

THE TREATMENT
OF SUPERFICIAL BURNS
BY PICRIC ACID SOLUTION:
A Study in Repair.

by

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"Five things are proper to the dutie of a chirurgian;
to take away that which is superfluous; to restore
to their places such things as are displaced; to
separate those things which are joyned together;
to joyne those which are separated; and to supply
the defects of nature.

Thou shalt fare more easily and happily
attaine to a knowledge of these things, by long use
and much exercise, than by the reading of Bookes,
or daily hearing of Teachers. For Speech, how
perspicuous and elegant soever it be, cannot so
vively express anything as that which is subjected
to the faithfull eyes and hands".

From the translation published in
London 1634, of "The Workes of that famous
Chirurgian, Ambrose Paré." Paris 1579.

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Introduction.

The pathology and therapeutics of the injuries caused by burns have, from their frequent occurrence, forced the attention of surgeons from the beginnings of the art. We find Hippocrates (1) indicating principles of treatment which are still impressed upon us. For he recommends the use of soothing applications, insisted on the preservation of the injured surface from the external air and indicated the remedies he had found useful. It was not however, till early in the seventeenth century that Fabricius de Hilden (1) placed the Treatment of Burns on a scientific basis, and it is therefore to him that we owe any real advance in modern times. For Guy de Chaliac(1) a mediaeval writer, only discusses the prognosis of those injuries.

Hilden, on the other hand, recognised three ^{the} degrees in a local lesion, and, going further, he laid down rules by which complications might be warded off, vicious cicatrising prevented, and in the event of its occurrence, the methods to be adopted for its correction. The degree in a burn he recognised were:-

(1) Dict. Encyclop. des Sciences Medicales.

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1. Redness.
2. Vesication, with destruction of the dermis to a certain depth.
3. Slough formation, with more or less destruction of the soft parts.

It is to Hilden that we are indebted then for the first internal pathology and treatment of burns. After him Hairster(1) added a degree including the destruction of bone.(1) Boyer, still later, went back to a classification in three degrees, in which he was followed by Billroth.

Our present method of definition of the various degrees we owe to the French surgeon Dupuytren, whose classification, based on the anatomical characters of the lesion, has now become classic. His divisions are as follows:-

1. Hyperpyrexia.
2. Vesication.
3. Partial destruction of the skin.
4. Total " " " "
5. Charring of Muscles.
6. " " bones and joints.

If the pathology of burns is thus on a satisfactory basis, the same cannot be said with regard to their treatment; for hitherto we imagine

(1) Dict. Encyclop. des Sciences Medicales.

few injuries have been more painful to the patient, and more full of disappointment to the surgeon. The great advances of later years in Medicine and Surgery have not, till quite recently, shed much light on the treatment of these injuries.

The use of Picric Acid, however, for superficial burns, gives results so far surpassing those formerly obtained that this method, which we owe to M.Thiéry, may be said to have revolutionised the treatment of such injuries. In our own country, Mr. D'Arcy Power (1), and Mr. Miles (2) have already confirmed his results, while in the Continent, several other observers have come to equally favourable conclusions as to the extreme value of the method.

In this thesis it will be our aim to elucidate and establish the use of Picric Acid in the treatment of burns.

(1) Brit. Med. Journ., Sept.12, 1896.

(2) Scottish Med. Journ., Oct.1897.

The Healing of Superficial Wounds.

In considering the process by which a wound or a burn is repaired, we must keep in mind the predominant part nature plays in the process, and ask what she demands in its successful issue. It was a saying of Hippocrates "νοσῶν φύσις ἰσχύει," and the words of Pare are well known "Je le pansays, Dieu le gaurit."

We see then that surgeons have early recognised that the power to directly repair the injured part did not rest with them, and further they saw that their aims should always be to assist Nature in the reparation of an injury, by the recognition and removal of all that hampers her in the efforts she puts forth for Repair.

Thus, they may assist her in the removal of the dead elements she wishes to throw off, and seek in different ways to protect the new forming delicate tissue from external disturbing influences and further if the growth of one portion over step that of its fellows, they can use means to restrain its undue activity, that reparation when complete, may be uniform.

It is not our purpose here to discuss the reparative process in detail, but to illustrate how

it appears to us that by the use of this new remedy for superficial burns, we assist in fulfilling some of the most important conditions for natural and rapid healing. In the repair of any wound Nature at the outset demands of the tissues - Rest. Its importance in the healing process was a note which rang clear in the teaching of the Surgeons of the past; nor can those who have passed from the Edinburgh School in those later years, forget how vividly its necessity in repair was impressed upon them. And yet in the unceasing struggle against disease, while often insisting vaguely on rest, as a means of restoration, how seldom does the mental picture of its place in repair come before us, and with it, a full appreciation of its action in cure.

