EROSION OF THE ALA NASI FOLLOWING TRIGEMINAL DENERVATION

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Introduction

It is the purpose of the present paper to draw attention for the first time to a clinical syndrome observed in a series of eight patients in whom anæsthesia of the skin supplied by one trigeminal nerve had been produced either by retroganglionic section of the root fibres or by the injection of alcohol into the Gasserian ganglion. The most striking feature in seven of the eight cases was an erosion of the numb nostril. Allied with this were paræsthesiæ, self-inflicted trauma, epistaxis, nasal fissures, and facial ulcers. The following table analyses the frequency with which these phenomena were met with in the present series.

Six of the eight patients complained of unpleasant sensations in the anæsthetic half of the face and seven admitted to having rubbed, picked, or otherwise traumatized the numb skin, particularly the nostril. It is the thesis of the present communication that the patients injured the anæsthetic skin in an attempt to rid themselves of paræsthesiæ and that this is the main mechanism in the evolution of the skin lesions; tissue inferiority due to advanced age and superimposed infection very probably influence their course. It is the writer's belief that trauma not only affects a numb area more intensely and more frequently but that the response of an anæsthetic part to injury differs from that of the normal. A full discussion, however, concerning the trophic function of sensory nerve fibres lies outside the scope of the present clinical report.

Case Reports

Case 1. W. C., aged 70 years, male.
Trigeminal neuralgia. Alcohol injection into right Gasserian ganglion. Keratitis right eye. Erosion right ala nasi. Ulcers on right side of face.

The patient presented himself for examination in August 1941, ten years after the right Gasserian ganglion had been injected with alcohol. The injection was followed by complete and lasting anæsthesia of the right side of the face and by freedom from pain. Keratitis which threatened the right eye some days after the injection was successfully treated by tarsorrhaphy. From the date when the right side of the face was rendered anæsthetic the patient was uncomfortably aware of his breathing, for the right nostril seemed to him to be blocked. He concluded that crusts had formed in the nostril and when he attempted to pick them out the nostril bled. In the years that followed, the right ala nasi gradually became thinner and wore away, but in the months preceding this examination the process had been accelerated.

About May 1941 a small, superficial ulcer appeared on the right upper eyelid, another on the right cheek and a third on the skin of the right lower jaw. The last of these healed with the application of ointment and left no scar; the other two were still present three months later. They appeared as superficial erosions of the dermis, their floor was covered with dried serum and blood and their edges were sloping and soft. The skin adjacent to the ulcers showed no inflammatory reaction. The condition of the right nostril can be appreciated from Fig. 1. The loss of substance included the whole thickness of the anterior half of the ala and extended into the skin immediately above. The edge of the skin defect was covered with epithelium, but posteriorly at the junction of the ala with the floor of the nose there was a fissure covered with a slough. There was no enlargement of lymphatic glands and although the patient was unusually thin he had not recently lost any weight.

TABLE I

Case	Age	Sex	Paræsthesiæ	Trauma	Epistaxis	Fissure	Erosion	Ulcers	Keratitis	Anæsthesia of divisions	Operation
1 W.C.	70	M	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1, 2, 3.	Alcohol injection
2 S.McD.	46	F	Yes	Yes	Yes	No	Yes	Yes	Yes	1, 2, 3.	Root section
3 D.P.	65	F	Yes	Yes	Yes	No	Yes	Yes	No	1, 2, 3.	Alcohol injection
4 E.R.	61	M	Yes	Yes	Yes	Yes	Yes	No	No	1, 2, 3.	Alcohol injection
5 J.B.	49	M	Yes	Yes	Yes	Yes	Yes	No	Yes	1, 2, 3.	Alcohol injection
6 A.S.	58	F	No	Yes	Yes	Yes	Yes	Yes	No	1, 2, 3.	Alcohol injection
7 A.E.	50	F	Yes	Yes	Yes	Yes	No	No	No	(1), 2, 3.	Root section
8 E.H.	40	F	Yes	Yes	Yes	No	Yes	Yes	Yes	1, 2, 3.	Removal acoustic neuroma

Analysis of the eight cases forming the material of the present series.

A year following this examination the man died and his medical attendant stated in answer to an enquiry that death had been due to myocardial degeneration. More ulcers had appeared on the right side of the face and had bled. The condition of the right nostril had remained stationary.

