Myopes, squints, and scans

Why should some people with severe axial myopia develop a marked esotropia combined with hypotropia? Although rare, this unusual form of restrictive extraocular muscle imbalance is well recognised. Various suggestions regarding its aetiology have been proposed. Several points to an underlying anatomical cause; the large, myopic globe leading to an imbalance of the structures within the orbit which results in a limitation of normal ocular rotations. In this issue of the journal Krzizok and co-workers (p 625) present magnetic resonance imaging (MRI) and surgical findings in a series of such patients with high myopia and strabismus. Their high definition magnetic resonance scans demonstrate that the lateral rectus muscle takes a pathological course, developing an inferotemporal deviation at the equatorial plane, in a significant percentage of these patients. This finding is confirmed at operation and surgery aimed specifically at correcting the abnormal path of the muscle proves curative.

This paper illustrates well how newer and more accurate imaging techniques can be helpful in improving understanding of the aetiology of extraocular muscle disorders and how this understanding can lead to more defined methods of management. It also reinforces the concept that when considering incomitant strabismus it may not always be possible to explain the clinical picture in terms of the usual simplistic concepts of extraocular muscle weakness or restriction. In some cases it is necessary to consider abnormal muscle anatomy or function and occasionally a clearer view of the intraorbital dynamics is necessary to understand the exact mechanism. Indeed, the role of the connective tissue system within the orbit and its connection with the extraocular muscles is often overlooked as an important factor in the genesis of a number of eye movement disorders.

High quality MRI has undoubtedly improved our understanding of the intraorbital contents. Compared with conventional computed tomography it provides excellent soft tissue differentiation which delineates the muscle anatomy in detail. Thus, in addition to the relative relation with other intraorbital structures, the extraocular muscles themselves can be evaluated with regard to abnormalities in muscle size or shape as well as any variations in the origin, insertion, or pathway. Three dimensional reconstruction is an exciting extension of the standard two dimensional scan and, as this provides a fuller anatomical picture, may assist in improving the understanding of certain conditions such as blowout fractures, lost or dropped muscles, postoperative overcorrections and undercorrections, and craniofacial disorders.

Anatomical detail, however, may not be sufficient to unravel the entire story and, as described in Krzizok et al’s paper, functional assessment of the muscles can be carried out by examining scans taken in different positions of gaze. Information is thus obtained about the contraction/relaxation characteristics of each muscle, as demonstrated by the length and breadth features in different locations and in different planes. ‘Dynamic’ images are usually made up by building a cine loop of multiple static orbital scans, taken as the patient fixates on a series of targets. These ‘fixed eye’ dynamic scans do not, therefore, represent a real time picture and so give no details about the velocity of movements and therefore only provide limited information. ‘Moving eye’ methods of examining the extraocular movements have been described and seem to give a more helpful and relatively accurate portrayal of the actual movements of the eyes; these, however, are very demanding on the patient and cannot currently be considered as feasible. At first glance it may be considered that such imaging techniques will only be useful in the rarer and more unusual types of ocular motility disturbance which have an obvious intraorbital or functional anomaly. However, utilising information derived from such cases may lead to an improvement in the knowledge of many commoner conditions. There are a surprising number of disorders which can readily be identified as being candidates for high quality dynamic scanning—for instance, the alphabetical patterns (A, V, and X) and DVD, as well as some rarer disorders such as Duane’s and Brown’s syndromes, strabismus fixus, and the adherence syndrome.

Imaging can also contribute to the identification and monitoring of pathological processes within the muscles. The understanding and management of dysthyroid eye disease has been improved by the use of MRI, using the STIR (short tau inversion recovery) sequence. This distinguishes the amount of active muscle inflammation and therefore acts as an index of disease activity and, taken with the clinical findings, allows this disease involving the extraocular muscles to be staged and treated appropriately.

There are therefore a variety of ways in which imaging may assist in motility disorders. This field is constantly advancing and improvements in resolution, special sequences, three dimensional reconstruction, and real time
techniques are inevitable and should ensure that MRI becomes an increasingly valuable tool which contributes further to the understanding, and therefore management, of ocular motor disturbances.

