

NOTES ON THE POISON OF VENOMOUS SNAKES.

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WHEN a wound has been inflicted by a venomous snake, it is well known that the first efforts should be directed to prevent the poison from being absorbed into the system. To effect this it is recommended that a tight ligature should be immediately applied close to the bite, between it and the centre of the circulation, and that suction should then be practised to the wound itself. This suction is of extreme importance, and though it is generally understood to be unattended by danger, I am aware that very many persons do not consider it to be altogether so, and that they would hesitate before taking into their mouth even the smallest quantity of a poison so virulent as that of the snake.

I am not aware if experiments have ever been conducted for the purpose of proving from actual observations whether or no the snake-poison can be swallowed with impunity, and I have thought it of some importance to endeavor to set the question at rest, not by the collection of hear-say evidence, but by experiments on living animals.

Having obtained therefore a common black snake, I dissected out both poison glands, having previously put a ligature round the ducts to prevent the loss of any of the venom. I then took a young chicken, and having its bill held open, thrust down its throat the entire of one gland—having first snipped it once or twice across in order to ensure the free escape of its contents when received into the stomach. After the act of deglutition was evidently complete, observation was continued for a considerable time, lest the contents of the stomach might be rejected, and the experiment be thus vitiated. No symptom however of the slightest distress ever manifested itself, and when food was offered it was readily seized and swallowed. Another chicken of the same age was next taken, and an incision having been made through the skin of the leg, the remaining poison-gland—previously snipped across as before, in order that the venom might freely escape—was pressed into the wound. The lips of the wound having been brought together by sutures, the chicken was then placed under observation. In twelve (12) minutes distinct symptoms of poisoning were manifested,—the eyes became dull, the wings dropped, the head fell—and death ensued in twenty-eight minutes and a half (28½) after the application of the poison.

Thinking it advisable to repeat the experiment on animals of a totally different nature, two very young cats were secured. The two poison glands having been taken as before from a black snake, one, after being cut across, was laid on the tongue of one of the cats, and was immediately swallowed. In a short time afterwards, a tea-spoonful of milk was placed before the cat, and as it was at once lapped up, it was very evident that the poison had been fairly taken into the stomach. Observation was continued for several hours, but not the slightest symptom was shewn of any effect having been produced by the poison, either on the stomach or the system at large. The second gland was now cut open, and inserted into a wound made on the hind leg of the remaining cat. Symptoms of poisoning were very soon manifest—the animal trembled—appeared disinclined to move—became dull and lethargic; but death did not take place until the expiration of two hours.

Now it is a generally understood fact, that the snake-poison acts with much greater certainty and rapidity in very young and small animals, than in those of greater age and size. The size and age of the subjects of the above experiments, rendered them therefore peculiarly susceptible of the influence of the poison, yet no effect whatever was produced when it was swallowed, although its influence was sufficiently marked when introduced into the system in the usual way, that is, by a wound on the surface. The results thus obtained were so decisive, that I did not think it necessary further to repeat observations which could only necessitate pain and loss of life, without adding anything to the certainty or truth of the conclusions arrived at.

In conducting these experiments in the manner indicated, one decided source of fallacy was avoided. Had the entire poison of a snake been administered internally to one animal, while to another the poison of a second snake was externally applied, the results would have been the same as above. But it might then have been objected, that the poison-glands which were swallowed, had perhaps been exhausted of their venom before the death of the snake: or that the poison contained in them was not equal in virulence to that which was applied to the wound; and many experiments would have been necessary to set these points at rest. By applying however the poison of a single gland only, to a wound in one animal, the fellow-gland being given to another to be swallowed, it is certain that each subject of the experiment had not only an

equal quantity of the poison, but that the virulence of the venom was identical in each—a point of great importance in forming a reliable conclusion as to the comparative effect of the poison when applied to a wound, or when taken into the stomach. It is thus proved that animals to whom the bite of a snake is fatal, and we know that man is in this category, may with perfect impunity swallow the poison.

