Brit. J. Ophthal., 35, 419.

CASE NOTES

INFECTION OF THE CORNEA WITH *B. PYOCYANEUS**

CLINICAL STUDY AND SUMMARY OF TEN CASES PERSONALLY OBSERVED

BY

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CORNEAL ulcers of a very severe nature and recognizable clinical appearance are caused by infection with *Bacillus pyocyaneus*. Practically the only severe corneal ulcers (*i.e.*, those involving loss of the eye, or states approaching this, within a day or so of admission) seen at the Moorfields Branch in the course of a year were due to this organism. The typical history is as follows:

The patient has a minor injury or abrasion with or without removal of a foreign body from the cornea. Approximately 3 days later a severe, painful corneal ulceration arises with opaque dead-white centre and perhaps an hypopyon. This extends rapidly, at first without breaking the surface epithelium and then with central superficial necrosis, and leads to a later stage with a dead-white ring of infiltration and semi-transparent central area.

The opportunity of observing, in epidemological form, several cases of corneal infection with *B. pyocyaneus* is rare. The severity of these infections has been emphasized by Joy (1942) who reviewed 64 cases found in the literature; loss of the eye or loss of useful vision occurred in nineteen of the 23 reported since 1922. His experimentally produced *B. pyocyaneus* ulcers in rabbits were healed in 57 per cent. by oral administration of sulphonamides, no human case being treated.

Brown (1943) added three more cases; the affected eye in two was enucleated and in the other the eye, although saved, had greatly reduced vision after sulphonamide therapy.

Juler and Young (1945) treated a case with penicillin without effect. Maschler (1948) reported a case treated heroically with penicillin, streptomycin, and Saemisch section, the eye being retained in the orbit. Pendexter (1948) reported a case of corneal ulceration

* Received for publication March 10, 1951.

with *B. pyocyaneus* treated with penicillin drops and intramuscular penicillin; the ulcer healed and, 3 months after onset, vision reached 20/200.

Case Reports

Cases 1, 4, 5, and 6 all came from the employees of one industrial concern, and the last four cases all came from another similar source. The cases in one of these groups all occurred within a short period, and communication with the source resulted in the avoidance of further infection.

Case 1. J. G., male, aged 42.—He was admitted on January 19, 1950, with a history of a foreign body in the eye when using a grindstone 10 days before. The foreign body was removed at work, but the eye became progressively sore and on admission he had a corneal abscess 7 mm. in diameter, and 1-mm. hypopyon. Vision in this eye was perception of light. He was treated with subconjunctival penicillin and streptomycin as well as with systemic sulphonamides and penicillin. A culture report on January 14 revealed the presence of a heavy growth of *B. pyocyaneus*. He was discharged on February 21, when the eye was soft and the vision was perception of light only.

Case 2. L. E., male, aged 27.—Admitted on February 19, 1950, with a history of having had a foreign body removed from the right cornea 3 days previously. On admission vision was 6/9 in the left eye. There was a typical corneal ulcer and 2-mm. hypopyon present in the right eye. Culture showed a heavy growth of *B. pyocyaneus*, this being sensitive to aureomycin and sulphanilamide but resistant to streptomycin and albucid, the latter being in weak solution. He was treated with subconjunctival penicillin prior to culture report coming to hand and then with gutt. streptomycin and gutt. aureomycin half-hourly. The ulcer healed and the patient was discharged on March 15, 1950, vision in the right eye being 6/24 with −1.0 D sph., and +4.0 D cyl. at 60°. The upper margin of the ulcer was just approaching the pupil area. (This case was from the same source as Cases 8, 9, 10, and 11.)

Case 3. G. B., male, aged 67.—Admitted on March 7, 1950, stating he had had a painful right eye for 3 days. On admission he had a large corneal ulcer with infiltrated edges and large descemetocele. Vision was no perception of light. Culture of the conjunctival sac was sterile. This eye was eviscerated on March 8, 1950. The cornea on section showed a perforating corneal ulcer, and methylene blue revealed the presence of numerous ? diplobacilli, morphologically similar to *B. pyocyaneus*. The appearance of the corneal ulcer was quite typical.