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Evaluation of corneal transplantation

Corneal transplantation is the most widely practised form of clinical allografting. First successfully carried out almost a century ago, its place in clinical practice was well established before the vagaries of immunological privilege and allograft rejection were appreciated.

Early on, the cornea and anterior segment of the eye were established as ‘privileged sites’ which led to a widely held view that corneal grafts were invariably successful. This is far from the truth.

Paradoxically, corneal transplantation is both the most successful and the least successful form of clinical transplantation. Grafts done for dystrophic conditions, particularly keratoconus, seldom reject, with a graft survival rate of 50% after 5 years. However, grafts done for acquired diseases fare badly. This is a great pity since acquired corneal blindness is second to cataract as a cause of visual loss on an international scale.

The mechanisms of these frequent failures are many. Various factors account for the differences which are reflected in the wide variations in outcome seen between various centres. This variation is common in other branches of transplantation, is referred to as the ‘centre effect’, and defies specific elucidation.

Dissecting out the various factors contributing to graft outcome demands extensive multicentric prospective analyses. Vail and others report such a study in this issue of the BJO (p 631). They confirm some widely held clinical beliefs, provide support for intuitions, and report some new and perhaps unexpected findings.

In recent years, the importance of recipient factors has been established and is further confirmed by their study. Corneal inflammation and vascularisation are known to be associated with a high risk of rejection. Inflammatory disease erodes corneal privilege. Patients with acquired diseases are much more likely to reject their corneal transplants.

The importance of allograft rejection is further confirmed by the small but significant benefit bestowed by class I HLA matching. That a degree of class II matching was associated with less rejection than zero HLA-DR matches is interesting in view of an emerging understanding of the various mechanisms contributing to corneal allograft rejection. It is generally believed that indirect presentation of antigen is important in allograft rejection and particularly so in corneal rejection where the graft carries few passenger cells.

The essential elements of this process involved the bone marrow derived cells of the host, principally macrophages and interstitial dendritic cells, presenting foreign histocompatibility antigens of the donor to the host immunocytes. This process is class II restricted. The concept of indirect presentation of antigen is important in understanding the biology of corneal allograft rejection and in establishing the principles of management for patients undergoing this procedure. Corneal allografts are more likely to be rejected if placed in a recipient cornea replete with high numbers of inflammatory cells. Grafts complicated, for one reason or another, by postoperative inflammation are more likely to suffer allograft rejection.

Postoperative care is aimed at reducing the influx of host inflammatory cells into the graft. The use of non-reactive monofilament nylon sutures, the use of topical corticosteroids, the prompt and energetic treatment of inflammatory events, such as infections or ulceration, are directed at reducing the accumulation of host inflammatory cells in the graft.

Of immediate relevance to the surgeon are the issues where there is a choice in the management options of a particular case. For example, all other things being equal, it would seem better to avoid large grafts. This has been observed in other studies.

The importance of clinicians making appropriate decisions is emphasised by the better results achieved by high volume surgeons. This difference is likely to be the result of making better management decisions based on greater experience than on better developed surgical skills. Immediate post-surgical failure is uncommon.

It is important that the authors have taken the evaluation of graft outcome beyond an assessment of endothelial failure. Not all grafts which are clear and functioning provide good vision, and not all grafts providing reasonable levels of acuity contribute to the patient’s visual ability in the general sense. Although the majority of grafts are done for visual reasons the evaluation of their outcome is complicated. Best corrected acuity is not always satisfactory for patients. More relevant is the level of acuity with a form of correction which is acceptable and usable by the patient. Furthermore, binocular acuity is important. Visual ability is related to vision in the better eye, rather than the worse eye. Unless patients achieve vision in the grafted eye better than or comparable with the contralateral eye very little is gained from the procedure.

The claim of Vail and his colleagues that, ‘Far more is known concerning corneal transplantation in the UK than was known at the outset of the Corneal Transplantation Follow up Study’, is entirely justified. What is disappointing is that the authors have been forced to provide their conclusions at such an early stage. As a 1 year study the data will not supply anywhere near their full potential of information. Transplantation is a long term intervention...
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