

RADIUM IN THE TREATMENT OF UTERINE
HEMORRHAGE AND FIBROID TUMORS *HOWARD A. KELLY, M.D.
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The association of several diverse pathologic conditions may occasion surprise. Our excuse for presenting them together in this instance is that they have certain characteristics in common, namely, they are all benign, all chiefly troublesome on account of hemorrhage, and all remarkably united in their ready response to ray-therapy.

Until recently the control of uterine hemorrhage and the relief of symptoms of pressure occasioned by fibroid tumors have been possible with certainty only by radical surgical procedures.

The benign conditions which we wish to consider in this paper fall readily into four groups, excluding uterine hemorrhages due to cancer and other malignant disease, as well as those due to inflammatory disease of the adnexa, and those due to pregnancy and miscarriage.

The first group includes cases in adult women in which there is marked menorrhagia or metrorrhagia with no disease of the pelvic organs, except perhaps a slight enlargement of the body of the uterus. The endometrium taken from such uteri is microscopically normal. These cases belong to the so-called myopathia hemorrhagica class.

The second group takes in most of the hemorrhages which occur in young girls. In many of these the local findings are exactly as in Group 1. In some instances the condition is similar to that found in Group 3 (polypoid endometrium). Although pathologically this group cannot be separated from the others, it presents marked and distinctive features clinically, and in especial it differs radically in the indications for treatment. It is most important with these patients to avoid both sterility and mutilation.

The third group includes patients suffering with uterine hemorrhages who show no pathologic condition except an extensive polypoid overgrowth of the endometrium, which is generally termed polypoid endometritis.

The fourth group includes true uterine myomas, whether they are causing hemorrhage or merely giving discomfort through pressure on adjacent organs. Here the true aim of treatment is not only to regulate or stop the bleeding, but also to bring about the complete disappearance of the tumor.

MODE OF ACTION OF ROENTGEN AND RADIUM RAYS
ON UTERINE HEMORRHAGIC CONDITIONS,
ESPECIALLY FIBROID TUMORS

It has been firmly established both from animal experimentation and clinical observations on human beings that the Roentgen ray and the penetrating rays from radium are capable of destroying the primordial follicles of the ovary and the spermatogenic cells of the testicle. We have but to mention the names of Albers-Schoenberg, Brown, Osgood, Halberstaetter, Fraenkel, Faber, and many others who have contrib-

uted to our accurate knowledge in this direction. As it is the primordial follicles which give rise to the corpora lutea and determine menstruation, these results suggested at once that the penetrating rays might offer a means of causing amenorrhea and sterility. From the older literature it was known that many fibroids ceased to bleed and grew smaller after a double oophorectomy. A case of complete disappearance of a large fibroid tumor after this operation occurred in the service of one of us (H. A. Kelly) at the Johns Hopkins Hospital and is reported.¹⁰ Reasoning on the basis of similar experiences, it was felt that the ray therapy had its primary effect on the ovaries and secondarily controlled the pathologic conditions in the uterus. Most of the technics devised for radiation based on this idea have particularly endeavored to concentrate a maximum amount of rays on the ovaries, leaving the tumor more or less out of consideration.

It has been well established both from Roentgen-ray and radium radiation that an obliterative endo-arteritis occurs almost invariably in the field radiated. We have noticed this condition in a marked degree in a number of cases in which we have operated after extensive radiation with radium. The natural conclusion therefore is that the effect on a fibroid tumor is due to the anemia following the occlusion of its nutrient vessels.

Against the conception that the influence on fibroids is mainly indirectly through the ovaries are the facts that many fibroids grow after the menopause, that some grow after the removal of the ovaries, and that marked regressions occur in tumors treated by the ray method in patients past the menopause. For these reasons we believe that there is a *specific and direct action of the rays on the tumor itself*, and we further believe that this happy result can be secured *quite independently of any action on the ovaries*. In the series of fibroids to be recorded in two cases the tumor disappeared without cessation of menstruation! In another already past the menopause there has been marked regression from a single treatment!

TECHNIC

In the tables we give with each case the amount of radium and the duration of the application. The reader will observe at once a wide variation in the individual cases. While we feel that the results given can all be duplicated by the same technics, we do not consider the matter of dosages in any sense settled. Our plan has been steadily to increase the milligrammage while decreasing the time. This is not only for economy and comfort to the patient but because of the better results and fewer complications occurring. The ideal method, where it is not desired to secure amenorrhea, is to limit the radiation so far as possible to the tumor itself, avoiding touching the ovaries. This is best secured by intra-uterine applications. It is sometimes well to reinforce such treatments by abdominal radiation either with radium or the Roentgen ray.