In the treatment of snake-bites therefore, it is evident that the most effectual mode of relief, vigorous suction of the wound, may be resorted to when practicable without the slightest risk; and further, that it is of little or no consequence whether the poison thus taken into the mouth be swallowed or not. It is said that some risk might be run if a wound or sore of any kind existed in the mouth. Now, as in the process of sucking all fluids are strongly drawn inwards within the line of the teeth, it is clear that none of the sores which are of more common occurrence on the margin of the lips, such as cracks, sun-blisters, &c., could come within the action of the poison. Then as to sores of any kind about the tongue, when we consider how very limited in size they generally are—how low the absorbing power of a diseased surface is—also the very small quantity of poison that could be present at any one time in the mouth, together with the state of salivary dilution in which it must exist—and lastly the very small quantity of this fluid which could come even into temporary contact with the diseased points, we may safely conclude that the alleged danger from the presence of sores is altogether inappreciable. I notice this point somewhat in detail, because if the commonly received idea, that any sore in the mouth rendered the suction of a poisoned wound dangerous, were acted on, a most prompt and valuable mode of treatment might in many cases be left altogether unemployed. It is just possible however, that there might be a slight degree of risk if a recent wound existed on the tip of the tongue, as this part of the organ would necessarily, during the action of suction, be immediately applied to the poisoned punctures. But the circumstances of such a case must be so exceptional and so unlikely to occur, and the danger—if any exist—is so hypothetical, that the point is scarce worthy of notice.

For the treatment of these accidents it is generally recommended, as has already been observed, that a ligature should be applied at the proximal aspect of the wound, and that suction, scarification, &c., should then be practised. These directions are, I think, somewhat faulty, as *moments* which under these circumstances are altogether invaluable, must necessarily be lost if a ligature is in the first instance to be sought for. I would rather recommend that the patient instantly on being bitten, should if possible, seize firmly by his teeth the tissues all around the punctures, and thus having arrested the poison before any of it could be taken into the system, should keep up suction vigorously until a ligature can be procured. This should consist of some strong fine material, such as whip-cord, boot-lace, a twisted strip of silk handkerchief—it would be dangerous to trust to any soft bulky substance—and it should be applied as close to the wound as possible on its proximal aspect. The teeth might now be removed, and the skin being tightly pinched up, an incision should be made with a pen-knife or other sharp instrument, laying the two fang punctures* into a single wound, and a second and longer incision should be made between this and the ligature, parallel to the latter—or if the skin be well raised from the subjacent tissues, a small portion of it embracing the fang-wounds may with safety be cut out. Suction should then be immediately recommenced for at least twenty or thirty minutes, but the ligature may be allowed to remain for an hour or so longer. If the bite should have been received on any part of the body inaccessible by his mouth, the patient, if he has no companion who could act according to the above recommendations, should immediately seize with his fingers the skin at the seat of injury, so as to raise and isolate the region of the wound, and then proceed to scarify or remove the wounded part as directed, if its locality was such that he could do so without assistance. The fingers should not be removed until assistance has been procured. The immediate grasping whether by the fingers or the teeth, of the tissues round the fang-wound, will not only arrest the poison and confine it to the spot, but by the continuous pressure necessarily exerted, would probably cause the greater portion of it in many cases to exude at once from the wound. If it so happened, as might readily be the case, that neither knife or ligature is immediately available, this firm and steady grasp of the bitten part by the fingers until assistance was obtained would add materially to the patient's chances of recovery.

I may here notice the mode of treatment which I have been informed was

* In some notes on the anatomy of the teeth and poison-apparatus of our snakes, published in Vol. 2 of the Tasmanian Journal, I have already shewn that frequently only a single fang-puncture will be found,

pursued in these cases, by the aborigines of this island. It consisted in continuously beating the bitten part by a small rod, or rods, till the vitality of the tissues was entirely destroyed. Although it cannot be supposed that the mind of the aborigine who first practised this method was enlightened by science, it cannot be denied that the idea of thus rendering the bite innocuous is not, even on scientific principles, altogether unsound, as it is clear that neither absorption or any other physiological action could take place in tissues so deprived of vitality. It must however have been a tedious and very painful process, in some cases it must have been inapplicable, in others the tissues could scarcely have been destroyed before absorption to a fatal extent had gone on, but occasionally it is possible it may have proved effectual as a means of cure.

