high concentrations are present in the cornea even within five minutes of the application of the drug. Of interest, too, is the fact that sulphanilamide has also been shown to penetrate readily through the cornea, especially when it is put in the conjunctival sac in the form of a powder (P'an, 1941); under these conditions high concentrations were found to be present at the end of one hour.

These experimental results suggest that the local application of certain sulphonamides might be of value in the treatment of infective conditions of the eye. The oral administration of sulphonamides has already been used in the treatment of trachoma (Lian, 1938; Loe, 1938; Thygeson, 1940), and although the drugs have not been proved to have any action on the trachoma virus itself, there appears to be general agreement regarding their value in controlling the secondary infection. There are, however, very few records regarding the value of locally applied sulphonamides in the treatment of eye conditions, although Johnstone (1941) has used various sulphonamides locally, in solution or as a powder, for the treatment of hypopyon ulcers.

During the past year sodium sulphacetamide has been used in the eye wards of the Royal Infirmary, Edinburgh (Traquair, Cameron, Paterson, Flint—personal communications) in the treatment of various infections of the eye, and especially of hypopyon ulcers of the cornea. The impression has been obtained that this treatment is of considerable value, although much further work will be necessary to assess this value accurately. Concentrations of the drug up to 30% have been used in this clinical work, and have produced no irritation or other ill effects, thus emphasizing the advantages of a substance which gives a neutral non-irritant solution.

Summary

Equal areas of corneal epithelium were removed from both eyes in a number of rabbits and the lesions infected with *B. pyocyaneus*. In all animals one eye was used as a control, the other eye being treated with a 30% solution of sodium sulphacetamide. All control eyes developed severe corneal ulceration.

When the first treatment was applied 1 hour after inoculation with the organism, ulceration was completely prevented in 11 out of 17 eyes; when it was applied 5 hours after inoculation, ulceration was completely prevented in 5 out of 12 eyes. When the first treatment was applied 12 hours after inoculation, ulceration was prevented in only 2 out of 12 eyes; the lesions in the 10 remaining eyes, however, were less severe than in the control eyes.

The relevance of these findings to the clinical use of the drug for the treatment of infective eye conditions by local application is discussed.

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REFERENCES

- Axenfeld, T. (1908). *The Bacteriology of the Eye*, Baillière, London.
Buttle, G. A. H. (1940). In *Wound Infection*, p. 47, Lancet Ltd., London.
Buxton, St. J. D. (1940). *British Medical Journal*, 2, 802.
Colebrook, L. (1941). *Proc. roy. Soc. Med.*, 34, 337.
Gordon, J., and McLeod, J. W. (1941). *Lancet*, 1, 407.
Hawking, F. (1941). *British Medical Journal*, 1, 263.
Johnstone, I. L. (1941). *British Medical Journal*, 1, 887.
Joy, H. H. (1940). *Proc. Soc. exp. Biol.*, N.Y., 45, 709.
Legroux, R. (1940). *Mém. Acad. Chir.*, 66, 415.
Lian, B. (1938). *Geneesk. Tijdschr. Ned.-Ind.*, 78, 1058.
Loe, F. (1938). *J. Amer. med. Ass.*, 111, 1371.
Nitti, F. (1939). *Bull. Acad. Med.*, Paris, 122, 432.
P'an, S. Y. (1941). *Proc. Soc. exp. Biol.*, N.Y., 46, 31.
Rambo, V. C. (1938). *Amer. J. Ophthalm.*, 21, 739.
Robson, J. M., and Wallace, A. B. (1941). *British Medical Journal*, 1, 469.
Thygeson, P. (1940). *Amer. J. Ophthalm.*, 23, 679.

