for paracentesis. The patient should then be given a complete series of radiation treatments followed by a second operation in 6 to 12 weeks with removal of all or as much of the tumor as possible. Further radiation may then be administered as indicated.

The tumor dose necessary to inhibit the further growth of ovarian carcinoma or its secondary transplants has not been established. Healy (4) considers approximately 2 threshold erythema doses adequate to inhibit tumor growth activity in many cases and usually sufficient to cause complete disappearance of all secondary transplants. Montgomery and Farrell (16) consider a minimum of at least 1,600 to 2,000 tissue r an adequate dose. Walter, Bachman, and Harris (27) classified therapy as "adequate" in their group of cases only if a minimum of 1,200 r (in air with backscatter) was delivered to each of 3 pelvic fields in approximately 1 month. For purposes of analyzing results, our cases have been classified into 2 groups: (a) those receiving a small tumor dose, less than 1,500 tissue r (31 patients) and (b) those receiving a larger tumor dose of 1,500 tissue r or more (53 patients). Curves were then made of the survival rates in these two groups of cases as shown in Fig. 2.

A comparison of these curves shows a higher percentage of survivals especially in the first 18 months following treatment and a significantly greater number of 5 year survivals (47.2 per cent) in the group of patients receiving over 1,500 r as compared to a 5 year survival rate of 25.8 per cent in the group receiving less than 1,500 r. This suggests that the difference of 21.4 per cent in the 5 year survival rate of the 2 groups at least in part is due to the effects of radiation.

Since many of the 5 year cures in Stage I group may be due to surgery alone, these patients were omitted and curves of survival again made as shown in Fig. 2.

### Table VIII: Three and Five Year Survival Rate

<table>
<thead>
<tr>
<th>Stage</th>
<th>Patients</th>
<th>3 Year survival</th>
<th>5 Year survival</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>21</td>
<td>16 (76.2%)</td>
<td>15 (71.4%)</td>
</tr>
<tr>
<td>II</td>
<td>12</td>
<td>7 (58.3%)</td>
<td>6 (50%)</td>
</tr>
<tr>
<td>III</td>
<td>12*</td>
<td>10 (31.2%)</td>
<td>8 (25%)</td>
</tr>
<tr>
<td>IV</td>
<td>19</td>
<td>5 (26.3%)</td>
<td>4 (21%)</td>
</tr>
</tbody>
</table>

*Three additional Stage III patients not included as complete follow-up was not available.

A five year survival of 39.2 per cent in our series compares favorably with that reported by other authors (5, 7, 10, 11, 16, 17, 18, 20, 27) in patients treated by surgery and postoperative radiation.
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Of the remaining 63 patients, 25 received less than 1,500 tissue r, while 38 received 1,500 tissue r or more. The 5 year survival rate in the group receiving the larger tumor dose is now 20.5 per cent greater than that for the group given a smaller tumor dose, less than 1,500 tissue r. This again seems to indicate that radiation increased the number of 5 year cures. However, since the percentage difference in the 5 year cure rate is not changed significantly by omitting the patients in Stage I, this would suggest that radiation did not have any real effect on the 5 year cure rate, i.e., in preventing recurrence, in patients whose tumor was localized to the ovaries and completely removed. The small number of patients in our series, however, makes it impossible to draw any definite conclusions.

The histological type did not appear to be of any real value in determining the radiosensitivity or predicting the future growth of the tumor. There was little or no difference in the 5 year survival rate between papillary and non-papillary serous cystadenocarcinoma. Six of the 9 patients with pseudomucinous cyst adenocarcinoma survived 5 years but in 5 of these the tumor was confined to the ovaries and completely removed. There were 3 patients with a carcinoma arising in a dermoid. In 2 of them, the disease had spread beyond the ovary and was incompletely removed. One of these patients survived 6 months, the other, 5½ years. The third patient was living and well 13 years after operation. Two patients with a granulosa cell tumor failed to survive 1 year. A third patient with a granulosa cell tumor is still living and well after 9 years.

