

The Treatment of Burns and Scalds, with especial reference to the use of Tannic Acid.

PHILIP H. MITCHINER.

(This is an abstract, by permission, of the Hunterian Lecture delivered before the Royal College of Surgeons on February 1st, and published in full in "The Lancet," of February 4th, 1933).

WHILE in Europe, Hippocrates in 435 B.C. was advocating the treatment of burns by a mixture of beeswax and myrrh, a far older treatment advocated by physicians in China—the treatment of burns by tannic acid in the form of tea, was in use and is still carried out to this day. This form of treatment has been revived in recent years by the Americans and has reached us from the West instead of the East.

The factors which have contributed to the reduced mortality from burns during the last three decades are:—

- (1) Improved social conditions in the homes of the poor ;
- (2) The disappearance of the naked light ;
- (3) The passing of the Children's Act in 1908, making it a punishable offence to have a child alone in a room containing an open grate insufficiently protected. (The mortality at the London Hospital between the years 1899-1903 was 25.3%, whereas from 1924-28 it was 6.6%, although the treatment used was practically the same during both these periods).

After giving further details concerning the mortality from burns, and stressing the importance of differentiating scalds from burns, the causes of death from burns is next mentioned. The period immediately after the burn or scald is the stage of initial shock which follows the upset of the nervous system resulting from exposure to flames or scalding fluids. From his experience at St. Thomas' Hospital the writer of this article concludes that from 6 to 24 hours after the burn, the stage of acute toxæmia sets in. This is due to the absorption of toxic substances from the damaged tissue in the burnt or scalded area. This toxæmia has been shown to be the result of histamine freed into the blood from the traumatised part. It is stated that such a condition is best combated by removing a measured quantity of toxic blood from the patient and replacing it by a somewhat larger volume of the whole blood from a suitable donor. This step is unnecessary if by coagulation of the damaged tissue we can prevent absorption toxæmia. It is therefore

unnecessary in the treatment of burns the surface of which has been sufficiently coagulated with tannic acid.

Further it is emphasised in this article that an important factor in the causation of shock at a period 6 to 12 hours after the burn or scald, is the loss of blood-serum from the burnt surface; this is clinically demonstrated by the condition of the dressings and the extreme thirst and restlessness of the patient. This loss is most pronounced in third-degree burns, and a man weighing about 10 stone who might be expected to have 5,000 c.c.'s of blood in his body, would lose 3,500 c.c.'s in the 24 hours following a third-degree burn involving one-sixth of the total body surface. This factor constitutes a very potent cause of the collapse which subsequently ensues and is responsible for 80% of the deaths after burns.

This excessive loss of fluid may be combated by administration of fluid intravenously, but with an extensive burn it is almost impossible to get a sufficient quantity into the tissues to replace the loss. It was here that the picric acid treatment constituted such an advance on the older bath and grease method, but the coagulum formed did not penetrate deep enough to prevent the absorption of toxic substances from the deeper tissues. Again, it was impossible to retain this dressing more than two or three days owing to the toxicity of the picric acid manifested by skin rashes, irritation, albuminuria, and therefore paraffin had to be substituted, and sepsis not infrequently supervened. Figures and statistics are given to show the improved results and lowered mortality in St. Thomas' Hospital after the introduction of picric acid. It is noted that the mortality from scalds was not lowered, but that from burns was markedly so.

The tannic acid treatment for burns was introduced in St. Thomas' Hospital in 1928, and a 2% solution of tannic acid was used and the spray method adopted. There was an enormous difference in the general condition of the patient and the entire absence of pain and sepsis was noted as the result of the introduction of this method. The disadvantages of the method were (*a*) the necessity for keeping the area exposed to air while at the same time keeping the patient warm; (*b*) the disadvantage of mechanical restraint in order to keep the damaged area at rest; (*c*) the need for constant attention and hourly sprayings for from 10—24 hours; (*d*) the impossibility of being able to expose the entire burnt or scalded surface in those cases burnt both in front and at the back; (*e*) the necessity for fresh solutions hourly. Because of these difficulties work was done to

devise a method to overcome the drawbacks of this technique, and the steps taken in the discovery of the compress method are detailed.

TECHNIQUE OF THE COMPRESS METHOD.

A compress of 2% tannic acid with 1/2,000 perchloride of mercury, makes a most efficient first-aid dressing for all burns and scalds, but in the home and other places where burns occur but rarely, tablets or powder to be dissolved in warm water and applied by soaking clean linen in the resulting solution will be found more advantageous than keeping a large quantity of a stock 2% solution. The formulæ given are as follow :—

Powder.—Tannic acid, grs. $17\frac{1}{2}$; perchloride of mercury, gr. $\frac{1}{2}$; to be dissolved in 2 oz. of warm water when a 2% solution will result.

Tablets.—Tannic acid, grs. $17\frac{1}{2}$; perchloride of mercury, gr. $\frac{1}{2}$; boric acid, gr. 1; to be dissolved in 2 oz. warm water when a 2% solution will result.

Whatever method of first-aid may have been employed it is essential that the first-aid dressing, even if of tannic acid, should be removed and the area carefully cleaned before the final tannic acid dressing is applied. By this careful dressing alone can subsequent sepsis be avoided. Should sepsis supervene during the course, it is necessary to remove the dressing and reclean the area thoroughly, and apply a new tannic acid dressing in order to get a good result.

