

AGAINST ORTHODOXIES IN RABIES

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(THE material for this communication was collected in 1932 when the writer was officiating as Director at the Pasteur Institute of India, Kasauli*).

Infectivity of the biting animal versus susceptibility of the victim

Mortality in untreated cases bitten by rabid animals is low. The following statements taken from the literature are typical :—

'Infections from rabid dogs were said to occur in 16 per cent of bitten individuals, whereas 80 per cent of cases bitten by rabid wolves are said to become infected. Inasmuch as the lesions caused by wolves are more extensive this increased infectivity may depend on the amount of virus introduced' (Horder and Mathews, 1929).

'Not all persons bitten by a rabid animal develop the disease, the site and number of bites influencing its development. About 40 per cent of dogs and 16 per cent of human beings who are exposed become infected' (Williams, 1930).

'The following estimates of mortality among the bitten and untreated have been made on various cases by different workers: Doeberl—14.8, Hogyes—15, Marx—6 to 8, and Babes about 5 per cent. Figures collected at Kasauli from cases of persons who have come for treatment, but have received little benefit from it on account of late arrival, show that the percentage mortalities amongst untreated persons who have been bitten on the face, arm and leg must be greater than 9.5, 1.6 and 0.9 respectively. In dealing with such mortality figures it is well to remember that they have been calculated from large numbers of collected cases, involving large numbers of biting animals. They refer to the probability of death from the bite of an animal of average infectiveness. The infectivity of the biting animal is known to vary widely both amongst individuals and according to the stage of the disease. Thus in some cases it would appear that the biting animals are highly infective, and give rise to a mortality of 80 or 90 per cent amongst the creatures which they have bitten, whereas in others they appear to be incapable of transmitting infection at all' (Harvey and McKendrick, 1923).

With the exception of the last part of the last statement the impression created by these statements is that man is not a very susceptible subject to rabies from a rabid dog. The object of this communication is to point out that there is no justification for such an impression. At least equally possible is the assumption that the

* [Note.—The publication of this paper was withheld in 1932 in deference to the opinion of the Director of the Pasteur Institute, Kasauli, who looked upon it as a criticism of the treatment given in the Institute. In the annual report of the aforesaid Institute for the year 1933-34, however, a list of serious post-treatment sequelæ has appeared (part II, p. 4). It is presumed, therefore, that the objection no longer holds.

The paper was written under two names. The name of the second writer, who did not wish to have the paper published under his name, has been omitted. Otherwise the paper is materially unaltered.]

infectivity of the rabid dog varies. Immense strength is added to the assumption by the well-known fact in experimental work that some street viruses (1st passage) are almost inert, while others are almost cent per cent lethal.

On the hypothesis of variation in infectivity the enormous difference between the average mortality of 16 per cent and the extreme mortality of '80 or 90' per cent can also be explained in terms of simple arithmetic. There must be many more viruses of 0—16 per cent mortality (= infectivity) than of 16—'80 or 90' per cent mortality (= infectivity) to give an average of 16 per cent mortality (= infectivity). In fact the majority of viruses must be non-infective, for chances of the viruses being non-infective are greater than of the human beings being so capriciously distributed with regard to susceptibility, that, though sometimes an '80 or 90' per cent infection results, on an average it is only 16 per cent. The presumption is strongly in favour of a variation in infectivity as opposed to a difference in susceptibility.

Incidentally, the fact that bites from wolves give a higher mortality figure would suggest better, more natural and original conditions for the 'maturation' of the virus in forests than in inhabited areas, if the factor of the greater severity of the bite could be controlled. The writer (Greval, 1932 and 1933) has contributed to this view in connection with rabies in the wild carnivores.

The supposed greater susceptibility of the dog may be entirely due to the fact that dogs bite dogs mostly on head and neck, parts which anatomically are better suited for the planting of the infection.

The question of susceptibility versus infectivity would hardly have arisen if it were not so difficult to obtain correct health returns of untreated and bitten cases fulfilling these two conditions: (i) The cases should fall into batches bitten by the same animal on the same day and (ii) there should be at least one death from hydrophobia in each batch. It is only by analysing batches of this kind (controlling factors of mechanical and anatomical importance) that a true susceptibility of man to hydrophobia could be worked out. As an illustration is given the following batch recorded at Kasauli :—

Locality of the incident—Jaipur (State).

