

coefficient is  $-0.244$ , and no significance can be attached to this figure. But when the ratio of the integral dose to the body weight is compared with the length of the latent period the value of the correlation coefficient is  $-0.567$ , and the correlation is statistically significant. The  $P$  value for this correlation is in fact less than  $0.01$  but greater than  $0.001$ .

When the ratio of the integral dose to the total body surface area is compared with the length of the latent period, the value of the correlation coefficient is  $-0.529$ , a value not significantly different from the coefficient obtained when body weight was used.

These findings indicate that if the length of the latent period can be regarded as an indication of one aspect of the biological response to x-radiation, then its length is not only a function of the dose of radiation but also of the size of the individual irradiated. In the opinion of the authors, the dependence of dose upon body size may well indicate that a diffusible metabolite plays an essential role in the development of those symptoms that occur within a few hours of exposure to x-rays.

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## A Method for the Quantitative Study of Surface Wounds

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One of the difficulties in the study of wound healing and of factors influencing this process is the lack of quantitative criteria. In the case of cut wounds, measurement of the tensile strength of the scar has been used (1). Histological study of granulation tissue has provided some yardstick of the healing process in other types of wounds.

In the case of surface wounds such as burns or pressure sores where one wishes to study the rate of granulation and epithelialization the surface area of the wound constitutes a good objective index of wound healing (2).

The following method has been found to give re-

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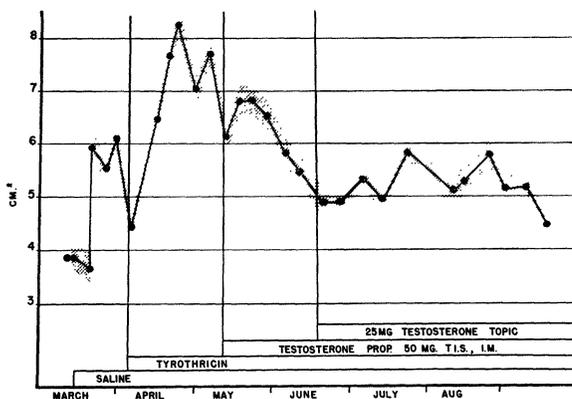


FIG. 1. Long-term study of a patient with hemiplegia showing the quantitative change of the surface of a sacral bed sore under various regimens of treatment. This patient's general condition remained the same throughout. This chart demonstrates the enlargement of bed sores that occurs whenever the treatment is changed; also a distinct deleterious effect of Tyrothricin. The magnitude of the technical error is indicated by the shaded area.

producible results in the study of decubital ulcers in man. A Coreco camera is used to take 35-mm Kodachrome photographs of wounds at frequent intervals. This camera provides constant illumination, focal distance, and aperture. The frames of it are modified by superimposing upon them a centimeter scale made of cellophane and placed in such a way that it will show on the photograph in close apposition with the pictured wound. These Kodachromes are projected in a standard enlarger adjusting the magnification so that 1 cm on the screen corresponds exactly to 1 cm on the centimeter scale on the photograph. A thin white cardboard is used as a screen. The outline of the projected wound is drawn upon the cardboard. The tracing is cut out and weighed by means of an analytical balance. Ten squares, measuring 1 cm square, are drawn upon the same piece of cardboard and cut out. These are weighed, the weights are averaged and the figure obtained is used to divide the weights of the various

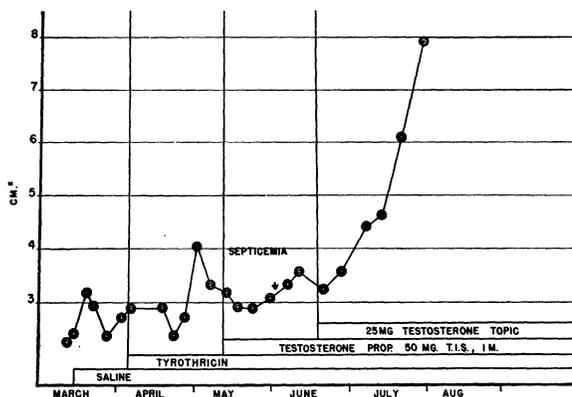


FIG. 2. Shows the same observations as in Fig. 1 although less pronounced, and also the relationship between the size of the bed sore and the general physical state of the patient. This patient developed a septicemia and died, with concurrent enlargement of the bed sore.

wounds projected upon the same cardboard in order to obtain their surface in square centimeters.