The last topical treatment which I shall notice, is one which has obtained a certain degree of notoriety in Tasmania and the neighboring colonies. I refer to the so-called antidote or specific of Underwood. Several years ago, a body of medical officers, of whom I was one, was appointed by Government to examine into, and report upon the efficacy of this application. Underwood appeared before us, and conducted a series of experiments with snakes, and living victims provided for them. As a very brief summary of the proceedings, I may state that two sets of animals were bitten by the snakes; to one set the antidote was applied, and to the other nothing was done; and as it was found that at least as many deaths occurred in the former set as in the latter, we could not do otherwise than come to the unanimous conclusion that the application was valueless as an antidote. Since that time I have observed in the local newspapers several notices of accidents from snake bites, in which I think dogs were the chief sufferers. In some of the recoveries which took place "Underwood's Specific" happened to be used, and was consequently lauded as a sovereign remedy for all such wounds. The deduction however is a very unsound one, as is proved by the experiments above referred to, when it was evident that the treatment, though conducted by Underwood himself, had no effect either way. At the same time I do not deny that in some cases it may have been beneficial in an indirect manner. The confidence of recovery it may have inspired in case of a man being bitten, would, by removing the depressing effects of terror, be a very likely means of bringing about a result, in which the curative qualities of the application itself had no part whatever.

In calculating the value of a remedy, it is to be borne in mind, that the bite of a snake is by no means invariably fatal to man, even when no treatment is adopted; in such cases the proportion of deaths to recoveries would, perhaps, be about as one to three or four. Leaving out of consideration the general influence of the seasons in modifying the virulence of the snake-poison—also the fact that the state of health and nervous susceptibility of the patient himself must always greatly influence the issue of any given case, a great deal will, probably, depend also on the manner in which the bite itself is given. If the snake is provoked and irritated, it will bite fiercely—all the powerful muscles of the jaws and poison-glands will be thrown into strong and continuous action—a large quantity of the venom will be poured into the wound, and such a bite, if the most prompt and vigorous treatment be not immediately adopted, will in all probability prove fatal. It will be in the recollection of many members of this Society that a marked instance this kind occurred about five years ago at New Town, to a man who professed to be able to handle these dangerous animals with impunity. On the other hand a rapid bite inflicted under the influence of surprise or alarm, could not inject the same quantity of venom, and would probably be proportionately less fatal in its effects.

Thus far as to local measures. The general treatment is of the most simple character, and consists in the immediate exhibition of some powerful stimulant, the effect of which is to be kept up by rapidly repeated doses, until the symptoms of depression induced by the poison have all passed away. The two great stimulants used for the purpose are alcohol under its various guises of brandy, whiskey, &c., and ammonia. The former has been given in some cases in this colony with good effect,* and is also extensively made use of in the United States of America, especially on the western frontier where rattlesnakes abound. It is given in quantities sufficient to produce intoxication,—a wine-glass full every half-hour to an adult—and the patient is not considered safe until this effect is present. Ammonia however as a stimulant, possesses probably a far superior efficacy. In Ceylon, this drug is considered to be of such value that in a code of instructions for the treatment of snake-bites, published under the

* See a paper on Snake Bites, by E. S. Hall, Esq., Australian Medical Journal, April, 1859, &c.

authority of Government, very precise and ample rules are given for its administration.

It is there stated that "this medicine if promptly and properly used (in addition to topical treatment) will inevitably cure people of the bite of all kinds of snakes." To these instructions (a copy of which I accidentally noticed in the *Argus*, when concluding these remarks) I need not further allude at present, as I shall give at length in an appendix that portion of them which refers to the exhibition of the drug; and in order to complete the subject, shall there supplement them by a few concise rules for the topical treatment. From the more general accessibility however of spirits of various kinds, I expect they will, as a rule, be made use of in the first instance; nor if it were so, would such treatment have any bad effect, even if the administration of ammonia were subsequently had recourse to.

It is to be remarked that probably neither of these agents can be looked upon, strictly speaking, as an antidote. They act not by rendering inert or destroying the poison itself, but by rousing and exalting the nervous system, and so by keeping the vital forces active, prevent the occurrence of that fatal coma, which so depresses all physiological action as to render impossible the elimination of the poison from the system.

