Had these factors been the same for both methods the film comparisons would have been fairer.

The miniature radiographs were carefully examined with a magnifying viewer before the large films were read. Of the miniature films, one showed active pulmonary tuberculosis (the second case of active tuberculosis did not have a miniature film taken)—the large film did not add to our knowledge of this case; 2 left us in doubt as to the condition (here the large film simply confirmed our opinion that these cases required further observation); 4 others showed minute apparently unimportant shadows, and the large films confirmed the absence of any significant lesions. We consider that as the method of miniature radiography is still in its infancy it is advisable to take full-size films where definite or doubtful lesions are seen. Careful comparison of the 239 full-size and miniature films showed that the latter did not miss anything of importance. Calcified hilar nodes were more easily recognized as such in the full-sized films: this is probably explained by the difference in the distance and exposure factors already mentioned.

The number of miniature films so far examined by us is too small for a final opinion, but we feel that the results are promising. With further technical improvement and increased interpretative experience miniature radiography will take a leading place in the campaign against tuberculosis. The speed with which the films can be taken, the reduction in filing space, and, after the initial cost, its cheapness, make this method, together with tuberculin testing, the ideal for a case-finding survey.

Our thanks are due to Prof. W. H. Tytler, Director of Research to the Memorial Association, for his valuable advice and assistance. To Dr. D. A. Powell, principal medical officer, we are particularly indebted for his guidance throughout.

REFERENCES

- Cranch, A. L. (1940). *Publ. Hlth.*, 53, 176.
Hart, P. D'Arcy (1932). *Med. Res. Cncl. Sp. Rep. Ser.*, No. 164, London.
Hetherington, H. W., McPhedran, F. M., Landis, H. R. M., and Opie, E. L. (1934). *Amer. Rev. Tuberc.*, 29, 142.
Israel, H. L., Hetherington, H. W., and Ord, J. G. (1941). *J. Amer. med. Ass.*, 117, 839.

ORBITAL CELLULITIS FROM GAS-PRODUCING ORGANISMS

BY

IAN STEWART MCGREGOR, M.B., Ch.B., F.R.F.P.S.
*Ophthalmic Surgeon, Glasgow Royal Infirmary; Assistant to
the Professor of Ophthalmology, Glasgow University*

(From the Tennent Institute of Ophthalmology, Western
Infirmary)

Orbital cellulitis caused by gas-producing organisms is a rare occurrence. I have been unable to trace any reports of it in the recent literature. In the following case the condition arose from infection of the nasal sinuses.

Case Record

A maltster aged 67 was admitted to the Tennent Institute on September 27, 1941. For five days he had complained of very severe pain in the right eye, and the lids had become grossly swollen. Small incisions had been made in the outer third of both eyelids close to the upper and lower orbital margins. Brown pus and bubbles of gas were escaping from the wounds. The smell was so foul that it was difficult to remain in the room. The proptosed globe was immobile, and purple folds of conjunctiva were overhanging the margin of the cornea, which was intact. The patient was very ill. On the day after admission right antral lavage was carried out by Mr. Fulton Christie, and was positive. This was repeated every few days over a period of six weeks. Disease of the right antrum and right ethmoidal cells was revealed by radiographs. On September 29 the anterior end of the middle turbinate was removed. A radical antral operation (Caldwell-Luc) was deferred until November 7.

when the patient was stronger. Anti-gas-gangrene serum and sulphathiazole were used from the outset, both intravenously and intramuscularly. The details are shown in the table. In

Week	Anti-gas-gangrene Serum	Sulphathiazole	Operations	Blood Picture, etc.
1st	Three preliminary doses of 277 units at 4-hourly intervals. A total of 86,000 units (i.v.) and 24,000 units (i.m.), spread over three days	23 gm. (i.v.) over 48 hours; 4 gm. (orally) 4-hourly for remainder of week, with one day's rest, totalising 40 gm. orally	+antral lavage three times. Turbinectomy and curettage of ethmoids	Group B. i.v. glucose saline drip for 48 hours. W.B.C. 18,000 on 28th, W.B.C. 15,000—85% neut., 14% lymph—on 30th
2nd		4 gm. orally 4-hourly for the first 3 days, with one day's rest, followed by 1 gm. orally 4-hourly, then stopped	+antral lavage three times	Hb. 80%; R.B.C. 4,000,000; W.B.C., 9,000
3rd			+antral lavage three times	
4th			+antral lavage twice	
5th			+antral lavage twice	
6th			Radical antral operation (Caldwell-Luc)	

four days the patient was feeling better. His temperature, which had been 100° to 101°, came down to normal. The swelling of the lids subsided very slowly, and the cornea, which had developed a marginal keratitis, healed. The proptosis receded, and on November 11 it became possible to examine his fundus. The optic nerve was found to be atrophic. There was no evidence of haemorrhages or exudates.

