OPERATIVE TREATMENT OF CONGENITAL PTOSIS* REPORT ON 25 OPERATIONS

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If one excludes excision of skin, or of portions of the orbicularis, from the upper lid, operations for the relief of congenital ptosis may be divided into three groups:

- (i) those designed to make the frontalis raise the upper lid,
- (ii) those making use of the superior rectus,
- (iii) those designed to shorten and advance the levator palpebrae muscle.

As Berke has pointed out, however, more than eighty operations have been described, although all are modifications of one or other of the above procedures. This multiplicity of methods is proof in itself that surgeons, in general, do not obtain consistently good results from any one operation.

Since Dransart (1880) first suggested the insertion of subcutaneous sutures of catgut to try to create a band of cicatricial tissue between the frontalis and the upper lid, many similar procedures have been described, but to-day the most frequent method of utilizing the frontalis is undoubtedly by the insertion of strips of fascia lata, as suggested by Wright (1922) and recommended by Lexer (1923) and other authors. This operation is widely used and is an effective method of correcting many cases of ptosis. It has, however, the undoubted disadvantage that the cosmetic result is often not satisfactory, which is hardly surprising in view of the fact that the pull is vertically upwards with consequent loss of the normal curvature of the upper lid. Even the insertion of extra stitches to join the fascia to the skin, as suggested by Juler (1939), does not achieve a good cosmetic result in most cases. It is of interest to note that Juler himself, although mentioning the latter procedure, expressed a preference for the method of Blaskovics (1929), namely advancement and resection of the levator, to that described by Wright and by Lexer.

The use of the superior rectus (as originally suggested by Parinaud (1897) and Motais (1897), with modifications introduced by later workers) while it produces, when successfully performed, a good cosmetic result, is not without grave disadvantages. A certain degree of lagophthalmos is unavoidable since the eyeball cannot roll upwards during sleep and there is consequent danger of exposure keratitis in cases where ptosis is fully corrected by this method. It is also difficult to avoid undue arching of the lid margin, and

* Received for publication March 3, 1952.

there is a definite danger, in cases of unilateral ptosis, of producing post-operative vertical muscle imbalance.

The third basic procedure, namely to shorten and advance the levator palpebrae muscle, was first suggested by Bowman (1857) in a report of one case. Following this, various approaches to the levator were described by Wolff (1896), Eversbusch (1883), Blaskovics (1929), and other writers.

The Eversbusch procedure consisted of a shortening of the levator by taking a tuck in it, the approach being through the skin of the upper lid. While this operation has proved effective in cases of ptosis of slight degree, it is generally regarded as ineffective in severe cases.

Blaskovics (1908) described an operation for resection of the levator using a conjunctival approach as had been suggested by Bowman fifty years before, but his technique was not fully elaborated until 1929. In 1923 he reported his results in 21 operations after resection of a portion of the levator and excision of a considerable portion of the tarsus. Six years later he elaborated his technique, by the addition of extra sutures designed to create a fold in the upper lid, to improve the cosmetic result, and he recorded another twelve successful cases. In these 33 cases Blaskovics had only two over-corrections and one under-correction.

Dunnington (1941), Malbran (1941), and other writers, although advocating the Blaskovics type of operation as the best in selected cases, consider that the operation can be used successfully only when the levator muscle is present and active, and that there is a tendency to under-correction. On the other hand, the same writers stress that the operation has several great advantages in that lagophthalmos is rare, the margin of the lid is rarely deformed, and there is no wrinkling of the brow or backward tilt of the head, and no risk of producing diplopia.

While, as noted above, many surgeons consider that the levator must be active, if a resection type of operation is to give adequate correction, Blaskovics, and also Lindner (1934) and Jaensch (1935), all of whom published results showing a high proportion of successes, maintained that the operation could be used for correction of any degree of ptosis and even when the levator was apparently completely inactive.

More recently, Matthews (1949), as a result of considerable experience, has expressed the opinion :

for congenital ptosis, shortening and advancement of the levator muscle is the most satisfactory method of correction, even if no action of the muscle can be detected pre-operatively.

Before 1947 various operative procedures were used at the Royal Infirmary of Edinburgh, and during the years immediately prior to that date the method most commonly used was a Lexer type of operation. It is fair to state that no method appeared to produce anything like consistently good results. One conclusion I had come to, however, was that when successful the Blaskovics type of operation produced an excellent functional and cosmetic

result. It therefore seemed desirable to try to find out whether such failures as did occur were due to faults in the method as described by Blaskovics, or to faults in the performance of the operation.