DELAY IN THE UNION OF FRACTURES

BY

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While it is a common practice to describe the normal healing of fractures as a process which extends over a period of a certain number of weeks, it is recognized that the rate of union is not the same in all areas. Fractures occurring in the neck of the femur and in the carpal scaphoid unite slowly and uncertainly, probably on account of the peculiarity of their blood supply and the difficulty of maintaining the fractured surfaces in apposition for a sufficiently long period. A similar sluggishness in the normal process of union is also found in fractures of the tibia, particularly in the region of the junction between its middle and lower thirds. At this site delay in union is common and definite non-union is occasionally seen, apparently in spite of adequate treatment. In this case the delay cannot be attributed to difficulty in maintaining apposition of the fractured surfaces, but seems to be caused by the absence of any vascular muscle attachment to this area of the bone and by the necessary restriction of blood supply to an easily torn nutrient artery. The lagging in the normal process of union at this point has long been appreciated, but since the beginning of the war the delay has been greater and has occurred in a higher percentage of cases than previously.

Rate of Union

Figures collected by different surgeons with respect to the normal rate of union of any particular fracture are of comparatively little value, because the standard varies so greatly as to what clinical and x-ray evidence constitutes union. It is therefore impossible to set down any specified number of weeks as the normal period for union in a particular fracture treated adequately and continuously, but it can be agreed that if, after fourteen to sixteen weeks of complete immobilization, union is not yet present in a perfectly reduced fracture of the tibia the designation of delayed union may safely be applied.

Owing to the transference of patients in wartime from one hospital to another it has been possible to examine a very large number of fractures at all stages of treatment, and the original impression that the rate of union of fractures of the tibia is much slower than previously has become a conviction. The reason for this alteration in the normal rate of union must be either a change in the patient's metabolic processes or some alteration in the generally accepted standard treatment for this type of fracture. It seems impossible to accept the suggestion of a change in the patient's metabolic processes, especially as there has been little or no alteration in the rate of union of fractures of other bones. The only alteration in treatment during the past few years is the almost universal adoption of non-padded plaster casts for the treatment of every fracture of the lower limb.

For the promotion of union in any fracture there must be apposition of the fractured surfaces and immobilization of the broken bone for a period long enough to permit consolidation of the callus. Fractures will unite even though there is not exact apposition of the broken surfaces; in fact, it has been shown by Wardle that the rate of union in a fractured tibia is greater with slight overlapping of the bone ends than with perfect apposition. Similarly, if complete immobilization has not been secured union may occasionally take place rapidly and completely. This is illustrated in fractures of the clavicle and in fractures of

the femur in children treated by suspension, where complete immobilization is impossible.

The following are typical examples of seventeen patients treated adequately in non-padded plaster cases for fracture of the tibia and fibula. These reports illustrate the slowness of union which is so often caused by this form of treatment, and suggest a simple method by which union may be hastened.

Cases of Slow Union in Non-padded Plaster

Case 1.—This patient, a sergeant, had a fracture of the tibia and fibula in the lower third of the leg, treated by fixation in a non-padded plaster, which included the knee-joint. Reduction gave little trouble, as the fracture line was almost transverse, and the patient walked in the cast after two weeks' recumbency. After the third cast had been removed twenty-two weeks later there was no clinical or x-ray sign of union, movement being free at the site of fracture. The x-ray photographs showed almost perfect apposition of the fractured surfaces without sclerosis of the bone ends and with a slight degree of decalcification. A calliper splint and a cloth boot were applied, and in this apparatus the patient walked about freely and without pain. After eight weeks, union was complete clinically and almost complete radiologically.

Case 2.—Fracture of both bones in the same region; reduction was excellent, and a non-padded plaster cast was applied. In this the patient walked continuously, starting three weeks after its application; but on removal of the second cast eighteen weeks later the conditions present were almost identical with those of the first patient. A calliper splint and a cloth boot were applied, and in nine weeks union was complete both clinically and radiologically.

Case 3.—A gunner aged 27 had a simple fracture of both bones of the leg—fracture long transverse—reduced and put in non-padded plaster. Eighteen weeks later, when the second plaster was removed, non-union was apparent. Radiographs showed perfect apposition, no sclerosis of the bone ends, and no sign of new callus formation. A calliper splint and a cloth boot were fitted, and in seven weeks union was sound; at the end of another two weeks the calliper was removed and freedom of the limb was allowed for increasing periods.

