one local on the growth immediately irradiated; the other general, affecting the whole body. If the growth is purely local and superficial, good results are often obtained. If the growth has extended to other parts it is highly improbable that rays can reach all the cells in sufficient quantity to destroy them. Moreover, the power of X-rays diminishes rapidly the deeper they penetrate, so that if sufficient rays are allowed to enter a body to destroy a growth three inches below the surface the skin over the growth will be destroyed also: and if the dose be kept small enough not to destroy the skin it will be far too small to destroy the deeper-lying growth. To some extent this difficulty is overcome by giving multiple small doses from different angles so that the tumour receives a full dose although no part of the skin over it receives more than a very small dose.

The reason for the complete failure of the Erlangen technique is thus obvious—it consisted of one or two enormous doses. The modern method is to apply multiple small doses over a more or less prolonged period.

As I have said, small, purely local and superficial growths X-rays may completely cure, such, *e.g.*, as rodent ulcer or a cutaneous epithelioma. Sarcoma is often beneficially affected and the local mass may sometimes be completely removed. Unfortunately recurrence after a longer or shorter period is practically invariable. It is doubtful whether X-rays in any way affect the deep-seated carcinomas.

It is impossible ever to be certain that a surgical operation removes every malignant cell, and if X-rays destroy these cells it is clearly reasonable to give to every patient after such operation a course of X-ray treatment to the area affected. The method has been fairly extensively tried but controversy still rages as to its value. Some maintain that the recurrence rate is diminished thereby, others that it is unaffected, and others again that it is increased. Where the truth lies none can yet say. One inherent and almost insuperable difficulty besets investigation of the matter—if a patient is treated with X-rays after operation and no recurrence occurs it is impossible to know that the growth would have recurred had X-ray treatment not been applied. My personal feeling is in favour of leaving well alone.

One of the chief stumbling-blocks in the way of efficient X-ray treatment has hitherto been the impossibility of measuring the dose accurately. Many methods have been devised and tried, but all have failed until quite recently. X-rays, as I have said, are generated by the passage of an electric current through a tube so that a spark leaps across a gap on to a metal disc. The greater the voltage of the current the harder the rays emitted. No method has yet been discovered by which a constant current of the necessary power—in the region of 200 to 300 KV—can be obtained; the voltage varies from moment to moment and the hardness of the rays constantly changes with the voltage. Within the last year or so an instrument has been made which allows for this variation and records accurately the dose of X-rays given off by a tube in a given time. This is an enormous advance and may lead to valuable developments in the future.

Whether or not X-rays cure cancer, their use has two justifications. In the first place, there is good evidence that in many cases the progress of the disease may be materially slowed so that life is definitely prolonged. Secondly, great improvement may be effected in the mentality of the patient by the knowledge that something is being done.

Radium is another source of radiation. It is a chemical substance which emits three kinds of radiation. Two of them consist of minute particles, far too small ever to be seen even under the highest power of the microscope. They are called α, β and γ radiation respectively. The α particles are relatively large and do not penetrate solid matter. So far as I am aware, they are not used in the treatment of disease; β particles are far smaller and move more rapidly, but even so, they do not penetrate solid objects to any great extent. These are the particles chiefly responsible for radium burns. Being absorbed by the superficial tissues, such as the skin, they destroy the cells and cause burns very like those due to X-rays. They may also be responsible for even more serious damage. If the skin be subjected to their action in small amounts over a long period of time a burn does not result, but a chronic irritation is caused which is very liable to become cancer at a later date.

The third kind of radiation is the γ-ray, analogous to X-rays but of shorter wavelength. The γ-ray has the shortest wavelength that is at present known. It penetrates the tissues and quite quickly destroys those which absorb it, such as bone. Like X-rays it is absorbed to a greater or less extent by the tissues through which it passes, so that its effect diminishes rapidly the further it passes away from its source. It is the γ-rays which are used in the treatment of cancer and, again like X-rays, they are deflected and give rise to secondary rays when they meet with any opaque object such as a metal. The secondary rays are relatively long and consequently penetrate only a very short distance, being absorbed almost immediately.

Radium may be used by superficial application; and for rodent ulcer, cutaneous epithelioma, cancer of the tongue or lip, this is the most satisfactory way of employing it. The radium is placed in a suitable container and applied to the surface of the growth where it is maintained in position for a suitable time. The β-rays are excluded by surrounding the radium with a layer of aluminium, silver or platinum of the necessary thickness; β-rays cannot pass through these metals, while the γ-rays freely do so.

In the case of deeper growths it was originally the custom to place in the growth one or two tubes containing a large amount of radium and leave it there for some hours. The effect was extensive destruction of the centre of the mass; but the growing edge, clearly the part which it is most important to destroy, was unaffected. The method now in use, therefore, is to divide the radium up in small amounts in separate needles which are buried at intervals around the growth. In this way the mass may be encircled by a ring of up to 10, 20 or 30 needles, and a much more uniform effect is attained at the same time as the growing edge receives the largest dose. A certain amount of success has followed this modification, but even so it is obvious that it is possible to expect a cure only if the site of the growth can be adequately reached, and if the disease has not spread to distant parts.

This method is now used by some surgeons even for the treatment of early and operable growths, and a short time ago was enthusiastically employed. Wonderful results were claimed. In early cancer of the breast, for instance, a ring of needles was inserted round the growth and into the axilla to get at the glands there, but the number of surgeons using this method is getting fewer. In many cases of carcinoma of the tongue no attempt is now made to excise the growth, but needles are embedded round about. The immediate effect is sometimes extraordinarily good. The ulcer heals, pain disappears; the tongue, which was formerly fixed down by the growth so that protrusion was impossible, becomes freely movable. The trouble is that the glands in the neck remain and the growth reappears in them. Irradiation of these, as well as the primary growth, was then tried, but most surgeons now deal with them by operation and do a complete dissection of the part, clearing away every gland they can find.

The results obtained scarcely justify the method when the growth can be removed by surgical means. The use of radium should be restricted to inoperable cases, when palliative treatment is alone possible. Here improvement