The cleansing must start by removal of all dead and charred tissue, the excision of all loose skin raised over blisters and the removal of grease, especial attention being given to the edges of the damaged area. The whole area should then be gently but thoroughly cleansed with soap and water, applied with a sterile swab, and finally carefully sponged over with ether to remove all natural and applied grease, in order to get thorough coagulation. It is obvious that this cannot be carried out unless the patient is rendered insensible to the pain, which this cleansing must entail. Anæsthetics are not advised, but large doses of opium are given and the following recommended :—

TABLE.—OPIUM DOSAGE FOR CLEANINGS BURNS AND SCALDS.
I.—IN CHILDREN

<i>Age.</i>	<i>Preparation.</i>	<i>Dose.</i>
1/12	Tinct. camph. co.	<i>m</i> ii.-iii.
2/12	" " "	<i>m</i> iv.-vi.
3/12	" Tinct. opii."	<i>m</i> $\frac{1}{4}$ - $\frac{1}{2}$.
6/12	" " "	<i>m</i> $\frac{3}{4}$ - $\frac{1}{2}$.
1 year	Tinct. opii (a) or	<i>m</i> ii.-iii.
	Inj. morph.	gr. 1/75.
Over 1 year	Tinct. opii or	<i>m</i> ii. for each year and <i>m</i> ii. in 15 min. if necessary.
	Inj. morph.	gr. 1/75 for each year.

II.—IN ADULTS

12-15 years	..	Tinct. opii <i>and</i>	<i>m xxx.</i>
15-20	..	Inj. morph. Tinct. opii. <i>and</i>	gr. $\frac{1}{6}$. <i>m xxx.</i>
Over 20	..	Inj. morph. Tinct. opii. <i>and</i>	gr. $\frac{1}{4}$. <i>m xxx.</i>
		Inj. morph. (b) <i>or</i>	gr. $\frac{1}{4}$ - $\frac{1}{2}$.
		Inj. morph. (c)	gr. $\frac{1}{2}$ - $\frac{1}{4}$.

Remarks.—(a) Tinct. opii is more satisfactory than morphia. (b) For women. (c) For men according to stamina.

N.B.—Should slow or shallow breathing give rise to anxiety, atrophine sulphate gr. 1/200-1/50 should be administered hypodermically.

APPLICATION OF COMPRESS.

This consists of either six layers of sterile gauze or three layers of lint, which should be thoroughly soaked in a stock solution of 2% tannic acid and 1/2,000 mercury perchloride, and applied closely and evenly over the entire burnt surface without wringing the dressing out. This compress should then be firmly and evenly bandaged in position, the bandage being applied directly to the outer side of the compress. The whole of the outside of the bandage may then be soaked with a spray of 2% tannic acid and 1/2,000 perchloride in order to ensure that the underlying dressing is thoroughly wet. Mackintosh or jaconet should be placed under the patient until the dressing is dry, in order to save soiling the sheets. It is also well to secure the burnt limb temporarily in order to prevent undue movement until the tannic acid coagulum has formed firmly. The dressing should be left in position for a fortnight in the case of small burns and three weeks where large areas are involved. At the end of this time the bandage should be cut and the dressing lifted when the scab will usually separate completely from the burn; if it does not the dressing can be re-bandaged and removed later. The separation can be rendered painless by spraying with tannic acid solution between the coagulum and the skin during this process.

Temperature and toxæmia as shown by rapid pulse, dried and furred tongue and pain, with possibly the escape of sero-pus in considerable quantities, are the only indications calling for the removal of these dressings before the time stated. Should removal be necessary the area should be re-cleaned carefully and another tannic acid dressing applied.

As indicated, the dressing must be closely and evenly applied to the burnt area, and there are certain regions,

e.g., perineum, groin, axillæ, neck and face, where the absence of bandages is an advantage and where the spraying method gives better results, but the compress method has been and can be used with good effect in these areas. It must be realised where destruction of subcutaneous muscular tissues has occurred, that scarring and contracture are inevitable, and therefore compresses or spraying should be applied in such a position, that subsequent contractures may be counteracted. Equally is it obvious that although full epithelialisation will have occurred in those areas where the first, second or third degree burns have occurred, an ulcer must be expected, and will be met with in deeper burns, and this, if extensive, should be treated by subsequent autogenous skin grafting, or if small, by the application of some such lotion as the following : purified alum, grs. 20 ; zinc sulphate, grs. 10 ; glycerin, 7 fluid ounces ; water, to one pint.

In order to meet the desirability of applying the solution warm, it is advised to keep a concentrated solution of tannic acid and mercury chloride and dilute with warm water when required. This stock solution should not be more than double strength, as in stronger strengths it is inclined to decompose more quickly. The tablets, the formula of which has been given, are advised where storage of solution is likely to be a bother. The tablets when dissolved in water make a slightly muddy solution due to the boric acid used as an excipient ; this does not interfere in any way with its efficacy of coagulation.

In St. Thomas' Hospital, from 1924—1928, the mortality from burns was 15.5% and that from scalds 7.5%. In the period from 1929-32, when 2% tannic acid and Hg Cl_2 1/2,000 was used, the mortality fell in the case of burns to 4% and in the case of scalds to 1.7%.

(We are indebted to the Editor of " The Lancet " for permission to abstract this valuable article, and would advise the reader to consult the original for further details.)