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Contributors

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EUCAINE AS A LOCAL ANÆSTHETIC IN THE SURGERY OF THE THROAT, NOSE, AND EAR.

[PRELIMINARY COMMUNICATION.]

BY

W. JOBSON HORNE, M.A., and MACLEOD YEARSLEY,

M.B.Camb., M.R.C.P.Lond.,

F.R.C.S.Eng.,

Physician in Charge

Surgeon in Charge

of the Department for Diseases of the Throat, Nose, and Ear,

Farringdon General Dispensary and Lying-in Charity.

SINCE the discovery of the anæsthetic action of cocaine by Niemann and its introduction into practice by Koller that alkaloid has held its own among the more valuable drugs of the *Pharmacopœia*, despite its disadvantages. But the untoward effects which have unexpectedly followed the use of cocaine have led those constantly using it to realise that its action is uncertain, and that it is therefore as well to keep antidotal remedies at hand.

Quite recently a rival has been introduced in the shape of eucaine, which is said to possess the anæsthetic action of cocaine without producing any of the toxic effects. The importance of a drug which could make good its claims to those properties it would be difficult to overrate, and, in order to arrive at its clinical value, we have lately used eucaine exclusively in throat, nose, and ear surgery.

Eucaine was first investigated by Dr. Gaetano Vinci, under the direction of Professor Liebreich. At the same time that Vinci's results were communicated to the Hufeland Society in Berlin,¹ Professor Emile Berger,² in Paris, was engaged in an extensive clinical examination of the drug. Both Vinci's and Berger's investigations, however, deal chiefly with eucaine from its ophthalmological aspect, one which is not within the province of this communication to deal with. A third observer in this branch of surgery is Professor Deneffe,³ of the University of Gand, Belgium. Dr. Hal Foster⁴ recently published some short notes on the Use of Eucaine Hydrochloride in the Nose and Throat, giving two cases—one of turbinate hypertrophy reduced by galvano-cautery, one of tonsillotomy. He also mentions other cases. His results were completely successful.

¹ April 16th, 1896.

² *Revue de Thérapeutique Médico-Chirurgicale*, 1896, No. 12.

³ *Le Scalpel*, 1896, No. 11.

⁴ *Langsdale's Lancet*, August, 1896.

Dr. A. L. Fuller⁵ used eucaine (by the endermic injection of 20 minims of a 10 per cent. solution) with complete success for the removal of a mole. He mentions also a case in which it was used to anaesthetise a tuberculous ulcer for curetting. Parlaghy, of Paris, is reported to have demonstrated the powers of eucaine before several physicians in the Assistance Publique de Paris, who proclaimed it an ideal anaesthetic. Other dental surgeons who have experimented with it are Kiesel, Warnekros, and Wolff, of Berlin, their verdicts are uniformly favourable. We shall have occasion to refer again to Kiesel's work.

Eucaine is the methylester of benzoyl-n-methyl-tetra methyl-gamma-oxy-piperidine-carboxylic acid. Its physical characters were thus defined to the Berlin Pharmaceutical Society by G. Merling.

Eucaine base crystallises from ether or alcohol in large glistening prisms, which melt at 104° C. Eucaine hydrochloride crystallises from methyl alcohol solutions in large glistening efflorescent prisms containing two molecules of methyl-alcohol, and from watery solutions in glistening leaflets containing one molecule of water of crystallisation and permanent in the air. Eucaine hydrochloride dissolves in about ten parts of water at room temperature.

Vinci carried out certain physiological experiments with eucaine on mice, rabbits, and dogs. He found that the instillation into the eye of a rabbit or dog of a 2 to 5 per cent. solution produced complete anaesthesia in one or two minutes, which lasted on an average ten or twenty minutes. A slight hyperaemic action was thereby developed, sometimes accompanied by slight symptoms of irritation of the conjunctiva. Eucaine acts upon the central nervous system at first as an excitant, later on in toxic doses producing paralysis. Small doses of eucaine increase the reflex excitability of mice and rabbits. Doses of $\frac{1}{3}$ grain per kilo body weight cause tonic and clonic convulsions, which last several seconds and recur at moderate intervals. An increase of the dose causes paralysis, under which the animal dies. Should the dose be resisted, the paralysis following upon the convulsions totally disappears. Vinci found that the pulse is gradually slowed by subcutaneous and intravenous injections of small and moderate doses to the extent of 20 to 30 beats per minute. There is no increase of blood pressure.

Berger's investigations corroborated those of Vinci upon all important points. The former demonstrated the action of eucaine to be analogous to that of cocaine, with the following important differences:

1. Eucaine is less toxic.
2. It slows the pulse.
3. It does not affect the pupils.

Dr. Charteris, Professor of Materia Medica and Therapeutics at the University of Glasgow, read a paper before the Royal Society of Edinburgh, in which he described experiments corroborating those of Vinci and Berger.

