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THE BRITISH JOURNAL OF OPHTHALMOLOGY

FEBRUARY, 1948

COMMUNICATIONS

THE SURGICAL TREATMENT OF PTERYGIUM*

BY

ARTHUR D'OMBRAIN

SYDNEY, N.S.W.

OF recent years investigations into the pathology and aetiology of pterygium have shed much light upon the true nature of this condition. It is about eight years since it was brought to my notice that some American surgeons regarded the sub-mucosal portions of pterygium as the active part of the process; I learnt that after shaving the head of the pterygium from the cornea, they then dissected and excised the sub-mucosa from the under surface of the conjunctiva before transplanting the head. At the time, although I had been operating upon pterygia for some fifteen years, I was in a state of some concern about my results and had already made one modification in the McReynold's operation, in an attempt to reduce the proportion of recurrences. This first

* Received for publication, November 26, 1947. N.B.—The first draft of this paper was submitted to the Editors in the early summer of the year 1946. Unfortunately it was lost in transit to the printers.

modification was the deliberate leaving of a bare area of sclera between the corneal margin and the edge of the downturned conjunctiva, instead of approximating this edge to the cornea. The objective was to give the raw corneal surface time to heal before the conjunctiva grew up to the limbus again.

This modification improved my results but there were still recurrences. Adoption of the American idea of a complete dissection and excision of the whole of the sub-epithelial tissues underlying the affected area of conjunctiva, in conjunction with the leaving of a peri-limbal strip bare of conjunctiva, practically eliminated recurrences, as well as making the transplantation a comparatively flat procedure instead of a thick lump, for the transplanted or tucked tissue consisted now of the thickness of the epithelial or mucous layer only.

During the course of my experiments in the evolution of a more efficient operation, I had tried a certain number of simple excisions of the head of the pterygium, without transplantation. These simple excisions were about 70 per cent. successful as regards non-recurrence.

When, however, to the principles of excision of the head, and the leaving of a peri-limbal bare strip some 4 mm. in width, there was added the technique of complete dissection and excision of all underlying sub-mucosal tissue, right back to the caruncle, uniform success came my way at last and has remained with me for the past seven or eight years. Before describing in detail the steps of the operation I will make some reference to the nature and cause of pterygium.

To my mind the best discussion of the nature of pterygium ever written is the brilliant paper by Dr. Sabri Kamel in the *Brit. Jl. of Ophthalm.*, of September, 1946, and I would hesitate to speak further on the subject except for the fact that my not inconsiderable experience in this field (some 1,500 operations) only serves to confirm Dr. Kamel's masterly synthesis and, in one or two items, to add to it.

Kamel maintains that pterygium is an irritative disease due to exposure and not primarily a degeneration. With this I quite agree, but would stress the fact that it is secondarily a degeneration. The older authors, notably Professor Fuchs, considered pinguecula to be the forerunner of pterygium and both to be degenerations. As I say, I consider Kamel to be more accurate in diagnosing an inflammatory origin but with the conception of the identical nature of pinguecula and pterygium I am in entire agreement, despite those who claim to have observed pterygium in the absence of pinguecula. The explanation of this, in my opinion, is simple, for I believe pinguecula and pterygium to

be, essentially, one and the same process aetiologically, anatomically and pathologically. What has been taken to be a pterygium in the absence of pinguecula is, in my opinion, simply a pinguecula situated at or in contiguity with the corneal limbus.

The pathological anatomy of pinguecula is that of a dense mass of fibrous tissue undergoing hyaline degeneration with deposition of amorphous hyaline material and excessive development of yellow elastic tissue. In its terminal stage it is a kind of localised tissue death, paralleling the displacement of normal connective tissues by excessive accumulation of elastic tissue found in old age in any part of the body's connective tissue strata. But, in pinguecula, old age is not a predominating factor; on the contrary, in Australia at any rate, pinguecula occurs in great frequency in young adults and even in adolescents. There must, therefore, be some other explanation or, perhaps it would be more accurate to say, some additional explanation than that of senility.

