Schistosomiasis of the conjunctiva, as any extraperineal schistosomiasis, is very rare in relation to the big number of patients affected with bilharzia in Egypt.

In 1944, only one case of bilharziasis of the conjunctiva was examined pathologically at the Memorial Ophthalmic Laboratory.

In 1945, up to August, only one case (the present one) has been examined pathologically at the laboratory.

This relative rarity may be due to one of two reasons or to both:

1. Infection with bilharzia through the conjunctiva is actually exceptional.
2. Bilharzial affection of the conjunctiva passes unnoticed by the patient until cured concomitantly with the urinary affection under specific treatment.

The first case of schistosomiasis of the conjunctiva observed was that of Sobhy Bey in 1927. The patient was a boy aged 8 years.

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The affection was a swelling of the palpebral conjunctiva of the right upper lid, extending to the upper and outer part of the bulbar conjunctiva and the upper part of the limbus.

The second case was examined in 1933 and described in the Annual Report of the Memorial Ophthalmic Laboratory. The patient was a girl aged 12 years. The affection was a pinkish swelling arising from the left plica semilunaris.

The third case occurred in 1936 and was described in the Annual Report of the Laboratory. The patient was a girl aged 12 years. Several small yellowish masses were present under the conjunctiva near the left upper limbal margin. They had the size of a pin's head and resembled streptothrix nodules.

The fourth case occurred in 1933 and was described in the Annual Report of the Laboratory. The patient was a boy aged 12 years. A flat yellowish pink mass occupied the region between the inner margin of the limbus and the semilunar fold of the right eye and extended upwards into the fornix.

Then Dr. Ahmed Kamel reported and described four cases, one occurring in 1939 and three in 1941, in a paper read at the Annual Congress of the Ophthalmological Society of Egypt in March, 1943.

Finally, a case was examined pathologically at the Memorial Laboratory in 1944. The patient was a boy aged 10 years. The bilharzial lesion was a swelling in the left upper palpebral conjunctiva including the upper fornix; it was adherent to the tarsus, semisolid and sessile.

All the above nine cases occurred in children, 7 boys and 2 girls, aged from 5 to 12 years.

Pathological examination of all the above specimens revealed the presence of bilharzia ova only in the granuloma. The presence of the worms could not be detected. The ova in all the specimens were terminal-spined (B. haematobium).

The presence of the adult bilharzia worms in the conjunctival lesion or in its neighbourhood was suggested by Sobhy Bey and by Ahmed Kamel.

Sobhy Bey says: "Il est plus que probable, d'après l'étendue de la lésion et le grand nombre d'oeufs trouvés dans les préparations que les vers bilharziens ne se trouvent pas très loin de là où, en d'autres termes, que les vers sont logés dans les veines orbitaires ou sous-conjunctivales et peut-être dans la partie de la tumeur enlevée."

Ahmed Kamel lays stress on the "recurrence of the lesion in the same locality (conjunctiva) after removal when patient did not receive general treatment" and says "this point is in favour of the great probability that the adult worms are present in the vessels of the vicinity of the conjunctiva."
The epithelial lining of the region of the caruncle is thinned. Groups of terminal spined Bilharzia ova are seen lying in the subepithelial tissue and forming pseudo-tubercles. Few ova show calcium deposit in the contents of their shells.

A high power view of Bilharzial pseudo tubercle showing a group of ova cut in different directions. The ova are surrounded by epithelioid cells and an outer zone of lymphocytes and plasma cells. To the left hand side of the photograph an ovum shows the terminal position of the spine.
Male and female Bilharzia worms are seen lying in a dilated orbital vein. Deeper, lying outside the tissues, the same worms are seen in tangential section.
Consequently, I endeavoured to search for the adult worms in the specimens of bilharzial granulomata submitted to me for pathological examination at the Memorial Laboratory, Giza. I was fortunate to find the adult worms in the following case which I am going to describe and is very interesting in view of the fact that it is the first case reported where the worms were observed in situ under the conjunctiva.

Description of the case

On May 16, 1945, a boy aged 12 years, presented himself to Dr. Ahmed Farouk, Ophthalmic Surgeon at the Fouad I. Ophthalmic Hospital, Alexandria.

On examination, Dr. Farouk found a tumour of the palpebral conjunctiva of the left upper eyelid near the inner canthus. The swelling was excised on May 17, 1945 and submitted to the Memorial Laboratory for pathological examination, with a provisional diagnosis of "? Hypertrophied Tarsus."