Discussion

These observations suggest that the immediate application of a non-padded plaster cast does not help in bone formation, even though it provides complete immobilization and maintains the corrected position. When used, especially in the early stage of treatment, it permits the formation of the haematoma which should be present in every fracture and which provides a scaffolding for the formation of bony callus. If the application of the closely fitting non-padded cast is delayed for a week until the haematoma has formed and has partly consolidated, these disadvantages are not present, and during this preliminary period alignment and apposition of the fractured surfaces can be secured by the use of a padded cast or gutter.

In using a calliper splint in this way to promote union the principle adopted is that described by Thomas in the treatment of delayed union of fractures by venous congestion. The calliper is applied to the limb with a long back knee-pad, extending from above the joint to the top of the boot, supporting the fracture posteriorly. The use of a boot, the upper of which is made of cloth rather than of leather, is an essential part of the treatment; by this means sores which would otherwise form over the back of the os calcis are prevented, and the soft boot may be kept on day and night. Once a day the boot is carefully removed without disturbing the fracture, and the back of the heel is gently rubbed with methylated spirit and dusting-powder to harden the skin and prevent irritation. When clinical and x-ray evidence of union is apparent the splint may be discarded at night only for a week or two, and then removed without risk.

SUICIDAL COMPROMISES: PSYCHOPATHY AND REHABILITATION

BY

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The hysterical fugue must at its beginning be a dramatic event. When reconstructed under hypnosis or evipan narcosis the patient recalls the change from normality to the pursuit of a course entirely different from that originally intended. The latter in not a few cases was a suicidal gesture which failed of achievement only because of the altered personality which was suddenly substituted for the one intending suicide. The patient, an individual of less than normal toughness, had been under duress; his schemes had failed; an abrupt ending of his life seemed the only solution. And suddenly this course is ended, and he wanders from the riverside or railway track, to be found some hours later having lost his memory—an amnesia usually stretching from some distance before the suicidal intent to some period after.

The Compromise of the Hysterical Fugue

The hysterical fugue is a compromise solution. The patient's determination to give up in view of his difficulties is prevented by the emergence of a different personality. Like Sir Thomas Browne's great amphibian, the fuguer lives in divided and distinguished worlds, but, unlike the philosopher, cannot pass willingly from one to another. A little introspection allows all of us to admit that the contemplation of suicide as a means of escape is not so rare as we might suppose. Everyone, if he is honest, will probably confess occasional fleeting impulses of this sort. What prevents it? Usually a recognition that the obstacles are but disappointments, looming large, which can be circumvented or tackled in satisfactory fashion. This entails criticism of our past methods, patience, and the knowledge that self-respect lost can be regained by fresh efforts and trials.

But it would be surprising if there was no connexion between the healthy individual's occasional thought of suicide and the condition of frustrated suicide which lies behind the hysterical fugue. Such a chain of connecting links is to be found. In the sense that suicide is a social problem, so also are the examples of the connecting links here presented. And it is because these have social as well as medical implications that they are described in terms of suicidal compromises.

We may remind ourselves that suicide occurs in a variety of conditions. In one group come cases in which as a result of confusion or intoxication the individual inadvertently does something resulting in loss of his life. To an intermediate group belong those cases in which as the result of delusion or of aural hallucinations the patient ends his existence. The deluded group contains persons so depressed that they believe they have done irreparable wrong, for which *felo de se* is the only solution. Volition is retained in those who are suffering from incurable or painful disease, in those persons in primitive societies upon whom custom forces suicide—e.g., suttee—and in depressed individuals not deluded so much as mistaken. These mistaken individuals include "the hysterics who commit suicide." It is now recognized that a diagnosis of psychoneurosis or hysteria does not automatically eliminate the danger of suicide. When this occurs it will generally be found that the individual expressed or indicated during life an exaggerated desire for revenge for some real or fancied slight.