MYECTOMY OF THE INFERIOR OBLIQUE

REPORT ON 100 CASES*

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THE beginnings of inferior oblique muscle weakening operations date back to the middle of the 18th century. A self-styled oculist, John Taylor, was then traversing Europe with a cure for squint which consisted of a single operation by incision in the lower angle of the eye, probably tenotomy of the inferior oblique. Then follows a description of the procedure by Bonnet (1841), but the operation was advocated as a treatment for myopia only. The history proper starts with Landolt (1885), when the possibilities of the operation as it is used nowadays were outlined. As Fink (1951) rightly remarks, there is no evidence that Landolt ever performed the operation, but it nevertheless was performed during the second half of the 19th century for torticollis arising from vertical imbalance. The weight of the opinion of von Graefe (1898), however, that obliques should not be touched in any circumstances, put a strong brake on development in this direction. The increasing confidence in the feasibility of inferior oblique surgery dates from Duane's experience with it which began in 1906—the work was never published, but it was reported in 1907 (Posey, 1915), and was referred to by White (1933).

Myectomy at origin was the only procedure practised until White and Brown (1939) described tenotomy at the insertion. White (1943) described the first two cases in which recession was performed. Since then numerous papers on inferior oblique surgery have appeared, especially in the American journals; as a rule these papers condemn tenotomies and claim the advantages of the recession. Of British authors, Lyle (1953) and Nutt (1955) have for several years given evidence of the feasibility of this and other surgery of the vertical muscles.

Clinical Material

My own interest and experience in inferior oblique muscle surgery goes back 10 years. The literature on the subject seemed contradictory, and 3 years ago I thought of making a systematic approach to the most common of these operations, the inferior oblique myectomy at origin.

The present report is based on an analysis of a hundred cases of myectomy of the inferior oblique at its origin in 89 patients. These cases were

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amongst 409 squint operations performed during this same period of 3 years. Ten of these cases had had horizontal muscle surgery before coming under my care; in thirty cases myectomy was the primary procedure (alone in thirteen cases and preceding other muscle surgery in seventeen cases). In 51 cases myectomy was performed at the same time as horizontal muscle surgery, and in nineteen cases after horizontal muscle surgery. Bilateral myectomy was performed in eleven cases. Surgery in two stages was necessary in thirty cases, three stages in ten cases, and four stages in two cases.

The majority of patients were children, the age range being from 2 to 51 years (Fig. 1).

FIG. 1.—Age at operation.

The five oldest cases had developed symptoms at 27, 28, 33, 46, and 51 years of age, and their reasons for asking for help were various. One patient, for instance, had become increasingly conscious of one eye wandering upwards when talking to people, and was very embarrassed by it. The main point was that the consumption of alcohol—rather lavish in this case—seemed to make matters worse. Another complaint came from a woman of 50 who came to me with a story of having trouble with seeing the “Halt Major Road Ahead” sign when driving. She had underaction of the left superior rectus and a very marked right inferior oblique upshoot. The operation seemed to be successful as she has had no driving licence endorsement for the past 3 years.

Refractive errors in this series present an interesting problem. In forty cases the eye with an overacting inferior oblique was the more hypermetropic or astigmatic eye with suppression. In ten cases, the eye with lower refractive error showed overaction of the inferior oblique. In 39 cases, refractive error was equal in both eyes or non-existent. These findings rather cast a

shadow on the usual belief that underaction of the muscles is the aetiological factor in such cases. The concept of *horror fusionis* is not easily acceptable nowadays. And yet the optically handicapped eye is found to be the one escaping the synergistic position in many cases, and to be doing so by overaction of the least differentiated ocular muscle.

Binocular function was absent in 77 cases before surgery (89 per cent.), and none of these patients developed it after the operation, in spite of good results and persistent orthoptic efforts.

Verhoeff (1941) stated that the primary overaction of the inferior oblique did not exist, and I am inclined to accept this view. The common primary insufficiency provoking the inferior oblique overaction is the contralateral superior rectus weakness, or the ipsilateral superior oblique weakness. My material consists of 24 cases of primary superior rectus weakness of the other eye and 56 cases of primary superior oblique weakness of the same eye. Nine cases were not diagnosed definitely before operation. In spite of very many very respectable tests, the diagnosis in small children and in some old-established cases with secondary contractures is very difficult. It is my experience, however, that overaction of the inferior oblique remains unchanged, even if the actually underacting muscle of the same or contralateral eye is dealt with surgically with a satisfactory result. This I found in spite of sharing the opinion that it is—as a rule—the underacting muscle that should be strengthened in eye muscle surgery.