Hilton(1) in his work "Rest and Pain" has laid full stress on its value. In his introduction he says "Growth is the antitype of repair, prefiguring the physiological capabilities of existing structures to repair themselves. Without digression I may say that, so intimate is the association between rest and growth as to make them appear on a superficial view to stand to each other in the relation of cause and effect. Accurate observation of the animal and vegetable world certainly reveals their perpetual co-existence; and growth as a rule, seems

(1) "Rest and Pain", page 5.

to proceed pari-passu with physiological rest. Repair is but the repetition of growth. The same elements, the same kindred conditions are necessary to the same results. Rest is the necessary antecedent to the healthy accomplishment of both repair and growth. This surely is the natural suggestion of a means towards an end which should never be lost sight of by the Physician or Surgeon."

Hilton further on describes in detail the essential action of albumen coagulating agents in aiding the reparative process. Speaking of the pain of fissure in ano, he says, "If the case be a simple crack or fissure in the skin or mucous membrane and we apply nitrate of silver or a solution of Bichloride of Mercury to it, what do we do? We form an adherent albuminous defence to the subjacent raw surface in order to give it "Rest" and Nature time and opportunity to fill up the gap by repairing the loss of substance. The explanation ordinarily given of the beneficial influence of these albumin coagulating agents is that they "set up a new action" as if the agents themselves took an active part in the reparative or reproducing process. On the other hand, I believe their usefulness depends chiefly on their giving rest to the parts and so enabling nature to fill up the gap. Thus by the coagulated albumin

the parts are defended from the external air and all morbid secretions, and in 24 hours, perhaps, that crack or fissure is healed, not by the nitrate of silver, not by the surgeon, but by nature herself."

In like manner by the action of Picric Acid dressing it would appear that we obtain rest to the injured surface in a two-fold way. Physiologically picric acid is one of the most powerful albumin coagulating agents we possess, a fact fully recognised by its use as a urine test. It in addition fixes epithelial elements, so utilising them for the formation of a most efficient protecting scab. As Thiéry well puts it - "Picric Acid hardens tissues and fixes epithelium on the living body as on the cadaver, and this property which has been of such value in histology is of as much use in the field of therapeutics."⁽¹⁾ Rest is moreover further induced by the rarity of its reapplication. For it is obvious that in the fervent changing of dressings there exists a fruitful source of unrest in the injured part. Nor can it be denied that on redressing the wound, however carefully, there must ensue a destruction of young embryonic tissue it is impossible to estimate. If the key-note of the teaching of the earlier surgeons was the value of rest in repair, to-day the aims of the

art tend strongly to the conservation of tissues. Examples are numerous, in which the conservative Surgery of the present day has preserved tissues greatly damaged by injury or disease, where formerly they would have been ruthlessly destroyed, to find in many instances a perfect restoration of function. It is an axiom in the treatment of burns to preserve the separated epidermis as far as is practicable, for no dressing we may substitute for it can protect the underlying injured surface half so well. This temporary preservation of the divorced superficial layer is brought about most efficiently by picric acid, and the healing usually with "no suppuration" which results under its protective influence is rapid in its completion. It has indeed seemed to us, that we approach as nearly as possible to the attainment of a healing, if we may put it, by primary union. True, we can never realise that fully, as the separated superficial stratum is usually too devitalized to adhere permanently as living tissue to its fellow, the deeper layer, besides inflammation more or less always exists, and Hunter long ago pointed out that repair by primary union takes place without inflammation, that the latter is a secondary complication, rather a disease which retards repair.

But if this suggestion of a first intention healing be considered from the nature of those lesions, as a far reaching enthusiasm for a new remedy, the same imputation cannot be laid to its charge, as to another means by which it promotes the healing process. We refer to its power in the production of scabs, those natural protectors of raw, abraded surfaces, whose value in aiding cicatrisation was fully appreciated by surgeons in the earlier part of the century, before the introduction of antiseptics. Hunter (1) regarded scab formation as the natural process of healing, for he said, it required no art. To-day, perhaps, we are apt to forget and underestimate its value, and yet in the reparation of a large superficial wound, such as results from a burn or scald, its necessity will, we think, generally be admitted.

The action of the acid in producing scabs we shall consider later in more detail, at present we may look at the method by which such a scab aids repair, as described by Mr. Jacobson (2) "Under a scab the granulations, now kept at rest and free from the disquieting influence of any external stimulus, develop from mere heaps of pyrid cells into

(1) Works., III. p.262.