The bacteriologist reported the presence of various cocci and a few Gram-positive bacilli from a smear and, on culture, *Staphylococcus aureus*. In a later stab culture we found a Gram-positive bacillus with filamentous forms, some of which showed swellings resembling spores. The clinical picture of gas bubbling from the wound was a fact which does not conflict with the equivocal findings of the cultures.

The right eye was completely blind, there being no perception of light. The visual acuity of the left eye was 6/6 and Jaeger 1 with a hypermetropic correction. The field of vision was full. There was no evidence of uveitis in either eye. The patient had bilateral nerve deafness from a shell-burst in 1916. The Wassermann reaction was negative. The clinical diagnosis was confirmed by Mr. T. Murray Newton.

Discussion

This case is put on record because of the extreme rarity of gas infection of the orbit. Cross (1941) reported 12 cases of gas gangrene following perforating wounds of the globe, in all of which the eye was lost and the patient recovered. In infection of the orbit the venous channels available for dissemination are numerous, and recovery is less easily understandable than in an infection limited to the globe.

There is now no paretic limitation of movement of the eyeball in the above case, and we may infer that there has been no gangrene of muscle. The surgeons of the last war (Fraser, 1919) differentiated clearly between gas infection of the wound and infective necrosis of muscle. In wound infection alone pain was less, the smell was less, the patient was usually not so gravely ill, and the outlook was better. But there would seem to be no picture of convincing constitutional signs pointing to muscle necrosis, and the proof is in surgical exposure. The decision is important to the general surgeon. Excision of affected muscle is considered essential, while exploration of gas cellulitis is needless. In the orbit this difficulty does not arise. The muscle mass is small. Further, the technical difficulty of exposing the whole muscle cone in order to inspect it convincingly would be great. The incisions would have to be very wide and would open up the fascial

planes of the scalp and the face. Small drainage incisions within the upper and outer and the lower and outer margins of the orbit seem to be all that is necessary.

The cause of optic atrophy in such a case is obscure. The suggestion that the nerve becomes atrophic as a result of mechanical stretching is unlikely. Orbital infections may give rise to a perineuritis in which the dural sheath shows little change, but the leptomeninges reveal hyperaemia and perivascular infiltration which extends along the fibrous septa of the nerve. The pia may be destroyed or may become fibrosed and adherent to the dura. A purulent optic neuritis may result from orbital infection (Cheney, 1923). The eye is usually lost in such cases whether the origin is from orbital sepsis, from metastatic infection, or from meningitis.

The literature on rhinogenic optic neuritis is controversial. Confusion arises because the blindness may clear in whole or in part whether the sinus disease is treated or not. Smith (1939) quotes two cases in which ethmoiditis gave rise to papilloedema with slight concentric contraction of the field and enlargement of the blind spot and no loss of central vision. This was not an optic neuritis but a true papilloedema which subsided after the nose was treated. The occurrence of papilloedema is probably dependent upon the situation of the toxic oedema. If this is in the part of the nerve close to the globe the central retinal vein may be pressed upon, resulting in papilloedema. On the other hand, if the oedema affects the deeper part of the nerve the retinal vein may escape. It is curious that the rhinogenic toxin should fail to affect the vulnerable papillo-macular bundle in Smith's cases. On the whole, grave sinus disease is very seldom accompanied by any sign of optic neuritis. The nerve sheath, like the intact dura in head wounds, must be a powerful barrier to infection, yet the causative factor invoked to explain the local spread from sinus to nerve is often some slight or chronic affection and the thinness of the lamina papyracea, or thrombosis of venous channels in connexion with the sheath, or the suction effect of "vacuum sinusitis." It may be that the role of the infected sinus in optic neuritis is similar to that of any other septic focus whose circulating toxins may give rise to uveitis and, less commonly, to optic neuritis.

As there was no preceding optic neuritis and no sign of uveitis in the above case, we may assume that the infection had not spread from the globe to the nerve. Atrophy of the nerve was observed a fortnight after the onset of the illness. The findings may be reasonably explained by an exudative perineuritis or neuritis with early thrombosis of the nutrient vessels, the posterior part of the orbital optic nerve being affected.

Summary

A case of orbital cellulitis from gas-producing organisms is recorded. There was coincident disease of the nasal sinuses.

Anti-gas-gangrene serum and sulphathiazole were used and details of dosage are given.