Date—14th August, 1932.

Number of persons bitten—4.

Number of deaths among the untreated cases up to 15th October, 1932—3.

These are the details: Four men were bitten by the same dog on the same day; the dog was then killed; about 55 days later two of the men developed hydrophobia and died; the other two, then, started for Kasauli; arriving at Kasauli one of them, a class III case (Hempt), developed hydrophobia (after one day's treatment = no treatment) and died.

Assuming that the fourth case, a class II case (Hempt), would not have developed the disease even without the treatment (an assumption not really justified in view of the different degrees of bites having different incubation periods) the mortality from the bite of this dog in untreated cases was 75 per cent.

Deaths from licks

'Opinion is equally divided as to the necessity of submitting to anti-rabic treatment persons whose skin has come into contact with the saliva of a rabid animal (or human being suffering from hydrophobia), if there be no visible break in the continuity of the skin surface'.

Resolution II, 4, of the International Rabies Conference, League of Nations (1927).

The common practice in India is not to advise treatment for licks if there are no apparent skin lesions. The following military case is quoted :

Lieutenant A., aged 26.

Previous history: His dog died of rabies some six weeks ago. States that on the occasion the dog caught hold of his forearm in its mouth but there was no abrasion on the skin. No anti-rabic treatment given.

History of malaria, August 1931: First felt unwell 20th August, 1932, when he experienced pain and hyperæsthesia of his right forearm and also felt tired. Bitten four times by wasps few days ago. On 21st August, 1932, he was still off colour and had a slight rise of temperature. He read up the symptoms of rabies and reported sick on 22nd August, 1932.

Present condition: Complains of being tired and of very slight discomfort in his right forearm. Is very anxious and when being examined collapsed and vomited. On being given a glass of water he found difficulty in swallowing, and gasped for breath. Heart shows a mitral murmur when patient is sleeping (lying?). Sound normal when erect. Temperature, 99.6°F. Respiration, 18. Pulse, 72. No headache or other symptoms. History and condition give rise to the suspicion of hydrophobia.

Later: Patient seems more comfortable. Vomited. [Bromide and chloral given.]

23rd August, 1932. Patient did not sleep well. Vomited his sedative. He is still very anxious, but has some control over his dysphagia. [Bromide and opium given per rectum.]

5 p.m. Patient is much better and has slept. His improvement may be due to the effect of his sedative not having worn off: or it may be genuine improvement.

7-30 p.m. Patient is not so well. His irritability is increased.

9 p.m. Patient is worse and appears to be definitely suffering from rabies. His saliva is rejected, his buccal muscles are working and his irritability is so intense that he is with difficulty kept in bed. Place on 'dangerously-ill' list to-morrow [morphine, grain 4, given].

11 p.m. Patient is worse. He looks exhausted and there is now some spasm of the legs; morphine repeated.

24th August, 1932. After a restless night, patient collapsed suddenly and died at 8-20 a.m.

Copy of a letter dated 24th August, 1932, from Major L. M. N., Staff Surgeon,.....Lines, X, to the Officer Commanding,.....X.

On Sunday, 26th June, 1932 (forenoon), I was sent for by Lieutenant A., who informed me that his dog had gone 'mad' and had bitten about seven other dogs before it could be secured. He had it sent to the Cantonment Veterinary Officer for observation immediately and I was informed that it died later that Sunday. I carefully examined Lieutenant A's arms, forearms, hands and knees and legs and could find no signs of any recent abrasions or cuts and asked him if

at any previous time within the last week or so he had been bitten or had any cuts or scratches that might have been licked, but he could not recollect any. He admitted that he had often been licked whilst playing with the dog and said that the only possible way he might have got any dog's saliva in contact with abrasions of his skin was possibly when he rubbed his cheeks or chin with his hands after shaving. There were no signs of cuts or abrasions on his face when I examined him. I put it to him that he could have a course of anti-rabic treatment if he wished to but that as he had no signs of any cuts or abrasions that I would not order him to have it.

This is a very unfortunate case. From the careful examination carried out by the Staff Surgeon there would appear to have been *no urgent indication* for anti-rabic treatment when the patient was seen immediately after the dog became rabid.