In Ceylon and elsewhere, great virtue is attributed by the natives to the snake-stone, the application of which to the wound is believed to be a cure even for the bite of the cobra. On reference however to Sir Emerson Tennant's admirable work on Ceylon, it will be found that the stone possesses none of the powers of an antidote, and is in fact quite inert. It varies in composition, but appears generally to consist of charred bone, sometimes of chalk, or other absorbing substance, and it is possible when applied to the wound that the poison, at least in part, may occasionally pass into its open tissue by the law of capillary attraction. Again, it is by some believed that the Mongoos (*Herpestes Vitiicollis*), an animal common in Ceylon and elsewhere, which frequently attacks and destroys poisonous snakes, is able to do so with impunity from making use of a certain herb which acts as an antidote. It is asserted that on the receipt of a bite, which of itself would prove quickly fatal, the animal has only to retire to eat of this herb, and is then, Antæus-like, immediately enabled with freshly-acquired health and vigor, to renew the combat. Later observations however tend to throw considerable doubt on this story of the mongoos, and the probabilities are it will eventually be found, like many other tales of travellers, to be due not so much to a wilful misstatement of facts, as to a too hasty conclusion from erroneous and imperfect observation.

But although no direct antidote has hitherto been discovered, it is very possible in the progress of scientific research that such a desideratum may yet be found. In the meantime, if the means within our reach were but made use of in a sufficiently prompt and intelligent manner, I am satisfied that very few, if any, fatal cases would be the result of the bite of even the most venomous snakes.

APPENDIX.

On being bitten, the patient or any one present, should immediately seize with his teeth the skin round the wounded part and suck vigorously; a thin strong ligature, such as cord, boot-lace, or a twisted strip of silk handkerchief, is then to be procured and tightly applied as close as possible to the mouth above the bite. The mouth is now to be removed, and the wounded part being firmly pinched up, an incision is to be made through both fang-punctures, and a second incision, longer than this, between it and the ligature. Suction is then to be continued as before for twenty or thirty minutes, or till bleeding ceases—the ligature may remain for an hour or so longer.

If no assistant be present, and if the patient cannot reach the wound with his mouth, let him with his finger and thumb pinch it well up, so as to expose the fang-punctures, scarify as before, and after some bleeding has taken place, remove the fingers and apply the ligature. If from its position he cannot scarify the wound himself, let him hold it tightly pinched up and isolated till assistance is available.

If no other remedy be accessible, spirits of any kind may be taken in quantities according to age every twenty or thirty minutes till symptoms of faintness disappear. The Government of Ceylon however, authorises the publication of the following (condensed) statement as to the value of ammonia in these cases, after topical treatment has been applied:—

1. "This medicine, liquor ammoniæ, if promptly and properly used, will inevitably cure people from the bite of all kinds of snakes; and if those bitten

be otherwise sick, or whatever may be their state of health, this medicine will do them no harm.

2. After as much blood as possible has been taken from the wound, a little of the liquor ammoniæ is to rubbed in:

3. The medicine must be now be quickly given internally in doses according to the bitten persons age as follows :—

<i>Age.</i>	<i>Liquor Ammonia.</i>	<i>Water.</i>
To an adult.....	35 drops	In 5 table-spoonfuls
From 12 to 15 years..	20 to 25 „	„ 3½ „
„ 8 to 12 „	15 to 20 „	„ 2 „
„ 3 to 8 „	10 to 15 „	„ 1½ „
Infancy to 4 „	3 to 10 „	„ 1½ „

4. If the sick person's head has become deranged or heavy, the medicine must be given every twelve minutes until the head becomes well, the symptoms of collapse subside, and sensibility and warmth of surface are restored.

5. If the bitten person be just on the point of death this medicine should always be given, as it has frequently cured people even in this state.

6. When the patient has lock-jaw from the effect of the poison, or when his head is very bad, it should be held up, and the bottle placed close under his nose for him to smell.

7. The bottle should be kept tightly stopped, or the strength of the medicine will go quickly. A little wax round the stopper will prevent this.

8. When the medicine has been frequently used, the strength of the remainder becomes less, and more drops should then be given.

9. Sometimes the stopper sticks firmly in the bottle. It should then be gently struck with a piece of metal, or a rag dipped in almost boiling water may be wound round the neck, when it will generally be loosened. A little oil applied to the stopper before being put in the bottle will prevent sticking.”

10. If much drowsiness be present, cold water should be frequently dashed over the face and chest. Warmth to be applied if necessary to the extremities &c.

