Macular Translocation with 360 Degrees Retinotomy – Role in the Anti-VEGF Era

Dr. Som Prasad MS FRCSEd FRCOphth FACS

Introduction
The advent of intravitreal therapies such as Ranibizumab and Bevacizumab have revolutionised outcomes for the majority of patients with neovascular or ‘wet’ age related macular degeneration (wAMD). However there is a small group for whom these pharmacologic treatments are not suitable (Figure 1), those who do not respond to these drugs or indeed have sustained complications of treatment with these agents (Figure 2). For these patients, who are loosing the last of their central vision to wAMD, macular translocation surgery (MT360) may offer the only realistic option for restoration of vision.

Macular translocation with 360 degrees retinotomy was first introduced by Machemer in the early 90s and later popularised by Eckhardt, Toth and other workers.  

Indications
MT360 surgery is reserved for patients who have poor vision in one eye already and present with recent loss of vision in the second eye. If intravitreal anti-VEGF (Ranibizumab or Bevacizumab) is thought to be appropriate, it is offered first, and surgery reserved for non-responders.

Surgical Procedure
Surgery is a two stage procedure. In the first operation a phacoemulsification with IOL implantation procedure is done (for phakic patients). Following this a complete pars plana vitrectomy with thorough vitreous base shaving is performed. This can be achieved by external indentation combined with vitreous base excision under direct visualisation with the operating microscope. Triamcinolone staining of vitreous is useful in visualising the vitreous base (Figure 4). Triamcinolone staining of vitreous is useful in visualising the vitreous base (Figure 1). The conventional light-pipe may be used as an indenter to trans-illuminate the vitreous base, thus facilitating identification and removal (Figure 4).

Once the vitreous has been totally removed, the retina is detached. This can be done by injecting fluid into the subretinal space through three point retinotomies in the mid peripheral retina using a 41 gauge cannula (Figure 5), or using a wider cannula to inject fluid through a retinotomy adjacent to the ora serrata (Figure 6).

The temporal retina is now reflected nasally and the subretinal neovascular membrane is removed (Figure 9) and the base treated with diathermy. The retina is then reopened and partially reattached using perfluorocarbon liquid (PFCL). The retina is then rotated with the attachment at the optic nerve acting as a fulcrum. The fovea is moved onto an area of healthy retinal pigment epithelium (Figure 10).

PFCL is then used to completely fill the posterior segment, thereby reattaching the retina. Endolaser is applied adjacent to the retinotomy edge, 360 degrees around. Direct PFCL to silicon oil exchange is then done. Silicon oil tamponade is then left in-situ for two months.
Fig. 1. Large sub macular haemorrhage in right eye. This patient already has poor vision in the left eye due to advanced disciform scar. Intravitreal drugs are unlikely to be successful in this setting. The patient was offered MT360 and had a good outcome, vision was restored to 6/9 NS and has maintained this for over 3 years after surgery.

Fig. 2a. A: Right eye has a vision of 6/36 from dry AMD. B: Left eye has a wAMD process reporting recent loss of vision to 6/60 at presentation. C: Red free fundus photo of left eye. D: Late frame from fluorescien angiogram of left eye showing an occult subretinal neovascular membrane. Intravitreal Ranibizumab was recommended.

Fig. 2b. Same patient as in Figure 2a. After first injection of intravitreal Ranibizumab developed a large tear of the retinal pigment epithelium with drop in vision. MT360 was done with good outcome.

Fig. 3. Intra-operative view of triamcinolone stained vitreous base being excised.

Fig. 4. Vitreous base excision using trans-illumination to highlight the vitreous base.

Fig. 5. The retina is detached using fluid injection through a 41 gauge cannula, one point has been injected already, this frame shows injection through the second point retinotomy.

Fig. 6. Injection of fluid through a retinotomy adjacent to the ora serrata to detach the retina. Multiple fluid air exchanges are then performed to push the recently injected subretinal fluid posteriorly and complete the detachment (Figure 7). A peripheral 360 degree retinotomy is then made using scissors to create a cut parallel and adjacent to the ora serrata (Figure 8). The retina is avascular here and therefore no bleeding is encountered.
Fig. 7. Fluid air exchange is done to complete the retinal detachment.

Fig. 8. Peripheral retinotomy is done all around to free the retina. The retina is now attached only at the optic nerve.

Fig. 9. By reflecting the temporal retina nasally, the subretinal space is accessed and subretinal neovascular membrane removed.

Fig. 10. The retinal ‘funnel’ is reopened using PFCL and fovea moved onto an area where the retinal pigment epithelium bed is healthy by rotating the retina.

Fig. 11. Post operative fundus picture. Silicon oil tamponade is in situ. The fovea is seen to be rotated upward by about 30 degrees with bare sclera visible under the retina in the original foveal location, now situated under the inferior vascular arcade.

Fig. 12. Post operative fundus picture showing stable attached retina and normal orientation of the new foveal location. The original foveal location is now inferior and visible under the inferior vascular arcade.

Two months later the second stage of the operation is performed. This consists of surgery to extraocular muscles to counter-rotate the globe, by the same amount as the initial macular rotation together with removal of silicon oil. This resolves most of the distortion and diplopia which the patient initially experiences due to rotation of the retina.

Outcomes are encouraging with about 40-70 % of patients gaining over 3 lines of vision, although 10 % of patients have worse vision after the operation than they had at presentation.
Conclusion

Macular translocation surgery involves the detachment of the entire retina from the RPE by a subretinal infusion of fluid and creating a 360° circumferential retinotomy followed by the rotation of the retina. Although postoperative complications such as recurrent retinal detachment have been reported in about 10-30% of cases after macular translocation, a large proportion of patients benefit from significant visual improvement. Thus for the patient losing central vision in the second eye from AMD which is not responding to intravitreal pharmacotherapy, this is the only approach which offers a reasonable chance of visual improvement. Further insights and refinements of this surgical procedure are likely to improve outcomes even more in the near future.

References