REMARKS ON THE TREATMENT OF TETANUS, WITH A

REPORT OF A CASE OF CEPHALIC TETANUS TREATED BY INJECTIONS OF ANTITOXIC SERUM.

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CEPHALIC tetanus is a sufficiently rare disease to make the following case of some interest. It was treated, though unfortunately without success, by desiccated serum most kindly sent to me by M. Roux, of the Pasteur Institute. Recently two cases of this disease have been reported by Caretti,¹ and by Giusti and Buonaiuti² respectively in which the serum treatment was successful. Allusion will be made to these cases later. The case recorded here occurred in the practice of the Public Dispensary, and was under the care of Mr. Herbert Rowe, one of the honorary surgeons, when I saw it. In addition I am indebted for some careful notes and observations to Mr. Walter Mayo and also to Dr. Stoney, two of our resident medical officers.

A man, aged 26, received on November 13th the following wounds, inflicted with a door key: (a) A small vertical cut through the right upper eyelid, (b) a small horizontal cut above the middle of the eyebrow, and (c) a lacerated wound nearly separating the lower eyelid. The wound was dressed with all the usual precautions. The attempt to save the lower eyelid failed, and it sloughed off about the ninth day.

On November 23th the patient complained of some stiffness of the lower jaw. In the evening he could only open the jaws to the extent of an inch. Slight facial paralysis was now noticed.

November 26th. After a restless night the trismus was more marked, there being no space now between the teeth. The wound looked healthy. There was complete right facial paralysis. A ptosis on the left side, said to have been present before the injury, was now much more pronounced. Sensation was unimpaired over the right face. There was slight rigidity of the muscles at the back of the neck and some difficulty in swallowing. At 6 P.M. half a tube of desiccated antitetanic serum (Roux) was dissolved in 68 c.cm. of sterilised water and injected into the back. The rigidity in the neck muscles was more marked than in the morning, and was more pronounced on the left side.

November 27th. Another sleepless night owing to pain and stiffness in the muscles of the back. The muscles at the back of the neck felt like a board. The remainder of the serum dissolved in 45 c.cm. of water was injected into the abdominal subcutaneous tissues. 6 P.M.: Deglutition is more difficult, spasm being brought on by attempts at swallowing. Considerable salivation has been present during the past twenty-four hours. Jerking movements of the head backwards are now noticed from time to time; $\frac{3}{4}$ gr. morphine tabloid was given about midnight.

November 28th. The patient's rest was disturbed by his waking up with the desire to spit owing to the salivation and imperfect swallowing. Suffocative attacks have now appeared, the patient at times getting blue in the face. The muscular spasm is still more pronounced. It is impossible to pass a nasal tube owing to the deglutition spasm produced. The movements of the left eyeball and pupil are normal. Morphine gr. $\frac{3}{4}$ was given hypodermically. An attack of opisthotonos occurred during the day, lasting several minutes.

November 29th. Weaker; deglutition worse; back muscles more rigid, especially on the left side; legs very stiff, especially the left. He was said to have foamed at the mouth. The attacks of dyspnoea occur from time to time. He has had five severe attacks of tetanic spasm up to now. Morphine gr. $\frac{3}{4}$ was injected.

November 30th. Very weak; the pulse can hardly be felt; there is less rigidity of the neck and back muscles; the trismus is less marked, and he can swallow much better; no marked attack of tetanic spasm for twenty-four hours. It was thought that there was now some weakness of the extrinsic muscles of the right eye, but this at any rate was slight. Pupils equal and small. Death apparently from cardiac failure at 1.30 P.M. At the necropsy no gross lesion was discovered.

Cephalic tetanus (*Kopf-tetanus*, Rose) is also known by the name of *tetanus hydrophobicus*, owing to the pharyngeal spasm induced by attempts at swallowing. Such spasm was well marked in this case. In some instances—such, for instance, as that reported by van Spanje¹³—there has been a true dread of drinking owing to the spasm caused by it. The term *tetanus paralyticus* has been proposed by Klemm⁵ to emphasise the importance of the facial paralysis. The name of bulbar tetanus has been used by others to accentuate the bulbar symptoms so frequently present. That there is no real difference between cephalic and ordinary tetanus is shown by the fact that the muscular spasm tends to become general in both; in fact, it is only a difference of mode of onset, cephalic tetanus more closely resembling experimental tetanus.