Comment.—Many features presented by this case will reappear in the descriptions of the other patients in this series. The anæsthesia of the right side of the nose and the inability to appreciate the passage of an air-current very naturally led the patient to conclude that the nostril was occluded. In much the same manner the failure to recognize movements of the anæsthetic portion of the face is frequently rationalized as “stiffness” or “swelling.” The

looked as if the superficial layers of the skin had been rubbed away without causing an inflammatory response. This may in fact have happened, but no history of trauma could be obtained. Strange that the ulcers should have appeared ten years after the alcohol injection at the same time as the erosion of the nostril increased. One might speculate *a priori* that an anæsthetic skin area would be among the first tissues to show the effect of a lowering of general vitality and reduction of regenerative powers due to advanced age. Possibly the transfer of infected material from the nose onto the face by the patient's finger might have caused the ulcer.

Case 2. S.McD., aged 46 years, female.
Trigeminal neuralgia affecting the right second and third divisions. Partial root section 1935. Total root

FIG. 1.—The appearance of Case 1, ten years following an alcohol injection of the right Gasserian ganglion.

FIG. 2.—Case 2.

phrases “crust formation” and “blocking of the nose” may not at first have formulated themselves in the patient's conscious mind, but he picked his nose as if it were actually obstructed. Epistaxis followed the self-inflicted trauma which, applied to an insensitive area, may have been excessive, and the hæmorrhage probably originated from the fissure between ala and floor of nose rather than from the septum. In four other cases of the present series a similar fissure was observed at the same site. Repeated gross trauma appears as the only obvious explanation of the progressive erosion of the nasal wing, but it seems unlikely that normally sensitive skin would react in this manner if it were subjected to similar mechanical stimulation. The skin defect was not surrounded by an area of inflammation and neither swelling nor redness were observed in any of the other cases whose alæ nasi had become eroded. This negative finding suggests that the absence of the protective and reparative processes which are associated with inflammation may to some extent account for the progressive destruction of the anæsthetic ala.

The ulcers on eyelid, cheek and lower jaw were not typical of any of the commoner skin diseases. They

section 1936. Erosion right ala nasi. Ulceration right side of face.

A fractional division of the root of the right trigeminal nerve was performed in 1935 and resulted in complete anæsthesia of the third and patchy anæsthesia of the second division. A year later the patient complained of neuralgic pain in the right eye and right side of the nose. The remaining root fibres were divided at a second operation, which produced anæsthesia in all three divisions. Immediately following the operation a few herpetic vesicles appeared on the upper lip; the eruption cleared up after a few days. The right cornea became œdematous, a small ulcer formed in its centre and since conservative treatment failed to check its progress a tarsorrhaphy was performed.

She presented herself for examination four years later with a well-marked triangular defect of the right ala nasi (Fig. 2). The patient claimed to have first noticed the nasal erosion at the time when the tarsorrhaphy was performed in 1936 at another hospital about three weeks after the root section. She also complained of a recurrent swelling on the right side of the nose near the inner canthus of the eye. Frequently superficial ulcers developed on the right side of the face and healed without leaving a scar. She volunteered the information that she could not lie on her left side without becoming distressed by a choking sensation. She admitted that she occasionally picked her nose and made it bleed.

Comment.—The patient was examined by ophthalmic and nasal surgeons, but no local cause was

found to account for the recurrent swelling of which the patient complained. It may be surmised that the swelling was really a subjective sensation, particularly as the patient has not attended again although she was asked to do so should the nose swell. The distress which lying on the left side caused her may equally be regarded as the result of the anaesthesia and failure to appreciate air passing through the right side of the nose. Self-inflicted trauma, epistaxis and recession of the ala nasi were again prominent features in this case and facial ulcers had been noticed by the patient, but had not been objectively verified.

Case 3. D.P., aged 65 years, female.

Trigeminal neuralgia affecting right second division. Alcohol injection of ganglion producing complete anaesthesia of all three divisions. Epistaxis, recession of anaesthetic nasal wing.

In 1936 this patient had the first attack of major trigeminal neuralgia confined to the second division on the right side. In 1938 the Gasserian ganglion was injected with alcohol and anaesthesia of the whole right side of the face resulted. Some days later the right eye became blood-shot, but the hyperaemia subsided with conservative treatment. A fortnight or so after her

FIG. 3.—Case 3.

discharge from hospital she began to lose blood from the right nostril; the hæmorrhage was at times profuse and for more than a year it occurred several times a week. She was in the habit of placing a handkerchief on her pillow at night to absorb the blood. A red patch later appeared on the border between upper lip and floor of nose and gradually spread upward and downward. The patient herself thought that this raw area had been produced by the frequent rubbing of her lip and nose to wipe away blood. Six months following the injection she first noticed that the nostril had shrunk and when she presented herself for examination about a year after the injection the erosion was very marked (Fig. 3). She was advised to pack the nostril gently with vaseline gauze but to refrain from otherwise touching it. Five weeks later she reported that the epistaxis had become much less and that the nasal ulcer was healing. In 1942 she stated in answer to an enquiry that she had had no further hæmorrhage, and the erosion of the nostril had not progressed.