(Sd.) O. P. Q. R.,

Major, R. A. M. C.,

D. A. D. P. X. District.

3rd September, 1932.

An unfortunate example of the risk taken by patients who decline anti-rabic treatment, even when there appears to be *no possibility of infection*.

(Sd.)

Lieut.-Col., I. M. S.,

3rd September, 1932.

This is clearly a case of death from a lick with no visible break in the continuity of the skin surface.

The following case was recorded by Malone (1928) in the Annual Report of the Pasteur Institute of India, Kasauli, for 1928 :

'Case 16; table XIII; European; dog proved rabid; saliva came in contact with scratches on both hands; patient was not bitten by the dog.

This is the first death from hydrophobia in a patient "licked" by a rabid animal and treated with carbolized vaccine'.

The table XIII shows that the patient, a female, class I (Hempt), started treatment on 7th May, 1928, and finished on 10th May, 1928. Death occurred 90 days after the lick. The treatment, to say the least, was half-hearted. In this case scratches are admitted. They were not, evidently, regarded as serious.

The Annual Report for 1908 gives another case of infection from a small scratch, recorded by Carter (1908) :

'Two boys aged about 12 years were returning from school when one was unexpectedly attacked and bitten by a rabid dog which escaped into the jungle. The boys state that the dog was furious and frothing from the mouth. The companion of the boy bitten, not observing a small scratch he himself had on his left thumb, touched the wound of his friend. The boy bitten came to Kasauli for treatment, whilst his companion, who received no treatment, developed hydrophobia and died 40 days after the accident'.

Here again a 'small' scratch was disregarded even though the dog was definitely recognized as rabid.

It is admitted that these occurrences are rare. The fact, however, remains that they do exist. Possibly some of the cases of unexpected death from unexplained asphyxia or tetanus are really cases of hydrophobia in which the infection has not been acquired in the usual way by a bite.

In the opinion of the writer, all cases of licks (class I, Hempt) should be given at least the same treatment as cases of superficial bites (class II, Hempt). He has taken three anti-rabic courses of varying strength, during the last 12 years, after accidental contacts with known infectious materials, in the laboratory.

Sequæ of anti-rabic treatment

A. Paralysis of anti-rabic treatment.

'We have come to the conclusion', says Remlinger (1927), 'that certain institutes conceal their cases'. Or, again, more charitably (Remlinger, 1927a), 'certain mild cases of facial paralysis or retention of urine passed almost unnoticed. Other cases occur after the conclusion of the treatment, when the patient has already returned home. The director of the anti-rabies institute is either not notified at all or is simply informed by letter. Such a communication attracts little attention. Soon the matter is forgotten, and it is with quite good faith that a negative reply is given to a demand for information'. The following cases have been collected at Kasauli or centres supplied from Kasauli, between March and October 1932. The severity of lesions has varied. No death has occurred. Presumably the recovery has been complete :

1. *Incontinence of urine in a European child, aged 2½ years.*

'In May 1931 my daughter then being 2½ years of age had a course of anti-rabic treatment.

I should like to know if as a result of the treatment she could develop bladder trouble, as since that date she has been a hopeless bed-wetter.

The desire to urinate comes on her quicker than we can get her to the commode. The doctor advised us to give her no liquids after 4 p.m. and awaken her frequently during the night. We have tried this but with little success. I would be very grateful for advice in this matter and to know if she will grow out of this rather unpleasant habit'.

P.S.—The trouble has grown on her very gradually.

A 5 per cent brain substance vaccine had been used. Attempts at obtaining more information through medical men did not succeed. But on 15th October, 1932, the father wrote:—

'My little girl is progressing very favourably and is very gradually growing out of the habit of wetting her bed. If I may be allowed to express an opinion, I think it is really bladder weakness and not any after-effects of the anti-rabic treatment she had. Thanking you.....'

If this case is a case of paralysis of anti-rabic treatment, two points are worth recording: (1) age incidence, children having been considered practically immune from the paralysis and (2) incontinence instead of retention.

