The Tannic Acid Treatment of Burns.

BURNS or scalds of relatively small areas of the body frequently have a fatal ending, especially in children, so that any method of treatment which will reduce this mortality requires careful examination and adoption if proved successful. In 1925, E. C. Davidson described a method of treatment by means of tannic acid which he had found reduced the mortality from these injuries, and the treatment has been put to a critical test by W. C. Wilson in the wards of the Royal Edinburgh Hospital for Sick Children and the Royal Infirmary, Edinburgh, with the result that the mortality has been reduced to little more than a quarter of that observed in another comparable series of cases.[1]

The course of events following a burn may be divided into four fairly well-defined stages. The first is the stage of reaction to the immediate effects of the injury or stage of initial shock; its clinical features are prostration, low temperature and blood pressure, a small rapid pulse and cold skin. It is of nervous origin and is most often only slight in degree. After it has passed off the patient appears well for a time, but after about 12-24 hours acute toxæmia or secondary shock appears and may be quickly fatal. The chief features of this stage are similar to those of the initial shock, but rapid shallow respiration, vomiting, restlessness, and anxiety, changing to coma, may also be observed, and the temperature is frequently considerably elevated. The condition is similar to the secondary shock developing in severely wounded patients, which was proved by experiments carried out during the War to be due to the absorption into the circulation of toxins set free in severely damaged tissues, especially muscle.

The work of Dale and his collaborators showed that typical secondary shock was produced by the intravenous injection of such a vasodilator as histamine, and that the vasodilator effects of tissue extracts could be matched by the injection of histamine and choline together. The isolation of histamine from muscle by W. V. Thorpe (*Biochem. Jour.*, vol. 22, p. 94; 1928) was the final confirmation of these experiments, whilst the work of Lewis and his collaborators showed that the responses of the skin of man to injury and to the injection of minute doses of histamine were identical. It may be considered as certain that secondary shock is due to the absorption into the blood stream of some substance which is formed at the injured area itself; Wilson suggests that it is probably a product of protein lysis; it may quite possibly be histamine itself.

The third stage is that of septic toxæmia and is only well developed clinically when there is severe infection of the injured area. The fourth and final stage is that of healing, and its duration depends largely on the depth of the lesion. First and second degree burns heal quickly and without the formation of scar tissue; in the third degree lesions the surface becomes covered with granulations over which the epithelium grows, leaving a supple and greyish-white scar: in deeper burns, or where sepsis has been a prominent feature, scar tissue development is more marked, and owing to its subsequent contraction, deformities and disabilities may follow.

Each of the four clinical stages requires its own treatment. For a slight degree of primary shock no special treatment is necessary, but where it is severe, morphine should be given, artificial heat applied, and fluids administered. Local treatment is begun at the same time and involves cleansing and dressing of the injured area. To prevent secondary shock it is necessary to prevent the absorption of the products of tissue breakdown: the only methods which have been at all successful have been excision of the burned area and coagulation of the damaged tissue by tannic acid. In the third stage the condition is that of a septic wound and fomentations and antiseptic dressings will be necessary, whilst during the healing stage special measures may be required to prevent contraction.

Wilson gives a full description of the method of treatment by tannic acid, and includes in an appendix a description of its use in the first aid treatment of burns. In hospital the burned area is first cleansed with ether under general anæsthesia, either gas or oxygen (if shock is marked) or ether being administered. The area is then sprayed with a warm sterile 2·5 per cent aqueous solution of tannic acid, freshly prepared, and the parts dried in hot air under a bed-cage. The spraying is repeated hourly until the area is covered with a firm brown layer of coagulated tissue: 8-12 applications may be necessary in burns of the second and third degrees. No dressings are required: if the whole of the injured area cannot be exposed to the air, compresses of tannic acid are applied to the parts on which the patient lies. In most cases the coagulum is left until it peels off, leaving either a healed area or healthy granulations according to the depth of the burn. In no circumstances should a moist dressing be applied, since this procedure results in the appearance of toxic signs and symptoms.

In this study 117 children were treated by the tannic acid method between November 1925 and January 1929. The mortality was 11·1 per cent, or in 105 children under ten years of age 10·5 per cent. In 300 cases under ten years treated by other methods, the mortality was 38·7 per cent. The percentage distribution of the mortality over the first three stages was, in the present series, 30·8, 23·8, and 23·8, and in the previous series 2·5, 80, and 15 respectively. Thus the tannic acid method of treatment controls the acute toxæmia of the second stage, and by reducing the mortality due to it, brings into greater prominence the fatalities which occur at other stages: and in some instances these deaths were not directly connected with the injury.