(2) Rest and Pain, p.69.

the more stable spindle or fibre cells, just as granulations round the edge of an ulcer; as soon as they are defended by epithelium rapidly pass into fibrous tissue. Again, this fibrous tissue newly-formed, whether under a scab or epidermis, gives itself fresh rest by its power of contraction. This obliterates superficial capillaries and by thus cutting off much of the water supply to the ulcer, helps to dry up alike any granulations that remain and also the newly-formed fibrocellular tissue, diminishing the wasteful cell proliferation or suppuration of the former and consolidating the as yet gelatinous condition of the latter."

In this relation it is further of interest to note ~~what~~ Paget (1) says as to the value of the scabbing process, and how in fact he considers it the best method of healing a superficial burn. "The healing of a wound by scabbing has always been thought a desirable process, and when one sees how quickly by this process wounds in animals are healed and with how little general disturbance, one may well wish that it could be systematically adopted. But to this there seems some hindrance. Many surgeons have felt as Mr. Hunter did, that the scabbing process should be permitted much oftener than it is,

(1) Pathology.

with cases of wounds or ulcers; but none have been able to lay down sufficient rules for the choice of the cases in which to permit it. Probably the reason of this is, that at the best, in the human subject, the healing by scabbing is an uncertain process.

When the scab is once formed and the wound covered in it is necessary that no morbid exudation should take place. When, therefore, inflammation ensues in a wound or sore covered with a scab, the inflammatory material collecting under the scab produces pain, compresses the wound surface and forces off the scab with discomfort to the patient and retardation of the healing. I suspect that the many instances of disappointment from this cause have led to the general neglect of the process of scabbing in the treatment of wounds.

The observation of perfect rest and of other means forwarding off inflammation will make it a valuable auxiliary in the treatment of wounds, especially of large superficial ones. Thus also I imagine the rest healing of superficial burns and scalds is effected when the exposed surface is covered with cotton wool, or other substance, which as the oozing fluids become entangled with it may help them to form a scab."

Without doubt the most marked feature in the action of picric acid is the almost superabundant scabbing which results from its application, not only from the prompt coagulating action of those escaping fluids, but in addition from its heaping on their surface fixed masses of separated epithelial elements. The scar resulting under such a scab is obviously nature's scar, and Paget (1) thus describes it - "The edges of this scab adhere over those of the wound so as to form for it a sort of air-tight covering, under which it heals without suppuration and with the formation of a scar, which is more nearly like the natural parts than are scars formed in wounds that remain exposed to the air; and which does not, like them, contract so as to produce deformity of the parts about it." The superiority of a scar formed under a scab is further emphasised by Mr. Power (2) when speaking of one of the advantages of using picric acid, in these words - "A scar remains which is as much superior to the ordinary scar from a burn, as our present surgical scar is superior to that obtained by our predecessors who allowed their wounds to granulate."

This last fact, taken along with the fact which we mentioned, namely, that in many cases a

(1) Pathology.

(2) Brit. Med. Journ., Sept.12, 1896.

cure results with no suppuration, may form an apology for our proposition to consider the repair as effected by a primary union.

Picric Acid then appears to form the link which joins the best of the old methods with the best of the new; for we have shewn that it favours Rest and facilitates the healing process under scabs: and further, we see that by its marked preservation of the damaged epithelium it favours conservation of tissue and function - the latest aim of modern conservative surgery.

Antiseptics, their action in repair.

Since the advent of the Antiseptic era, there is scarcely one of these agents, which has not been used in some form or another, as a local application to burns. One glance at the endless list of such remedies suffices to prove that our treatment of burns has hitherto proved most unsatisfactory. The power of Picric Acid in preventing septic changes is marked, but its action on a burnt surface differs widely from that of other antiseptics, nor does it incur their attendant risks. The attention of surgeons and dermatologists has constantly been called to the action of ordinary antiseptics on epithelial structures; and though it is admitted that septic processes are by them held in check, then pain would have some agent which would not act so injuriously on cell life. Mr. Hamilton (1) writing on this subject more than ten years ago said, "when dressing a burn of any depth, we may surround it with an atmosphere of Carbolie Acid, and carefully cover it with carbolie gauze, yet we cannot prevent pus from being formed.