The technic advised is filtration through glass 0.5 mm. of platinum, 0.5 mm. of zinc foil, and 0.3 mm. of rubber. Such an apparatus, suitable shaped, is carefully introduced directly into the uterine cavity. Cervical applications alone we find to be less reliable, demanding much more radiation to secure results. As a preliminary to the introduction of the radium, the patient is given nitrous oxide and then thoroughly curetted, and examined carefully under complete anes-

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* On account of lack of space this paper has been abbreviated for THE JOURNAL. It will appear in full in the Transactions of the Section and in the author's reprints.

10. Kelly and Cullen: Myomata of the Uterus, 1909, p. 505.

TABLE 1.—FIRST GROUP BLEEDING UTERI "MYOPATHICA HEMORRHAGICA"

| No. | Name | Age | Date | Duration | Severity | Previous Treatment | Pelvic Examination | Treatment | Immediate Results | Complications | Final Results |
|-----|-------------------------|-----|----------|---------------|--|---|------------------------------------|---|---|---------------|---|
| 289 | Case 1 Miss L. H. | 44 | 9/ 3/13 | 6 months | Marked bleeding; anemic | Medicinal benefit. | Normal organs | 100 mg. 24 hrs. | Nauseated 3 days; no fever; abdom. tenderness 2 weeks. | None | Slight menstrual period October 3. None since. General health splendid. Slight menopausal symptoms. |
| 291 | Case 2 Mrs. R. S. | 38 | 9/11/13 | 2 years | Rather severe; markedly anemic. | Medicinal only. No benefit. | Normal organs | 80 mg. 24 hrs. | 24 hrs. nausea; abdom. discomfort 3 weeks. Some discharge; leukorrhea. | None | Slight period October, 1913. None since. Splendid health. No menopausal symptoms. |
| 335 | Case 3 Miss S. McL. | 27 | 10/22/13 | 2 years | Very severe; anemic. | Local applications iodine, repeated curettages without result. | Normal organs | 100 mg. 9 hrs., 10/23; 60 mg. Ra. 18 hrs., 12/1/13. | Menstruation November and December; slight nausea for 24 hrs. | None since | Complete amenorrhea. No menopausal symptoms; general health splendid. |
| 383 | Case 4 Mrs. F. M. | 42 | 11/14/13 | 1 year | Very severe; anemic. | Medicinal. No benefit. | Slight enlargement of uterus. | 60 mg. 10 1/2 hrs. | None | None | Slight bleeding in December. None since. Slight menopausal symptoms. |
| 385 | Case 5 Mrs. J. D. | 41 | 11/18/13 | 4 years | Very severe; marked anemia. | Local applications; general medication; curettement. | Uterus size of 6 weeks' pregnancy. | 70 mg. 12 hrs. | Nauseated 1 day; headaches; some abdominal pain 2 weeks. | None | Menstrual period in December. None since. General condition excellent. Uterus reduced to normal size. Marked menopausal symptoms. |
| 348 | Case 6 Mrs. J. H. H. | 45 | 12/18/13 | 1 year | Excessive; anemic. | Medicinal. No benefit. | Normal organs | 100 mg. 6 hrs. | No discomforts | None | In January normal period. Since then no bleeding. No menopausal symptoms. Splendid health. |
| 272 | Case 7 Mrs. A. B. | 28 | 7/21/13 | Several years | Marked upset; marked anemia; general weakness. | Curettements, local applications, general medication; no benefit. | Normal organs | 60 mg. 24 hrs. | Nauseated 2 or 3 days; uterine discharge 2 weeks; slight abdominal discomforts 2 weeks. | None | No further menstrual periods. Slight menopausal symptoms. Splendid general health. |
| 786 | Case 8 Mrs. C. R. C. | 39 | 4/18/14 | 4 months | Severe; anemic. | Curettement; medicinal; no benefit. | Normal organs | 268 mg. 2 hrs. | None | None | No further menstrual periods to date. Apparently cured. No menopausal symptoms. |

