Of 114 inoperable cases, 15 appear to be without any recurrences, the longest being three and a half years and the shortest one year. This equals 13.2 per cent.; 12.4 per cent. were greatly benefited.*

Of 67 borderline cases, 24 are still living, the time since the beginning of treatment varying from one year to three and a half years—making 35.8 per cent.; 35.8 per cent. were greatly benefited.

Of 24 operable cases, 11 (45.8 per cent.) are still living without any sign of recurrences, for times varying from one to three and a half years. In another 25 per cent. the disease disappeared locally.

The statistics published by the Radium Institute of Brussels are roughly as follows:

Operable Cases.—Of 14 operable cases treated by radiotherapeutic methods, 73 per cent. were living and free from signs of growth at the end of one year or more.

Borderline Cases.—Of 24 doubtful cases, 12 were free from any signs of growth after one year or more—making 50 per cent.

Inoperable Cases.—Of 24 inoperable cases, 8 per cent. were living and free from any sign of growth after one year or more.

The figures from the Radiumhemmet, Stockholm, are:

Of the 181 inoperable cases treated, 16.6 per cent. were well after five years.

Of the 36 operable and borderline cases, 40.5 per cent. were well at the end of five years.

The following list shows the number of cases treated in various years at the Memorial Hospital, New York, and the number living in May, 1921.

<i>Inoperable Cases:</i>				Alive May, 1921.
Of 15 cases treated in 1915	...	...	...	None
" 24 " " " 1916	...	...	...	1
" 41 " " " 1917	...	...	...	None
" 41 " " " 1918	...	...	...	7
" 69 " " " 1919	...	...	...	23
" 92 " " " 1920	...	...	...	58
<i>Borderline Cases:</i>				
Of 3 cases treated in 1916	...	...	...	2
" 3 " " " 1917	...	...	...	2
" 17 " " " 1918	...	...	...	5
" 10 " " " 1919	...	...	...	7
" 12 " " " 1920	...	...	...	8
<i>Operable Cases:</i>				
Of 1 case treated in 1915	...	...	...	1
" 3 cases treated in 1916	...	...	...	None
" 3 " " " 1917	...	...	...	2
" 4 " " " 1918	...	...	...	2
" 9 " " " 1919	...	...	...	7
" 14 " " " 1920	...	...	...	6

RADIUM TREATMENT OF INOPERABLE CARCINOMA OF THE CERVIX.†

BY

GILBERT I. STRACHAN, M.D., M.R.C.P.,

F.R.C.S.ENG. AND ED.,

ASSISTANT GYNAECOLOGIST, CARDIFF ROYAL INFIRMARY; FIRST ASSISTANT TO THE PROFESSOR OF OBSTETRICS AND GYNAECOLOGY, WELSH NATIONAL SCHOOL OF MEDICINE.

This communication is founded on a study of 40 cases of carcinoma of the cervix treated by the application of radium. The radium is supplied to the Cardiff Royal Infirmary by the Medical Research Council for research purposes, and inoperable cases of this disease have been treated in this manner since May, 1922.

Technique of Application.

The dose usually employed is 150 mg. of radium bromide, and it is inserted for twenty-four hours. Two tubes of 50 mg. each, sheathed in 2 mm. of platinum, are inserted into the cervical canal, and the others are distributed at the periphery of the growth according to the anatomical conditions. In some cases six tubes of 10 mg. each are inserted in a circle, but in other cases, when the condition is of irregular shape, the smaller tubes are inserted where they would appear to be most effective.

* In 1919 and 1920 every single case that could reach the institute was treated. Since then the inoperables have been selected slightly, as it was found that when very far advanced the treatment did more harm than good. The authors consider that x-ray treatment only is better for these cases than radium.

† A paper read before the Fifth British Congress of Obstetrics and Gynaecology, London, April, 1925.

Difficulties may be met with during application. In a number of cases the cervix had ceased to exist as a protrusion into the vaginal vault, and was represented by a foul, bleeding, friable ulcer, and in these it was often very difficult to get a satisfactory grip of the friable material with a volsellum. In some cases the cervical canal was difficult to find, especially where the growth was hard and excavated. It is essential, however, to find and explore the canal with a sound to exclude the presence of an unsuspected pyometra. This condition was present in 12 cases, in none of which was there any pyrexia or marked uterine enlargement. If pyometra be found the cervix should be dilated and the uterine cavity drained before radium is applied. In the cauliflower type of growth and in some others showing exuberant fungation the cervix is scraped prior to the insertion of radium. In such cases the radium should be inserted immediately after scraping, so as to prevent dissemination of the carcinoma cells.

After removal of the radium a vaginal douche should be given, and repeated night and morning for three weeks. This is recommended by Hayward Pinch, and is a practical necessity in the prevention of adhesive vaginitis, which developed in certain cases where douching was omitted and rendered future applications and investigation very difficult.

