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Implant and Prosthetic Motility Following Enucleation —A Comparison of Traditional Enucleation, Myoconjunctival Enucleation and Enucleation with Integrable Implant

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Enucleation of the eye is often considered a failure for an ophthalmologist and the end of a professional relationship. On the contrary, it is the beginning of a new relationship aimed at providing optimal cosmesis and maintaining a healthy socket. For a patient who has already

lost vision in his eye, good cosmesis can often be equated with greater self-esteem.

Motility of implants and subsequently movement of the overlying prosthesis is an important aspect of cosmesis. Implants used can be integrable or non-integrable with orbital tissues. Non-

integrated implants are inexpensive, technically uncomplicated, well tolerated, and have very few complications. However, non-integrated implants do not allow direct or indirect integration with the orbital structures or with the prosthesis. Such implants have no direct attachment to the prosthesis. Although various materials have been used to make nonintegrated implants in the past, the current favourite is silicone. Silicone is less prone to migration because a layer of fibrous tissue sequesters it. In contradistinction, integrable implant materials like porous polyethylene get bio-integrated to the orbital soft tissues and are reported to provide better implant and prosthetic motility. The 400-micron large pore size of this material allows fibrovascular ingrowth and causes integration. However, these implants are very expensive and can get exposed because of the presence of an outer rough surface.

Enucleation, at present, consists of three main techniques; all done with a view of improving implant motility and subsequent prosthetic motility. These are: Enucleation by the traditional 'muscle to muscle imbrication' technique, Enucleation by the myoconjunctival technique and Enucleation with the use of integrable porous polyethylene or hydroxyapatite implants.

The present study attempts to compare the differences in implant and prosthetic motility amongst all these three techniques.

Aim of this study is to evaluate implant and prosthesis motility following enucleation with traditional silicone, myoconjunctival silicone, and porous polyethylene implants.

Materials and Methods

This prospective comparative clinical trial included 10 patients in each group. All patients were operated by two experienced surgeons. Implant and prosthesis motility were the primary outcome measures.

Until the eyeball is enucleated, all the steps

are similar in all three techniques.

An orbital implant is placed either posterior to the posterior Tenon's (nonintegrated implants) or within the Tenon's capsule (integrated implants).

There are two options to deal with the extraocular muscles if a nonintegrated implant is placed – one is to imbricate the lateral rectus to the medial rectus and the superior rectus to the inferior rectus; over the posterior tenons. The other is the myoconjunctival technique where each of the recti is attached to the posterior aspect of conjunctiva-Tenons close to the respective fornix. The muscles are then passed through the anterior tenons and the conjunctival layer and then sutured to the respective fornices. This technique of muscle suturing is supposed to impart greater implant motility as well as deeper fornices, post surgery. Thus, myoconjunctival technique may provide better prosthesis mobility and reduce the risk of implant displacement (the "sling effect" of the imbricated recti is one of the causes of implant displacement).

Porous polyethylene implants are implanted via the 'scleral cap' technique. A scleral disc is cut out from donor sclera and is sutured to the implant with 6-0 vicryl sutures. The implant is inserted via an inserter, which is included with the implant. This implant is placed anterior to the posterior tenon layer. The muscles are then sutured to the disc with the 6-0 vicryl sutures. The muscles can be attached to integrated implants either directly (porous polyethylene or coated hydroxyapatite implants) or to the wrapping material. Exaggerated anterior attachment of the muscles within 5 mm of the implant's central axis is currently advocated. This is believed to result in more posteriorly positioned implant, reducing the risk of exposure. The subsequent steps of closure and conformer insertion are similar in all three techniques.

Measurement device & technique: An

independent observer measured motility using a custom-made slit-lamp device with real-time video documentation. The measurement device was indigenously made in-house at our institute as to the best of our knowledge, no such device has been documented or described in literature. The device was indigenously fabricated with two millimeter rulers, having the dimension of 15mm & 5mm respectively. The larger ruler represented the X axis while the smaller one represented the Y axis. The larger horizontal ruler was fixed from the center while the vertical one was arranged such that it could be move along the X axis. The complete measurement device was mounted on a rod of length 15 mm and with the overall diameter of 6mm, which was then attached to the Slit lamp biomicroscope in the Hruby lens holder. This Hruby Lens holder can be moved in 5mm in each direction from its center, while the whole Instrument can be moved in Y axis as per the individual patient and can also be fixed for the particular individual.