TABLE 2.—SECOND GROUP: BLEEDING UTERI IN YOUNG GIRLS

| No. | Name | Age | Date | Duration | Severity | Previous Treatment | Pelvic Examination | Treatment | Immediate Results | Complications | Final Results |
|-----|----------------------|-----|----------|--|--|---|---|--|---|---------------|---|
| 176 | Case 1 Miss F. P. | 13 | 7/ 5/13 | 1 year with onset of periods. | Irregular, prolonged, severe. | Medicinal | Normal organs; normal endometrium. | 20 mg. 5 hrs. | None | None | Normal periods since treatment. |
| 377 | Case 2 Miss E. W. | 23 | 11/13/13 | Difficulty since onset of periods; very bad 2 yrs. | Moderate; anemic. | Repeated curettages; medicinal; resection of ovaries. | Normal organs; normal endometrium. | 12 mg. 7 1/4 hrs. | None | None | Normal regular periods since treatment. |
| 361 | Case 3 Miss E. N. | 16 | 11/ 4/13 | 2 yrs. since onset. | Quite severe. | Curettages; general medicinal. | Normal organs; normal endometrium. | 60 mg. 12 hrs. | None | None | Normal regular periods up to present time. |
| 186 | Case 4 Miss A. R. | 19 | 6/ 4/13 | 1 year | Continuous; not particularly severe; anemic. | Curettement; medicinal. | Normal organs; excessive endometrium; polypoid. | 55 mg. 24 hrs. | No menstrual periods for 2 months; some abdominal tenderness. | None | Normal menstruation has returned; patient in splendid condition. |
| 30 | Case 5 Miss H. B. | 20 | 2/ 7/13 | Several years' irregular bleeding. | Very severe; complicated by organic heart disease. | Curettement; medicinal. | Normal organs; normal endometrium. | 400 mg. 7 hrs.; abdominal application. | Nausea; slight rise in temperature. | None | Complete cessation of menstruation; artificial menopause. Some menopausal symptoms. |

thetia; this is indispensable to good work. The amounts used intra-uterine in the fibroid cases have varied from 30 mg. to 560 mg. and the time of application from one and one-half hours to forty-eight. In the young girl class the amount of radium introduced has been as small as 12 mg. In speaking of milligrams radium element is meant; whatever the salt and whatever its purity, in all reports the amount in equivalent of radium element pure should be given. In the case of mesothorium, which varies with age, the strength equivalent to radium element at the time of radiation should also always be stated.

In conjunction with Dr. Robert M. Lewis and other workers of the Howard A. Kelly Hospital we have been using radium in the treatment of these bleeding cases for a year and a half and have had in all 39 cases: 8 hemorrhagic metropathies, 5 polypoid endometria, 5 irregular bleedings in young girls, and 21 cases of uterine fibroid tumors. All of these latter have belonged to the class of large or medium tumors, none to the group of small tumors to which the treatment is limited by Chéron.

In the first group, that of bleeding uteri of adult women without any demonstrable pathologic lesion, the eight cases are summarized in Table 1. The average age is 38 years, the youngest 27, the oldest 44. All were suffering from anemia and had not yielded to the palliative measures previously applied. The amounts of radium used varied from 60 to 268 mg., the time of exposure from two to twenty-four hours. In two cases (7 and 8) the bleeding never recurred after the first treatment. In one case (3) a second treatment was necessary. In the remaining 5 cases a normal menstrual period followed at the regular time to be followed by complete amenorrhea. The average time from treatment to complete amenorrhea was 3½ weeks. Mild menopausal symptoms occurred in 3 cases, marked menopausal symptoms in one case, and none in 4 cases. The patients all left the hospital within forty-eight hours and except for a slight abdominal burning which lasted two or three weeks and which was accompanied by some leukorrhœa, have had no bad results. All now report themselves in good health.

In the third group, of adult women with uterine hemorrhage and no disease except a polypoid endometrium, there are 5 cases the details of which are given in Table 3. The average age was 43 years; the oldest 49 years, the youngest 35 years. Except in Case 1, in which a combined uterine abdominal and vaginal application was used, only the intra-uterine method was used. The amount of radium employed varied from 100 to 30 mg. The duration of the treatment was from twenty-two to seven hours. With the exception of Case 1, in which bleeding led to hysterectomy five days after application, all were relieved at once by the single application. All these patients were anemic, all had resisted other forms of treatment, all have regained their normal condition since treatment. In 2 cases menopausal symptoms were slight. In 2 cases they were not present. Case 1 is not included as here oophorectomy and hysterectomy was carried out.

