will be mentioned later. There was continuous pyrexia of a variably remittent type, which neither quinine nor salicylates influenced. On one occasion it rose above 105°, and on several occasions was above 104° in the evening. No rigors. The tongue remained throughout the illness in the same condition as on admission. About February 27th he developed slight cough accompanied with scanty sputum, in which no tubercle bacilli could be found. Examination of the lungs revealed a few rhonchi at the bases, but no other signs of import. At the same time there was some diarrhoea. A few days later he became drowsy, passing his evacuations involuntarily, but he was still able to answer questions. In the evening there was some delirium, and he frequently tried to get out of bed. The drowsiness increased, and on March 4th he was unconscious, and had to be fed by the nasal tube. This condition continued to his death, which occurred on March 7th.

Necropsy.—The body was fairly well nourished. The lungs were congested, with fluid exudation at both bases, but no consolidation and no trace of tubercle. Heart normal. The liver was somewhat enlarged, congested, and showed considerable amount of fatty degeneration. All the other organs were healthy. A very careful examination was made, but no sign of enteric lesion was found either in the alimentary canal or in the other organs. On removing the skullcap and opening the dura mater the arachnoid seemed unduly opaque, and there was certainly an excess of subarachnoid fluid. On cutting into the cerebral hemispheres the lateral ventricles were found to be markedly dilated, otherwise this part of the brain was normal. In the pons an elongated tumour was discovered, situated on the left side near the middle line in the posterior part but not encroaching on the floor of the fourth ventricle, and extending through almost the whole length of the pons. The growth, which was about half an inch in diameter, was not encapsuled, but was marked off from the rest of the pons by its deeply-congested appearance.

Microscopical Examination.—The brain and spinal cord were hardened in Müller's fluid and pieces embedded in paraffin. The tumour was found to be a glioma. There was no degeneration (Marchi method) either ascending or descending as a direct result of the tumour, but the cervical cord showed (1) very marked symmetrical degeneration of the intraspinal portion of the first cervical posterior roots, the extraspinal portion of the roots being quite normal; (2) scattered symmetrical degeneration in Goll's column, and also a few degenerated fibres in Burdach's column. The source of the fibres in Goll's column appeared to be a scattered degeneration in the lumbar posterior roots, but this could not be quite definitely determined. The degenerated fibres of (1) and (2) terminated above in the outer part of the cuneate and the gracile nuclei respectively.

No definite diagnosis was made in this case, but it was thought that it was most probably acute tuberculosis. This the necropsy proved to be an error. The cause of the peculiar temperature is obscure. Affections of the pons are known to be associated with pyrexia, but it is hardly of this prolonged remittent type. Moreover, it is an association more commonly of haemorrhage than of tumour of the pons. It seems very possible that the pyrexia may have been due to the condition of the liver, but it is important to point out that this organ showed no signs of acute yellow atrophy, but merely a considerable amount of fatty degeneration. Acute yellow atrophy may indeed be fairly excluded by the duration of the case, because after such a period the liver would almost certainly have assumed the atrophied condition typical of that disease.

Degeneration of the posterior columns of the cord in cases of cerebral tumour was the subject of an exhaustive paper recently published by Drs. Batten and Collier.¹ These authors found it present to a greater or less degree in about 65 per cent. of cases. They find that the degeneration is of root origin, is nearly symmetrical, and is more common in the cervical region than in the dorsal or lumbar regions. According to the view of these authors the degeneration is due to increased intracranial tension which causes distension of the spinal arachnoid and consequent traction on the spinal roots. The anterior roots are less liable to suffer than the posterior, because they are less attached to the arachnoid. In my case the degeneration in the postero-external columns of the cervical cord was undoubtedly of root origin, and arose from the point where the first cervical posterior root entered the cord; the extraspinal portion being quite normal.

In three of the cases in the above paper there was sym-

metrical degeneration of the direct cerebellar tracts in the upper cervical region which it is suggested is due to pressure on the upper cervical cord brought about by the descent of the cerebellum and bulb, so as to block the foramen magnum, a condition which occurs when the intracranial tension is rapidly increased.² Such a condition would of necessity shut off com-

For permission to publish this case I am indebted to the kindness of Dr. F. M. Turner, Medical Superintendent of the South-Eastern Hospital.

REFERENCES

- ¹Batten and Collier, *Brain*, 1899, Winter. ²Hill, Allbutt's *System of Medicine*, vol. vii, p. 266.