Besides reducing mortality, the treatment lessens

[1] "The Tannic Acid Treatment of Burns", by W. C. Wilson. Medical Research Council; Special Report Series, No. 141. Pp. 34. (London: H.M. Stationery Office, 1929.) 1*s.* net.

the severity of the symptoms at all stages and promotes rapid healing: at the same time it permits of the recovery of patients with involvement of a considerable area of the body surface. Previously it was considered that burns of 30 per cent of the body surface in an adult and of 11-12 per cent in a child were almost certain to prove fatal. From the results obtained in this series of cases it may be concluded that involvement of more than 60 per cent of the surface in children will cause death from shock in a few hours: when between 35 and 60 per cent of the surface is affected, the outcome depends mainly on the degree of sepsis which develops and therefore on the depth of the lesion. With less than 35 per cent of the surface involved the prognosis is good, provided treatment is begun within a few hours of injury.

The results of this method of treatment have been so successful in the hands of Davidson and Wilson that it is to be hoped that many other clinicians will try it out and find it equally satisfactory.

Obituary.

SIR HENRY JACKSON, G.C.B., K.C.V.O., F.R.S.

THE death of Admiral of the Fleet Sir Henry Jackson on Dec. 14 has caused deep regret in both naval and scientific circles. His courtesy, his charm of manner, his unswerving devotion to duty, and the sweet simplicity of his nature endeared him in an extraordinary degree to all with whom he came into contact. The recollection of their association with him will be a treasured memory to many throughout their lives.

Henry Bradwardine Jackson was born at Barnsley in 1855 and entered the Navy in December 1866. During 1878 and 1879 he served on the African station and took part in the Zulu War. On returning to England he was appointed to the *Vernon*, where he qualified as a torpedo-lieutenant and remained there three and a half years. About this time he was sent by the Admiralty to study torpedo design and construction at the Whitehead establishment at Fiume.

In 1891 the Navy was seeking some means by which a torpedo boat could announce her approach to a friendly ship, and the idea first came to Sir Henry Jackson of employing Hertzian waves as a means of communication for this purpose. He was then at sea and was unable to put his ideas into a practical form until in 1895, when in command of the *Defiance*, he read of some experiments by Dr. (now Sir Jagadis) Bose on coherers. Having obtained a satisfactory coherer, he managed in this year to effect communication by electromagnetic radiation from one end of his ship to the other. During the next two years he continued his experiments with increasing success. On Sept. 1, 1896, he first met Mr. Marconi, and the two pioneers of radio-telegraphy kept in close touch and gave each other much mutual assistance until Sir Henry Jackson was appointed Naval Attaché in Paris early in 1897.

In 1899 Sir Henry Jackson was appointed to command the *Vulcan*, and in 1900 wireless telegraphy received definite recognition in the Navy, a contract being placed with the Marconi Company for the supply of installations to a number of His Majesty's ships. The new means of communication was employed with considerable success in naval manœuvres in that year. From this time to his promotion to flag rank in 1908, Sir Henry Jackson remained generally responsible for the development of radio-telegraphy in the Navy. His own researches were mainly on the lines of improving methods of tuning and the study of the effects of land screening, the interference of atmospherics, and the influence of meteorological conditions on radio communications.

In 1901 Sir Henry Jackson was elected a fellow of the Royal Society, and in the next year communicated to the *Proceedings* of the Society a paper entitled "On Some Phenomena affecting the Transmission of Electric Waves over the Surface of Sea and Earth". This is now a classical paper and well illustrates the careful and methodical manner in which Sir Henry Jackson always made and recorded his observations. In modern radio research, in particular on wave propagation, much attention is given to the results of the mutual interference of several waves arriving at a point with various phase differences. In this connexion it is interesting to note that Sir Henry Jackson observed the zones of weak signals; for he wrote: "This phenomenon manifests itself by the gradual weakening and occasionally by the total cessation of signals, as the distance of two ships increases, up to a certain point, and their reappearance as the distance is further increased". He went on to say that he considered this effect was due to want of synchronism in the oscillatory discharge between the spark balls of his transmitter, so that there was a change in frequency between the successive discharges of the transmitter. This, he pointed out, would produce successive oscillations out of phase with each other which would at one point annul each other, while at a further distance they would reinforce each other.

In 1905, Lord Fisher, under whom Sir Henry Jackson had served in the Mediterranean, appointed him Third Sea Lord and Controller. In this post his scientific qualifications made him specially suited to take charge of the application of science to the practical work of the Fleet at a time when the design and equipment of warships were undergoing rapid development and improvement.

At the beginning of the War, Sir Henry Jackson was retained at the Admiralty, working in conjunction with the War Staff, and was appointed First Sea Lord on May 23, 1915, when Lord Fisher left the Admiralty. He held this high office until December 1916. During this period he worked n complete harmony with Lord Jellicoe, and the foundations were laid for various schemes for fighting the submarine menace, including the raid