In the second group, which includes young girls who were bleeding, there are 5 cases, the tabulation of which is given in Table 2. The ages varied from 13 to 23, the average being 18 years. In addition to the usual medicinal treatments, all but one had had curettages and one had had a resection of the ovaries, with

TABLE 3.—THIRD GROUP: BLEEDING UTERI FROM POLYPOID ENDOMETRIUM

| No. | Name | Age | Date | Duration | Severity | Previous Treatment | Pelvic Examination | Treatment | Immediate Results | Complications | Final Results |
|-----|----------------------|-----|---------|--------------|---|---|---|---|---|---|---|
| 129 | Case 1 Mrs. R. L. | 49 | 2/16/13 | 3 years | Intermittent; very severe; marked anemia. | Medicinal; local applications; curettage. | Normal organs; excessive endometrium; polypoid. | 50 mg. in uterine cavity; 100 mg. in vagina; 100 mg. on abdomen 22 hrs. | Marked nausea and vomiting for 24 hrs. | Continued hemorrhage; hysterectomy 5th day; abdominal tenderness 3 weeks. | Well-marked menopausal symptoms. |
| 88 | Case 2 Miss N. H. | 35 | 5/24/13 | 1 year | Quite severe; marked anemia. | None | Normal organs; excessive endometrium; polypoid. | 30 mg. 18 hrs. | Nausea a day or two; uterine discharge 1 month. | None Abdominal tenderness 2 weeks | No menstruation since treatment; no menopausal symptoms. |
| 245 | Case 3 Miss J. W. | 47 | 6/24/13 | 9 months | Rather severe; marked anemia. | Medicinal only | Normal organs; polypoid endometrium. | 70 mg. 16 hrs. | Slight nausea | None Abdominal tenderness several weeks. | No further bleeding; menopausal symptoms mild in 2 months from treatment. |
| 271 | Case 4 Mrs. A. H. | 40 | 7/14/13 | 2 months | Continuous; severe; marked anemia. | None | Normal organs; polypoid endometrium. | 50 mg. 24 hrs. | Nausea and vomiting 1 day. | No further menstrual periods; slight metropathic symptoms; abdominal tenderness 1 month | No further menstruation; slight menopausal symptoms. |
| 758 | Case 5 Mrs. A. B. | 43 | 3/4/14 | 4 or 5 years | Very severe; marked anemia. | Medicinal; frequent curettages; reduction of uterus by operation. | Small normal uterus; other organs normal; polypoid endometrium. | 100 mg. 7 hrs. | Nausea; slight headache | None | Entirely well; no menopausal symptoms. |

the idea of diminishing the period. All were in general good condition except for the anemia, with the exception of Case 5, in which there was extreme organic heart disease. The amount of radium used varied from 12 to 60 mg. The time of application ran from five to twenty-four hours. In the first three cases the menstrual periods have returned to the normal type and the patients recovered a normal hemoglobin content.

In Case 4 there was amenorrhea lasting two months, then a return of menstruation, which has been a little irregular at intervals of from three to five weeks but never excessive. In the fifth case, where the application was through the abdominal wall, complete amenorrhea with distinct menopausal symptoms was produced. Where we desire to diminish hemorrhage the treatments are short and the milligrammage small, although it is harder to produce a complete amenorrhea in this group than in women over 40.

In the fourth group, which includes the fibroids, there are 21 cases; the average age is 44; the oldest 59 years; the youngest 32 years; menorrhagia, metrorrhagia or both, were present in 19 cases; in one there was normal menstruation, in one no menstruation, as patient was six years past menopause.

The tumors with one exception (Case 10, Table 4) were either large or middle sized. By large we mean those reaching half way to the umbilicus or larger, while middle-sized tumors include those from the size of a two and a half months' pregnancy half way up to the umbilicus.

In 3 cases the tumor was definitely submucous. With the exceptions of Case 5, in which there was an ovarian cyst, and Case 16, a cystic ovary, and Case 20, chronic pelvic inflammatory disease, and Case 8, marked exophthalmic goiter, and Case 10, infection of the tumor and uterine cavity, the fibroid condition was uncomplicated. The amounts of radium and the duration of the application are shown in Table 4.

In Case 8 the application was atypical, in that radiation had been given with the Roentgen ray both prior to and after the radium radiation. Owing to the extreme illness of this patient the ordinary technic was not followed and the application was made through the abdomen. In Case 21, the only failure in the group, the application was also atypical, from the abdomen and from the cervix. At the time this patient was treated it was not realized that the intracervical treatments require much longer times of exposure. Here, owing to the tortuosity of the cervical canal, the introduction of the tubes into the uterus was difficult. After the failure, however, it was thought better not to radiate further, but to treat surgically.