Comment.—This patient did not complain of paræsthesiæ but the connection between self-inflicted trauma and the superficial ulcer at any rate is obvious.

Case 4. E.R., aged 61, male.

Sixteen years bilateral trigeminal neuralgia treated by repeated alcohol injections. Epistaxis left nostril, ulceration and retraction of left nasal wing. Fissure along floor of nose.

Sixteen years ago this man had the first attack of trigeminal neuralgia on the left side of the face. Five years later the left Gasserian ganglion was injected with alcohol and recurrence of the neuralgia made five more injections necessary during the subsequent four years. Following the last injection, seven years ago, he remained free from pain on the left side of the face. One year after this last ganglion injection he complained of an itching sensation in the left nostril; he rubbed and scratched the nose and one day "burst a blood-vessel." An ulcer appeared on the floor of the nose and in time the left nasal wing became shorter. When he presented himself for examination the appearances were those recorded in Fig. 4. A fissure extended for about 1 cm. along the floor of the nose at its junction with the ala. The remnant of the ala felt thickened and the skin adjacent to the defect was a little dusky. Anaesthesia was still complete in the area supplied by the first division, but pin-prick was appreciated as light touch in the areas supplied by the second and third divisions.

In the light of what has been said before the foregoing case appears as a very typical example of the syndrome and no comment appears necessary. The following two cases are examples of very early stages of the condition.

Case 5. J.W.B., aged 49 years, male.

Right-sided trigeminal neuralgia affecting the second and third divisions. Alcohol injection of ganglion. Keratitis. Paræsthesiæ, epistaxis, nasal fissure, erosion right nasal wing.

Some weeks following an alcohol injection of the right Gasserian ganglion which had produced numbness of the whole trigeminal area the patient noticed a small fissure at the junction of nasal wing and upper lip. His attention was first drawn to it when the nose bled, but he could not say for certain whether or not he had first scratched his nose. He had, he said, noticed an itching of the left nostril and had at times attempted to free the nostril by picking it and by removing scabs and blood clot. When he presented himself for examination six months after the injection there was a Y-shaped fissure in the anterolateral portion of the floor of the nose and the crack extended onto the upper lip. The ala was slightly elevated and on the skin covering it there were a number of teleangiectatic vessels which were not present on the opposite side. Examination of the nasal passages revealed no abnormality. The patient was advised to keep the fissure covered with vaseline and to refrain from touching the nose. When he was seen a month later the fissure was noticeably smaller and epistaxis had ceased.

Comment.—One cannot tell whether in time this nostril will shrink as much as the others in this series have done. Keeping the fissure covered with ointment and preventing the patient from traumatizing it should cure the condition if self-inflicted trauma really is the most important single factor. It is, however, possible that once the insensitive nostril has begun to shrink through trauma a train of tissue changes has been set in motion which cannot be halted by protecting the part.

Case 6. A.S., aged 58, female.

Left trigeminal neuralgia. Ganglion injected with alcohol. Total anaesthesia all three divisions. Epistaxis, ulceration, fissure and elevation of left nasal wing.

In November 1939 the patient's left Gasserian ganglion was injected with alcohol to cure a trigeminal neuralgia which had for 15 years affected the second and third divisions. Total anaesthesia of all three divisions resulted. Three months later the patient attended the hospital complaining of daily epistaxis and of ulceration of the floor of the nose and the upper lip on the left side. She had had no paræsthesiæ, but she had frequently rubbed the nostril and dabbed it to stop the bleeding and to clear it from clot. For six months the area of superficial ulceration continued to increase in size in spite of the application of Ung. hyd. amm. dil., but since treatment was carried out in another department of the hospital it is not known whether the patient was told to refrain from touching the nose. She was seen again a year following the injection. By then the ulcer had healed, but a fissure was present on the floor of the nose and the left nasal wing was slight elevated. Epistaxis

FIG. 4.—Case 6. Note the beginning of shrinkage of the ala nasi and the absence of inflammation in the skin surrounding the ulcer.

had ceased. The patient has not attended since and has not replied to enquiries regarding her progress. It may be assumed that the neuralgia has not recurred.

Comment.—The case is an important one in the series, but unfortunately it is not as well documented as one would wish. Epistaxis, ulceration, nasal fissure, and elevation of the nasal wing were all present suggesting once again that these factors are causally related. No clear history concerning self-inflicted trauma was obtained when the patient attended hospital, and she has left repeated enquiries unanswered. It is impossible therefore to say whether the elevation of the ala progressed in the absence of injury.