Technique

In his paper on the myectomy of the inferior oblique, White (1933) refers to his experience with 400 operations dating from 1914 when he started doing them under the guidance of Duane. The operation performed was a simple myectomy through a cutaneous incision. 17 years later Brown (1950) states: "The tenotomy or myectomy of the inferior oblique at the origin or insertion is still used rather extensively by the writer". In the flow of publications advising longer, bigger, and more complicated operations to replace the older ones, one tends to feel embarrassed when using simple procedures. Nevertheless, the operation used throughout this series was a myectomy at the origin of the muscle through a cutaneous incision under general anaesthesia. After reviewing 100 myectomies operated upon in this way, one is rather overwhelmed by statements like that of Davis (1944) that: "the cutaneous incision is inexcusable; it adds a scar on the face to what is already a sad situation". There are no scars. The incision of course must follow the skin creases—of which there are many near the inner angle of the eye even in small infants—it does not need to be longer than one-third of an inch. The technique of stitching the skin has probably something to do with so very different experiences with this incision. Whatever the other criticism of the myectomy of inferior oblique, I think the trans-cutaneous operation is quite permissible.

In one important point my technique differs from that of White: when the muscle is held on a strabismus hook it is grasped by two fine Spencer-Wells forceps, and the division of muscle—or excision of a portion—performed between them. This in nearly all cases prevents a haemorrhage into the orbital tissues. The patients will nevertheless end with a very black eye in spite of all precautions, if the anaesthesia is not right, for jugular congestion during the operation is the surest way to produce it.

Results

The literature on the subject does not give much in the way of statistical assessment of what can be achieved by myectomy of the inferior oblique. It is agreed by all authors that the actual correction of hypertropia varies within wide limits and that it is not predictable. This unpredictability of the result led to the operation of recession. It is true that myectomy at origin produces varying degrees of correction of hypertropia in seemingly identical cases with an identical technique. In degrees or prism dioptres of correction the operation is indeed unpredictable. Statistically—even in my small series of cases—and functionally, however, it certainly achieves its purpose. There were many cases in which the result seemed negligible as measured by the major amblyoscope but in which the cosmetic improvement was beyond doubt. In those cases in which pre- and post-operative measurements were possible, the difference of hypertropia from the operation varied between zero and 22 prism dioptres (Fig. 2, opposite).

The situation is not very different from that which obtains in horizontal recti surgery. One has recognized for many years that the theoretical calculation of millimetres of recession and resection per degree of squint corrected is only a very approximate guide at the operating table, and I do not think that the callipers used for the purpose of measuring this distance are now often seen in the instrument tray for a squint operation. Scobee (1951) summed up the situation.

The results were assessed in three ways: on clinical grounds by myself, on clinical grounds independently by the orthoptist, and by the major amblyoscope. The two sets of clinical assessments (Table I) are very much alike.

TABLE I
CLINICAL ASSESSMENT OF RESULTS OF OPERATION

Assessment	Number of Cases			
	Poor	Fair	Good	Very Good
Author's	7	23	41	18
Orthoptist's*	6	20	39	17
Patients with Binocular Single Vision	—	—	3	9

* Seven cases were not seen by the orthoptist post-operatively.

FIG. 2.—Major amblyoscope assessment of change in hypertropia resulting from myectomy of the inferior oblique muscle in 51 cases for which pre-operative assessments were available (each stroke represents one case).

This shows rather a gratifying degree of agreement between the surgeon and his orthoptist. It also shows that there was very little wishful thinking in assessing the material, but the amblyoscope reading—of which we were not aware when assessing clinically—shows only 28 cases with vertical orthophoria post-operatively (Table II).

TABLE II
MAJOR AMBLYOSCOPE ASSESSMENT OF POST-OPERATIVE VERTICAL DEVIATION

Δ of Deviation ..	0	1-3	4-7	Over 7	Impossible to assess	Not assessed
Number of Patients ..	28	18	15	13	10	7

Many cases with more marked hypertropia obviously looked better cosmetically than some with lesser deviation. It was felt that the answer might lie in binocular functions; indeed all cases with fusion have fallen in the "good" and "very good" category. Amongst the alternators and amblyopic patients, the relation between the clinical appearances and amblyoscope

measurements was haphazard. The cases with full binocular function are analysed by age at onset of squint and age at operation in Table III. Neither late onset of squint, nor early operation seemed to influence the preservation of binocular function in this small series.