These patients almost invariably suffer from nausea for twenty-four hours, and from abdominal tenderness for from ten days to three weeks, and some of them have leukorrheal discharge for a few weeks. The symptoms above enumerated have been much less marked when large amounts of radium are used for relatively short times. In only one case, No. 20, has any serious complication followed the treatment. Here an inflammatory process was lighted up and a pelvic abscess formed. It healed, however, without operation, and the patient is perfectly well to-day.

EFFECTS ON HEMORRHAGE

In 16 of the 21 cases, complete amenorrhea has been obtained; immediately after the treatment in 6 cases, at the end of one month in 4 cases, at the end of two

months in 4 cases, at the end of several months in one case (3) in which the milligrammage and hours were small. In one case the patient is six years beyond the menopause and there was no bleeding. In one case, No. 21, the treatment failed. In one case, the time since treatment is too short to state the effect. In two cases, and these in our opinion are most important, *the menstrual periods have persisted regularly and the tumors have disappeared.* The details of these two are shown in Table 4, Nos. 4 and 11.

This happy result must be due to the fact that the fibroid has received much more intense radiation than the ovaries, and serves to point the way in which to extend our efforts in this field, that is, *to secure a maximum effect on the tumor with a minimum treatment of the ovaries.* This observation, which reverses the European technic, is possibly applicable to Roentgen ray as well as radium treatments.

The effects on the tumor are as follows:

Case 1, from the size of three months' pregnancy to six weeks' pregnancy.

Case 2, tumor 4 inches in diameter has completely disappeared.

Case 3, tumor 6 inches in diameter has completely disappeared.

Case 4, uterus and tumor size of three month's pregnancy reduced to size of normal uterus.

Case 5, tumor 9 inches in diameter reduced to one 4½ inches in diameter.

Case 6, a huge tumor filling pelvis and lower abdomen has entirely disappeared.

Case 7, uterus and tumor size of a two months' pregnancy reduced to the size of a normal uterus.

Case 8, no report on size of tumor, except that it is markedly smaller.

Case 9, huge tumor filling pelvis and abdomen to umbilicus reduced to the size of a two and one-half months' pregnancy.

Case 10, uterus and tumor the size of three months' pregnancy now a normal uterus.

Case 11, tumor reaching to within 1 cm. of umbilicus reduced to the size of a six weeks' pregnancy.

Case 12, tumor 5 inches in diameter reduced to 2½ inches in diameter. Duration of observation only six weeks.

Case 13, no report obtained.

Case 14, tumor 6 inches in diameter reduced to 1 inch in diameter.

Case 15, tumor size of four months' pregnancy reduced to that of a six weeks' pregnancy.

Case 16, tumor size of four months' pregnancy reduced to one of six weeks' pregnancy.

Case 17, uterus size of three months' pregnancy reduced to a normal uterus.

Case 18, huge tumor filling pelvis and lower abdomen to umbilicus reduced to one-third original size.

Case 19, six years past the menopause, tumor 6 inches in diameter reduced to one 3 inches in diameter, and still decreasing.

Case 20, uterus twice normal size, reduced to normal size.

Case 21, practically no change in size of tumor which is about 4 cm. in diameter.

With intense radiation of the fibroids, the reduction is usually rapid, occurring within two or three months. Where the principal effect has been on the ovary, the disappearance may be much slower extending over months or even years, as in the cases reported by Robert Abbé.^{6, 7}

