

more and more each day until by the end of the fortnight it can be bent to a right angle. Massage is begun as soon as the wound is healed. The patient is allowed to get up before the end of the third week and by the end of the fourth he is able to walk without a limp and to kick. In one instance bicycle riding was resumed before five weeks had elapsed from the date of the accident without any ill result.

In none of the 40 cases has there been a rise of temperature worth mentioning and not one of them has caused me a moment's anxiety. The 12 patients whom I have been able to trace can walk perfectly well and can kneel. One or two of them are conscious of the presence of the wire when they kneel and reach forward but it does not give them sufficient inconvenience to render removal advisable. There is no doubt that when this method of treatment is carried out under proper precautions the result is infinitely better than is that attained by any other method and that there is an enormous saving of time and inconvenience to the patient. Of course unless those precautions can be carried out with absolute thoroughness it should never be attempted.

During the same period I have met with two instances in which the ligamentum patellæ had been torn off from the tubercle. Both were in young subjects and in both the ligament had become curled up under the patella so that union could not have taken place without an operation. The ligament in each case was withdrawn from the recess in which it lay and was fastened to its insertion by silk sutures. Both patients did well.

Wimpole-street, W.

A CASE OF ACUTE TETANUS TREATED WITH INTRACEREBRAL INJECTIONS OF ANTITOXIN.

By K. S. STORRS, M.B., B.C. CANTAB.,

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THE following case may, I think, be of interest.

The patient, a man, aged 30 years, came to me on March 26th, 1905, suffering from a suppurating wound on the back of the left hand which had been caused on the previous evening by a dirty piece of galvanised iron. It was treated with hot carbolie fomentations. On the following day there was some lymphangitis up the arm which subsided under treatment in a few hours. On the morning of the 28th the wound looked cleaner, was less painful, and the tenderness of the axillary glands had gone. At about 2 P.M. the patient was suddenly seized with a severe shivering attack, followed by violent headache and vomiting. At 7 P.M. he came to see me, complaining of feeling very ill; his face was pale with an anxious expression; the headache was very severe, and he complained of pain and stiffness in the muscles at the back of his neck. The temperature was 96.8°F . and the pulse was 64. I sent him into the Chelmsford Infirmary and saw him again at 8.30 P.M. Feeling convinced that it was a case of commencing tetanus we resolved to give him an intracerebral injection of antitoxin. While being prepared for operation he had two spasms, the second more severe than the first, both of them affecting the muscles at the back of the neck and the second one being accompanied by considerable retraction of the head. He was taken into the theatre directly after the second one and I injected 10 cubic centimetres of serum into the second anterior frontal convolution on each side and 10 cubic centimetres into the skin over the abdomen. He was put back in bed and 30 grains of chloral hydrate were administered per rectum and this was repeated every four hours. On the 29th, at 9 A.M., I ascertained that the patient had slept for short periods during the night. The headache was still severe but there was less pain in the back of the neck; he had had no more spasms. The temperature was 100° and the pulse was 70. 20 cubic centimetres of serum were injected into the left forearm. At 6 P.M. I injected 20 cubic centimetres of serum into the left axilla and 10 cubic centimetres into the skin over the abdomen. On the 30th, when seen at 9 A.M., the patient was decidedly better, the stiffness and pain in the neck were nearly gone, and he only complained of slight headache. The temperature was

99.4° and the pulse was 74. A total of 30 cubic centimetres of serum were injected into three different places in the left arm. At 6 P.M. the patient expressed himself as feeling quite well except for slight headache. 20 cubic centimetres of serum were injected into the skin over the abdomen. After this progress was uneventful; as no more spasms occurred I administered no more serum and omitted the chloral. The patient was kept under observation till April 15th, when he left the infirmary quite well.