Case 7. A.E., aged 50 years, female.

Trigeminal neuralgia right second and third divisions. Partial root section. Epistaxis, nasal fissure.

In June 1942 a fractional division of the right trigeminal root was performed by the temporal approach. The areas supplied by the second and third divisions were rendered completely anaesthetic: sensation in the right side of the forehead and right eye was depressed, whilst the right side of the nose including the ala was completely anaesthetic. The operation was an unusually difficult one, the dura stripped badly and a good deal of bleeding had to be dealt with. Eleven days after the operation the patient noticed a "trickling" sensation down the right side of the nose and in the right nostril. She rubbed the nose and the right nostril bled. About a month after the operation a small fissure between ala and upper lip was detected by the patient and she presented herself for

examination. The patient was examined by a nasal surgeon who found no abnormality in the mucous membrane of the right nostril, apart from a small ulcer on the anterior end of the inferior turbinate bone on the right. There was no inflammation, no swelling and the ala was not elevated.

Comment.—In this case the future progress will be important. The patient has been warned that trauma might cause a disfigurement and she has been advised to keep the fissure covered with ointment.

In the case which follows, the last of the series, nasal erosion was observed following the removal of an acoustic neuroma.

Case 8. E.H., aged 40 years, female.

Left acoustic neuroma. Extracapsular removal. Left facial paralysis and anaesthesia. Extensive superficial ulceration of anaesthetic half of face. Progressive recession of left ala nasi.

In May 1941 the patient was operated on by Professor Jefferson and a left-sided acoustic neuroma was removed together with its capsule. The left facial nerve and the trigeminal root were both divided in the course of the operation. Some days after the operation it became necessary to perform a tarsorrhaphy to protect the anaesthetic cornea. The patient failed to attend for examination as she had been asked to do and was next seen seven months after the operation, when she gave the following history. About one month after her discharge from hospital a swelling appeared on the left side of the bridge of the nose. The skin broke and some pus escaped. Next sores developed on the anaesthetic portion of the face and scalp and for five months the ulcers continued to spread and at the same time the anterior half of the left side of the scalp lost a good deal of its hair. At the onset of the condition there had been a purulent discharge from the nose and the patient admitted to having picked off scabs and crusts from the ulcers and from the left nostril. At the time of this examination the ulcers had begun to heal (Fig. 5 A). They were irregular in outline and varied in depths. The deepest

FIG. 5.—Case 8.

A.—The appearance of the patient seven months following section of the fifth root.

B.—The same patient eight months later. Note the increased erosion of the ala nasi.

skin defect was at the side of the nostril where the dermis had become eroded. The floors were covered with dried blood and with encrusted serum. Several small ulcers were present along the lower border of the left lower jaw and were not in the anæsthetic area. The scalp was covered with a layer of oily seborrhoeic scales which was thickest in the numb part. The left nasal wing was eroded.

Eight months later the ulcers had completely healed without leaving any scars. The nasal wing had shrunk further (Fig. 5 B) and the epistaxis frequently occurred from the left nostril. The area supplied by the first trigeminal division was still completely anæsthetic, but some sensation had returned to territories of the second and third divisions. In answer to a questionnaire the patient wrote a full "confession" from which the following are quotations: "... I am in the habit of picking my nose and rubbing it. My left nostril does not feel to be blocked up, but it has done. ... I have attempted to remove crusts from my left nostril ... my nose only bleeds when I either pick it or touch it. ... I have kept the ulcerated area covered with ointment but I do not do so now. ...". The ulcerated area to which the patient refers in this letter was on the lower part of the nasal septum and the left side of the philtrum.

Comment.—This is the only case in the series in which the progress of the condition was reviewed after a considerable interval had elapsed. There was evidence of an infection with the *Pityrosporon* of Molassez and presumably the patient had been subject to seborrhœa before her face became numb, but the infection spread on the anæsthetic skin in a manner which is never equalled in a normally sensitive skin. The importance of the infection in causing the ulcers was peculiar to this case; in others similar but less severe ulceration occurred without evidence of *Pityrosporon* infection. The ulcers in the sensitive skin on the left side were smaller and quite superficial.