TABLE 4.—FOURTH GROUP: MYOMATA UTERI

| No. | Name | Age, Yrs. | Date | Duration | Hemorrhage | Size and Position of Tumor | Condition of Other Pelvic Organs | Treatment | Immediate Results | Complications | Final Results |
|-----|-------------------------|-----------|----------|--------------|--|---|--|--|--|--|--|
| 0 | Case 1 Mrs. E. R. W. | 45 | 3/18/13 | 6 months | Menorrhagia, 10 days; clots profuse; some anemia. | Subperitoneal and interstitial uterus and fibroid size of 3 months' pregnancy. | Normal | 30 mg. for 48 hrs. 3/25/13 | Nauseated 24 hours. No fever. Abdominal discomfort several weeks. | None | Leukorrhoeal discharge for 2 months. Moderate period in April and May, none since. Uterus size of 6 weeks' pregnancy. General health splendid. Marked menopausal symptoms. |
| 55 | Case 2 Miss E. G. E. | 35 | 3/23/13 | 1 year | Menorrhagia, excessive, 10 days; moderate anemia. | Interstitial; 4 inches in diameter | Normal | 30 mg. 48 hrs. 3/25/13 38 mg. 48 hrs. 5/1/13 55 mg. 24 hrs. 1/1/14 | Nauseated headaches and leukorrhoea. | None | Good deal of pain and aching in the back and abdomen. Between May and November regular 3-day periods, scant. Excessive in December. Uterus slightly smaller. No period after January. Uterus normal. Feels splendidly. |
| 175 | Case 3 Mrs. F. P. | 44 | 5/17/13 | 1 year | Rather marked; 7 or 8 days; menorrhagia. | Interstitial; indistinctly visible from uterus; 6 inches in diameter; one-half way between symphysis and umbilicus. | Normal | 80 mg. 24 hrs. | Some nausea and vomiting for 24 hours. | None | Moderate flow in June, 1 day in July. No further bleeding. Mild menopausal symptoms. Uterus normal in size. Most of the decrease before December, 1913. |
| 119 | Case 4 Miss K. | 46 | 5/27/13 | 4 months | Menorrhagia, 10 days. | Just reaching out of the pelvis; interstitial; little larger than a 3 months' pregnancy. | Normal | 50 mg. 24 hrs. | No discomfort. | None | Missed June period; moderate menstruation in July. No menstruation between July and November. In November fibroid plainly felt in anterior wall 4 cm. in diameter. From December on regular menstrual periods of 3 days' duration. Fibroid entirely gone. |
| 274 | Case 5 Mrs. A. A. W. | 51 | 7/22/13 | 3 years | Menorrhagia; marked anemia apparent. | Interstitial, subperitoneal, submucous; cross diameter 9 ins.; extends far up in abdomen. | Ovarian cyst of right ovary 8 in. in diameter. | 60 mg. 47 hrs. | Nauseated for 48 hours. Abdominal distress for several weeks mild. | None | No further hemorrhage whatever. By October 25 fibroid reduced to one-half original size. Entirely intrapelvic. Ovarian cyst no more than 1½ inch in diameter. Same condition in June, 1914. |
| 281 | Case 6 Miss M. B. | 33 | 8/25/13 | 2 years | Marked menorrhagia. | Interstitial and subperitoneal; fills entire pelvis and extends 4 fingers above umbilicus. | Normal | 120 mg. 18 hrs. | Nauseated, vomiting for some temperature for some days. | For nearly 2 mos. marked discharge; some afternoon temperature | Irrregular bleeding for 2 months. Then complete cessation. Very mild menopausal symptoms. Splendid general health. Tumor entirely disappeared. |
| 324 | Case 7 Miss E. B. | 43 | 10/ 4/13 | 2 or 3 years | Menorrhagia 10 days; very low hemoglobin; metrorrhagia for 1 month before treatment. | Interstitial and subperitoneal; uterus size of 2 months' pregnancy; one subperitoneal nodule 1 inch in diameter. | Normal | 80 mg. 24 hrs. | Nauseated for 24 hours. Some leukorrhoea and abdominal tenderness for 4 weeks. | None | One moderate period in December. Complete amenorrhoea. Uterus normal in size. Slight menopausal symptoms. General health splendid. |
| 332 | Case 8 Mrs. M. M. | 40 | 10/ 7/13 | 4 years | Menorrhagia and metrorrhagia, 40 per cent. contraction of entire of uterine cavity; gonorrhoeal complications to level of umbilicus. | Subperitoneal, interstitial, indistinctly visible; entire filling of pelvis and lower abdomen; to level of umbilicus. | Not made out. | Abdo. 734 mg. 6 hrs. 484 mg. 4 hrs. | Thyroidism, nausea and vomiting for a week. Rather high fever. | Thyroidism | Patient had Roentgen-ray treatment by Dr. Stern of New York. Although tumor decreased, bleeding continued in November and December. Further Roentgen-ray treatments were given by Dr. Stern. Amenorrhoea reached in January. Since then no bleeding. General health has been excellent. Tumor reported to be much smaller. |

TABLE 4.—FOURTH GROUP: MYOMATA UTERI—(Continued)