2. *Pain in hands and difficulty in micturition in an Indian patient.*

'With reference to my case no. 4248, dated 1932, of p. 4, I beg to inform you that from the time I came to Benares I feel very much heat, on account of this reason my mind is roaming always, besides this I have got pain in my both hands and feel some trouble in making water. Nowadays I am in Benares. Please reply me soon as I am in great trouble.

For this act of kindness I shall remain thankful to you'.

A 5 per cent brain substance vaccine had been given. No further information could be obtained through a medical man. Presumably the patient was suffering from a mild neuritis of the arms and a paresis of the bladder. Incidence in an Indian case is noted.

3. *Paralysis of the bladder and the rectum with a paresis of the legs in a European patient.*

'With reference to your letter no. SP/12848, dated 7th August, I would advise that towards the completion of the anti-rabic treatment in L. my stomach became very tender and after the treatment was finished the inflammation appeared to settle in both my groins, showing as a red weal from the fork to the buttocks. I went to D. for four days' rest but I felt decidedly off colour, developing severe headache. I returned to A. and a couple of days later I developed fever and severe pain in my back, making it difficult to find a comfortable spot to sleep. After a couple of days with no relief, my bladder and bowels refused to function entirely, so I went into the M. hospital L., for treatment under Colonel N. and Colonel B. and remained there 5 or 6 days. The urine was taken off by means of a catheter for three days after which I began to pass urine slowly unaided, and thereafter steadily improved. The only medicine I was given in hospital as far as I know was P. C. Before and whilst I was in hospital also for about a month afterwards I had a peculiar feeling in my legs and feet as if they were semi-paralysed. This has now completely worn off.

I would mention that whilst taking the anti-rabic treatment in L. necessitating a motor ride of 70 miles each way, it was exceedingly hot, and probably the long motor drive in the heat had something to do with my subsequent illness.

The above particulars are as correct and complete as I can remember and I trust will be of use to you'.

Yours faithfully,
F. E. B.

This is definitely a case of paralysis of anti-rabic treatment with symptoms typical of the involvement of the cord in the lumbar region. The fact, however, does not appear to have been recognized by anybody at any of the stations mentioned (all big stations). At one of the stations (D.) the likelihood of an accidental puncture of the urinary bladder, during the course of injections, was seriously considered. This consideration and the consequent fear on the part of another patient who had gone to Kasauli from D. for an anti-rabic treatment was responsible for an enquiry into this case which otherwise would not have been recorded at all.

The red weal locally on the point of injections or elsewhere at a distance is known to occur.

A 2 per cent brain substance vaccine had been given for licks (class I, Hempt).

4. *Paralysis of the bulbar type in an Anglo-Indian girl, aged 8 years.*

'..... On the 10th August my youngest daughter was bitten on her feet by my own bull-terrier pup, aged three months. This pup was definitely rabid..... developed paralysis of the legs and died on the 14th night. My child had her bites, amounting to nearly 16 in all, cleaned with ether..... and within half an hour to one hour had her anti-rabic injection, classes III and IV vaccine. Nothing untoward happened till the morning of the 23rd August when all she complained of was that she was very weak and had to be carried to the bungalow, a distance of twenty yards from the B. M. Hospital. That evening we noticed her voice

had sunk to a whisper. She was suffocated and could not drink or eat anything. She was taken into B. M. Families Hospital at M. For four days her condition was critical. Her eyes were blood-shot and at the very attempt at swallowing fluids only came up. Three days later she got a certain amount of paralysis of her left arm. Immediately on completion of treatment she broke out all over with the huge sores and is now recovering slowly'.

Remarks on the treatment card by the anti-rabic centre at M.

Child completed treatment on 23rd August, 1932, and admitted into hospital on 25th August, 1932, suffering from laryngitis, acute catarrhal, with some aphonia, no pyrexia and no other unusual symptom. Throat swab negative to K. L. B. Some congestion of throat. No membrane. Treated with inhalation and throat paint. Discharged 30th August, 1932, normal.