We have substituted for the natural covering the living skin, a foreign, an alien, a dead

(1) Lancet. May 5, 1887.

structure and no living inter-communication takes place between the two. Contact with such substances destroys the vitality of every cell on which they may impinge. In this particular class of cases therefore, Lister's method fails as fully as any other, and of necessity for when the living and the non-living are brought into contact, the former cannot vitalise the latter, but the latter devitalises so much of the former as comes into apposition with it. By keeping two living surfaces in accurate apposition and by allowing no alien matter to collect between or interfere, rapid union takes place - but be it to the smallest ulcer or the largest burn and in either case, we are just as ever as much at sea as to the best methods of assisting Nature as ever we were, except in one important particular - A deeper insight into Nature's way of healing breaches of continuity has led us to banish one after another many of the usual appliances formerly had resort to, because they are seen rather to interfere with, than to aid the process. The application of the anti-septic principles in the dressings of burns and scalds and lacerated wounds with loss of skin has led to no better results, than many of the other methods in vogue." The Picric Acid method at least gets over one of these objections just mentioned for

if the raised vesicle when punctured to allow the fluid to escape is accurately re-applied to the underlying surface, it is immediately fixed there, and no foreign matter can intervene between it and the raw surface.

Unna (1) in speaking of repair in superficial wounds and the action of most antiseptics on the processes thus writes "Successful cicatrisation of cutaneous wounds depends on the proper relation to each other of the central and superficial layers of the dermis. Healthy granulations may remain uncovered by epidermis for a long time, a fact often observed when using antiseptic dressings. The two layers cannot react in the same way to chemical substances and the usual antiseptics. Carbolic, and Salicylic acids, and weak solutions of corrosive sublimate are directly Keratolytic, destroying the epidermis and hindering Keratinisation. Keratinisation results in spite of antiseptics but it is not assisted by them." This brings us to the further question of the use of moist dressings so generally employed in these lesions, and bids us enquire into their action in the wound.

Hamilton (2) again with regard to them

- (1) Quoted Gaz. des Hop. Jan. 18, 1896
- (2) Lancet. April 28, 1877.

says "What is the admitted action of a poultice? It favours the production of pus. And how? By warmth and moisture being applied under the most favourable conditions, the one supplying the elements and the other exactly the right temperature required for the conversion of healthy cells into pus cells".

And Nageotte (1) thus writes in speaking of wound treatment "Experience has shown that moist dressings which hinder the drying of the wound, are the worst from the point of view of epidermisation", while Thiéry (2) also says "moisture of the dressing provokes a maceration clearly Keratolytic to the Epithelial layers". The value of permitting the dressing to become dry as the technique of this method requires is further emphasised by the opinion of Schümmelbush (3) in those words "Moisture is the first requisite for the lower forms of life, drought their bitterest foe. The very best nutrient media known to bacteriologists if deprived of the water in their composition, allow no growth to take place - A proper use of evaporation has the inestimable advantage, that while it checks the growth of bacteria,

(1) Th. de Paris. 1894.

(2) Gaz. des Hopit. Jan. 1896.

(3) Treatment of Wounds.

it cannot hurt the patient. Besides which, it is almost impossible to leave those moist dressings or freely suppurating wounds, for more than 24 hours, without a disagreeable smell becoming perceptible". In the light of these facts, it is evident that whatever antiseptic may be selected, when it is applied to the wounded surface in a continuously moist condition, as occurs when impermeable material is placed over it, a combination is formed, which is manifestly most injurious.

To assert that Picric Acid is quite innocuous, would doubtless be erroneous; but that it favours Epidermic growth, as no other antiseptic does has been remarked by all who have used it, while in addition by the rapid evaporation of the dressing, the beneficial results of the dry method as described by Schimmelbush, are obtained in a striking manner.

Fully recognising then, the immeasurable advantage of Antiseptics in ordinary wound treatment, we conclude that their use in burns has certainly induced two great evils, unrest, through frequency in changing the dressings, and delay in the reparative process from the inimical action of the

vast majority of agents employed in the life of the cell, a detrimental result which has been moreover further brought about, by the endeavour to ensure the continuous moistures of the dressing.

Chemistry and Therapeutics of Picric Acid.

This acid derives its name from one of its most marked properties.- its bitterness. *Πικρος*, bitter), which is equally marked in its crystals and in solution, being, however, unassociated with caustic effect. It possesses many synonyms, among the commonest Carbazotic or Trinitrophenic Acid. It can be obtained in several ways by the action of nitric acid on a variety of substances very often by contact with Carbohic Acid. The mixture is heated, and purified by recrystallization, it then occurs as yellow, shining, laminar crystals, which give an intense deep yellow colour to water in which it is soluble in the proportion of 1 to 90, and 1 in 16 of rectified spirit - It is also soluble in ether, benzine, Chloroform and Petroleum. In the laboratory it has long been recognised as a most excellent tissue fixing agent, but its use in Pharmacology has been rather limited. Its salts of ammonium and potassium have been used medicinally and have been thought to act like quinine. Given internally it produces a yellow colouration of the skin after a few days' use the patient however showing no reaction against it. (Thierý). The tinting of the skin disappears in about a week after the removal of

the drug. In dermatology it has enjoyed a certain reputation. Cerasi (1) Gaucher (2) and Maclellan (3) among others having pointed out its value in many inflammatory skin affections. Clinically, as is well known, it is a valuable test for albumen, and also for sugar, with the addition of an alkali. It is only somewhat lately that it has entered the field of Surgery as a local application in the treatment of burns.