The points worthy of notice in this case are, I think, the following: (1) that it was an acute case, the first symptoms developing about 90 hours after the injury; (2) the symptoms which manifested themselves before the spasms commenced; and (3) the early resort to serum. With regard to the second point this is the third case of tetanus which I have met with in my practice in the last seven years and in which I have had the opportunity of watching the development, and in each I have been struck with the occurrence of the same symptoms—viz., severe headache and vomiting, the pain and stiffness in the muscles at the back of the neck, the anxious aspect, and the appearance of being more ill than the immediate circumstances seemed to warrant. In one of the previous cases a subnormal temperature was registered. With regard to the third point, one of my previous cases had been treated unsuccessfully with intracerebral injections but they had not been used till the spasms had become well established; hence my object was to get those parts, probably the ganglion cells of the cerebral nervous system, which the tetano-toxin affects immunised before the toxin had effected any great damage and in this I venture to hope that I was successful. In giving so many of the subcutaneous injections into the arm I hoped that possibly the toxins on their way to the cerebral nervous system might be neutralised before having reached it.

Chelmsford.

SOME RECENT DEVELOPMENTS IN THE SURGICAL TREATMENT OF STRABISMUS.

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EDITOR OF "THE OPHTHALMOSCOPE."

THE surgical treatment of strabismus dates from the earlier half of the nineteenth century when a German surgeon, Stromeyer,¹ divided the recti muscles on the cadaver, and pointed out that squint might be corrected in that way. Pauli² first attempted to perform the operation, which later was actually carried out successfully by Cunier and by Dieffenbach.³ It is of some historical interest to recall the fact that Cunier performed his first operation on Oct. 20th, 1839, exactly six days before Dieffenbach operated. The first surgeon to perform the operation in England appears to have been P. B. Lucas,⁴ who in 1840 published a treatise upon the subject. He devised a blunt hook not very dissimilar from the one now always employed in the operation of tenotomy. At first the rectus was exposed by means of a vertical incision through the ocular conjunctiva midway between the edge of the cornea and the caruncula lacrymalis, and a blunt hook being passed under the muscle, the latter was divided with scissors on the nasal side of the hook. As originally practised, therefore, the operation was a myotomy as opposed to a tenotomy. It was believed that the two ends of the divided muscle would eventually become united by means of cicatricial tissue and it was thought that in this way the ultimate result of myotomy would be to elongate the rectus. But it was soon shown that, in point of fact, the two parts of the muscle did not unite with one another. It is not a little curious, as readers will perceive later, that one is

¹ Stromeyer: Beiträge zur Operativen Orthopädie, 1833.

² Pauli: Monatschrift für Medicin, Augenheilkunde, und Chirurgie, 1840, p. 321.

³ Dieffenbach: Ueber das Schielen und die Heilung desselben durch die Operation, Berlin, 1842.

⁴ Lucas: A Practical Treatise on the Cure of Strabismus or Squint by Operation, &c., London, 1840.

to-day engaged in realising an end almost identical with that aimed at by the earlier operators—namely, an actual elongation of the muscle.

The researches of Bonnet (1841) into the anatomy of the capsule of Tenon appear to have led von Graefe to advocate tenotomy in preference to division of the muscle. Since that time the operation has undergone few modifications and has retained its place in the mind of the medical profession as the operation *par excellence* for the cure of squint. In the hands of British operators, at all events, the so-called "open" operation was largely superseded by the introduction by Critchett of the "subconjunctival method." In this operation, as everybody knows, the tendon is not exposed but divided beneath the ocular conjunctiva by scissors introduced through an incision in the neighbourhood of the lower border of the tendon, close to its insertion into the sclera. This method of operating is still the favourite one in England, although elsewhere it seems to enjoy little favour. Indeed, even among British surgeons there is nowadays some tendency to revert to the less elegant but more certain plan of dividing the tendon openly.

During the last two decades, however, surgeons have become painfully conscious of the fact that tenotomy, although easy to perform, is uncertain in its results. The fibrous bands—the so-called "check ligaments"—which unite the sheath of the muscle with the capsule of Tenon may limit the due retraction of the tendon which it is the aim of the operation to produce. The result in this event is disappointing. On the other hand, if the ligaments be freely divided a divergent squint may readily result, especially when both eyes have been treated surgically. In tenotomy the surgeon accordingly lies between the Scylla of doing too little and the Charybdis of doing too much, and that without being in a position to prevent either mishap with certainty.