NOTES ON ADRENALIN CHLORIDE SOLUTION IN OPHTHALMIC PRACTICE.

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THE value of suprarenal extract as a haemostatic is well known. In 1896 Bates published his first experiences in ophthalmic surgery of a solution of the extract, and later Dor, Darier, Velich and others recorded their experiences of a similar solution. But evidently the want of a stable, sterile and more convenient preparation of the drug was required to make its qualities better known. John Abel separated an alkaloid which he named epinephrin. It was found to cause conjunctival blanching and slight anaesthesia. Bates recorded his experience of its use in the eye; he found it lessened congestion and hastened absorption of inflamed tissue. The preparation, however, was not to be had commercially, which probably accounts for its limited use. Wolffberg also records his experience of atrabalin, another preparation of the suprarenal bodies. We are now indebted to

Dr. Jokichi Takamine for the separation of what appears to be the active principle of the suprarenal bodies. To this alkaloid he has given the name adrenalin. The alkaloid itself is not to be had, as it is impossible to make a solution of it by ordinary methods. It is therefore supplied as adrenalin chloride solution. In this form the drug has been used for some time with satisfactory results in the United States, both in the treatment of throat and eye affections. Papers on the action of the preparation were read last year at the Chicago Laryngological Association, by Casselberry and Wilson, who with many others spoke of its use in very favourable terms.

I am indebted to Messrs. Parke, Davis, for a supply of this preparation. Adrenalin chloride is supplied diluted in normal salt solution (1 in 1,000). It is colourless, odourless, sterile, and stable if protected from light, heat, and oxidation, particularly the latter.

I find that when instilled into the healthy eye adrenalin chloride solution (1 in 1,000) causes first a slight smarting, and, within a few moments, a blanching of the conjunctiva, which is best marked at the caruncle. This blanching reaches its maximum within five minutes. The action very gradually passes off, and the eye resumes its usual colour in about the same time or a little longer. The solution is non-irritating, and does not cause any dilatation of the pupil (Königstein found dilatation of the pupil with a 10 per cent. solution of the extract), neither does it render the conjunctiva or cornea insensitive to any extent. The solution has also no effect on the accommodation. Under its influence the eye feels slightly dry.

Applied to the inflamed conjunctival sac it gives relief in a few moments, evidently by checking the congestion; indeed, in some cases, especially those of foreign bodies in the cornea or under the lid, the relief obtained is not unlike that given by a weak solution of cocaine. In severe acute conjunctival hyperaemia several instillations may be required before complete blanching takes place. The hyperaemia of acute inflammation does not appear to yield so readily as chronic hyperaemia. The inflamed eye resumes its injected appearance within fifteen minutes after the instillation of the solution; but repeated instillations gradually overcome the hyperaemia provided, of course, the original cause of the irritation be removed. The solution is rapidly absorbed into the anterior chamber, and its action is seen on the congested iris, especially if the instillations be frequently repeated (once every fifteen minutes). This fact renders the drug particularly valuable in iritis. It relieves photophobia, and by its control over congestion assists atropine in dilating the pupil. The solution seems, too, to hasten absorption of serous exudation. It certainly assists the absorption of subcorneal deposits and thus improves vision; it also reduces tension, especially when above normal. This fact was also noticed by Zimmermann in using a preparation of the extract. Landolt's experience of the extract, however, is that it does not affect the tension of the globe. But Darier, at the Congress of the Société Française d'Ophtalmologie, recommended surrenaline (another preparation of the extract?) as useful in reducing intraocular tension.

In operations on the eye adrenalin chloride solution will be also found of use. In tenotomy and advancement of the rectus, the previous instillation of the solution helps to control the haemorrhage. It is necessary often to reinsert a drop or two during the operation. A minim or two previously injected beneath the conjunctiva has, however, a more lasting effect. In this way most operations on the superficial tissues are rendered practically bloodless. The solution is also of use in stricture of the lachrymal duct from swelling of the mucous membrane. Its use facilitates the passage of a probe. No secondary haemorrhage has been observed, but when we consider that the drug only temporarily influences the blood vessels, such a sequence is, when larger vessels are divided, quite possible. In rhinology, Hopkins states that secondary haemorrhage does occur after the use of a solution of the extract (due evidently to delayed relaxation). Peters, too, has had similar experience with the extract, and found secondary haemorrhage occurring two hours after. Landolt also experienced troublesome haemorrhage. The experiences, however, of Mullen and Macleod Yearsley are contrary to these observers. In inflamed conditions of the eye, especially chronic, it will be noticed that there is a tendency for a reaction to set in after

the influence of the drug passes off and the hyperaemia is temporarily increased.