On the other hand, pharyngeal spasm has been noted by Samelsohn (quoted by Velich³), by von Jaksch, and by

Larger⁴ in ordinary tetanus, and this latter has been known to follow a wound on the head. Klemm⁵ has gone so far as to say that a similar local onset is present in ordinary tetanus, but for obvious reasons it is liable to be overlooked. Brunner²³ has maintained that facial spasm has been taken for facial paralysis, and thus he would make cephalic tetanus agree with the experimental tetanus produced by the inoculation of the tetanus bacillus within the region of the head and face. Naturally Brunner's view has not received a wide acceptance. Finally, the tetanus bacillus has been demonstrated, both by culture and experiment (Nicolaier⁶) or by experiment alone, in cephalic tetanus. Thus cephalic tetanus is only a variety of ordinary tetanus.

Cephalic tetanus is always due to the infection of a wound with the tetanus bacillus. A case is recorded by Buisson¹⁰ of so-called rheumatic cephalic tetanus, but most probably a wound was present in some place not easily accessible to examination—as, for instance, in some part of the pharynx, etc. The wound is situated in some part of the head or face, and especially within the territory of the fifth nerve. In looking through the recorded cases it is striking to see how frequently it occurs about the orbit, and especially, perhaps, its lower margin. Oppenheim⁷ mentions the orbital margin and nose as being the most frequent site of the wound in cephalic tetanus. It may be a small, trifling, perhaps punctured wound, or a large one contused or complicated by fracture. The injury has been inflicted by sticks, whips, firearms, horsekicks, falls, etc. Cephalic tetanus has been known to follow removal of a tumour (Bernhardt¹⁷), and has been said to supervene upon suppurative catarrh of the middle ear (Behr¹⁸), but the latter case is open to some doubt. Earth would unquestionably appear to be the chief means which carries the infection, and implements contaminated with it are most likely to convey the disease. Cephalic tetanus has been observed at almost all ages from quite a tender age up to senility. Men are affected in greatly preponderating numbers.

The most constant and striking feature of cephalic tetanus is the facial paralysis. It may vary in degree, as is well seen in the three cases recorded by Caird.⁴ It mostly affects all the branches of the facial nerve, as in the case reported here; sometimes the lower part of the face has alone been involved. This facial paralysis practically always occurs on the same side as the injury, but it has been seen on the opposite side (Terrillon²¹), and has been even known to be bilateral (Huntingdon⁹). It has been put down by some authorities to a toxic neuritis, but no lesion has hitherto been found in the nerve. The spasm on swallowing is less constant, and therefore less characteristic, than the paralysis of the seventh. Paralysis of some of the other ocular nerves has been noted in some few cases (Roberts,¹⁰ Rockliffe,¹¹ Sereins¹⁹). The ptosis in the case recorded here was present, according to the patient's account, before the injury, and a slight ptosis was observed by Mr. Mayo when he first dressed the wound. The fact that this ptosis became much more pronounced as the disease advanced is indisputable. Symptoms referable to a lesion of the fifth nerve have been noted but they were absent here. Whether a reflex ptosis (Gowers¹²) due to irritation of the fifth nerve can be offered as an explanation in these cases is open to much doubt. Spasm is, of course, a marked feature of the disease, especially in its advanced stages. This spasm is persistent in character and also comes on in paroxysms. Trismus appears early but not by any means always before the facial paralysis. The pharyngeal and respiratory muscles may also be affected as well as the muscles of the trunk. At times the spasm is more marked on one side than on the other, and this is not always the side of the lesion as in the above case. Spasm of the non-paralysed side of the face is not uncommon. Death occurs at varying intervals, often in the second week, by respiratory spasm, sometimes by cardiac failure, etc. It is curious to note how frequently an apparent improvement has occurred shortly before death. It may give rise to delusive hopes of recovery. The temperature nearly always rises in fatal cases, so much so that a raised temperature is of bad import. An excessive frequency of the pulse was noted in the above case. While the temperature and breathing were normal the pulse ranged from 112 to 130 (see temperature chart).

Little need be said about the morbid anatomy. Examination has with few exceptions given negative results. The facial nerve has frequently been examined and found healthy (Lannois,²⁰ Nerlick,²¹ Williamson,¹⁰ Charcot,²² Remy and Villar²³). Lesions have been found in the bulbar centres by Nerlick and Lannois. The material from the above-named case has not yet been examined. If any lesions are found a description of them will be published later.