ANATOMY.—Agatston (1924), in describing a modification of Blaskovics's operation stated that he was convinced that poor results were often due to faulty technique, and both Hildreth (1941) and Berke (1945) have stressed certain anatomical details which are essential to the proper performance of advancement and resection of the levator.

It is true that Wolff (1905) drew attention to the surgical importance of certain points in the anatomy of the region with which we have to deal, and in particular to the insertions and relations of the levator palpebrae superioris and of Muller's muscle. As Berke has pointed out, however, other surgeons, although they may have included both the levator and Muller's muscle in their resections, have failed to record any differentiation.

Many surgeons have described the levator as sometimes very friable and even as absent, an observation which makes one think that on some occasions they may have mistaken Muller's muscle for the levator, and advanced and resected the former in mistake for the latter. In the author's experience, Muller's muscle, although usually thin and friable, can often be dissected quite readily as a separate layer, which one could well imagine a surgeon, unfamiliar with the operation, using in his resection and advancement. On the other hand, the aponeurosis of the levator is always considerably thicker and stronger and should certainly be capable of sufficient resection and advancement, if clearly exposed, to correct even severe degrees of ptosis.

Matthews (1949) has also stressed how bulky the levator is, even when clinically there appears to be no levator action at all.

Whitnall (1921) has given us a detailed description of the insertion of both the levator palpebrae superioris and of Muller's muscle, and, as has been noted above, the recent anatomical studies of both Hildreth and Berke have emphasized their surgical importance.

As Whitnall has said, the levator terminates in an expanded tendon called the "aponeurosis", and the fore edge of this breaks up into fine connective tissue fibres which are inserted into the skin of the lid and the lower third of the anterior surface of the tarsus.

Moreover, lying in close contact beneath the aponeurosis is a thin lamella of pale, smooth muscle fibres, which appears to be a direct continuation of the fleshy belly, but is inserted directly into the upper margin of the tarsal plate. This is the superior palpebral involuntary 'muscle of Muller', and constitutes a secondary insertion of the levator.

Whitnall also pointed out that the aponeurosis of the levator is a band of dense connective tissue about 7 mm. in depth from before backwards, and that it fans out into lateral and medial horns.

The principal insertion of the levator, therefore, is into the skin of the whole pre-tarsal portion of the lid, the uppermost fibres fusing with the septum orbitale, and the lowermost fibres gaining attachment to the lower third of the anterior surface of the tarsal plate (Fig. 1, opposite).

Of the two 'horns' the lateral is the stronger. On the medial side the aponeurosis becomes less well-defined as it thins out to gain attachment to bone along with the medial palpebral ligament.

As described by Whitnall, Muller's muscle forms a thin sheet of red muscle fibres lying in front of the conjunctiva, and connected to the upper border of the tarsal plate, the muscle being about 1 cm. in length.

In addition, some authors point out yet another attachment of the levator, to the conjunctiva of the upper fornix of the conjunctiva. Whitnall states that this attachment is in reality a thickening of the muscle sheaths: nevertheless it is an attachment which has to be freed at operation.

Another point of some practical importance is the fascial sheath of the levator. Once again we are indebted to Whitnall for an adequate description of this structure:

Its superficial part, covering the upper aspect of the muscle just behind the aponeurosis, is condensed to form a definite ligamentous band, which stretches transversely across to reach the orbital walls on either side, parallel with but attached at a higher level than the aponeurosis: medially the main connection is to the trochlea, but behind this some fibres pass to the bone, and a well-marked slip passes forward to bridge the supra-orbital notch; laterally the band is connected with the stroma of the lacrimal gland and cuts into it, as does the lateral horn of the aponeurosis, and beyond the gland it reaches the lateral orbital margin: it lies for the most part free above the aponeurosis, but stout strands of connective tissue may unite them. In front of this ligamentous condensation the sheath becomes abruptly so thin that it appears to end in a free border.

FIG. 1.—Relationships of structures involved in operation for resection, and advancement of levator and Muller's muscle (after Whitnall, 1921).

APPLIED ANATOMY.—In the light of these observations, Blaskovics's operation was performed upon fairly fresh cadavers, and an attempt was made to correlate the findings with those found at operation upon the living subject.

In the cadaver the plane of cleavage between the levator and Muller's muscle was difficult to define, mainly owing to the relative similarity in colour of the bloodless tissues and also to the hardening of them by preservative fluids.