- (1) Gaz. med. de Roma avril 1889.
- (2) Soc. med. des hopit. 21 March, 1897
- (3) Brit. Med. Jour. Dec. 26, 1896.

The Action of Picric Acid in the repair of Burns.

In discussing the pathology of the various degrees in a superficial burn Thiéry (1) points out that there may result in the skin lesion.

1. Conservation of the Epidermis, though slightly altered; first degree.
2. Separation of the horny layers, disassociation of the middle layers and the deeper strata but slightly changed; second degree.
3. Total removal of superficial layers, but islands of epidermis are left here and there which can start an epidermic growth. We must aim he goes on to say, at the conservation of this epidermic debris, and in the preservation of its vitality we favour its transformation to horny material. These ends are attained by
 - a. Epidermoplasty, which increases the layers of a pre-existing epidermis.
 - b. Keratogenesis and Keratinisation which changes young epidermic elements into horny matter.

(1) Gaz. des Hopit. Jan. 1896.

c. Keratoplasty which heaping up the layers of the horny substance, consolidates the cicatrix, and favours the adhesion of the horny stratum to the underlying Malpighian layer.

The method of action of Picric Acid in the repair of the different degrees is thus described by Thiéry (1)

a. In the first degree separation results with immediate fixation of the damaged epithelium, the cure is instantaneous, desquamation is extremely slight, or may be absent.

b. In a burn of the second degree, if the solution be applied at once, before the formation of vesicles, or at least before they have become affected, fixation of dermic and epidermic elements results, and the albuminoid material is at once coagulated. So the epidermis does not become separated. Serous exudation is checked, drying of the epidermis with fixation to the dermis results, and at its removal the new epidermic layer is already formed. If, on the other hand, the vesicles have had time to form, if here and there slight tears have permitted of their infection, the exudation of serum

(1) Gaz. des Hopit. Jan. 1896.

is after absorbed, or hardened, the part becomes covered with scaly crusts, and the healing is effected underneath those incrustations.

c. In the case of a deeper burn, third and fourth degree for example, after the first dressing, the injured surface can be seen to divide into distinct islands, parts where the epidermis is still preserved and places where it has been completely destroyed and is replaced by a slough of varying depth. Those latter portions are not suited to the picric acid dressing. The former, however, behave like burns of the second degree, the slight superficial slough of the dermis (third degree) underneath the vesicle is fixed like it, and the healing goes on in the same conditions, with Epidermisation of the Epidermic layers.

Its threefold action in the healing of a burn he thus sums up.

1. Fixation and hardening of the tissues.
2. Conservation of Epithelium.
3. Keratogenesis, or the transformation of young epidermis into horny material.

With regard to those crusts, which are formed so abundantly, almost to excess, under this dressing

Thiery rightly insists on nothing being done to hasten their fall, but rather to prevent it by covering the healed region with a thin layer of wool and a bandage.

But beyond those properties just described, it possesses several others of value. As an antiseptic its power is abundantly proved by its frequent use in Laboratories, and of its value in lessening sepsis in burns there can be no doubt in the minds of those who have used it. If however with other antiseptics it shares this last quality, it has, over the majority of them incontestable advantages, for it is neither irritant, provoking erythemas, nor caustic, inducing pain, nor toxic to the organism as a whole. For what antiseptic in common use, except the most feeble, could be applied over large areas as this one has been without provoking symptoms of toxicity. It is in addition a strong astringent, and must as Miles⁽¹⁾ has pointed out act most beneficially in controlling the inflammation in the hyperaemic area around the burn. Its value as an astringent is further supported by Maclennan (2) who records its use in a case of haemophilia, in

(1) Scottish Med. Jour. Oct. 1897.