Case 4. L. P., male, aged 57.—Admitted on March 20, 1950, having been struck in the right eye 3 days previously, when "something" was removed from the cornea and drops were put in. This right eye became progressively sore and on admission he showed a large sloughing ulcer of the cornea with exudation and 2-mm. hypopyon in the anterior chamber. Culture finally grew *B. pyocyaneus* which was resistant to penicillin, streptomycin, and aureomycin. Treatment was with sulphonamides orally, subconjunctival streptomycin, and aureomycin drops, and the patient was discharged on April 4, when the healed ulcer 4 mm. in diameter was beginning to vascularize from the limbus. On November 21, 1950, the eye was white and the vision 6/18.

Case 5. W. P., male, aged 48.—When seen on March 23, 1950, he gave the history of having had a foreign body removed from his right eye 4 days before, and sub-

sequent treatment with penicillin drops. Vision in the right eye was perception of light only, and a large opaque white corneal ulcer was present with half hypopyon. A purulent conjunctival discharge was present as well as some degree of proptosis. Treatment with oral sulphonamides and subconjunctival penicillin was instituted. On March 25, 1950, the right anterior chamber was washed out. On March 27, the right eye was eviscerated. The patient was discharged on April 17, 1950, with only a small amount of discharge from the socket, persisting for almost 3 weeks. The culture from the conjunctival sac taken shortly after admission revealed a heavy growth of *B. pyocyaneus* sensitive to albucid and sulphathiazole, and slightly sensitive to sulphonanilamide (these in varying concentrations).

Case 6. L. G., male, aged 33.—Was seen on July 1, 1950, having had a foreign body removed from the right cornea at 5 o'clock, 2 mm. from the limbus, 3 days previously; a slight infiltration around the unhealed ulcer was present. On July 3 a spreading infiltrating ulcer was present with a 1-mm. hypopyon. Penicillin was injected subconjunctivally. Culture from the conjunctival sac on this day grew *B. pyocyaneus* in pure growth. Endophthalmitis rapidly spread within the globe and on July 12 the eye was eviscerated. The cornea was examined pathologically, and revealed spread through the superficial lamellae predominantly, penetration of the cornea being present at one point only. The Gram-stained section showed the presence of Gram-negative organisms.

Case 7. B. G., male, aged 19.—Was admitted on August 5, 1950, with a history of having been using a hammer and chisel when something had struck his left eye 36 hours before. A small perforating corneal wound was found at the limbus, 3-mm. hypopyon was present, and a yellow reflex was seen in the pupil area. He was treated with penicillin subconjunctivally and sulphonamides orally. Four days later his left cervical glands were swollen and his general condition was deteriorating. On August 14, the left eye was eviscerated. Culture from the left conjunctiva grew *B. pyocyaneus*, while the vitreous culture showed free growth of the same organism. The use of intramuscular streptomycin was followed by the rapid subsidence of the orbital oedema and glandular swelling.

Case 8. S. W., male, aged 24.—Was admitted on December 7, 1950, having had a foreign body removed from his left cornea and penicillin drops instilled 2 days previously. A typical ulcer with white infiltration 5 x 3 mm. in area was present and the iris was seen through the cornea only hazily. Subconjunctival streptomycin 0.5 g. was injected daily. Two days later, no hypopyon being present and the cornea much improved, the streptomycin injections were stopped. Three days later a rapid recrudescence occurred for a period of 12 hours, during which the ulcer occupied almost all the cornea. Treatment by streptomycin, both by drops and subconjunctivally, was instituted. Culture revealed a coliform organism resembling *B. pyocyaneus*. The ulcer cleared and on January 9, 1951, the patient was discharged with a large healed corneal opacity, slight vascularization from the superficial vessels, and the cornea thinned over this region. Vision in the left eye was 6/36, lenses being of no assistance. (Having been admitted on the same day, from the same source, with similar clinical appearances and course as the next, this case has been included despite the lack of final differentiation of the coliform organism.)