Before concluding this short review of the work done by others we should like to quote the following remarks of Kiesel⁶ summarising the advantages of eucaine:

1. The heart is not influenced in any way; with nervous patients I have often had the opportunity of observing that the pulse before the operation had risen to 120 or 130, whilst after injection it rapidly fell to its normal rate without irregularity, and maintained its normal character.

⁵ *International Journal of Surgery*, ix, p. 259.

⁶ *Zahnärztliche Rundschau*, 1896, No. 196.

2. Anæsthesia is more extensive than with cocaine, both as regards time and locality. In my experience the anæsthesia has in individual cases extended to the muscular tissues.

3. Solutions prepared with sterilised water and maintained at the room temperature remain always clear even without the addition of carbolic or salicylic acid, and never become flocculent like those of cocaine.

One more advantage—considered by Berger to be one of its most valuable properties—is that eucaine can be sterilised by boiling without undergoing decomposition.

In investigating the uses of eucaine in the surgery of the throat, nose, and ear, we feel that the points to which we should endeavour to direct special attention are:

1. The strength of solution required.
2. The rapidity, intensity, and extent of the anæsthesia.
3. The general and local action upon the circulatory system.
4. The after-effects.

Although upon all these points the opinions we have been enabled to form are favourable, we wish it to be clearly understood that they are but tentative, and our final verdict is withheld until we have given the drug a more extended trial.

The number of occasions on which we have employed eucaine is thirty-two, and they may be classified as follows:

A. Examinations:

1. Ear	...	...	...	...	2
2. Laryngoscopy and posterior rhinoscopy	...	...	...	...	4

B. Operations:

I. Ear:

1. Myringotomy	...	...	...	...	4
2. Furuncle	...	...	...	...	1

II. Nose:

1. Galvano-cautery	...	...	...	...	11
2. Spurs	...	...	...	...	4
3. Polypi	...	...	...	...	1
4. Other growths	...	...	...	...	1

III. Throat:

Tonsillotomy	...	...	...	...	4
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Of these, 19 were males varying in age from 4 to 42, and 13 were females from 6 to 70 years. Moreover, 6 of the patients (3 males and 3 females) had experienced the local anæsthesia of cocaine, a fact to which we shall revert later.

1. *Strength of Solution required.*—The solutions used were in three strengths, 2, 5, and 8 per cent. Of these, we found that the 2 per cent. is quite sufficient for anæsthetising the uvula, etc., for laryngoscopy or posterior rhinoscopy, and for aural examinations. In one case (Case II, male, aged 21) seven drops of a warm 2 per cent. solution dropped into the left ear and retained (with the head inclined to the right) for 5 minutes caused complete anæsthesia of the membrana tympani lasting nearly 20 minutes. Another man (Case xxvii, aged 42) who was most intolerant of laryngoscopy, permitted a complete examination. In the latter case, the 8 per cent. solution was first used, but on the next occasion the 2 per cent. was found sufficient, as also for Case xxxii and for Case xxix (posterior rhinoscopy). The 5 or 8 per cent. solutions have been used for operative procedures on nose, throat, and ear; and, although in Case iv an aural furuncle was incised without pain under the 5 per cent., and in Cases iii, vi, vii, and x the same solution sufficiently anæsthetised the membrana tympani to permit of myringotomy, it was generally found that for all operative measures on throat, nose, or ear the 8 per cent. solution was the more reliable. Furthermore (as will be noted below), eucaine being in our

experience (so far) devoid of unpleasant after-effects, it is of advantage to use the stronger solution. In Case 1 an attempt was made to cauterise an inferior turbinate body under a 2 per cent. solution, thus obtaining our only unsatisfactory result, the case requiring the 5 per cent. before proceeding.

Methods of Application Used.—1. For the ear, warm instillation retained for from five to eight minutes by inclining the head to the opposite side. 2. For the nose, either simple swabbing, or the insertion of a pledget of cotton-wool (soaked in eucaine) for five to ten minutes. 3. For the throat, simple swabbing with a pledget of cotton wool. On no occasion was eucaine applied by means of a spray.

2. *Rapidity, Intensity, and Extent of Anæsthesia.*—We have found that the anæsthesia is slightly slower in onset than that of cocaine, and that the cases required from five to ten minutes to elapse before they were ready for operation. When established the anæsthesia is fully equal to that of cocaine, and in this our opinion is endorsed by the patients who had previously experienced the latter. The duration of the anæsthesia is from ten to twenty minutes, fifteen minutes being the most usual. In the extent of the anæsthesia we have had no reason for dissatisfaction. We found that when the membrana tympani was anæsthetic, the tympanum and ossicular chain were equally so. A pledget of wool passed into the anterior-half of the naris rendered the inferior turbinate body anæsthetic in its whole extent. Similarly, simple swabbing of the tonsils rendered them anæsthetic throughout.