The specimen was embedded, as usual, in paraffin and was submitted to me for examination on June 3, 1945 (Lab. Report No. 283/1945).

Pathological description of the specimen

The specimen consists of a portion of the fornical conjunctiva together with a granuloma in the region of the caruncle.

The fornical conjunctiva shows a cicatrising trachoma with pseudocysts (T.3); about four trachoma follicles are also seen (T.2a). A piece of a serous gland (accessory lacrimal gland, most probably) is shown under the conjunctival epithelium amongst the fibrous cicatricial tissue.

Gradually the epithelium merges into the stratified epithelium covering the region of the caruncle. There, the epithelium is thinned out and infiltrated with migrating cells. It is ulcerated in a large portion of its extent and bilharzia ova are seen making their way through this ulcerated area to the surface.

Just beneath the epithelium, and extending deep into the tissues in the region of the caruncle, lies an inflammatory granuloma containing a large number of terminal-spined bilharzia ova arranged in groups and surrounded by tuberculoid nodules of various sizes. These nodules are composed of epithelioid cells with an outer zone of lymphocytes and plasma cells (Figs. 1 and 2.) Eosinophils are present everywhere in great numbers; they are massed together in places (Schistosomal pseudo-abscess).

Many of the ova are degenerated having only their distorted shells which are either empty or contain a collection of piknotic,
necrotic cells. A few ova show calcium deposit in the contents of their wrinkled shells.

A few giant cells are seen surrounding the degenerated ova, others are lying amongst the cells of the granuloma away from any ova. In other places, a marked fibroblastic reaction is present surrounding the degenerated ova.

The terminal position of the spine is well shown in the majority of the ova. Others are cut transversely or obliquely and show as rounded or oval spaces.

The granuloma occupies all the region of the caruncle and extends deeply into the connective tissue and fat reaching the tissues of the orbit.

There, a male and an included female bilharzia worms are seen in cross section, lying in a dilated orbital vein (a branch of the superior ophthalmic vein). The vein is surrounded by the fibro-fatty tissue of the orbit which is infiltrated with plasma cells and lymphocytes. There is no endophlebitis (Fig. 3).

The male worm bears prominent, cuticular, wart-like papillae on the outer surface of its body; the borders of its gynoecophoric canal are overlapping. Its intestinal branches are shown in cross sections.

The female lies in the gynoecophoric canal of the male; it is rounded in cross section: Its cuticle is smooth and in its body cavity we can see the intestinal caeca distended with deeply staining material and a cross section of the yolk gland.

Deeper to that, lying outside the tissues, the male and enclosed female worms are seen in tangential section. The cuticular papillae on the outer surface of the body of the male worm are more markedly shown. The female shows its intestinal canal distended with deeply staining material. It is probable that the worms have been squeezed out of the vein during excision of the tumour.

Unfortunately, I could not have the patient at the Laboratory to complete examination. He could not be found in spite of the repeated efforts of Dr. Farouk.

It would have been interesting to know whether he had a concomitant urinary bilharzial infection and to exclude such congenital anomaly as the presence of a patent foramen ovale. It would have been interesting also to examine him for another extraperineal (or systemic) bilharzial affection, to examine his lungs and to note the result of specific treatment on the conjunctival granuloma.

How do the Bilharzia worms reach the conjunctival tissue?

Before describing the life history of the parasite, it is interesting to note the following:

The *ovum* of bilharzia haematobium measures 110 to 120 u. in length and 46 to 50 u. in breadth.
The cercaria (schistosomulum) of the same worm measures 170 u. in length (without the tail) and 57 u. in breadth.

The *male* worm measures 11 to 18 mm. in length and 1 mm. in breadth.

The *female* worm measures 20 mm. in length and 250 u. in the broadest middle portion of her body.

The blood capillaries, including the capillaries of the lung, vary in size, averaging 8 to 10 u. in diameter.

"In man, in the eyelids, the terminal ramifications of arteries connect with the veins not only by ordinary capillary network but also by direct arteriovenous anastomosis" (Maximow).

Now let us consider briefly the life history of *bilharzia haematobium*.

The ova are voided by the patient with the urine. If voided in fresh water, the miracidium hatches and is attracted towards the intermediate host, a fresh water mollusc of the genus *bullinus*. In this host, the miracidium develops into the primary sporocyst and secondary sporocysts. Cercariae are produced in the interior of the secondary sporocysts. The cercariae, when fully mature, break through the sporocyst wall and bore their way through the tissues of the snail into the surrounding water.