The patient recovered, but the optic nerve was atrophic. Certain pathological processes are discussed.

I am indebted to Prof. W. J. B. Riddell for advice in the preparation of this paper.

REFERENCES

- Cheney, R. C. (1923). *Arch. Ophthalm.*, **52**, 252.
Cross, A. G. (1941). *Lancet*, **2**, 515.
Fraser, J. (1919). *Med. Res. Cttee. Sp. Rep. Ser. No. 39*, p. 8, London.
Smith, E. G. (1939). *Arch. Ophthalm.*, **21**, 856.

Medical Memoranda

Sulphonamides for Ulcerative Endocarditis due to Type 4 Pneumococcus

For many years cases of pneumococcal endocarditis have been recorded, and this condition is now recognized as an uncommon complication of lobar pneumonia. Fishkin and Pilot (1940), in a survey of the literature, found that in pneumococcal endocarditis Types 2 and 5 most commonly occurred, although isolated cases of endocarditis due to Types 4, 7, 8, 11, 12, 20, and 29 of the pneumococcus were on record. Rakov (1939) reported a case due to Type 18. Terry and Beard (1940) recorded a case of pneumococcal meningitis treated by sulphapyridine, and although this illness terminated fatally with endocarditis the examination of the cadaver showed morphologically that the meninges at this stage were clear of any exudate. Huber, Lièvre, and Payet (1939) reported a similar case in which sulphapyridine undoubtedly prolonged life.

The following case was treated with sulphapyridine and sulphathiazole, and clinical improvement resulted with both drugs. In spite of this improvement Type 4 pneumococcus was isolated from the blood two days before death, during a course of treatment by sulphathiazole.

CASE REPORT

The patient, a man aged 36, was admitted to hospital on April 25, 1941, and was confined to bed throughout his illness. There was no history of any recent or previous illness or of local injury. He complained of shivering, cough, and pain in the chest of thirty-eight hours' duration. On examination his breathing was laboured and his lips were blue. Pulse 100, respirations 30, temperature 102°. There was impaired resonance at the left apex of the lung and at both bases, with numerous coarse rales in these areas. No clinical enlargement of the heart was discovered; the sounds were clear. No abnormal constituents were found in the urine on admission. A diagnosis of bronchopneumonia was made, and 6 grammes of sulphapyridine was given daily, also continuous oxygen.

29/4/41.—Restless. Severe headaches. Some neck rigidity. Cerebrospinal fluid turbid but under normal pressure. Pathological report: 1,600 cells per c.mm.; Gram-positive diplococci; culture sterile.

The sulphapyridine was continued, and the meningeal and chest signs cleared rapidly.

5/5/41.—Temperature normal. Feels well. No signs or symptoms.

8/5/41.—Sulphapyridine stopped. Altogether 64 grammes on the last six days in reduced doses.

9/5/41.—Sudden acute pain in the left chest. Cyanosis. Temperature 102°. Heart slightly dilated, with diffuse systolic bruit. Impaired resonance at both bases.

12/5/41.—Temperature 102°. Good colour. Physical signs unchanged, but patient more comfortable.

19/5/41.—Heart dilated, the left border being two inches external to the mid-clavicular line. A loud and widely conducted systolic bruit was audible. No thrill. Basal congestion of the lungs. Oedema of the feet. Radiograph revealed left ventricular dilatation. Blood culture: pneumococcus Type 4 isolated. Sulphathiazole 4 grammes daily was started, with immediate clinical response. The temperature fell and the patient was more comfortable.

23/5/41.—Blood culture: pneumococcus Type 4 isolated. Urine contained sulphapyridine crystals.

25/5/41.—Two convulsions, the second terminating fatally.

Post-mortem Examination.—Heart: Weight 18 oz. Left ventricle dilated and thinned. Aortic valve: Pale yellow stalactite vegetation on the ventricular aspect of the cusps, spreading on to the adjacent endocardium. A fairly large perforation was present in the centre of the vegetative mass (pneumococcus isolated). Mitral valve: Old fibrous thickening of valve and fine warty growths on upper surface of anterior cusp. Thoracic and abdominal aorta both showed yellow streaks of fatty degeneration on the intima. Pulmonary valves: Normal in structure. Brain: Considerable oedema of leptomeninges.

The issue of the *Schweizerische medizinische Wochenschrift* for November 1, 1941, is a Festschrift in honour of Dr. Robert Doerr, professor of hygiene and bacteriology at Basle and author of works on psittacosis, typhus, dysentery, and anaphylaxis, on the occasion of his seventieth birthday.