(2) Brit. Med. Jour. 1896.

which by its local application, he obtained a much better result , than with iron and other astringents. If still further proof of its astringent properties were necessary, we need only remark, that the oozing which may result on removing the dressing, is at once checked by the momentary application of a swab dipped in the solution. As an analgesic too it has a most useful action which has been apparent to all who have used it. In our own experience it has never failed, after causing a slight smarting, to markedly alleviate pain -

If then it aids in the repair of the local lesion after nature's own method - being antiseptic and analgesic, while the congestion of the surrounding area is reduced by its astringency, the organism as a whole in no way reacting against it, must we not admit that in this substance, we find a rare union of qualities, which render it pre-eminently useful in the treatment of superficial burns. The best technique in surgery must ever be the simplest, this essential is admirably attained by the use of Picric Acid, for the most uninitiated may safely use this method, which indeed it may here again be noted greatly resembles the dry dressing - that aim of modern aseptic work. Finally, owing to its marked

effect in checking suppuration, the need of frequent dressing is removed, a point of no little moment in an extensive burn. The importance of infrequency of dressing was insisted on by the late Mr. Erichsen in those words "Whatever local application be adopted I hold it to be of the utmost importance in the early stages of the burn, to change the dressings as seldom as possible; not indeed until they have been loosened or rendered offensive, by the imbibition of the discharges. Every fresh dressing causes the patient very severe pain, produces depression and certainly retards materially the progress of the case".

Disadvantages of the Method, General and Local.

It is convenient to consider the disadvantages of the method under three divisions;

1. The question of its general toxicity.
2. Local Erythema, from its action on the burnt surface.
3. Inconveniences in technique, or disadvantages to the surgeon.

The last objection is fully discussed under the method of its application, the other two fall under consideration now. Beginning with the second division, in local Erythemas which occur so frequently with the antiseptics, e.g. iodoform, carbolic acid, etc., with Picric Acid used in Aqueous Solution, they practically do not exist. Largely used as it has been in cases of burns in children, whose susceptibility to antiseptics is well known, no Erythemas have been observed. In Thiéry's large experience extending over several years, he has not seen half a dozen cases. He notes one case where a picric acid powder was applied to a big ulcer, and another due to an over prolonged immersion of an arm in a bath of the solution. But in neither case did the patients complain in the slightest degree of any

constitutional disturbance.. Thiéry indeed has used it several times to cure erythemas resulting from the use of other antiseptics and has found it uniformly successful. But the question of its causing a general intoxication is of more importance, as several apparent cases have been recorded resulting unfortunately in the rejection of this method by some surgeons. In the Lancet of February 5th 1898, there occurs the following communication with regard to this question:- "On January 19th, Larouche communicated some observations to the Society of Surgery, (Paris) upon two cases of poisoning brought about by the use of picric acid as a dressing for burns in two children. Each of the children was dressed with 200 grammes of an ointment of the strength of 1 in 10 and both suffered from vomiting, intestinal pains, diarrhoea, black urine, and jaundice. M. Brun had seen a case of death following the use of the acid, in an infant of 18 months, and had abandoned its use.

Different opinions were expressed. M.M. Michaux and Reynier saying they had seen very good results follow from the use of picric acid. From the various opinions, M. Walther drew the following

conclusions: that infants appeared to be very sensitive to this particular antiseptic, and that even adults exhibited very varying degrees of tolerance, a fact which must be taken into consideration as regards its use". A criticism of all such observations is perhaps best made in connection with a fatal case which occurred in our own experience, the details of which are as follows.

A boy aged 11 was admitted to hospital suffering from burns of both forearms and hands to the thighs anteriorly as far as the knee, the whole thorax anteriorly, laterally, and posteriorly on the right side, and the abdomen right down over the pubis to the penis and bottom of the scrotum. The abdomen and thorax were burnt to the 4th degree and sloughed in one large mass. The other parts were of the 2nd and 3rd degree generally with deeper destruction here and there. Though we were well aware that the lesions of the trunk put this case beyond the pale of successful treatment by any method, yet knowing the power of picric acid in preventing Sepsis, we applied it freely to the whole burnt area. Eight days before his death (which was delayed for 6 weeks), his condition, critical from the first and complicated by Bronchitis, became worse. Profuse sweating

with rigors, flushed cheeks, dilated pupils, sordes on the teeth in turn appeared, and his cough became more troublesome. He was emaciated to the last degree, so much so that the inferior angle of the right scapula came through the skin. A few days before death we noticed that the urine was slightly darker, but on the day immediately preceding the end a dark green tint was quite apparent and accompanied by vomiting and diarrhoea, ushered in the fatal issue.

At first sight, on looking at the termination of this case a toxic effect from the dressing suggests itself. More careful consideration however, will surely shew that these are precisely the symptoms of septic absorption so commonly observed before death, from large burns, after any treatment. In this connection, the analysis of the urine is furnished by the Clinical research Association, London, is of interest. It is as follows:- "No carbolic acid as such, is present in the urine, and only a minute amount of picric acid. But there can be no doubt that this acid has been absorbed, as there is abundant evidence of the presence of substituted phenolic derivatives in large quantities. The specimen more-over shews the characteristic colour changes on standing, and

also reduces Fehling (though sugar is absent) in a typical manner. We can detect no bile derivatives. Albumen is present, but only in very small amounts".