At the first and each subsequent insertion a specimen of the growth is obtained for microscopic examination. As the condition improves it becomes progressively more difficult to fix the cervix, to get a proper view, and to remove a piece for examination, as, in the process of "healing," the carcinomatous cervix becomes more and more retracted up into the vaginal vault until only a little cicatrized area is present there, with the vaginal walls often slack below it.

Contraindications.—The main contraindications to the use of radium may be classified under these headings:

1. The presence of pyometra. This is discussed above; drainage is required before radium is introduced.
2. The presence of inflamed appendages. Radium is apt to set up an acute exacerbation in such cases.
3. Vesico-vaginal fistula. If this is present when the case is first seen radium is inadmissible, as an acute cystitis may be set up. If fistula develops in the course of treatment no further application should be given.

Histological Changes.

The histological changes in the carcinoma cells were at first puzzling and difficult to interpret; but after familiarity with the appearances had been acquired the changes were found to be of a more or less uniformly degenerative character in a large number of sections examined at different periods after treatment.

The first change observed was enlargement of the cells and of the nuclei. It was found in a number of cases as early as the third day, and usually by the end of the first week. In the majority of cases the cell cytoplasm and nucleus did not take up the stain as deeply as before. Here and there atypical karyokinetic activity was seen, shown by splitting of the chromosomes, often in an irregular manner. Oedematous infiltration also was seen in the stroma; the changes in both situations were attributed to oedematous swelling due to a vascular reaction to the damage caused by the radium. True degeneration was usually well marked by the end of the second week. The nucleus was affected first; karyokinetic changes were no longer seen, the definite nuclear structure was lost and it stained darkly, showing little or no structure, and having an indefinite margin. The cytoplasm of the cell also underwent granular degeneration, and vacuolation occurred, while the cell walls stained faintly. By the fourth week degeneration was well advanced and the nuclei had either disappeared or were represented by dark structureless masses in the interior of the cells. Degeneration of the cytoplasm had also advanced; it stained irregularly, and vacuolation was well marked. In some cases what was left of the nucleus was seen to be pressed against the cell wall by a vacuole which occupied the rest of the cell. The cell walls were very faint or indistinguishable, so that areas were seen here and there occupied by an irregularly stained mixture of degenerated cytoplasm and nuclei with vacuolation—almost the appearance of degenerated syncytium. At about this period the stroma began to show reaction. Around the epitheliomatous columns lymphocytic infiltration was marked, together with an increase of vascularity and a return of oedema.

These changes progressed until about the sixth week, after which little more effect on the carcinoma cell was to be expected as a result of a single application. The reaction of the stroma now became the main feature, and in time a condition of fibrosis was brought about; it did not occur until the cellular degeneration was advanced, and is to be regarded as a process of repair bringing about what amounted to scar formation. In some

sections this fibrosis was universal and no remains of carcinoma cells were to be found, but in the great majority of sections taken as long as one year after infiltration lighter staining areas were seen occupied by the debris of cells and representing the degenerated remains of columns of carcinoma.

The stroma remained infiltrated with lymphocytes in the areas surrounding such masses of debris usually for several months. While these degenerative changes were well marked and easily observed, it was remarkable how fragments or debris of the carcinoma cells persisted even in cases showing clinical cure.

Clinical Changes.

The clinical changes were usually well marked, and consisted of all degrees of improvement of the three main symptoms—haemorrhage, pain, and discharge.

Haemorrhage was the symptom most completely controlled. Usually it ceased within the first ten days, and, in a case reacting satisfactorily, either did not recur or only an occasional slight loss occurred. This often happened even when subsequent physical examination showed some persistence of ulceration which might bleed on manipulation.

Cessation of discharge occurred in 18 cases, but in 6 others it was considerably diminished. It was usual for a patient to state that the bleeding had ceased and that she now had only a little discharge.

Pain was affected variously. In about one-third of the cases it was entirely relieved, in another third partially relieved, and in the remaining third either unaffected or aggravated. It is probable that such aggravation is due to pelvic fibrosis compressing the nerves, in spite of the fact that the majority of such cases showed clinical improvement and increased mobility of the uterus.

On *local examination* marked changes were found. Usually by the end of the first month the ulcerated surface had cleared up considerably, and in another month the improvement was such that ulceration had disappeared and the cervix was represented by a cicatrized dimple at the vaginal vault. By this time also the periuterine infiltration had usually cleared up, and a uterus which, at the first examination, was found to be firmly fixed was now more or less mobile with the thickening dispersed from the fornices. This would show that at least a certain amount of such pelvic infiltration is inflammatory.

Results of Treatment.

The following is a summary of the results of treatment in this series.

Of the 40 cases, 26 had one application of radium, and of these 3 are known to have died within a year, 4 failed to report again, and 2 developed vesico-vaginal fistula. Of the remaining 17 cases the clinical improvement in symptoms and on examination was so marked as to constitute clinical cure in 10; while in the remaining 7 discharge and pain have persisted in 5, with haemorrhage in 2, and the local condition shows unsatisfactory healing and some persistence of infiltration.