The two statements taken together exclude diphtheritic paralysis otherwise there is not much agreement between them. The father of the patient, let it be noted, is also a medical man of some experience. There is no reason why this case should not be diagnosed as one of bulbar lesion. Such cases have been described as representing a culmination of the Landry's ascending type of paralysis of anti-rabic treatment. 'There is difficulty in closing the mouth and the eyes, and in making any sound (the patient speaks only in a whisper and without being able to articulate distinctly). There is difficulty, too, in swallowing, fluids being returned through the nose or causing coughing by entering the larynx, and syncope, tachycardia and dyspnoea supervene. After an extremely anxious time, during which it was doubtful whether or not the bulbar symptoms will cause death at any moment—and this indeed occurs in 30 per cent of the cases—the symptoms begin to improve and then disappear in an inverse order to that in which they developed. . . . The recovery is complete in a few days or at most in two or three weeks. Weakness, however, may persist for a very considerable time, with a tendency to fatigue, especially in the lower limbs' (Remlinger, 1927b).

Accepting this case as one of paralysis of anti-rabic treatment, then, there are three points to note: (1) age incidence (children not being regarded as liable), (2) race (only Europeans in India are regarded as liable) and (3) primary bulbar involvement (as opposed to a culmination of the Landry's ascending type of paralysis of anti-rabic treatment).

The significance of the 'huge sores' is not understood.

A 5 per cent brain substance vaccine had been given for deep and multiple bites (class IV, Hempt).

B. Epileptiform seizures during anti-rabic treatment.

Only two cases are recorded. One occurred at Kasauli and the other at one of the anti-rabic centres served by Kasauli. Both of them caused quite a commotion at the time but recovered.

Case 1. A military case, European, treated at a military centre.

27th July, 1932. Saw patient at 11-30 p.m. Tonic contraction. Asphyxia. Cyanosis present. Has been having anti-rabic treatment. Some paralysis of epiglottis and great hardness of abdominal muscles. Artificial respiration had to be resorted to on three distinct occasions following contractions. Pulse thready. Sweating profusely. No foaming or frothing from mouth. Unconscious and unable to speak. Did not pass urine or faeces unconsciously during spasm.

Condition improved on applying mouth gag and drawing out tongue with tongue forceps.

The Orderly Medical Officer saw patient and left him in a quietened condition.

28th July, 1932. Quiet and restful. Pulse normal. Respiration normal.

The fits occurred after 10 injections. The treatment was discontinued.

Case 2. A non-military case. European treated at Kasauli.

C. G. R., male, aged 49. Under treatment for a class III bite. History of an operation on the brain and treatment with radium several years ago in London.

On the fifth day of treatment complained of loss of sensation in the legs below the knees. Pressure on Achilles' tendon without response. Knee, ankle and plantar reflexes absent. Loss of sensation to pin-pricks below the knees. Pupil normal. Throat and conjunctiva normal. Superficial abdominal reflexes normal.

The general feeling described as one preceding a 'brain attack' to which the patient apparently had been subject on occasions under mental strain. Treatment suspended.

The patient seen in his hotel next morning in status epilepticus. Several such attacks for two days with intervals of consciousness. Sedatives given.

Recovery complete in a week. Patient left fatigued and tired looking (not altogether due to the fit—domestic worries). In another week the patient left for his station in a normal condition, having taken a modified course of treatment.

No details could be obtained about the previous operation of case 2. The case cannot be definitely regarded as representing a sequel of the anti-rabic treatment. But for case 1 it would not have been described. It shows, however, that even under stormy conditions in the brain a modified course of treatment (1 per cent brain matter) is possible.

Both these cases were being treated with 5 per cent brain substance vaccine when the fits occurred.

C. High temperature resulting from anti-rabic treatment.

A slight rise of temperature during anti-rabic treatment is known to occur. It may even simulate the chill and the sweat of malaria. After excluding malaria by a blood examination no further notice need be taken of it. An interruption of treatment is generally not called for. In 1932 there occurred at Kasauli, however, the following two cases of high temperature necessitating an interruption of treatment:

Case no. 3454 (Kasauli), M. H., European, adult, female. Under treatment for class III bite. History of malaria. Blood repeatedly negative. Admitted 27th May, 1932. Did not complete treatment.

Case no. 3772 (Kasauli), B. T. S., Indian, 28, male. Under treatment for class III bite (Hempt). No history of malaria. Blood repeatedly negative. Admitted 12th June, 1932. Discharged 28th June, 1932.