3. *Action upon the Circulation.*—*a. General.* So far our investigations as to the effect of eucaine on the pulse are inconclusive. In many instances the observations must be excluded as unreliable, on account of the mental influences in the patient due to operation. In the few instances, however, in which the observations may be considered reliable, the pulse has remained the same in rate and character throughout. In no instance have we noted any slowing of the pulse. In only three cases have we seen any unpleasant effects upon the circulation following an operation or examination under eucaine, and in each of these there was sufficient reason to otherwise account for the trouble without attributing it to the drug. We have judged it best to relate briefly these three occurrences.

CASE XV.—J. W., aged 25, male, has been suffering from chronic suppurative otitis media for twenty years. A warm 8 per cent. solution of eucaine was introduced into both ears and retained for ten minutes to allow of an examination with the probe. The anæsthesia was complete, but on touching a small granulation on the inner wall of the left tympanum the patient fell from the chair in a swoon, his face becoming livid, his lips blue, and his pulse small and irregular. He revived as soon as he was laid upon the floor, and then broke out into a profuse cold sweat. Later he stated that with the swooning sensation he experienced one of intense nausea, and thought he would vomit. He had experienced similar sensations before, while syringing the left ear. The unpleasant symptoms in this case were undoubtedly due to the combined cardiac and gastric aural reflexes.

CASE XVI.—A. C., aged 70, female, suffering from a large new growth in the right nostril. A piece was removed for microscopic examination after being swabbed with 8 per cent. eucaine. The pulse was 72, and remained unchanged in rate or character throughout. The local anæsthesia was complete. After the operation the patient complained of feeling faint. She had, however, been suffering from attacks of profuse epistaxis for five months, and was also the subject of aortic insufficiency.

CASE XXV.—A. A., aged 28, female.⁷ A nasal polypus was removed from this patient under an 8 per cent. solution of eucaine. Immediately after

⁷ *Proc. Laryng. Soc. Lond.*, vol. iv, I. p. 14

the operation she became faint, but did not lose consciousness. Pulse 108. This patient was in a very low state of health, having active syphilitic ulceration of the soft palate, and active tuberculous deposit at both apices, while she was also suffering from anæmia and debility consequent upon a recent miscarriage.

b. Local.—Our observations upon the local effects of eucaine on the circulation are at present incomplete, several points having arisen requiring further consideration. We have not, however, found it to cause hyperæmia of the turbinate bodies, in fact in several cases it has induced slight ischæmia. In two cases it has been noted that a turbinate body which before the application was in contact with the septum was not touching it in any part when anæsthesia was established. Of course, any ischæmia observed was not to be compared to that caused by cocaine. This is a point upon which we hope to make further observations in the future. In no case has there been the hæmorrhage after an operation which so often forms an unpleasant feature of cocaine anæsthesia. We would here wish to mention an apparent effect upon the salivary secretion. In the first case (XXVII), in which an 8 per cent. solution was used to anæsthetise the uvula for laryngoscopy, a considerable increase of saliva was noted. On another occasion, when a 2 per cent. solution was used, this feature was absent. A similar increased salivation was noted in Case XXXII under the 2 per cent. In Case XXIX (posterior rhinoscopy) the saliva was not increased. Out of four tonsillotomies, in only one was increased salivation noted. This is an important point for decision by future observation, as its upholding will establish another point of difference from cocaine (which decreases the salivary secretion), and may detract from the usefulness of eucaine in operations upon the oral cavity.

4. *After-effects.*—With the exception of Cases XV, XVI, and XXV, we have not noted a single instance of what might be construed as an unpleasant after-effect; the 3 excepted cases have been already related and explained. We have alluded to 6 cases as having experienced the effects of cocaine. In the first of these (Case III) a female, aged 55, the use of cocaine for the removal of a nasal spur had caused such alarming syncope as to necessitate the employment of ether and amyl nitrite. This case has since been three times under eucaine without the least discomfort. The 5 remaining cases all declared that, whilst cocaine had caused unpleasant sensations in the mouth and throat (variously described as "contracting," "freezing," and "numbing"), lasting for some hours, eucaine on the contrary rendered them anæsthetic to the operation without causing any after-effect greater than (in one case) an unpleasant taste lasting half an hour.

Several points remain for further experience to decide, but we consider that our results so far justify us in continuing the investigation. Eucaine cannot, however, wholly replace cocaine, since the effect of the latter in reducing the size of the turbinate bodies gives it a value as an aid to diagnosis which eucaine does not appear to possess.

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