| | | | | | | | | | | | |
|-----|--------------------------|----|----------|--------------|---|--|-------------------------------|---|---|------|---|
| 475 | Case 9 Miss A. D. S. | 48 | 1/ 4/14 | 4 years | Marked menorrhagia; metrorrhagia; marked anemia; 30 per cent. hemoglobin; foul discharge; daily fever. | Fills pelvis, lower abdomen to umbilicus. | Not made out | 100 mg. 12 hrs. April 25 on abdomen 1,100 mg. 1 hr. 40 min. | Marked nausea; fever for 10 days; purulent discharge from uterus. | None | Since the treatment in January no hemorrhages. On several occasions slight bleeding. Uterus now size of 2½ months' pregnancy, freely movable. Hemoglobin and general condition excellent. |
| 637 | Case 10 Miss O. F. F. | 40 | 2/22/14 | 7 years | Menorrhagia and metrorrhagia; marked anemia; general symptoms from anemia; shortness of breath; hemoglobin 50 per cent. | Uterus size of 3 months' pregnancy; 1 small nodule felt on posterior surface. | Normal | 100 mg. 10 hrs. | Nausea and considerable upset for 2 days; abdominal tenderness and miserable feeling for 6 weeks which kept her in bed. | None | No menstrual period after a moderate one in March. Reports she is feeling splendidly, better than for years. The growth has entirely disappeared. |
| 681 | Case 11 Miss B. S. | 39 | 3/16/14 | About 1 year | Menorrhagia and metrorrhagia; marked anemia. | Subperitoneal, interstitial and submucous, reaches to 1 cm. of umbilicus. | Normal | 300 mg. 1½ hrs. April 25 1,100 mg. 2½ hrs. on abdomen. | Twenty-four hours nausea; soreness in abdomen for 10 days; temperature 1 degree above normal for 8 hrs. | None | Normal menstrual periods in March, April, May and June. On April 25 growth one-half original size. On June 14 growth found to be entirely gone. |
| 825 | Case 12 Mrs. A. L. | 38 | 4/30/14 | 1 year | Menorrhagia marked. | Uterus size of 6 weeks' pregnancy; attached to its right wall is a fibroid 5 in. in diameter filling the right broad ligament. | Normal | 560 mg. 3 hrs. | Little nausea | None | Rather profuse menstrual period in May. None up to present time in June; growth is about half original size. |
| 771 | Case 13 Mrs. L. H. C. | 44 | 4/20/14 | 1 year | Menorrhagia 10 days, but not very anemic looking. | Interstitial, 15 cm. in diameter, reaches half-way to umbilicus, fills pelvis. | Normal | 400 mg. 1½ hrs. | None | None | No report secured. |
| 533 | Case 14 Mrs. C. N. B. | 43 | 10/ 8/13 | 4 years | Menorrhagia | Interstitial; uterus and tumor inseparable; fully 6 in. in diameter; reaches half-way to umbilicus. | Normal | 60 mg. 24 hrs. 300 mg. 21 hrs. from abdomen. | Nausea 3 or 4 days, marked discomfort in pelvis for 1 month. | None | No further menstrual period; general health splendid; uterus normal in size, small, attached to its right wall; a small pedunculated myoma 1 in. in diameter. |
| 334 | Case 15 Mrs. C. E. D. | 40 | 10/20/13 | 2 years | None | Interstitial; inseparable from uterus; size of large cocoon; reaching almost to the umbilicus. | Normal | 100 mg. 26 hrs. 60 mg. on abdomen 1½ hrs. | Nausea for 24 hours. | None | Normal menstrual period in November; none since then; general condition splendid; no menopausal symptoms; tumor practically gone; uterus freely movable; slightly larger than normal; no fibroid can be felt. |
| 370 | Case 16 Mrs. H. W. T. | 59 | 11/ 6/13 | 4 years | Although 59 yrs. old patient is apparently still menstruating; for 4 years has been having irregular excessive menstrual periods. | Interstitial; size of 4 months' pregnancy; reaches half-way to umbilicus. | Apparently cystic left ovary. | 100 mg. 24 hrs. | No upset. | None | No further bleeding; splendid health; growth reduced to one-third original size. |
| 394 | Case 17 Mrs. A. McG. | 46 | 11/18/13 | 2 years | Rather marked menorrhagia; symptoms of pressure. | Uterus size of 3 months' pregnancy; freely movable; growth interstitial. | Normal | 60 mg. 17½ hrs. 60 mg. 2 hrs. 1/6/14. | Period in December, rather excessive; none since. | None | Feels splendidly; no menopausal symptoms; no bleeding; tumor entirely gone. |
| 375 | Case 18 Mrs. W. T. D. | 33 | 12/10/13 | 1½ years | Menorrhagia 8 days. | Interstitial, subperitoneal, irregular; fills pelvis and lower abdomen. | Not made out | 60 mg. 18½ hrs. | No disturbance. | None | One menstrual period; since then complete amenorrhea; growth reduced to one-third original size; splendid health. |