After the first three or four injections the temperature would shoot up to 103-104°F. a few hours after an injection and would remain stationary until midnight when profuse sweating would occur. Next morning the patients would feel exhausted and refuse treatment. If given a day off they would look and feel quite well, and partake (within prescribed limits) of the social amenities of a pleasant hill station in summer. There was a definite loss of weight. The first case gave up the treatment. The second case was given several days off. Both the cases were being injected with a 5 per cent brain substance vaccine.

D. Troublesome insomnia resulting from anti-rabic treatment.

Two cases occurred that caused considerable anxiety at the time. They recovered, presumably, completely.

Case no. 3454 (first case under C) on her return home developed a very troublesome insomnia. She wrote:—

12th August, 1932.

My husband suggests that I should write and ask you if you could advise me about the after-effects of the dog treatment. Ten days after the last injections I had fever on and off which was proved definitely not to be malaria and then I gradually became unable to sleep at night, until now even sleeping draughts won't help me, and for the last two or three nights I have not been able to sleep until daylight. It's really awful, and we wondered if any other patient had suffered like this, and if you could help me in any way?

Advice was given. On 24th October, 1932, information was received from her local medical adviser that she had left the station and that the insomnia had improved.

Case no. 5627 (Kasauli), F. L., European, aged 40, female. Treated for class III bite (Hempt). Admitted 15th September, 1932. Discharged 29th September, 1932. Developed insomnia a week after completion of treatment.

Her husband, who had come for anti-rabic treatment later than his wife and had brought her back to Kasauli with him, stated that she had not slept at all the previous night. She looked tired and was inclined to be tearful. Full doses of bromides, an atmosphere of quietness and encouraging remarks on the capacity of the nervous system to stand the strain like that of insomnia restored her to the normal in four days.

A feature common to both the cases was a previous abdominal operation involving probably the pelvic organs. A 5 per cent brain substance vaccine was used.

E. Other complications of a more-or-less local character.

One case of dry and scaly condition of the skin persisting long after the treatment, reported from one of the centres supplied from Kasauli, was the only one that could be included under this heading.

(i) Erythematous patches at the site of inoculation, (ii) scarlatiniform erythema, (iii) urticaria, (iv) acute abscess and septicæmias to which they may give rise, and (v) sub-acute abscess in corpulent subjects, referred to by Remlinger (1927c), were not seen.

Comments on the sequelæ

Out of the four cases of paralysis three occurred with intensive treatment. The fourth case which, however, was the only typical case of paralysis of anti-rabic treatment occurred with a mild treatment. Opinion generally held is that the incidence of paralysis is independent of the intensity of treatment. It may be so.

Out of the six cases of other complications, fits, high temperature and insomnia, all six occurred with intensive treatment.

The racial influence may be proportional to the facilities for expression.

Carbolization of the vaccine does not ward off the sequelæ. It would not be necessary at all to state this point if the opposite were not so widely believed in India by the general medical profession. In the early history of the Pasteur Institute of India, Kasauli, with introduction of a carbolized vaccine, cases of paralysis of anti-rabic treatment appear to have been absent. Cunningham in 1930 (Cunningham, 1930), however, reported four cases. Later two cases were reported by Shortt (1931) in the Annual Report for 1930. The writer is inclined to believe that the apparent lack of the sequelæ was due to a lack of an efficient system of correspondence. Such a system was evolved and perfected by Cunningham.

In spite of the fact that the morbid anatomy of paralysis of anti-rabic treatment (and presumably of all allied complications explicable on the basis of a dysfunction of the nervous control) has assumed a formidable aspect, in changing from a vascular lesion (Remlinger, 1927d) to a demyelination (Bassoc and Grinker, quoted by Hadfield and Garrod, 1932), such as occurs in post-vaccinal encephalitis on the one hand and in disseminated sclerosis on the other, there is some satisfaction in knowing that all the cases reported have completely (with a proviso of probability in two only) recovered.

No attempt has been made to calculate percentages of the various sequelæ as it is felt that all cases of sequelæ have not been collected. The first case of paralysis* described occurred amongst cases treated in 1931. All others occurred amongst cases treated in 1932. The total number of cases treated at Kasauli and centres supplied from Kasauli in 1931 was 11,147. Figures for 1932 are not yet available. [The number treated in 1932 was 12,801.—Editor, *I. M. G.*]

Summary

1. The importance of the infectivity of the rabid dog, as opposed to susceptibility of the victim, in the development of hydrophobia is discussed.