This simple method provides a means by objective measurements to make evident changes in the surface of wounds that are not apparent to the naked eye. Figure 1 shows the observations recorded with this method in a man of 42 years of age with hemiplegia and a decubital ulcer over the right buttock. The clinicians who had observed this wound daily had not noticed any remarkable change; however, it is quite obvious that the wound grew larger each time the treatment was changed, and that the use of an antibiotic was followed by a particularly striking enlargement of the lesion. In this instance the procedure of projection and gravimetric planimetry was repeated by different operators and a variation of  $\pm 5\%$  was found (indicated by a cross-hatched area on Fig. 1).

Figure 2 shows the same type of observation in a woman with hemiplegia and a decubital ulcer. This patient died from septicemia, and the decubital ulcer worsened with the general condition of the patient.

A method of gravimetric planimetry by standard photographs offers a means to study the course of surface wounds more accurately than by clinical observation or by the pictorial record alone.

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## Regularly Occurring Periods of Eye Motility, and Concomitant Phenomena, During Sleep<sup>1</sup>

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Slow, rolling or pendular eye movements such as have been observed in sleeping children or adults by Pietrusky (1), De Toni (2), Fuchs and Wu (3), and Andreev (4), and in sleep and anesthesia by Burford (5) have also been noted by us. However, this report deals with a different type of eye movement—rapid, jerky, and binocularly symmetrical—which was briefly described elsewhere (6).

The eye movements were recorded quantitatively as electrooculograms by employing one pair of leads on the superior and inferior orbital ridges of one eye to detect changes of the corneo-retinal potential in a vertical plane, and another pair of leads on the internal and external canthi of the same eye to pick up mainly the horizontal component of eye movement. The potentials were led into a Grass Electroencephalograph with the EOG<sup>3</sup> channels set at the longest

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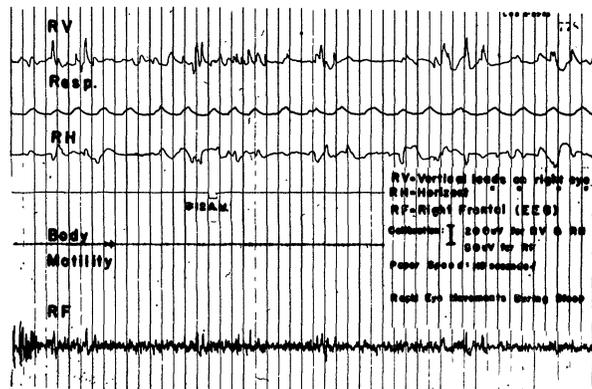


FIG. 1. Sample record exhibiting rapid eye movements in a sleeping subject. RV=vertical leads on right eye; RH=horizontal leads on right eye; RF=right frontal (EEG). Calibration: { 200  $\mu$ v for RV & RH } ; paper speed: 10 sec.

time constant. Brain waves, lid and jaw muscle activity, and electrode movement introduced superfluous potentials which severely hindered the identification of eye movement potentials. To eliminate this difficulty, a monopolar recording was made simultaneously from the frontal area (and occasionally from the anterior temporal area) to be compared with the bipolarly recorded electrooculogram. In this way, the eye movement potential could be recognized easily as a wave in phase on the monopolar and bipolar recordings, but with a potential from 2 to 4 times greater on the latter recording. Note that the gain settings (Fig. 1) for the bipolar recording (RV) and monopolar recording (RF) were adjusted so that an equal excursion of both pens signified that the bipolar potential was actually 4 times greater than the monopolar potential. The criterion for identification of eye movement was confirmed by direct observation of several subjects under both weak and gradually intensified illumination. Under the latter condition, motion pictures were taken of 2 subjects without awakening them, thereby further confirming the validity of our recording method and also the synchronicity of eye movements.

Twenty normal adult subjects were employed in several series of experiments although not all the subjects were involved in each series. To confirm the conjecture that this particular eye activity was associated with dreaming, 10 sleeping individuals in 14 experiments were awakened and interrogated during the occurrence of this eye motility and also after a period of at least 30 min to 3 hr of ocular quiescence. The period of ocular inactivity was selected on the basis of the EEG pattern to represent, as closely as possible, a depth of sleep comparable to that present during ocular motility. Of 27 interrogations during ocular motility, 20 revealed detailed dreams usually involving visual imagery; the replies to the remaining 7 queries included complete failure of recall, or else, "the feeling of having dreamed," but with inability to

<sup>3</sup> Electrooculogram.