We sent an account of the above case, with the analysis of the urine to M. Thiéry, stating that in our opinion, the patient had succumbed to the effects of his severe burn, and asking what view he took of the case. He pointed^{out} that in the first place from the age of the patient, the extent and depth of the burns a fatal issue was almost certain, Further, that the presence of picric acid in the urine did not prove an intoxication existed. As many other drugs (e.g. iodide of potassium) could be recovered from samples of urine, when not the slightest intoxication or general toxicity could be suspected and finally that the serious symptoms above described were all complications of grave burns, and would of course supervene whatever local application was used.

In another of our cases, a burn in a much younger child, complicated by measles and pneumonia from the outset, with the whole of the front of the thorax and forearms burnt in the greater extent to the 4th degree, not the slightest toxic effect was observed, the child making a perfect recovery. We are aware

that certain observers have described a yellow tint of the skin, from the local application of this remedy, but it should be noted that in these cases, the patients presented no constitutional disturbance. In short, the fact of toxic absorption, we regard as quite unproven. At present with regard to this point it is enough to say, that in the experience of M. Thiery which has now extended over several years, and in that ~~xxxxx~~ of Mr. Miles who has also largely used the remedy, no symptoms have arisen which could be put down to a toxic action of the acid.

Technique of the Method.

The mode of application of the Picric acid dressing though very simple, requires attention called to a point of great importance which we shall point out presently.

The solution is a saturated aqueous one (1) (Thiéry) and is best prepared by dissolving the active substance in hot water and then decanting. Thiéry's formula is

Picric Acid	12 grammes
Boiled water (tepid)	1 litre.

allow to cool, and decant.

If the burnt surface has been under some Popular method of treatment most probably a fatty body has been applied. He recommends its removal as far as possible with tepid water. If it has not been subjected to treatment, a rapid sponging by boracic lotion may be done, but is not necessary, and we have often dispensed with any preliminary cleansing to obtain rapidity in the application of the remedy which we believe is of more importance than a puri-

(1) Gaz. des Hopit. Jan. 1896.

fication which under the most favourable circumstances must be incomplete. Blisters when present are pricked in the usual way, but great care is taken to preserve the raised epidermic layer which is accurately applied to the underlying surface. Plain sterile gauze dipped in the solution is squeezed fairly dry and is applied to the burnt surface. It is covered by a layer of absorbent wool and a light gauze bandage. Miles suggests here the advantage of the many tailed bandage in preventing undue movement at subsequent dressings, and also the use of splints where their application is possible. In cases of children suffering from burns of the cheek and neck, we have found sandbags placed laterally, of value in lessening the amount of movement. The point to be insisted upon in the application of the gauze is, that no waterproof material be interposed between it and the layer of wool. The value of the dressing as Thiery points out, consists in its rapid evaporation; the presence of protective or waterproof material by converting it into a poultice obviously prevents this, and produces a maceration of tissue which ends in an incomplete and delayed result. The removal of the dressing at the outset, need not take place before the third day. Afterwards in burns which suppurate.

one is guided by the amount of discharge, smell and the patient's temperature. But as we have pointed out in many cases of second degree burns in removing the wool, the gauze will be found to be adherent to the skin and quite dry. In these cases a simple swabbing as Mr. Miles directs is all that is necessary and four to five days afterwards it may be removed altogether, a thin layer of plain wool being substituted to protect the thick scaly crusts which already cover a layer of young pink epithelium. To remove the dressing which will be found to adhere mostly closely to the surface, most experimenters who have used it, recommend moistening it with the solution. Thiery on the other hand advises its removal in a perfectly dry condition unless suppuration be present, and if a few bleeding points result he recommends the reapplication of dry picric gauze for five days when the surface will be found quite healed. In our experience we have found that if healing has taken place without suppuration, and therefore without a tendency to separation of the scabs, it is not a difficult matter to strip the gauze off in a dry condition. And should a scab adhere to the dressing and come away with it, it will usually be found that a minute quantity of pus is there which it is better to see and remove, thus preventing its further spread.