During operations upon the living subject, a good deal of variation was found. On reflection of the conjunctiva, first by sharp dissection and then by 'scissor-spreading', Muller's muscle was always readily identified as a thin red sheet of muscle fibres, and, if this was picked up by traction sutures, the line of cleavage between the muscle and the aponeurosis of the levator could be readily identified in view of the contrasting pale pink aponeurotic appearance of the connective-tissue of the levator, which was always quite a substantial layer of tissue.

There was also considerable variation in the friability of Muller's muscle. In some cases the muscle was readily dissected as quite a well-defined layer which one might easily have resected and advanced in mistake for the levator: in others it was much more friable.

The fascial sheath of the levator also presented some differences of practical importance. In the cadaver, the anterior portion of the sheath, anterior that is to the ligamentous condensation described by Whitnall, was very thin and friable. In the living subject, one could, however, quite readily dissect along the upper surface of the levator aponeurosis and beneath the anterior portion of the fascial sheath (Fig. 1), and it is this plane of cleavage which one should define in order to avoid prolapse of orbital fat. Only occasionally did the sheath tear during dissection, and then only slightly.

Dissection in the above planes, first between the conjunctiva below and Muller's muscle above, and then along the upper surface of the levator but beneath its fascial sheath, allows of dissection as far back as the anterior part of the belly of the levator. In this way approximately 10 mm. of the levator are exposed, and this, together with the 8 mm. which can be removed from the tarsal plate, is ample for purposes of resection and advancement.

If one wishes to free more of the levator, then its fascial sheath can be separated still further by "scissor-spreading" dissection.

Operative Technique

Bearing the above anatomical points in mind, seventeen consecutive cases of ptosis were operated upon by a modification of Blaskovics's original technique. Sixteen of the cases were congenital in nature, and one was an adult case of acquired ptosis following encephalitis.

Eight of the cases were bilateral, so that in fact 25 consecutive operations were performed.

It is of interest to note that the method employed since 1947 has been essentially similar to that adopted by Matthews in the same year, and described by him in 1949. In some respects, however, for reasons which will be discussed later, the technique, particularly in the later stages, is different.

The various stages in the operative procedure, emphasizing the application of the anatomical details referred to above, may be summarized as follows:

(i) The first stage, after double-eversion of the upper lid, is the insertion of three traction sutures in the upper border of the tarsal plate. The conjunctiva is then incised 2 mm. from the upper edge of the tarsus (Fig. 2, opposite).

The conjunctiva is now dissected downwards, partly by cutting but mainly by 'scissor-spreading' (Fig. 3), thus exposing the under surface of Muller's muscle and its insertion into the tarsal plate. The three double-armed sutures (No. 1 black silk) to be used later in the advancement of the levator are then inserted in the conjunctiva, as originally described by Blaskovics.

(ii) It is to be noted that Muller's muscle covers the whole of the doubly-everted tarsal plate, whereas the levator aponeurosis—covered by Muller's muscle—only overlies the lower third of the tarsal plate. A spatula should therefore be inserted behind the doubly-everted upper lid, so as to push forwards the anterior portion of the levator aponeurosis. Three traction sutures (No. 1 white silk), taking a deepish bite, are now inserted immediately below the lower border of the tarsal plate so as to pick up both Muller's muscle and the underlying aponeurosis of the levator (Fig. 4). The spatula is then removed.

(iii) As soon as traction is applied, the next step should be to dissect backwards along the under surface of Muller's muscle. The line of cleavage is exposed by snips with scissors, and the latter are then inserted and 'spread' (Fig. 5). In this way a free space is cleared reaching as far back as the under surface of the belly of the levator. During this procedure the fibres going to the upper fornix of the conjunctiva will also be divided (Fig. 6, overleaf).

FIG. 2.—Control of doubly-everted upper lid by traction sutures. The dotted line shows the position of the incision into the conjunctiva.

FIG. 3.—Separation of conjunctiva from underlying Muller's muscle by 'scissor-spreading' dissection.

FIG. 4.—Three black double-armed sutures, to be used later in advancement of levator, inserted in conjunctival flap retracted downwards. White traction sutures have been inserted immediately below the lower border of the tarsal plate to pick up both Muller's muscle and the underlying aponeurosis of the levator.

FIG. 5.—Exposure of line of cleavage between conjunctiva below and Muller's muscle and levator above by 'scissor-spreading' dissection.

(iv) The next stage is dissection anterior to the traction sutures. Muller's muscle and the fibres of the levator attached to the lower third of the tarsus must be stripped from the tarsal plate to expose the portion of the aponeurosis immediately posterior to the fusion of the orbital septum with the latter.