2. Deaths from licks of rabid dogs have been reported from records of the Pasteur Institute of India, Kasauli. Special attention has been

(Continued at foot of next page)

EPITHELIOMA ADENOIDES CYSTICUM
REPORTS OF THREE CASES

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UNTIL recently, tumours arising from the epithelium of the skin and its appendages were generally known as carcinoma of skin and no attempt was made to classify them into various types according to the predominant type of cell of the new growth. To Krompecher (Kaufmann, 1929) belongs the credit of separating the various forms of skin carcinoma into:—

1. A basal-celled type called 'basal-cell epithelioma'.

2. A squamous-celled type.

Some authors call them non-cornifying, and cornifying carcinoma or acanthoma. These two types differ not only in their histological characters but also in their clinical course, response to treatment and progress. Hanse-mann (Ewing, 1928) contends that since all

(Continued from previous page)

drawn to a recent death from licks with 'no visible break in the continuity of the skin surface'.

3. Sequelæ of anti-rabic treatment have been recorded. Deviation from the type has been noted in cases of paralysis. Cases of high temperature, insomnia and fits have been included.

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epithelial tumours arise from the basal cells the term basal-cell carcinoma was not quite suitable. But Krompecher's choice of term may be justified on the ground that basal-cell epithelioma is composed of basal cells which retain their morphological characters throughout their existence, in contrast to the squamous-cell carcinoma in which the basal cells are further differentiated and lose their original characters. Epithelial tumours of the skin showing a tendency to reproduce the structure of dermal glands are designated as adenoid epithelioma. These tumours may show cystic spaces and are then known as epithelioma adenoides cysticum. We have come across three cases of this type which are reported here.

REPORTS OF CASES

CASE I. *Clinical history*.—Female, aged 30 years. The trouble began one year ago with headache and pain in the left eye. The latter gradually protruded and vision began to fail. The conjunctiva, congested and œdematous, bulged in front of the socket and the lids could not be closed over the eyeball. Gradually headache which was originally severe changed into pain of a dull character and vision became completely lost.

On admission, she showed marked exophthalmos, the eye projecting about one inch in front of the socket. The eyeball, which was collapsed and tensionless, was situated at the summit of the swelling. On palpation through the conjunctiva, a firm lump appeared to fill the socket entirely.

The conjunctiva was incised round the eyeball which was excised. There was no sign of infection within the eyeball. The growth felt hard and appeared to fit tightly in the socket. On passing the handle of the scalpel round the growth, it was possible to separate it from the surrounding bony walls without force, it was not attached to the periosteum except at one spot, even here not firmly. There was very little hæmorrhage. At the operation, the lachrymal gland was not identified, as such, and the surgeon thought that it had either entirely atrophied as a result of pressure of the tumour, or that the growth arose from the gland and had replaced it. There were no metastases. The patient left the hospital two weeks later in good condition and well satisfied except for the loss of the eye.

Naked-eye appearance of the growth.—The growth, $1\frac{1}{2} \times 1$ " in size, was conical in shape, and felt firm like a hard fibroma without any glandular lobulation. In section, it presented a uniform greyish-pink appearance without oozing of any fluid.

Microscopic examination.—Section of the orbital growth under low power shows numerous cell collections of varying sizes which are separated from one another by bands of dense fibrous tissue. These cell masses contain a number of spaces of different sizes which are either empty, or containing either an acidophilic or a basophilic substance (plate I, figure 1). There is no stratified epithelium on the surface. Under high power, the periphery of a cellular mass is seen to consist of elongated cells bearing a close morphological resemblance to the basal cells of the epidermis which are arranged in a palisade manner (plate I, figure 2). The central zone of some of the cell groups consists of cells in various stages of disintegration, for example, those in the centre are devoid of nuclei and the remnants are acidophilic in reaction. As we proceed towards the periphery, the degeneration becomes less marked so that the cells at the extreme periphery are normal in their staining properties. Some of the cystic spaces are filled with a colloid-like substance. In others, a brownish amorphous substance is present. The contents are homogeneous, granular, or laminated. The cells internal