Endeavours have on this account been made to render the effects of tenotomy more certain by modifications of several kinds or by replacing it by operations of a somewhat different nature. For example, Parinaud⁵ (1890) proposed in some circumstances to replace tenotomy by an operation to which he has given the name of *recullement capsulaire*. This operation consists essentially in separating the muscle from its adhesions to the capsule of Tenon and to other parts, without, however, dividing the tendon itself. A vertical incision, made between the tendinous insertion and the caruncle, allows a pair of scissors to be introduced for the purpose of separating all premuscular adhesions that can be reached. The final step is to suture the conjunctival wound in the usual way. Again, some few years ago Panas⁶ (1896) advocated what he called "elongation of the ocular muscles" in pronounced non-paralytic deviation. This consisted in making successive and steady tractions upon the rectus muscle enveloped in Tenon's capsule by means of a large strabismus hook passed beneath its tendon until the inner border of the cornea could be brought without the least resistance to the canthus, inner or outer, as the case might be. The tendon was then divided and the conjunctival incision closed with a suture. Panas recommended the performance of his operation of muscle stretching upon both eyes at the same sitting. L. Webster Fox (1900),⁷ after doing tenotomy of the external rectus for divergent squint, stretches and removes an elliptical fold of conjunctiva and Tenon's capsule from over the internal rectus and finally closes the wound thus left by four sutures.

Several operations have been devised with the object of shortening without actually dividing the antagonist muscle. The effect is produced by rucking or folding the tendon, often by means of special instruments, and then by fixing it in place by sutures (Todd, Valk, Brand, and others). In the same category may be placed the operation of myectomy devised by J. F. Noyes⁸ in the year 1874. Noyes excised bodily a piece of the external rectus in cases of convergent squint and sutured the cut ends together. For the cure of convergent strabismus Noyes usually combined this operation with tenotomy of the internal rectus.

The most important advance in the surgical treatment of squint lay, however, in the introduction of the operation of "advancement" first devised by Jules Guérin (1849) and

since modified by many surgeons. Advancement consists in bringing forward the direct antagonist of the divided muscle to an attachment nearer the cornea, thereby increasing the power of the advanced muscle as regards rotation of the eyeball. With advancement a tenectomy of the muscle is often combined (Agnew). The result of this combined operation—that is to say, of tenotomy of one muscle together with tenectomy and advancement of the opponent muscle—is much more certain than that of tenotomy alone, and it can be graded with considerable accuracy by those who have acquired a moderate degree of proficiency in operations upon the muscles of the eye. Moreover, as the operation is nowadays often undertaken under cocaine, it is possible to judge by actual inspection whether a correct adjustment has been secured or whether too much or too little has been effected. When a general anæsthetic, as chloroform, is administered, it becomes more difficult to gauge the immediate result, because the patient can give no help in the matter and no dependence whatever can be placed upon the position assumed by the eyes when the patient is narcotised.

It has thus come about that few operators would now care to attempt to rectify a convergent squint, say, of 40 degrees angular measurement, by the operation of tenotomy alone. On the other hand, they would feel tolerably confident of a good result by combining with tenotomy of the one muscle advancement and shortening of the other, more especially if the operation was done under local anæsthesia.

A further development of the operation of advancement has consisted in advancing not only the tendon but also Tenon's capsule and the overlying conjunctiva. This is spoken of as "capsulo-muscular advancement" in order to distinguish it clearly from advancement of the tendon pure and simple. This excellent operation is capable of yielding a more marked effect than advancement of the muscle alone. Upon the whole, it appears to be the operation preferred by a majority of operators.