TABLE III
RELATION OF AGE AT ONSET OF SQUINT TO AGE AT OPERATION
IN TWELVE CASES WITH POST-OPERATIVE BINOCULAR FUNCTION

Case No.	Age at Onset (yrs)	Age at Operation (yrs)
1	Birth	6
2	Birth	8
3	6 mths	2
4	2	4
5	2	8
6	3	3
7	3	5
8	3	5
9	3	6
10	6	7
11	6	10
12	7	27

Discussion

There are two points for discussion in the light of these results: the indication for operations on the inferior oblique, and the evaluation of the results of the particular procedure described. The 100 cases in this series were amongst 409 cases of squint surgery performed during the past 3 years. Another 22 cases had other vertical muscle surgery during this time. That means that 30 per cent. of operations for squint were necessitated by a vertical anomaly alone or in combination with other anomalies; 26 per cent. had an overaction of the inferior oblique muscle. Comparable figures in the literature are 36·6 per cent. (White and Brown, 1939), 71 per cent. (Anderson, 1947), 43 per cent. (Scobee, 1950), and 22 per cent. (Nutt, 1955); compared with these figures, my assessment of the number of cases with a vertical component does not seem over-enthusiastic.

The inferior oblique overacts as a rule in the presence of contralateral superior rectus weakness, or ipsilateral superior oblique weakness. Bielschowsky (1935) and Gifford (1941) found the superior oblique most often at fault, but White (1933) found the superior rectus to be the offender. There is no doubt, however, that the one extra-ocular muscle which most frequently overacts is the inferior oblique. With the number of cases of squint in this country, the problem is a major one even allowing for the small number of cases where the overaction of the inferior oblique in adduction is of secondary significance and will be corrected by medial rectus surgery.

It is said that the treatment of squint should aim at the restoration of binocular function and not only at improved appearance; 89 per cent. of my

patients had no binocular function before operation, and did not develop it subsequently. Twelve cases (11 per cent.) had some grade of binocular vision before operation and they all retained or improved it, nine of the cases being in the "very good" and three in the "good" category of results (Table I). Undoubtedly the alignment of the visual axes preserved their binocular function. But in this series of vertical component squints, the majority of patients in spite of their youth had the operation—it would seem—for purely cosmetic reasons. To operate for a vertical component on a child of 2 or 3 years old is easy enough, but the diagnosis in such cases is often extremely difficult. Nearly all my "poor" results were found in this group of small children with bad squints and obvious hyper- or hypotropia. In a few instances I now know that my original diagnosis as to the primary muscle involved was wrong, and five of them are now waiting for further surgery. My personal conclusions have made me much more cautious with vertical muscle surgery in very small children, unless I am quite certain as to the diagnosis of the primary vertical muscle involved. The youngest patient with post-operative binocular function was operated on at 2 years of age. Table III shows that the delay in operating does not materially influence the preservation of binocular function, and I think that a delay of 1 or 2 years in young children—horizontal muscles being tackled as early as possible—may not be very damaging.

In many of the apparently cosmetic cases an interesting feature appears: the post-operative amblyoscope readings indicate only medium success in reducing hypertropia, but binocularly the eyes are kept level and the symptoms disappear. The orthoptic assessment by such tests seems a little misleading, as the tests interfere with the binocular use of the eyes. The Hess screen is in many cases impossible because of suppression, and the amblyoscope measures the tropia in the primary position, but not in the functional position for a given muscle, both tests being impossible and unreliable or even misleading for very young children.

After being confronted with the frequent discrepancy between the orthoptic and clinical result of the operation, it seems to me that the functional result of the operation is not strictly assessed by measurement of the eye position. The surgery lengthens the normal muscle to achieve less contracture, but the inferior oblique does not overact because of anatomical hypertrophy or shortening, and the nerve impulse that leads to overaction cannot as yet be measured. Scobee (1951) pointed out—in relation to horizontal muscle surgery—that our operations merely give the oculomotor mechanism a chance to do the work itself. I do not know in how many of my cases trace of peripheral fusion existed, and I think that its existence is frequently missed in routine examination, but given "a chance" by the weakening, if not by the correcting of the overacting inferior oblique, it maintains alignment of the eyes. Without vertical correction there can be no successful squint surgery in such cases.

If the indications for surgery in cases of overaction of the inferior oblique muscle are agreed upon, it may be asked whether a myectomy at origin or a recession at insertion should be undertaken. (Free myectomy at insertion has a bad reputation and I have no experience of it.)

Recession of the inferior oblique muscle was described 15 years ago, and a few variants in technique have been published more recently. The argument in favour of this operation, which is strongly advocated by American authors, is the better predictability of results. The operation takes longer, though it is technically not difficult, but I have had no better results with it than with myectomy at origin. The main argument against myectomy at origin is that a free myectomy is always a bad operation, and may lead to complete loss of function, but the failures in my series were always associated with persisting hypertropia in spite of not only myectomy but up to 5 m. excision of muscle tissue. I have not seen one case in which the inferior oblique became underacting as the result of operation.

It is not my intention in presenting this paper to claim special merits for myectomy at origin, but to put on record a series of cases in which the operation was used. If it stimulates a report relating to a series of recession operations, it would be very gratifying. Weakening of the inferior oblique will always remain an essential procedure in squint surgery, and the empirical rather than the theoretical tackling of the problem will eventually show the best way of dealing with this muscle.

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