The stroma or sub-conjunctival portion of pterygium presents a similar histo-pathological picture to that of pinguecula, namely, an extensive aggregation of fibrous tissue containing numerous elastic fibres and patches of amyloid and hyaline degeneration. But as Kamel points out, when this contracting fibrous tissue becomes anchored at one end to the unyielding corneal tissue, the looser conjunctival tissue becomes pulled towards the cornea.

The cornea itself becomes involved in the inflammatory process and also in a secondary degeneration, with the presence of elastin, down to and including Bowman's membrane.

In optic section from the slit-lamp, the sub-mucosal portion of both pterygium and pinguecula shows up as a raised gelatinous-looking mass of greyish-yellow colour, interspersed with yellow, grey and white granules. Even in the corneal portions of pterygium, behind the grey apical extremity, optic section shows a yellowish tinge due to elastin in the deeper epithelial layers.

As is well known, the first corneal changes (best observed with the slit-lamp microscope) consist of grey patches at or slightly anterior to Bowman's membrane. The number and forward extension of these isolated patches form a useful guide to the activity of the process; when many and far advanced and especially when vascularised, the pterygium is active; when few or absent beyond the grey apical border of the growth, the pterygium is not in a state of rapid expansion.

It has long been recognised that climate is the main predisposing cause of pterygium, but it has not been so widely emphasised that the same applies to pinguecula. Most European authors stress senility as the pinguecula's main cause; as has been stated above, in Australia pinguecula is extremely common in young adults and not rare in adolescence.

The high incidence of pterygium in hot countries led most of us to assume that its occurrence was in direct ratio to the heat of the climate. However, a few years ago investigations carried out by some American ophthalmologists, showed pterygium to be no more frequent in the hottest States than in others. Later, observers in both America and Australia (notably Banks Smith and Frank Flynn) have found an association between pterygium and the water vapour content of the atmosphere; where the humidity percentage is high, pterygium is less common than in places where the average annual percentage is low.

It would thus appear that pterygium is a reaction to the irritation of dry, hot, dusty atmospheres; its location in between the upper and lower lids, and particularly in the medial area where there is an anatomical pocket formed by the nasal, frontal and malar bones, gives credence to this view. Moreover, the bulbar conjunctiva lateral to the cornea, situated as it is immediately below the lacrimal gland, receives the tears first and freshest.

I have pinguecula in both eyes; they formed in my twenty-second year when I possessed my first motor bicycle and before I learnt the wisdom of wearing goggles; my late father, an ophthalmic surgeon, noticed the pinguecula and made me wear goggles. The pinguecula are situated midway between the limbus and the plica semi-lunaris and so far I have no pterygium but I have seen many hundreds of cases of pinguecula spread to the limbus and become pterygia.

Here then are two conditions of the same histological and bio-microscopical appearance, derived from a common cause and differing in site only as to whether they are or are not in juxtaposition to the corneal limbus. Those that are not or do not become contacts with the limbus remain pinguecula. Those that do, progress to the formation of pterygium. If this assumption is correct, it is of some academic interest but it is of far greater surgical interest. For if the essential portion of a pterygium is sub-epithelial, then surgical treatment must aim at the removal of the active connective tissue core and not be content with mere transplantations, however ingeniously devised. A recurrent pterygium is a major ophthalmic problem, often necessitating the use of skin or mucous membrane grafts. It is, therefore, important to succeed at the first attempt on every pterygium operated upon.

Dr. Kamel, in his procedure of applying carbolic acid to the under surface of the pterygium, is attacking the core of contracting fibrous tissue, but it would seem to me more logical and more surgically complete to dissect it all away. At all events, using my present method of combined corneal shaving, stripping of

the subconjunctival core and exposure of a bare peri-limbal zone, I have had no post-operative recurrence for the past seven years.