Some few years ago, realising the extremely uncertain effect of simple tenotomy, it occurred to me that a more strictly scientific proceeding would be to lengthen the tendon of the rectus muscle without at the same time interfering with its actual insertion into the sclerotic coat of the eyeball. In this way I hoped that the "dosage," so to speak, of tenotomy might be rendered more or less certain instead of being, as in the old operation, an almost unknown factor. My efforts were crowned with success. I described the method of operating, and exhibited several patients upon whom the operation had been performed, at the Ophthalmological Society of the United Kingdom in 1902.⁹ Briefly, the steps of the operation were as follows. A vertical or curvilinear incision was made with scissors over the insertion of the internal rectus muscle and the latter was exposed as fully as might be, and carefully separated from the overlying conjunctiva by a few snips of the scissors. After a small squint hook had been passed beneath the tendon a fine well boiled silk suture was inserted through the lower border of the tendon close to the sclera. The lengthening of the tendon without disturbing its insertion might be effected in several ways, of which the two most practical alone need be described (Figs. 1 to 4). 1. A long oblique incision is made with scissors, commencing near the lower border of the scleral insertion and terminating at the upper border of the muscle, some distance from its tendinous attachment to the eyeball (Fig. 1). The two ends of the tendon are then united by a couple of points of interrupted suture (Fig. 2). 2. The lower half of the tendon is cut through some little distance from the scleral insertion and the incision is carried along the centre of the tendon, midway between its upper and lower border, finally to be brought out at a right angle to its former course (Fig. 3). The free ends left by this step-like incision are united by sutures (Fig. 4).

The lengthening of the tendon as carried out by either of the foregoing methods should be directly proportionate to the linear measurement of the squint; in other words, in a strabismus of five millimetres an attempt to lengthen the tendon by just that amount should be made. The final step, after the tendon sutures have been tied and cut off short, is to close the conjunctival incision neatly with several points of interrupted suture. This is rendered

⁵ Parinaud.

⁶ Panas: Archives d'Ophthalmologie, Janvier, 1896.

⁷ Fox: American Medical Association, June, 1900.

⁸ Noyes: Transactions, of the American Ophthalmological Society, 1874, p. 277.

⁹ Stephenson: Transactions of the Ophthalmological Society, vol. xxii., 1902, p. 276.

easier if the conjunctival wound be kept stretched during the suturing by two small squint hooks, one inserted into its upper and the other into its lower angle. Before the incision into the tendon is made as much of the rectus as possible should be exposed. This may be accomplished by turning the eyeball in a direction opposite to that of the action of the muscle treated surgically and also by retracting the divided conjunctiva fully, for which purpose Prince's forceps (right or left, as the case may be) is a most convenient instrument. The operation of tendon lengthening

FIG. 1.



FIG. 2.

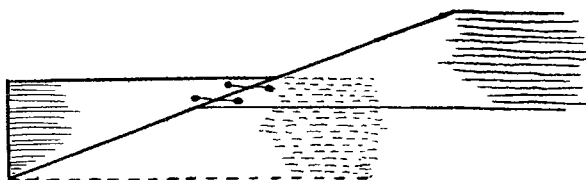


FIG. 3.

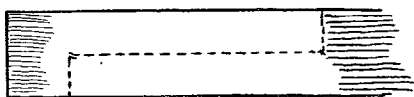
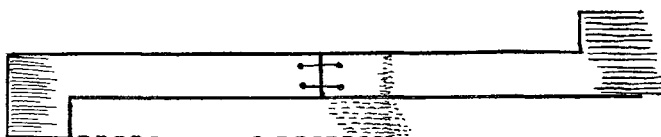


FIG. 4.



may or may not be combined with tenectomy and advancement of the antagonist muscle—the external rectus, of course, in the case of convergent squint. As a rough general rule for my own guidance, whenever I find the outward excursions of a squinting eye to be reduced or when there is a high degree of amblyopia in the misdirected eye I perform the combined operation. A squint of over 15 degrees angular measurement also furnishes another indication for the combined operation.