So far, I have observed no toxic effect. In eye work it is not likely that such evil effects will readily occur, the solution being used in such small quantities. It must not be forgotten, however, that suprarenal extract can produce marked toxic effects (Corona). Landolt likewise reminds us of the fact. How long and to what extent adrenalin chloride solution influences the deeper tissues of the eye it is not as yet possible for me to state definitely. So far, my observations tend to point that the influence is much the same as on the superficial tissues. The action of the drug varies with the intensity and chronicity of the inflammation. It is not easy to arrive at precise conclusions from instillations into the eye. The size of the drop, its dilution owing to varied lachrymation, etc., all render precision in such observation almost impossible.

My experience of adrenalin chloride solution is that it will prove a valuable addition to the small pharmacopoeia of the ophthalmologist. Indeed, since the introduction of cocaine no drug of greater interest and use in eye work has come before us. But it is essential to bear in mind that the preparation in its action is only indirectly of use, that is (like the extract) it contracts the muscular coats of the blood vessels (Schäfer, Olliver), and thus by controlling congestion promotes healing and absorption.

According to Grünbaum, suprarenal extract does not cause clotting. In eye operation I have noticed that coagulation takes place more readily when the solution of adrenalin is used; this, however, may be due to the haemorrhage being scanty. The solution may be combined with atropine or cocaine, but it is better to use it by itself. First, because to be of much use it requires frequent instillations; and next, because the solution, if exposed, tends to oxidize and lose its original potency. The action of cocaine on inflamed tissue (which, as is well known, is not satisfactory) is greatly promoted by the previous use of the solution. Finally, I must not omit to state that in cases where the nutrition of the tissues is at fault the solution of adrenalin chloride is contraindicated. In certain forms of corneal ulceration, for instance, the use of the solution appeared harmful. It will be thus seen that the drug must not be used indiscriminately.

BIBLIOGRAPHY.

Bates, *New York Med. Journ.*, May 16th, 1896. Darier, *Annales d'Oculist.*, September, 1896. Abel, *Zeitschrift für Physiologie*. Maurange, *Gazette Hebdomadaire de Médecine et de Chirurgie*, September 19th, 1897. Bates, *New York Med. Journ.*, October 16th, 1897. Velich, *Wien. med. Blätter*, 1897. Mullen, *Internat. Clinics*, vol. iv, Series 7. Swain, *New York Med. Journ.*, December 24th, 1898. Corona, *Rif. Med.*, May 16th, 17th, 18th, 1898. Kyle, *Ophth. Rec.*, April, 1898. E. A. Peters, *BRITISH MEDICAL JOURNAL*, July 8th, 1899. Macleod Yearsley, *ibid.*, October 14th, 1899. Landolt, *Centralblatt für Augenheilkunde*, November, 1899. Lermite, *BRITISH MEDICAL JOURNAL*, February 25th, 1899. Whitehead, *ibid.*, December 23rd, 1899. Hopkins, *Phil. Med. Journ.*, May 5th, 1900. Bates, *Medical News*, March, 1900. Zimmermann, *Die Ophth. Klinik*, September, 1900. Grünbaum, *BRITISH MEDICAL JOURNAL*, November 3rd, 1900. Wolffberg, *Wochenschrift für Therapie und Hygiene des Auges*, December, 1900. Peters, *Lancet*, March, 1900. Reynolds, *American Medicine*, July 6th, 1901. Colburn, *Clinical Review*, July, 1901.

CASE OF TOTAL SUPPRESSION OF URINE DUE TO THE OBSTRUCTION OF BOTH URETERS BY RENAL CALCULI.

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CASES of obstructive suppression of urine are of peculiar interest: first, from their rarity; secondly, from the "latency" of the symptoms produced; thirdly, from the good results which may be anticipated from operative interference; and, fourthly, from the light which they throw upon the pathology of uraemia and on the functions of the kidney. These cases are, therefore, of interest not only to the physician but to the surgeon, the pathologist, and the physiologist.

For an account of the symptoms observed in the following case, and for obtaining permission to perform a necropsy, I am indebted to my friend, Dr. Fred Evans.