Dissection should then be continued so as to cut through the levator aponeurosis just behind the orbital septum and thus reach the upper surface of the levator (*see* Fig. 1).

By 'scissor-spreading' one then clears a plane of cleavage between the upper surface of the levator and the anterior part of its fascial sheath. Again, once the initial cuts have been made to expose the line of cleavage, free exposure is best achieved by 'scissor-spreading' (Fig. 7, overleaf).

FIG. 6.—Further dissection to reach under-surface of belly of levator.

FIG. 7.—Levator and Muller's muscle retracted downwards. Dissection along upper surface of levator by cutting and 'scissor-spreading'.

FIG. 8.—Insertion of 'fold' sutures.

FIG. 9.—Levator sutures left long and strapped down on to cheek.

The 'hanging curtain' of the orbital septum is thus left attached to the skin through the terminal fibres of the levator aponeurosis, so that, when the anterior edge of the shortened levator is ultimately stitched to the anterior surface of the tarsus, the orbital septum will once more fall into place.

The sutures originally inserted into the conjunctiva are now passed through the levator, on an average about 10 mm. behind the traction sutures, in the manner described by Blaskovics, and the excess levator (with the underlying Muller's muscle) is excised.

(vi) The next step is to excise a portion of the tarsal plate, and my usual practice, in cases where the ptosis is moderately severe, is to leave 2-3 mm. of plate in the infant and 3-4 mm. in the adult. In less severe cases one should leave rather more of the tarsal plate, but excise the same amount of levator. In cases of complete ptosis, the extra effect should be obtained by resecting more of the levator.

(vii) The sutures used in the resection of the levator are then inserted between the anterior surface of the tarsus and the skin, so as to emerge on the skin-surface 2-3 mm. above the lid-margin. In this way the shortened levator is now once more re-attached to the skin and also becomes adherent to the anterior surface of the remaining tarsal plate.

(viii) With regard to the 'fold-forming sutures', I have found the method recommended by Spaeth (1939) more effective than Blaskovics's original suggestion. Three double-armed sutures (No. 00 black silk) are therefore inserted through the upper fornix to emerge on the skin-surface 4-6 mm. above the lid-margin (Fig. 8).

All sutures are tied over small glass beads or pieces of plastic tubing. The levator stitches are left long and fastened down on the cheek (Fig. 9). A pad and bandage are then applied, and an injection of 1,000,000 units penicillin is given intramuscularly.

Post-operative Care.—The sutures are cut short in 24 hrs, since post-operative oedema usually suffices to provide enough closure of the palpebral aperture to prevent any damage from exposure keratitis. The cornea is kept covered by a film of sodium sulphacetamide or penicillin ointment, and at first the eye is usually kept covered at night as a precautionary measure. The sutures are removed on the 8th day.

Results

The results in 25 consecutive operations have been as follows:

(1) In twenty cases a perfect or a near-perfect result was obtained. The surgical result, in so far as the correction of the ptosis was concerned, was excellent in all of them.

(a)

(b)

FIG. 10(a).—Right eye 10 days after operation. Left eye before operation.

FIG. 10(b).—Right eye 7 months after operation. Good correction of ptosis, but arching of lid-margin and a fold of redundant skin are seen. Imperfect cosmetic result.

Left eye 5 months after operation. Perfect result.

An absolutely perfect cosmetic result (Fig. 10, left eye) is always difficult to attain, and was only achieved in eleven of these twenty cases. The other nine cases, classified as near-perfect, showed minor degrees of arching of the lid-margin (four cases), or trivial degrees of under-correction (three cases) or over-correction (two cases). The right eye in Fig. 10 was one of the poorest cosmetic results in the 'near-perfect' group, the right eye in Fig. 11 being more typical of the slight imperfection which it is difficult to avoid. In none of these cases, however, was the residual defect sufficient to merit further operative interference, although, at a future date, the cosmetic effect might, in some cases (for example Fig. 10b, right eye) be improved by removal of redundant folds of skin.

The right eye in Fig. 12 is another example of a perfect result.

FIG. 11.—Case of moderate ptosis, right eye, 3 years after operation. 'Near-perfect' result.

FIG. 12.—Case of moderate ptosis, right eye, 3 years after operation. Perfect result.

(2) In two cases of unilateral ptosis, there was a definite under-correction which will require a second operation to achieve a perfect result. It should also be noted, however, that in three of the twenty cases reported above a second operation was required before perfection was achieved, and there is no reason to suppose that a perfect or near-perfect result will not also be achieved in these two cases.