The implant motility, prosthesis measurement & prosthetic motility were checked after 6 weeks post-surgery in all patients. Once it was established that the socket was healthy, then topical anaesthesia was instilled. Using a non-toxic colour marker (Sharpie ADA approved), the center of the palpebral fissure was marked. The patient was made to comfortably sit on the slit lamp biomicroscope. The external digital camera was aligned to face the patient. This camera was kept at a prior marked distance of 1.5 ft and the zoom was kept at 2.3 x in all patients for standardization. Using a wire speculum the visible mark was viewed and then ductions in all directions were photographed. Once the prosthesis was ready, it was placed in situ in the socket and the center of the pupil of the prosthesis was marked with an erasable white marker. The prosthetic movement was then measured in all directions with photographs. The photograph was downloaded onto the

computer and then the measurement was carried out via Adobe Photoshop version 6.0. This was done to avoid parallax error which could have occurred if assessment was done directly with the patient on the slit lamp. Fornix depth and implant displacement were also noted. Implant and prosthesis motility were the primary outcome measures. Fornix depth and implant displacement were the secondary outcome measures.

Results

In the myoconjunctival group, the mean implant motility on adduction was 2.67mm, on abduction was 3mm and the total motility was 5.66mm in the horizontal meridian and the upward motility was 2.22mm, the downward motility was 3.11mm and the total motility was 5.33 mm in the vertical meridian. The prosthetic motility was 4.22 mm for adduction, 3.78 mm for abduction and 8 mm total in the horizontal meridian and 3.22 mm for supra-duction, 3.56 mm for infra-duction and 6.77 mm totally in the vertical meridian.

In the traditional enucleation with silicone implant group, the mean implant motility on adduction was 3.82 mm, on abduction was 1.32 mm and the total motility was 3.27 mm in the horizontal meridian and the upward motility was 1.36 mm, the downward motility was 1.32 mm and the total motility was 3.68 mm in the vertical meridian. The prosthetic motility was 1.82 mm for adduction, 2.30 mm for abduction and 3.90 mm total in the horizontal meridian and 1.36 mm for supra-duction, 2 mm for infra-duction and 3.36 mm totally in the vertical meridian.

In the porous polyethylene group, the mean implant motility on adduction was 3.50 mm, on abduction was 3.60 mm and the total motility was 7.10 mm in the horizontal meridian and the upward motility was 2.75 mm, the downward motility was 2.95 mm and the total motility was 5.80 mm in the vertical meridian. The prosthetic motility was 3.80 mm for adduction, 3.65 mm for abduction and 7.45 mm total in the horizontal meridian and 3 mm for supra-duction, 3.30 mm

for infra-duction and 6.30 mm totally in the vertical meridian.

Thus, Myoconjunctival silicone implant showed better motility and fornix depth than the traditional route but motility was less than the porous polyethylene group. Only traditional silicone implants tended to displace.

Analysis was done by the Mann-Whitney U test. As the sample size was small, statistical level of significance was fixed at 10%. As three groups were present, P value of =0.03 was considered significant. Implant motility by the myoconjunctival technique as compared to traditional enucleation, both in the horizontal and the vertical meridians, were better and this was highly statistically significant (P =0.008 &0.006 respectively). Differences in implant motility were not significant in both meridia

between the porex and the myoconjunctival group.

Prosthesis motility in the myoconjunctival group was statistically significantly better than in the traditional enucleation group (P = 0.003 & 0.002 respectively). Differences in prosthesis motility between the porex and the myoconjunctival groups were not statistically significant.

Discussion

Silicone implant by myoconjunctival technique provides much better implant and prosthesis motility as compared to traditional enucleation. There is no significant difference in either implant or prosthetic motility between myoconjunctival silicone implant enucleation and enucleation with porous polyethylene implantation. Hence, myoconjunctival technique of implantation with silicone implant may be preferred over expensive porous polyethylene implant.

References

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