Ten cases had two applications of radium, and of these 2 died and 6 failed to report. The other 2 both showed marked local, general, and symptomatic improvement, being free of symptoms with the local condition cleared up beyond recognition and with increase of weight.

In 3 cases three applications were given, and one of these failed to report. The other 2, when last seen, were free of symptoms and the local condition was represented by a cicatrix in the vaginal vault.

In one case, in which carcinoma of the cervix developed subsequent to previous subtotal hysterectomy for a uterine fibroid, four applications of radium have been given; symptoms have ceased and the local condition has cleared up.

Of the 40 cases, then, 5 are known to have died and 11 have failed to report; vesico-vaginal fistula has developed in 2, and in 7 the clinical condition is unsatisfactory. Considerable improvement, amounting to clinical cure, has been obtained in 17 cases. It appears reasonable to estimate that of the 11 cases who failed to report 6 have died; on this estimate the total number of deaths would be 11, while if the whole 11 are to be counted as dead the total deaths would be 16.

The number of cases actually treated by radium is in excess of the 40 quoted, but none are included whose treatment commenced less than a year ago.

Conclusions.

The conclusion arrived at is that in inoperable carcinoma of the cervix we have in radium the most potent therapeutic agent yet to hand; that in practically all cases greater or less alleviation of the haemorrhage and discharge can be obtained; and that in slightly under 50 per cent. a condition of clinical cure is brought about. The action of radium is locally destructive to the carcinoma cells and produces such degenerative changes that further activity would appear to be out of the question. The line of further investigation is therefore by improved technique and, if necessary, by increased dosage to expose all parts

of the parent tumour, together with any extensions, to the fullest effect of the radium rays so that cell activity may cease.

It is to be emphasized that this paper represents essentially a personal experience which happens to be in general accord with the experience of others who have used radium as a palliative in carcinoma of the cervix.

The cases considered were all inoperable according to the usual clinical criteria, and such controversial aspects of the matter as radium as an alternative to operation in any given case, preliminary radiation in the so-called borderline cases, or post-radiation hysterectomy in cases showing such local improvement and disappearance of infiltration as may tempt the surgeon to operate, have been avoided. Again, all the cases recorded were treated locally, and no attempt was made to treat extensions in the pelvis, as by the Daels and Schwartz operations. The recorded results of these procedures have not tempted me to resort to them.

It is important to estimate the exact position that radium should occupy in the treatment of carcinoma of the cervix, and it is as a contribution in that direction that this paper is presented.

I am indebted to Professor Sir Ewen Maclean for putting beds at my disposal for this investigation.

THE APPLICATION OF ULTRA-VIOLET LIGHT IN GENERAL PRACTICE.

BY

T. CLYDE McKENZIE, M.B., CH.B.,

SMETHWICK, BIRMINGHAM.

At the present time much is being written on the specialized application of ultra-violet light, but to my knowledge nothing has been recorded of its use in general practice.

As a result of six months' experimental work on friends and myself with various types of lamps, I selected a quartz mercury vapour lamp* of the atmospheric type. Such a lamp has the advantage of portability, and combines economy of current with powerful ultra-violet radiation. The expense of producing the light is not prohibitive, for the electricity used does not cost more than the average bottle of medicine.

The actual source of the ultra-violet light is the gaseous particles of mercury raised to a point of incandescence by the passage of an electric current. This constitutes the mercury arc. Until recently the only type of mercury vapour lamp was the vacuum lamp, but the atmospheric pattern I have used is much stronger in ultra-violet radiation and has a longer effective life. It is important to add that it is necessary at all times to guard the eyes by glass goggles, since the ultra-violet light causes severe conjunctivitis unless such protection is used. Once installed, the lamp appears to be indestructible, except by mechanical breakage. I have had one in use for over 2,000 hours and it is apparently as good as new.

Various tests have been devised for measuring the intensity of ultra-violet radiation. Amongst others, the bleaching of methylene blue (L. Hill) and the toxic property of ultra-violet light on bacteria introduced into the blood stream (Eidinow). The methylene-blue test, however, is of use only for indicating comparative strengths of ultra-violet light and does not determine the reaction of the individual. The blood test, useful in measuring the effect on the patient, is somewhat difficult to perform in general practice. A simple preliminary test can be made by exposing a small area of the palmar surface of the patient's forearm to the light for one minute at a distance of 6 inches. The resulting erythema is noted after twenty-four hours.

I would emphasize the fact that in 90 per cent. of the following cases I had previously tried ordinary therapeutical measures which were either ineffective or progress was extremely slow. Details given below are of my early cases when I used a 110-volt lamp. Lamps can now be obtained

* Such a lamp is manufactured by Messrs. Kelvin, Bottomley and Baird, in their works at Hither Green, S.E.13. A suitable stand was designed for me, and has proved very satisfactory for applying local and general irradiation.