Case 9. P. N., male, aged 27.—Was admitted on the same day as Case 8 (*i.e.*, December 7, 1950) having had a foreign body removed at the same place. He came with a typical infiltration 3 mm. in diameter in the left cornea. Treatment with subconjunctival streptomycin and streptomycin drops was instituted and 3 days later

there was a pin-point of infiltration remaining. Treatment was stopped and after 3 days there was an acute exacerbation of the condition for a period of 12 hours, and a large infiltrated area, including hypopyon, developed until it occupied half the corneal area. The original culture had been negative, but the culture taken at this time revealed *B. pyocyaneus* in pure growth. Treatment with subconjunctival streptomycin was instituted, the hypopyon disappeared, the cornea became much clearer, and the white infiltration disappeared. This patient denied perception of light, despite an active pupil on direct light stimulation, and was discharged 3 weeks after admission.

Case 10. W. H., male, aged 71.—Admitted on December 13, 1950, with a history of having had a foreign body removed from the cornea 7 days before at the same place as Cases 8 and 9. His left eye showed a perforating corneal ulcer with white edges, and vision was perception of light only. He was treated with subconjunctival streptomycin and streptomycin drops, and the hypopyon cleared rapidly. The anterior chamber reformed and on discharge he had a large healed ulcer of the cornea including iris pigment. A shallow but well-formed anterior chamber was present. The lens was cataractous and the vision was hand movements with accurate projection. This man also showed total loss of abduction of the left eye on admission, but this had practically cleared by the time he was discharged.

Case 11.—Another patient with a typical corneal ulcer sent from the same source as the three previous cases (8, 9, 10) was seen on December 7, 1950, but was referred to another hospital for treatment as no bed was available.

Discussion

The relatively good results of the last four compared with those of the first seven cases indicate the importance of early clinical recognition of this condition. In the majority of cases the *Bacillus pyocyaneus* was sensitive to streptomycin, and this, used subconjunctivally in doses of 0.5 g. daily until the ulcer was apparently healed, and guttae streptomycin hourly until no dead-white infiltration remained, seemed here to be the treatment of choice. The discontinuance of this intensive treatment before the dead-white areas had disappeared resulted in two cases of severe recrudescence which did not show itself until 2 to 3 days after the drug was stopped. Two sets of four patients, among the eleven cases reported, came from only two separate sources; this leads to a further plea for the regular sterilization of guttae penicillin bottles, where these drops are used as a routine prophylactic measure in the treatment of corneal abrasions.

Conclusions

(1) Typical corneal ulcers, clinically recognizable, are caused by infection with *B. pyocyaneus*.

(2) Immediate treatment with streptomycin subconjunctivally followed by frequent instillation of drops was effective when used in this series.

(3) This treatment must be continued despite an apparent arrest of

the process until no dead-white patches can be seen, and also despite the angry appearances of the conjunctiva.

(4) That the possible source of infection is in bottles of penicillin drops is only implied, but a plea may be advanced for frequent sterilization of such bottles when the penicillin is used as a routine measure.

SUMMARY

The typical clinical appearance of corneal ulcers due to *Bacillus pyocyaneus* infection is described, and the record of ten cases personally treated in routine work is presented. The importance of clinical recognition and institution of early and continued adequate treatment is indicated for the saving of the eye.

My thanks are due to the Surgical Staff of the Moorfields, Westminster and Central Eye Hospital, City Road, E.C.1. (Moorfields Branch) for permission to draw on their clinical material, and to the Director, Department of Pathology, Institute of Ophthalmology, for the culture reports.

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