As a matter of experience I find it more satisfactory to undertake these operations upon the ocular muscles under cocaine (2 per cent.) or stovaine (5 per cent.) or eucaine lactate (2 per cent.) simply dropped into the conjunctival sac. The use of adrenalin hydrochloride (1 in 1000 or 1 in 2000) is a material help, inasmuch as it renders the intervention in many instances an almost bloodless one. In my opinion, it should be employed, indeed, whether a general anæsthetic is or is not given. It is worth noting that an agent has recently been placed at our disposal that acts even better in inducing local anæsthesia and hæmostasis than cocaine and adrenalin applied separately to the eye. The new combination has received the name of "eusemin" and consists of cocaine and adrenalin and chloretone dissolved in physiological salt solution. It is supplied in hermetically sealed tubes of amber glass, each containing three cubic centimetres. Eusemin has been used in ophthalmic surgery by Cohn.¹⁰ Applied to the eye before and during the performance of the operation which it is the purpose of this communication to describe, eusemin renders the work at once simpler and more speedy. One last point—namely, the instruments used, as scissors, hooks, and fixation forceps, should be somewhat smaller than those generally employed in the usual operations for squint.

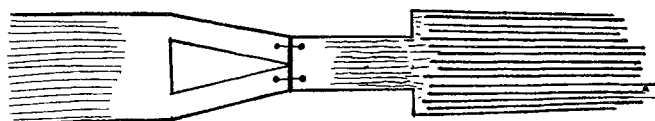
Mr. H. B. Grimsdale¹¹ fearing that my methods of tendon lengthening might interfere with the direction of the chief action of the muscle concerned, has suggested a method of overcoming the difficulty, which is, however, more apparent

than real. A glance at Figs. 5 and 6 will show that Mr. Grimsdale divides the tendon into three parts and that he then stitches the upper and lower parts to the mesial slip.

FIG. 5.

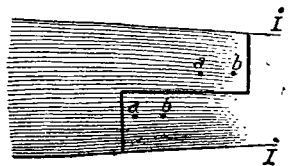


FIG. 6.



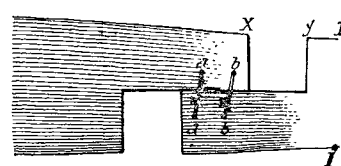
In December, 1904, Dr. E. Landolt¹² brought before the Academy of Medicine of Paris the operation of muscular elongation as a means of curing strabismus. It was described, in evident ignorance of my work in the same direction, as "a new operation upon the ocular muscles." Landolt had operated by these means in inveterate cases of convergent strabismus, concomitant or paralytic, in which marked contracture of the internal rectus was accompanied by changes in the structure of the muscle and by loss of its elasticity. Dr. Landolt described two ways of lengthening the muscle, previously exposed by a longitudinal incision through the conjunctiva. An inspection of Figs. 7 and 8, borrowed from

FIG. 7.



Lines of incision in muscle.
a, b, Points of suture.
z, Insertion of muscle.

FIG. 8.



Muscle advanced and sutured.
x, y, Gap in muscle. The remaining letters signify the same as in Fig. 7.

Dr. Landolt's communication, will show that the methods adopted by him in 1904 are identical with those described by me in 1902. After the advocacy of muscular elongation by so distinguished an ophthalmic surgeon as Dr. Landolt it may be predicted that the operation will be widely performed, so that we shall soon be in possession of ample evidence as to its true utility and real status in the surgical treatment of strabismus. The operation, however, as I remarked in my original communication, is by no means easy to do. "It is, perhaps, too much to expect," I wrote, "that in the hands of most surgeons so difficult and delicate an operation as that described will replace the simple and often quite satisfactory tenotomy. I am convinced, at all events, that it is a more exact and scientific proceeding to lengthen a rectus tendon than to divide it. Certainly the results can be foreseen and graded with considerable accuracy and so much cannot candidly be claimed for tenotomy as commonly practised."

Verhoeff¹³ has suggested an ingenious method of lengthening the tendon without dividing the latter or, indeed, of

FIG. 9.