The time at which treatment should be started following surgery is a still somewhat unsettled question but many authors feel that treatment should be begun as soon as the patient is able to come to the radiological department, preferably within the first 2 weeks after operation. Therefore, our series has been separated into two groups.

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**Fig. 2.**—Comparison of our survival rate in patients with primary ovarian carcinoma who received a tumor dose of less than 1,500 roentgens with those who received a tumor dose of more than 1,500 roentgens. Solid lines include all cases; broken lines cover all cases except those classified as Stage I.

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those treated within the first fifteen days (28 patients) and those treated 15 to 70 days after their surgical operation (47 patients). From 3 months to 1 year or more had elapsed following operation before the other 9 patients were referred to the radiological department and therefore they are not included. Curves were made comparing the survival rates in the two groups referred to above as shown in Fig. 3.

A comparison of the survival rates seems to indicate that patients in whom the start of treatment is delayed from 6 weeks to 2 months to give them a chance to recover from their surgical procedure certainly do as well and may perhaps do a little better than those treated within the first 2 weeks. Patients who rapidly fail following their operative procedure are seldom benefited by radiation and may be adversely affected by the added toxemia. The plan in our clinic at the present time is to wait 6 weeks after operation before beginning radiation therapy.

SUMMARY AND CONCLUSIONS

1. The records of 87 patients with a histological diagnosis of ovarian carcinoma who received radiation treatment at the Hospital of the University of Pennsylvania between 1930 to 1941 were reviewed with particular reference to the value of radiation therapy.

2. Seventy-two per cent of the patients were from 40 to 69 years of age.

3. In view of the increased interest in cancer survey studies, the importance of a routine cancer history is suggested.

4. The incidence of sterility (42 per cent) in the married women in our series is high in comparison to a normal incidence of ten per cent. A possible relationship to ovarian cancer susceptibility is discussed.

5. Pain, abdominal swelling, irregularity of menses, or postmenopausal bleeding were the most frequent presenting symptoms. Ascites was present in 34 patients at operation. A pleural effusion...
was noted in 8 patients at sometime during the course of the disease. Since the pleural effusion disappeared after removal of the primary tumor in 2 patients a possible similarity to a Meigs' syndrome is suggested in some of these cases.

6. The clinical stage of the disease appeared to be of greater significance than the histological type in the treatment and prognosis in our series.

7. The total 5 year survival rate in 84 of these patients in whom complete follow-up information was obtained was 39.2 per cent.

8. Adequate surgery is of first importance in the proper management of ovarian carcinoma and should include the removal of both Fallopian tubes, ovaries, and uterus. When only the involved ovary is removed and the lesion proves to be malignant, it is considered advisable in most cases to perform a second operation for removal of the opposite ovary even though it appeared grossly normal.

9. Our results in Stage I indicate that surgery alone gives results comparable to surgery plus postoperative radiation. Therefore, it is believed radiation should be withheld in these patients until there is clinical evidence to suggest a recurrence.

10. Postoperative radiation, however, is of definite value in patients with evidence of extension or metastasis at operation both in the relief of symptoms and prolongation of life.

11. The maximal tumor dose of radiation should be given whenever possible. The increased number of 5 year survivals following tumor doses of 1,500 r or more suggest that radiation has been a significant factor in the results. With smaller quantities of roentgen therapy, the symptoms are occasionally relieved but the life expectancy is seldom improved.

12. Patients with advanced disease should be given the benefit of an exploratory procedure with biopsy and thorough evacuation of abdominal fluid. Radiation should then be given to the maximum tolerance level and followed when possible by a second operation 6 to 12 weeks later. Further radiation may then be administered.

13. A delay of 6 weeks after operation before starting roentgen therapy is advocated to give the patient a better chance to recover from the surgical procedure.

REFERENCES