The question of its one real disadvantage falls under consideration at this point, and the methods to be used for its avoidance. Before discussing it, it may be well to point out here that in the matter of economy this dressing can compare most favourably with any other at present in use for those injuries. This must be quite apparent from the infrequent dressings which are necessary and the cheapness of the solution employed. An inconvenience however of some moment is the staining of the dresser's hands, and the bedclothes and linen of the patient. The colouration of the latter here and there is often unavoidable, however careful one is in manipulating the dressings. The stain which may result in the case of linen material comes out by ordinary laundry processes, but when it occurs in woollen articles it is permanent. For the prevention of the staining of the dresser's hands, and for the decolouration when stained, several methods have been recommended. We shall not describe those different methods beyond mentioning what we ourselves have found most useful, viz. an ointment consisting of Liniment, Ammoniae and Lanoline to the consistence of a paste, which should be smeared lightly over both hands and under the nails and afterwards removed by very hot water and a nail brush. It must

be apparent of course that the simplicity of the dressing, makes it easy of application by any surgical nurse. But we would advise the surgeon who prefers to carry out the treatment personally, to make use during the whole process of a pair of thin, flexible, rubber gloves.

Conclusion.

The advantage of Picric Acid in the treatment of Burns may be briefly summed up as follows, -

1. Simplicity of application.
2. Painlessness.
3. Absence of local irritation, or of general toxic effect.
4. Rapidity in healing due to
 - a. Rest (mechanical, physiological)
 - b. A favouring of epithelial growth
 - c. A minimum of suppuration.
5. A smoother, more natural cicatrix, than that obtained with other methods.

To vaunt this remedy as a panacea for all burns would be irrational. Only by an appreciation of its action, do we realise its limitations. We remember that it is amid the debris of an injured, devitalized epidermis that we look to it for aid in repair. And beyond a certain point (probably 3rd degree) its sphere of healing action is limited. In such cases it is perhaps no better than other antiseptics, but as Miles remarks "it at least brings the burn into the condition of a healthy healing ulcer, more simply, more safely, and more rapidly, than do other methods".

In the vast domain of modern science, Surgery truly has reaped an abundant harvest, and from the possession of such a wealth of material, there

has resulted a hastening after new remedies, and too often a depreciation of the old. But in advocating the addition of yet another antiseptic, to a list already too long, we claim that we have approached Nature - through her only interpreter, - experiment, having ever kept in mind Hunters great axiom, "Why think, try". Nor have we forgotten those words of a great teacher "Pin your faith to no master. Be a slave to no system. The scheme of Nature is broad and comprehensive, - truth is Catholic and many-sided: your chances of interpreting it rightly; and of practising the surgical art safely, will be enhanced in proportion as you keep your mind unbiased by theories and fashions, and strive to imitate Nature, in method and in means".

TABLE OF
TREATED WITH PICRIC

Name.	Age.	Nature of accident.	Site.
R.M.	8	Hot Water scald.	External aspect forearm.
J.C.	7	" " "	Anteriorly forearm, wrist.
R.W.	15	Hot Iron burn.	" " "
K.B.	16	Hot Water Scald.	Forearm, elbow to wrist, externally and in front.
W.T.	6	" " "	Wrist, hand fingers.
S.F.	9	" " "	Leg, ham to ankle, posteriorly externally.
W.W.	6	" " "	All forearm, anteriorly.
J.A.	5	" " "	Both legs.
H.C.	23	Turpentine explosion	Face, neck, forearms, hands.
E.H.	20	Hot Fat scald.	Forearm, anteriorly.
J.K.	26	" " "	From above elbow to back of hand, posteriorly and externally. Had been freely suppurating under oil and lime for three days.
W.W.	32	H ₂ SO ₄	Back and sides forearm.
L.M.	15	Hot Water scald.	All dorsum, foot and toes.
E.B.	16	" " "	" " " " "
C.M.	5	" " "	Forearm, posteriorly, laterally, fingers.
W.E.	28	Flame scorching.	Face, neck, ears, Wrist, hand, fingers.
F.R.	13	Hot Water scald.	Face, Forearm (elbow to hand anteriorly), Neck, Thorax.
A.H.	2	Hot Cocoa scald.	Face, Upper thorax.

CASES

ACID BY THE AUTHOR.

Degree.	Number of Dressings.	Healing completed in
1st and 2nd.	1	4 days.
" "	1	4 "
" "	1	5 "
" "	1	7 "
"	1 (reswabbed once).	7 "
2nd and 3rd.	2	7 "
1st and 2nd.	2	7 "
" "	2	8 "
" "	3	12 "
" "	3	10 "
2nd and 3rd.	3	14 "
" "	4	18 "
" "	5	18 "
" "	6	21 "
1st and 2nd.	2	8 "
" "	1 (swabbing only).	3 "
" "	3	9 " 9 days.
1st slightly 2nd.	1 (swabbing)	4 "
1st and 2nd.	1	8 "
2nd and 3rd.	7	22 "
3rd and 4th.		Discharged with 3 small ulcers.
1st and 2nd.	2	7 days.
2nd, 3rd, 4th.	4	Discharged with 2 ulcers resulting from 4.