

in gynaecological work contain from 50 mg. to 60 mg. each, and have a wall of platinum 0.6 mm. to 0.8 mm. in thickness; radium needles, which are inserted directly into a tumour or the tissues surrounding it, contain from 1 mg. to 2 mg. of radium, screened by about 0.6 mm. of platinum; radon seeds, also inserted interstitially and used frequently for neoplasm of the tongue and floor of the mouth, have a wall of gold of 0.2 mm. or 0.3 mm. in thickness.

#### Factors to be considered in calculating the amount of radiation necessary.

The calculation of the amount of radiation is no concern of the nurse, but in view of her responsibility concerning the checking and sometimes the removing of radium tubes, a few words on the subject may be of interest. The quantity of radiation to be given to a specified part depends upon four main factors: first, the amount of radium element or radon in use; second, the distance at which it can be applied from the centre of the area to be irradiated; third, the time which it is left in position; and, lastly, the type of neoplasm concerned.

The strength of radium for therapeutic purposes is calculated by the amount of the element present in the radium salt. The unit is 1 mg. of radium element, which is contained in 1.425 mg. of radium sulphate. The commonest unit in use for radon is the "millecurie," which corresponds in radioactive value to 1 mg. of radium. When a nurse is given charge of a radium case, she is told how much radium has been inserted and in how many containers. Radium needles and sometimes also radon seeds are threaded with fishing gut, which is brought to the surface. It is the nurse's duty to count these ligatures regularly to ensure that the requisite amount is present.

With regard to the second factor, the distance at which the radium is applied from the centre of the tumour, the nurse has again a responsibility. It is obvious that if needles or radium tubes, collars or plaques are allowed to slip out of place, the requisite amount of radiation will not reach the tumour and, in addition, injury may be caused to healthy tissues. Constant observation is, therefore, necessary.

The time factor is very important. In some cases a large amount of radium is applied for a short time (perhaps twelve hours), in other cases a small quantity is left in place for a much longer time up to, even, a week. The nature of the lesion is the criterion by which the radiologist is guided. As a general rule, malignant growths respond best to prolonged irradiation. The new treatment, which is coming into use more and more, enables patients to be subjected to the radiation from radium for one, two, or more hours daily. A large quantity of radium or radon is enclosed in a specially-constructed case from which the rays are directed through a "window," so that they can be focused upon the patient as required in a manner resembling X-rays. This treatment seems to be of great value for carcinoma of the breast and uterus. Non-malignant disorders, such as produce menorrhagia, for example, fibroids and ovarian mal-functions, are often treated with a fairly large dose of radium enclosed in a tube, 50 mg. to 60 mg. being applied for 48 hours. The nurse who is given charge of a case where radium has been applied is told, in addition to the amount of radium, the time which it has to be left in position. She is often responsible for the removal of the radium tube used in gynaecological work, and also for the applying of radium collars or plaques, which have to be worn by the patient for a stated time daily. Radium treatment can be very dangerous, and the strictest attention to instructions concerning it is imperative.

The fourth factor which the radiologist has to take into consideration is the nature of the lesion. Cells in mitosis

are, on the whole, more susceptible to irradiation than those which are not multiplying so rapidly, consequently the more malignant the growth the more susceptible to the action of radium. The more nearly the cells of a tumour are to the embryonic type, the more readily are they affected by the  $\gamma$  rays of radium and by X-rays. A basal-celled type of carcinoma usually responds better to radium treatment than a squamous-celled type, and this, in turn, than a columnar-celled type. In order to ascertain the type of neoplasm, a biopsy or diagnostic curettage is often resorted to. In gynaecological work the uterus is often curetted, the curettings examined and radium inserted in one operation while the patient is still under the anaesthetic.

#### Contra-indications to radium treatment and complications.

Sepsis is one of the chief contra-indications to the use of radium. The nurse's observation may be of value in this matter. The presence of salpingitis in connection with tumours and carcinomata of the uterus may cause serious complications if radium is applied. The nurse's report concerning the nature of the discharge is, therefore, important.

Cachexia is another contra-indication. If the neoplasm is so far advanced that the patient is in a cachetic state, radium will only cause more harm, although X-ray treatment may be of value.

No metallic medicines should be given while radium is in use, and no metal object, such as a safety-pin, should be allowed to come between the radium and the skin. In gynaecological work when douches are required, they are of normal saline as a rule. The reason for this precaution is that in the presence of metals secondary  $\beta$  radiations appear to be set up with harmful results.

Very troublesome diarrhoea may result from prolonged use of radium in bad cases of uterine and cervical carcinoma. This, in conjunction with pain in the lumbar and sacral regions which frequently occurs, can cause the patient great distress. Nausea and anorexia frequently accompany the treatment. Fortunately, the pain can usually be alleviated by mild drugs, such as aspirin, for a time at least. Sympathy from the nurse and an assurance that the treatment is not a long one often does much to comfort the patient.

Radium treatment is frequently used for the production of an artificial menopause. This is seldom employed now on patients under forty, as in younger women it was found to produce very severe menopausal symptoms. Even with patients over that age the nurse should be on the look-out for signs of mental disturbance.

Occasionally phlegmasia alba dolens and its complications may follow dilatation and curettage of the uterus and the insertion of radium. It is uncertain whether the curettage or the insertion of radium causes this.

#### Summary.

Radium is of tremendous value and very scarce, therefore the greatest care must be taken to avoid loss.

Serious injury to workers with the substance may result if precautions are neglected.

The patient may receive harm instead of benefit if radium containers or plaques are allowed to slip out of place. Similarly, the nurse cannot be too careful to observe the exact times ordered for removal of radium tubes or for daily application of radium plaques or collars.

Other symptoms for which the nurse should be observant are indications of the presence of sepsis, the commencement of mental disorders, symptoms of shock, or of thrombosis and the onset of diarrhoea.

Above all, the nurse should remember when in charge of radium cases that the patient often suffers pain and severe discomfort in addition to the dread of cancer, and that kindness gives great comfort to these people.

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