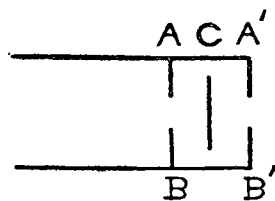
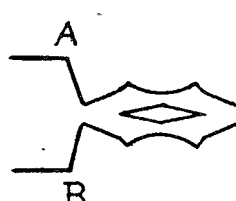


FIG. 10.



using any sutures. A glance at the accompanying figures (Figs. 9 and 10) will show how this is carried out by means

¹⁰ Cohn: *Wochenschrift für Therapie und Hygiene des Auges*, Nov. 24th, 1904.

¹¹ Grimsdale: *The Chief Operations of Ophthalmic Surgery*, 1904, p. 9.

¹² Landolt: *Archives d'Ophtalmologie*, Janvier, 1905. *THE LANCET*, Jan. 28th, 1905, p. 254.

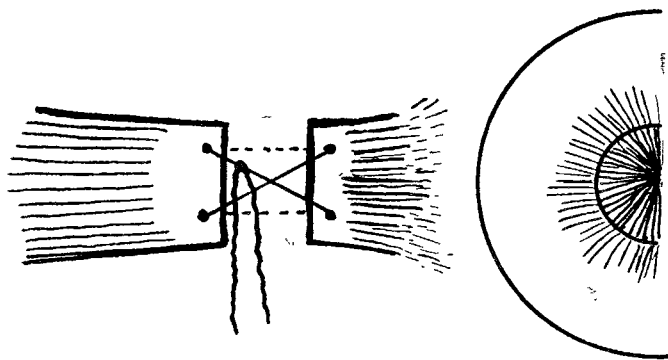
¹³ *Klinische Monatsblätter für Augenheilkunde*, April, 1903.

of incisions (A, B, C, A', B'). Verhoeff expressly states that no hyperphoria has ever resulted from the performance of his modified operation.

The technical difficulties of tendon lengthening as carried out upon the ocular muscles have led me to endeavour to find a simpler substitute. I have again borrowed a device adopted by orthopædic surgeons—viz., the so-called "artificial tendon." The plan was introduced in 1892 by Glück,¹⁴ who employed bundles of silkworm gut to bridge over the gap left after the traumatic division of tendons. Jochner¹⁵ some years later replaced a gap of two and a half inches in the extensor communis digitorum due to a sword wound with success. It has been shown by Kummell that in a case thus treated the sutures were eventually converted into fibrous tissue resembling tendon itself. Lange¹⁶ has described no fewer than 56 cases of tendon transplantation in which the tendons were lengthened by a number of strong silk threads. His first attempts were made in the hopes of rendering children with extensor paralysis of the knee able to dispense with instrumental aid. Some of the artificial tendons were eight inches in length. Primary union was obtained in all Lange's cases, while in two instances alone was the functional result unsatisfactory. Lange had an opportunity of examining the anatomical condition in one of his operations performed two and a half years previously. He found the artificial tendon to be of firm consistence and as thick as a cedar pencil. When it was cut open the silk was seen to lie in its centre without alteration. The sheath consisted of fibrous tissue, of which the central portion had the structure of normal tendon, made up of parallel and longitudinal fasciculi.

The operation as applied to the internal rectus muscle is quite simple. The tendon is exposed as in the former case and two sterilised silk threads are passed through the tendon about three millimetres from its scleral insertion—one through the upper and the other through the lower border of the muscle. The threads are then knotted, one long end armed with a small curved needle being left attached to each. The tendon, thus securely held, is next divided vertically on the outer side of the knots—that is to say, about midway between the latter and the scleral insertion of the tendon. The threaded needles are then passed between the distal and the proximal portion of the divided tendon in such a way as to bridge over the gap left between the two. Lastly, the two sutures are tied together. An even simpler way of forming the artificial tendon is to use two needles on one length of silk. In Fig. 11 the sutures have

FIG. 11.



been passed crosswise and tied. If advancement of the antagonist muscle has formed part of the operation the sutures should not be adjusted until the first operation has been completed. If, on the contrary, muscular elongation is alone contemplated, then before the threads are tied the eyeball should be strongly abducted so as to leave a distinct interval before inserting the silk threads of the artificial tendon.