The experimental pathology is of great interest, but it has not as yet provided a complete solution of all questions connected with the disease. Brunner,²³ Klemm,⁵ Velich,³ have been among the chief workers in this field. Facial paralysis has been produced by the injection of large amounts of tetanus toxins, but only spasm has been induced by the inoculation of tetanus bacilli. Why the facial nerve or its nucleus should be so susceptible is not obvious. The explanation of the spasm on the one hand and the paralysis on the other is a matter of difficulty. It would appear extremely probable that the toxins can produce a nephritis. In Nicolaier's case there was such a nephritis, but it could not be absolutely assigned to the tetanus. Perhaps a toxic myocarditis may account for some fatal cases dead apparently of cardiac failure.

To Nicolaier⁶ belongs the credit of being the first to cultivate the tetanus bacillus from a case of cephalic tetanus. The very incomplete bacteriological examination in the case recorded here can be dismissed in a few words, as neither grape sugar media nor yet the device of destroying other micro-organisms by exposure to heat at 80° C. were adopted. Ordinary nutrient media were inoculated by deep stab punctures. One or two streak preparations were made, and hydrogen forced into the tubes. Sterilised vaccine tubes were filled with secretion from the wound and examined. The nutrient cylinders from the stab cultures were turned out, laid open, and the track of the needle carefully examined. As might be expected, no tetanus bacilli could be found; almost pure cultures of the staphylococcus aureus alone were obtained.

The diagnosis of cephalic tetanus is generally very easy. The prognosis is very serious. A fair number of recoveries have been reported, but at least half the cases die. Recovery has hardly been seen after the age of 25. In the very acute cases, with short incubation period and rapid development of symptoms, the prognosis is almost, if not completely, hopeless.

In regard to treatment, resection of the wound seems to be useless, at any rate after the first symptoms have developed. Of course the unhealthy wound should receive appropriate local treatment. The cases that have recovered have been

mostly treated by chloral and other sedatives, but it is difficult to see, in the light of our present knowledge, how such remedies can be of any real use in combating the disease. The feeding of these patients is obviously of great importance. The nasal tube is of service when pharyngeal spasm is absent, but when, as in the above-named case, the spasm is marked it is impracticable. Rectal alimentation should be had recourse to early in the disease. If possible, large quantities of fluids should be supplied in order to promote the excretion of the tetanus poisons by way of the kidneys.

The only hope in severe cases can lie in the serum treatment, and yet, up to the present time, its efficacy has not been established with absolute certainty. In the above-named case half the serum tube supplied by M. Roux was injected on the second day and half on the third day, but no trace of improvement could be detected even by the most interested witness. The disease steadily pursued its course without being in any way influenced by the treatment. It is sometimes a matter of some little difficulty to get a rather large quantity of desiccated serum into solution, but this can be overcome by carefully rubbing it up to a fine powder before adding the water. Of course all apparatus and instruments are as far as possible sterilised. The water used in dissolving the serum in this case was, perhaps, rather warmer than desirable. Tizzoni and Cattani draw special attention to the importance of using cold water, yet surely a temperature below that of the body should not be destructive of the immunising and curative substances. It might have been well in this case to have injected further quantities of serum, but the absolute absence of any trace of improvement in conjunction with one's past experience was discouraging.

This is the third case of tetanus in which I have assisted in the serum treatment (including one in which the Tizzoni-Cattani serum was used), and in no case did it exercise the slightest effect on the subsequent course of the disease. They were, it is true, all three most severe cases, but these severe cases are just the ones that the serum treatment must eventually stand or fall by. Whether it would be possible to inject the serum without untoward effect direct into the veins is a thought that naturally forces itself upon one in these otherwise hopeless cases.

From many considerations it would certainly appear as if the time will come when the serum treatment of tetanus will be efficient. Within the last two years two cases of apparently severe cephalic tetanus have been thus successfully treated. Caretti's case¹ occurred in a woman, aged 44. The incubation period was only five days. The temperature was once 102.4°. There was no pharyngeal spasm. Improvement set in immediately after the injection. In Giusti and Buonaiuti's case² there was no facial paralysis, but there was facial spasm. It was typically a case of hydrophobic tetanus so far as deglutition spasm was concerned. The pulse rose to 140 to 150, and the temperature to 104°. Improvement set in within thirty-six hours of the commencement of the treatment. Sixty c.cm. horse and 110 c.cm. dog serum, as well as 20 g. of precipitated serum, were used in this case. The incubation period was long; some suspicious symptoms, however, appeared the day after the injury, but the disease did not really proclaim itself for three weeks. In both these cases the serum was obtained from the Bologna Institute, and Tizzoni himself took part in the treatment of the latter one.