Discussion

To the author's knowledge progressive destruction of the anæsthetic ala nasi has not been previously reported. Rowbotham (1939) in a careful study of the effects of trigeminal denervation made no mention of this condition. Harris (1940) in an analysis of his large material briefly described superficial skin ulcers, but neither he nor Härtel (1938) recorded nasal erosion following Gasserian alcohol injection. Harris had seen "sores around the ala nasi, especially just inside the nostril, but also sometimes on the cheek or forehead" and he drew attention to the fact that "the nasal ulceration may produce small hæmorrhages." In the present paper the emphasis has been laid on a combination of features of which nasal erosion and epistaxis were most constantly present, while skin ulcers and nasal fissure occurred in the majority of the cases.

With the exception of Case 8 all patients in this series had been sufferers from trigeminal neuralgia. Alcohol injection of the ganglion was performed five times and only in two patients was the fifth root sectioned. The injections were preferred to operation variously because of the patient's age, cardiovascular abnormalities or unwillingness to undergo operation. The injection which was followed by erosion of the nostril has in all five cases resulted in

an anæsthesia which up to the present has not receded. In Case 4 the ganglion was injected six times in four years but the last injection was performed seven years ago. Up to the present the area supplied by the first division has remained densely anæsthetic and the trophic lesion is situated in this area. In Case 1 total anæsthesia persisted for ten years until the patient's death, in Case 4 it has lasted for four years and in Case 6 for three years. These periods are already considerably longer than the average after an alcohol injection. About 1½ years is generally considered an average duration of anæsthesia after ganglionic injection (Harris (1940), Grant (1936) and the experience in this department is somewhat similar, although many permanent numbnesses have been obtained. It appears that the anæsthesia which is accompanied by nasal erosion is virtually permanent and it may well be that this combination is not fortuitous. Failure of return of sensation may mean that the ganglion cells themselves were irreparably damaged owing to the position of the needle at the time of the injection. It is, however, difficult to conceive of a comparable factor bringing about the lesions in the three cases in which the fifth root was sectioned.

Neuroparalytic keratitis was a feature in five of the eight cases, and preceded the onset of the skin lesions. It is known that the danger of keratitis is greatest in the first week or ten days after trigeminal denervation and that its incidence sharply declines after that date although rarely it may appear after a much longer interval. The immediate post-operative period is further characterized by the frequent occurrence of herpes vesicles in the anæsthetic skin and by a persistence of conjunctival hyperæmia. Erosion of the nasal wing and skin ulcers belong to a later post-operative period. Lewis (1927) produced evidence that irritation of sensory nerves caused the antidromic release of a vasodilator substance—H-substance—in the skin and he suggested that Herpes and herpetiform eruptions were due to an accumulation of this substance. Duke-Elder (1932) regarded Lewis's explanation as providing the most satisfactory theory concerning the evolution of neuroparalytic keratitis. Trophic lesions produced by the accumulation of H-substance presuppose the persistence of functioning nerve fibres capable of conducting antidromic impulses and should be characterized by vasodilatation. When, however, the sensory nerve paths have degenerated, the skin arterioles no longer dilate in response to local stimulation and the "flare" cannot be evoked. It has already been mentioned that hardly any inflammatory reaction occurred either around the skin ulcers or in the skin adjacent to the erosion of the nasal wing, and it is now suggested that these late trophic lesions occur when, owing to degeneration of the nerve-paths, the vascular manifestations of inflammation do not take place in response to local stimulation. On the other hand, the early trophic lesions—herpes and keratitis—are accompanied by a well-marked inflammatory response and may be due to disordered antidromic impulses releasing

excessive quantities of H-substance thus "allowing minor traumata to have gross effects and facilitating the access of organism" (Duke-Elder).

The localization of the skin erosion needs a word of comment. The nose is normally exposed to slight but repeated trauma and with the other area of the body is most affected by a fall in external temperature. The ala nasi possesses two skin surfaces which radiate heat and are separated by only a thin layer of cartilage dependent on the skin vessels for its nutrition. These factors explain why the nasal wing should be particularly susceptible to trophic lesions or to destructive lesions from other causes. A study of serial sections through the external nose of a full term foetus revealed no peculiarity of the blood supply relevant to the present discussion.

The treatment of the condition has been influenced by the theoretical conception of its causation. The patients were warned not to touch their noses and to keep ulcers and fissures covered with a bland ointment. The onset of the condition might be prevented if these instructions were presented to all patients who have had an alcohol injection of the ganglion or have undergone a root section.

Summary

1. A new syndrome which followed trigeminal denervation in eight cases is described.
2. The most striking feature in seven of the cases was erosion of the anæsthetic nasal wing.
3. Self-inflicted trauma, usually in response to paræsthesiæ, played an important part in the production of the lesion.
4. It is suggested that failure of the cutaneous vasodilator reflex determines the progression of the lesion.

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