This is the stage of development outside the body of man, the definitive host.

Then comes the next stage, *i.e.*, penetration of the cercariae through the skin or mucous membrane of man and migration of the cercariae (now called schistosomula) inside the body of the definitive host. Opinions vary as to the exact route followed by the schistosomulum to arrive at the bladder which seems to be the normal goal of the mature worm. The possible routes are the following:

1. From the lymphatics and veins of the skin or mucous membrane to the right side of the heart, then through the pulmonary artery, to the lungs. From the lungs they pass through the pleura, mediastinum or diaphragm and penetrate into the liver; then they go to the portal vein where they mature in 2 months, copulate and pass into the branches of the mesenteric veins to the bladder to deposit their ova. The ova are voided with the urine and thus the cycle is complete.

2. From the lungs instead of going directly to the liver through the diaphragm, they pass through the lung capillaries by the pulmonary vein, to the left side of the heart and then to the systemic arterial circulation. Thence some of the schistosomula pass through the capillaries of the gastro-intestinal canal to the mesenteric and portal veins where they attain maturity.

This route can be at once excluded for the simple reason that the schistosomula are 57 u. in breadth while the lung capillaries and
the capillaries of the gastro-intestinal canal have a diameter averaging between 8 and 10 u.

3. The third possible route is that supported by Diamantis who states that there is no necessity for a hepatic stage for bilharziasis in man and that the cercariae develop to maturity and pass their eggs in the veins directly subjacent to the skin or mucous membrane through which they have penetrated if the conditions are favourable for their development, i.e., if the part is richly vascularized. The cercariae (schistosomula) pass their incubation period in the veins of the diseased organ.

If the first route is the usual one in cases of ordinary infection of the bladder with bilharzia haematobium, the third route, though exceptional, is not impossible and it explains the cases of extravesical bilharzial infection, e.g., those occurring in the conjunctiva, and the case of the water-carrier who developed a bilharzial granuloma of the skin of the back at the site where he carried his goatskin (case reported by Bilharz and quoted by Sobhy Bey). In both these examples of probable direct infection, the conditions were favourable for the development of the worms, the parts being richly vascularized due to trachoma in the conjunctival group of cases and to irritation of the skin in the case of the water-carrier.

Direct infection through the conjunctiva is rendered possible by bathing in infected water; this is conceivable as it is a common habit of children to bathe in pools and shallow waters where the infected snails abound. As already stated, all the cases with conjunctival bilharziasis reported are aged between 5 to 12 years including the present case.

It remains to consider the possibility for the adult worms to pass from the portal to the systemic circulation through the big anastomotic veins between the two systems.

The worms pass through the inferior vena cava into the right side of the heart. From there, there are three possible ways for the worms to reach the conjunctiva:

1. From the right auricle, against the blood current, into the superior vena cava then to jugular vein and orbital vein. This way is far fetched. If the worms are supposed to travel against the blood current in the portal system, this is to reach the bladder which is their normal goal and to which they are attracted by a normal tropism. It is not the same with the superior vena cava. Moreover, the blood current is much stronger in the superior vena cava than in the portal vein and such a supposition would imply multiple bilharzial lesions in the head and body which is not the case.

2. The worms pass from the right side of the heart to the left side through a patent foramen ovale. This way, although possible
SECONDARY OBlique FACIAL CLEFT

theoretically, was not confirmed practically. The cases reported and examined by Ahmed Kamel had no heart defects.

3. The worms pass from the right side of the heart to the left side through the pulmonary capillaries. This, as already stated, is impossible if we know that the breadth of the male worm is 1 mm. and the diameter of the pulmonary capillaries is 8 to 10 μ. Moreover, Ahmed Kamel found no bilharziasis of lung and no eosinophilia in sputum.

Finally, I have to thank Dr. Wilson, Director of the Memorial Ophthalmic Laboratory, Giza, for allowing me to publish this case and to have the microphotographs. My thanks are also due to Dr. A. F. El-Tobgy and Dr. Ahmed Kamel for their advice and to Dr. Farouk for providing the clinical material and the pathological specimen.

REFERENCES


A CASE OF SECONDARY OBlique FACIAL CLEFT*

BY

A. MELLICK, Major, R.A.M.C.

Pte. P.L., age 20 years was referred to the ophthalmic centre for treatment of blepharitis of the left eye. On examination there was seen to be present a narrow bridge of skin passing down from the

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