The steps in the operation, together with the reason for each, are now described.

1. A horizontal incision is made with scissors in the bulbar conjunctiva above the upper border and below the lower border of the pterygium, from the limbus nasally for five millimetres. This incision is to ensure the creation of a peri-limbal strip bare of conjunctiva. The leaving of a strip of bare sclera, though it may seem an unsurgical procedure, is one followed independently by other workers (Colvin, Candlish, Accola), and is designed to give the cornea time to heal before conjunctiva grows across to the limbus. If conjunctiva is drawn right up to the limbus at the conclusion of a pterygium operation, there is a danger that the free edge may adhere to the raw corneal surface left by the removal of the apex of the pterygium, with consequent early recurrence.

2. The closed scissors are pushed downwards through the upper incision and beneath the pterygium tissue, in preparation for the next step.

3. One limb of a small dressing forceps is inserted either through the upper or the lower incision, so that the pterygium tissue may be firmly held between the forceps limbs inside and outside the tissue. This firm grip near the limbus prevents tearing of the conjunctiva.

4. With a sharp cataract knife or keratome, the apex of the pterygium is shaved from the cornea, a thin layer of cornea being included in the shaving, for the corneal part of a pterygium is essentially a degeneration of the cornea; also it ensures complete removal of all the conjunctival tissue with its blood vessels.

5. The apex of the pterygium, now free, is grasped at its tip by fixation forceps and held up vertical and taut by an assistant. The surgeon, using fine dressing forceps or iris forceps and sharp pointed scissors, dissects the whole sub-conjunctival portion of the pterygium from the under surface of the epithelial layer, as far medially as the plica semilunaris. This comes away in one triangular piece and is a remarkably thick and extensive structure, underlying the whole extent of the pterygium. Indeed, in my view, it is the pterygium, and its removal is essential. In addition, its absence makes the remaining conjunctival layer a thin one and avoids the lumpy and unsightly appearance left by the orthodox transplantation operation. I agree with Dr. Kamel that transplantation is illogical and quite unnecessary.

6. At the completion of these procedures, the free edge of the conjunctiva is trimmed so as to excise a sliver of it, and thus

FIG. 1.

Showing initial horizontal incisions in the conjunctiva, above and below the pterygium.

FIG. 2.

Showing the neck of the pterygium firmly held between the forceps blades, while the apex is being shaved from the cornea.

FIG. 3.

Showing the sub-conjunctival tissue being dissected away, prior to its excision.

FIG. 4.

Showing the apex being trimmed off by scissors in the direction indicated by the dotted line

FIG. 5.

Showing the quadrilateral of bare sclera, left at the termination of the operation.

leave a bare strip of sclera several millimetres in width. The conjunctiva rapidly grows over the scleral strip but not before the corneal surface has healed.

7. Before bandaging the eye, as well as antiseptic drops, atropine 1 per cent. should be inserted to help the cornea to heal.

This technique may be successfully used in recurrent pterygium but in cases of second recurrence the free graft method as described by A. L. North should be used. In this procedure a strip of skin is slid under the conjunctiva above and below, separating the free conjunctival edge from the cornea until the latter has healed, an application of the same principle as the bare scleral strip in the operation I have described. The reason for using the graft in second recurrence cases, instead of using the technique described in this paper, is this; in such cases the sub-conjunctival adhesions are of such density and toughness that tissue planes are lost and there is danger of actually perforating the sclera if dissection or even separation of the pterygium tissues from the sclera is attempted. This disaster once happened to me and taught me a salutary lesson.

In conclusion, argument has been presented for the view that pinguecula and pterygium are fundamentally identical aetio-logically and structurally, that the primary focus of activity is in the connective tissue and that efficient pterygium surgery must include removal of this tissue, the technique for which has been described.

Acknowledgment.—Abbott Studios, Sydney, for their careful illustrations.