My experience with the "artificial tendon" is not as yet extensive, but satisfactory results have been obtained in the cases where it has been tried. One thing is clear—namely, that it is much easier to carry out than tendon-lengthening, properly so-called, and on that score alone it is likely to commend itself to the minds of practical ophthalmic surgeons.

Welbeck-street, W.

¹⁴ The Practitioner, vol. lxxix., 1902, p. 360 et seq.; and Modern Methods in the Surgery of Paralysis by A. H. Tubby and Robert Jones, London, 1903, p. 113, et seq.

¹⁵ Ibid.

¹⁶ Ibid.

ON THE ACTION OF VENOMS OF DIFFERENT SPECIES OF POISONOUS SNAKES ON THE NERVOUS SYSTEM.

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AND

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UNIVERSITY OF GLASGOW.

IV.—VENOM OF DABOIA RUSSELLII.

In previous communications to THE LANCET¹ we described the histological appearances found in the nervous system in cases of intoxication with the venoms of two Indian species of snakes—namely, the cobra and the banded krait (*Bungarus fasciatus*)—and in each instance we pointed out the connexion which exists between the degenerative changes found and the symptoms observed during life. Both these species belong to the same family of colubridæ—namely, elapinæ; further, the symptoms which follow an injection of either of these venoms point undoubtedly to an interference with the functioning of the nervous system. In the present communication we propose to take up a similar study made with the poison of one of the most deadly of the Indian viperidæ—namely, *Daboia Russellii*. It is as well to state at the outset that the symptoms which follow an injection of this venom into the animal body are much more difficult of explanation than is the case with either of the venoms already considered. Thus, while the observations² which have already been made with *daboia* poison show that it has a marked action on the blood plasma, on the blood corpuscles, both red and white, on the endothelium of the capillary vessels, and on the cells of various organs, some experiments made by one of us along with Dr. Hanna³ point to the conclusion that this venom is free from any element which acts directly on the central nervous system, similar to the principal toxic constituent of cobra poison. No direct evidence has, however, up to now been brought forward in support of this conclusion but we hope in the present communication to have something more to say on this point.

The experiments which were undertaken to study the symptoms of intoxication with *daboia* venom were made on various species of animals—pigeons, rats, rabbits, monkeys, donkeys, and horses. Injections of the poison were made both intravenously and subcutaneously. In this paper we propose to give only a short summary, as far as symptoms are concerned, of the observations made under these varying conditions. Detailed accounts⁴ of such experiments have already been published by one of us.

Cases of intoxication with the venom of *daboia Russellii* may be divided into two classes. The first class is made up of those cases in which rapid death—that is to say, death within a few minutes—follows an intravenous injection of a small amount of venom, or, in the case of small animals, a subcutaneous injection of a comparatively large amount of poison. The symptoms in these cases begin almost immediately after the injection of the venom and soon end in death. They are restlessness and difficulty in preserving equilibrium, gasping and laboured respiration, followed by violent general convulsions just before death. Both Cunningham⁵ and Wall⁶ looked upon these symptoms as being due to a direct irritant action of the poison on the central nervous system.

¹ THE LANCET, Jan. 2nd (p. 20); August 20th (p. 518); and Oct. 22nd, 1904 (p. 1146).

² Cunningham: Scientific Memoirs by Medical Officers of the Army in India, part ix., 1895, and part xi., 1898. Wall: Indian Snake Poisons: their Nature and Effect, W. H. Allen and Co., London, 1883. Lamb and Hanna: Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India, New Series No. 3, 1903. Lamb: Ibid., No. 4, 1903. Rogers: Proceedings of the Royal Society, vol. lxxii, 1903. Flexner and Noguchi: University of Pennsylvania Medical Bulletin, July-August, 1903. Preston Kyes: Berliner Klinische Wochenschrift, Nos. 42 and 43, 1903; Hoppe-Seyler's Zeitschrift für Physiologische Chemie, Band xli., Heft 4.

³ Loc. cit.

⁴ Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India, New Series, No. 3, 1903.

⁵ Loc. cit.

⁶ Loc. cit.