(3) In one case with unilateral ptosis and associated paralysis of the superior rectus an under-correction was purposely performed. The operation was effective in that the faulty posture which had occurred was corrected, although naturally the cosmetic result was not as good as one would like to have achieved.

(4) In one patient with bilateral ptosis and marked blepharophimosis the result has been poor, and further operations will undoubtedly be required to deal with this complicated case.

Conclusions

Only by attention to all the anatomical details described above can one hope to attain the maximum benefit from advancement and resection of the levator, and failure to observe some of these points may well account for the fact that, in general, surgeons do not appear to have achieved the results recorded by Blaskovics, Lindner, and Jaensch. It seems probable, however, that surgeons like Blaskovics, Lindner, and Jaensch certainly performed advancements and resections of both the levator and Muller's muscle, since one could hardly imagine them achieving such a high percentage of success, particularly in cases of severe ptosis, in any other way.

It is true that in young children it is often difficult to assess whether or not the levator has any activity. In the present series, the advancement and resection operation was performed on a number of children, in whom several observers were of the opinion that the levator showed no activity, and yet, following operation, it was evident that there was in fact some function remaining. In any event, however, the results, in this series, have been equally effective, whatever the degree of ptosis, even in patients who had apparently no levator function when examined before operation. These findings agree with those originally recorded by Blaskovics and more recently emphasized by Matthews.

In the writer's opinion, the function of the superior rectus should be the main factor governing one's choice of operation.

IF THE SUPERIOR RECTUS IS NOT PARALYSED, THEN ONE SHOULD, I THINK, UNDOUBTEDLY DO A RESECTION AND ADVANCEMENT OF THE LEVATOR.

If, however, the ptosis is complete or nearly so, there will be considerable folding of the skin of the upper lid after correction of the ptosis, and in such cases an elliptical portion of skin will require to be removed, preferably 6 months or so later, to achieve the best cosmetic effect.

In severe cases of ptosis, and especially in those complicated by blepharophimosis, it is, I think, probably wiser not to attempt to achieve a full correction of the ptosis at the first operation. A partial correction will go far to correct faulty posture, and will enable the child to see. A second operation can then be performed at a later date to achieve the full effect.

Moreover, even in cases of moderate severity, the first operation may, in some cases, result in a slight under-correction. It is probably wiser, therefore, to warn the parents, in all cases, that a second operation may be required to achieve the maximum functional and cosmetic benefit.

IF THE SUPERIOR RECTUS IS PARALYSED, THEN ONE IS LEFT, IT WOULD SEEM, WITH ONLY TWO RATIONAL ALTERNATIVES. If the frontalis is obviously active, a fascia lata graft operation, as described by Wright, Lexer, and others, may be performed. If, however, the frontalis is not active, one must, I think, be content with an incomplete correction of the ptosis, preferably by advancement and resection of the levator, so as to avoid the danger of over-correction and the possible occurrence of exposure keratitis. One can raise the lid so as almost to clear the pupil, but one should not attempt to obtain a perfect cosmetic result.

In my experience, marked weakness of the superior rectus is not common. It is often difficult to assess its function in young children, and eyes which were thought to have little or no upward movement, will often be seen to roll well upwards during sleep or under general anaesthesia. Since, in my view, the choice of operation should depend upon whether or not there is marked weakness of the superior rectus, careful and repeated examination should be made in all cases recorded as having marked weakness of upward movement.

To sum up, therefore, the operation of choice in cases of congenital ptosis should, in my opinion, be a resection and advancement of the levator palpebrae muscle, except perhaps in those cases which show associated paralysis of the superior rectus. The operation should, I think, be done when the child is 3 years old, although in very severe cases it may well be advisable to operate at an earlier date.

Summary

(1) The literature regarding the operative treatment of congenital ptosis is briefly reviewed.

(2) The applied anatomy governing the performance of resection and advancement of the levator palpebrae is discussed, and the operative technique is described in the light of these findings.

(3) A report is given of 25 consecutive operations for correction of ptosis.

In 20 cases a perfect or near-perfect result was obtained.

In two cases there was definite under-correction which will require a second operation, but there is no reason to suppose that a perfect or near-perfect result will not be achieved.

In one case, with associated paralysis of the superior rectus, an under-correction was purposely performed.

In one patient, with severe bilateral ptosis and marked blepharophimosis, the result has been poor, and further operations will undoubtedly be required.

(4) The choice of operation is discussed, and it is concluded that advancement and resection of the levator, by a modification of Blaskovics's original technique, should be the method of choice in most cases of congenital ptosis.

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