The use of the serum as a prophylactic has been advocated from several quarters of recent times. It would certainly appear to be a wise precaution, and one would not hesitate to recommend it in cases of ragged wounds about the orbit if such had been contaminated with earth, or had been inflicted by an instrument which had been in contact with earth. Quite a number of cases of ordinary tetanus have been seen in the district of Leeds and neighbourhood within the last few years. A short time ago I recorded a case in the *Medical Chronicle*, 1893, which occurred in a house not so very far distant from the one in which the present case of cephalic tetanus was observed.

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ON KIDNEY TUMOURS DERIVED FROM SUPRARENAL "RESTS."*

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MY attention was first called to the subject by the examination of a tumour of this kind, which my colleague Mr. Coppinger successfully removed by nephrectomy in March, 1892. Another such case having been operated on at the Mater Misericordiae by my colleague Mr. Lentaigne in September, 1895, I resolved to publish both in detail, and at the same time to collect from various sources our knowledge of this class of tumour, which, so far as I can ascertain, does not seem to have received from British pathologists the attention which its well-marked characters undoubtedly deserve.

CASE I.—Mrs. B., a thin delicate-looking woman, aged 53, mother of seven children, had suffered for nine months from night sweats, vomiting, and abdominal pain. She had been operated on by Mr. Reeves at the Soho Hospital for movable kidney. Further operation for the removal of the organ was proposed and declined. There was now a tumour on the left side of the abdomen; no hæmaturia. On March 4th, 1892, abdominal section was performed by Mr. Coppinger, and a smooth tumour as big as a large melon exposed in the situation of the left kidney. It fluctuated, and after an unsuccessful attempt to aspirate its contents it was slit open, and a bowlful of brain-like hæmorrhagic material evacuated; Mr. Coppinger remarking that all previously reported cases of soft sarcoma of the kidney which had been opened had proved fatal by hæmorrhage. The cavity at once filled with blood, but the hæmorrhage was successfully dealt with and the tumour removed. The patient, who recovered without a bad symptom, is still alive and well.

Naked-eye Appearances.—The specimen consists of three-fourths of a left kidney, the lower fourth being merged into the walls of a sort of cyst, the inner side of which is covered with pultaceous and hæmorrhagic shreds of tumour substance. There is a distinct fibrous partition between kidney and cyst.

Microscopic Characters will be dealt with together with those of the second case.

CASE II.—Patient, female, aged 38, admitted in September, 1895, to the Mater, under the care of Mr. Lentaigne. Had been suffering for six months from abdominal pain and a tumour in left side of abdomen. No disorders of micturition. Patient looked cachectic and emaciated. Laparotomy revealed a large lobulated tumour of the left kidney extending to the middle line. The size and connections of the growth rendered the operation very difficult and prolonged. Death followed in nine hours from shock. Necropsy refused.

Naked-eye Appearances.—The mass weighed 1,100 grammes, and consisted of a mass of confluent encapsulated nodules, from the upper part of which projected the tip of the left kidney. The colour and consistence of the nodules were not unlike those of kidney cortex. The dimensions were 21 cm. × 16 × 8.6. The diameter of the largest nodule was 9 cm. The centre of each of the larger nodules was occupied by a necrosed cheesy-looking mass as big as a filbert, and here and there were yellowish degenerate patches as big as a pea. Elsewhere the tissue looked free from retrogressive change, and there were no cysts. The encapsulation of each nodule was perfect and definite.

Microscopic Characters.—To avoid repetition, the two cases will be described together. The structure of both was the same, and consisted of (a) rows and (b) groups of large (7 to

12 μ wide by 12 to 20 μ high) columnar or cubical cells of obviously epithelial character with clear, sometimes reticulated protoplasm and a relatively small, round, not very deeply staining nucleus, in which a distinct nucleolus was generally visible. Their general appearance was like that of liver cells

Fig. 1.—Low power view showing capsule with tumour tissue below and right, and kidney above and to the left.

The rows in which they were arranged were usually two cells deep, and there was usually no trace of a lumen. On each side of the rows was a line of delicate endothelial nuclei evidently forming the wall of capillaries in which remains of blood could still here and there be traced. Elsewhere the

Fig. 2.—Typical high power view; "fasciculate" arrangement of cells. capillaries were collapsed, and then the adjacent cell rows came into contact with each other. Between the epithelial cells comprising these rows there entered no stroma what

* Extracts from a paper read before the Royal Academy of Medicine in Ireland, Section of Pathology, November 29th 1895.