TABLE 4.—FOURTH GROUP: MYOMATA UTERI—(Continued)

| No. | Name | Age | Date | Duration | Hemorrhage | Size and Position of Tumor | Condition of Other Pelvic Organs | Treatment | Immediate Results | Complications | Final Results |
|-----|--------------------------|-----|---------|--------------------|--|--|--------------------------------------|--|--|--|--|
| 792 | Case 19 Miss M. L. C. | 49 | 4/25/14 | At least 10 years. | None. Patient is past menopause 6 years. | 15 cm. in diameter, in right broad ligament; uterus to left of tumor; size of 6 weeks' pregnancy. | Normal | 150 mg. 6 hours | None except leukorrhoeal discharge. | None | June 5 tumor only 7 cm. in diameter; general condition of patient excellent. |
| 614 | Case 20 Mrs. A. H. M. | 46 | 2/6/14 | 1 year | Very marked menorrhagia; marked anemia. | Uterus about twice normal size; one subperitoneal fibroid on anterior wall measures 4 cm. in diameter. | Pelvic inflammatory disease; chronic | 170 mg. 13 hrs. 13 min. | Nausea and vomiting; some temperature; abdominal pain for 3 weeks. | Lighting up of pelvic inflammatory disease with formation of pelvic abscess. | No further menstrual periods; pelvic abscess healed spontaneously; no menopausal symptoms; uterus normal in size; general condition splendid. |
| 340 | Case 21 Miss A. A. | 32 | 10/8/13 | 2 years | Menorrhagia 8 days. | Uterus 10 cm. in diameter, round and globular. | Normal | 30 mg. 25 hrs. 10/19/13 / 300 mg. 11 hrs., abdominal, 10/19/13 35 mg. 10 hrs. 11/18/13 35 mg. 12 hrs. 11/20/13 60 mg. 25 hrs. 1/7/14 400 mg. 6 hrs. abdominal 1/7/14 | No upset except nauseated a few hours after application. | None | Neither tumor nor hemorrhages markedly changed. The applications here were to the cervix and not intra-uterine. Radical operation carried out 3/14/14. |

CONCLUSION

We feel sure as the result of these remarkable experiences that radium offers a marvelous means for controlling, as well as for completely doing away with uterine hemorrhages, in the classes of cases cited.

We believe also that it is perfectly suited to secure the disappearance of fibroid tumors. A radium treatment ranks in severity as scarcely more serious than a simple uterine curettage.

In its brilliancy of curative results it is fully equal to radical surgical procedures while offering the advantages of freedom from danger, pain, suffering and the various postoperative complications and sequelae. Furthermore, when radium fails we still have the operation to fall back on and have not lost in the waiting. As compared with the Roentgen ray, radium is simpler of application, more rapid in bringing about the desired effect, and finally is better in that it acts on the diseased organ, the uterus, with more intensity than on the ovaries. Radium offers the possibility in the fibroid cases of doing away with the tumor without destruction of the ovaries.

We also insist that the fibroid itself should receive the major radiation, whether with the Roentgen ray or with the radium.

The radium can bring about a complete amenorrhea at any age.

The menopausal symptoms which follow this amenorrhea are absent in 50 per cent. of the cases and mild in nearly all of them.

We insist on the intra-uterine application, in contradistinction to the vaginal or cervical, and in this connection wish to contrast the shortness of the radiations in hours as compared with the exposures reported by Chéron⁵ and Gauss and Krinski.⁹ We feel that it is quite possible that suitable abdominal radiation with radium or the Roentgen ray may add to the rapidity of the results.

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ROENTGENOTHERAPY IN UTERINE HEMORRHAGE *

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The treatment of uterine hemorrhage by means of the Roentgen rays, is no longer a novelty, but has become an established method in most of the leading clinics in Europe, and is being well established in America. The first cases were treated and placed on record ten years ago by Deutsch. Since then reports have been made by several hundred roentgenologists and gynecologists, and the number of cases now definitely recorded are considerably over a thousand. There has been sufficient time for all the doubts and fears to have materialized, but instead, all hopes have been realized, the technic has been fairly well established, and the indications and contra-indications reasonably well outlined, so that to-day the method stands as one of the most brilliant achievements of roentgenology.

In 1904 Deutsch¹ found that the rays relieved four cases of uterine hemorrhage connected with fibroids. This report seemed to have been forgotten until

* Read before the Section on Obstetrics, Gynecology and Abdominal Surgery at the Sixty-Fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914.

1. Deutsch: Die Radiotherapie bei Gebärmuttergeschwülsten, München. med. Wchnschr., 1904, p. 1646.