MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.8.453.456

OPEN ACCESS

Key Words
Enucleation, dermis fat graft, non integrated implant, outcome

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Received: 16 June 2024
Accepted: 28 July 2024
Published: 30 July 2024

Citation: M.V.D.L. Satyanarayana, N. Kasturi Bai, M. Kiranmai, Asma Shaik and M. Sushmitha, 2024. A Comparative Study of Dermis Fat Graft vs Non Integrated Implants as Primary Orbital Implant Following Enucleation. Res. J. Med. Sci., 18: 453-456, doi: 10.36478/makrjms. 2024.8.453.456

A Comparative Study of Dermis Fat Graft vs Non Integrated Implants as Primary Orbital Implant Following Enucleation

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Abstract
The aim of our study is to compare the outcome of nonintegrated implants Vs dermis fat graft as primary implant in terms of prosthesis motility, retention, orbital volume replacement after enucleation. After obtaining approval from Institutional Ethical Committee, retrospective analysis of the records of 50 patients who underwent enucleation with primary orbital implant during the period of January 2023-May 2024 was done. Patients were divided into two groups. Group A included 25 patients who underwent with Dermis Fat Graft as implant whereas Group B included 25 patients who underwent Enucleation with Non integrated PMMA Orbital implant. Enucleation was performed for 28 patients with painful blind eye, 14 patients with open globe injury and 8 patients with anterior staphyloma. The mean age of patients undergoing surgery was 55.5 years. The results of both the groups with DFG Implant and PMMA orbital implant are comparable in terms of orbital volume replacement and motility of implant. Extrusion rate was nil for both the groups. Primary orbital reconstruction with DFG is better choice in terms of motility and implant retention. But in terms of orbital volume replacement non integrated implants are preferred choice.

INTRODUCTION

Enucleation may be performed in settings of refractory pain, intraocular malignancy, infection, cosmetic deformity and severe trauma. After removal of the globe, implants often are placed to restore the volume of the orbit, to facilitate motility and to improve the appearance of the socket. The ideal implant should be easy to place, well tolerated, resist migration, extrusion and infection, not cause socket irritation and be reasonably priced[1,2].

The first orbital implants were produced by Philip Henry Mules in 1885, who used hollow glass spheres to restore the orbital volume following evisceration[3]. PMMA, acrylic, Silicone implants are smooth, non-porous and non-integrated implants, which are inert and cause little reaction in the host. Smith and Petrelli first described the use of autogenous dermis fat graft as a secondary implant following extrusion[4]. As a primary implant, the use of dermis fat graft has been described following ocular enucleation. The site most frequently used to harvest the graft is the gluteal area, but other areas such as periumbilical area can also be used.

Objectives: The purpose of this study is to compare the results of Dermis Fat Graft Versus Non integrated PMMA Orbital implant as primary orbital implant following Enucleation.

MATERIALS AND METHODS

Study Design: Retrospective, Observational, Comparative study

Sample Size: 50 cases of Enucleation which were done during the period of January 2023-May 2024.

Patients attending OPD, Department of Ophthalmology, GGH, Kadapa, requiring enucleation for various causes were enrolled in the study. Detailed history was taken. Complete ophthalmic evaluation was done. Examination also included assessment of general health, routine blood investigations. Informed consent was obtained from all patients prior to surgery. A second opinion was taken from another ophthalmologist before proceeding with the procedure.

Surgical Procedure of Enucleation: 36° peritomy done. All the 6 extra-ocular muscles were identified, secured and disinserted. Optic nerve was cut and the eyeball removed.

Harvesting Dermis fat Graft: After local anesthesia the epidermis over the marked out site with pre determined measurements was shaved off with No. 15 surgical blade. The underlying dermis with fat was then excised using No. 15 blade and scissors elliptically to fit into the orbital socket (18-20mm in longest diameter, and about 4-6cm in depth) and placed in saline solution and the wound was closed.

Implantation of Dermis Fat Graft: DFG was implanted into the posterior tenon's space. Secured extraocular muscles, anterior tenon's and then conjunctiva was sutured to the edge of DFG with 6/0 Vicryl sutures in an interrupted fashion. Post operatively, the eyes were treated with oral antibiotics, NSAIDs and topical antibiotic eye drops for one week. Patients were followed up till 6 months. Sutures at the harvested site were removed 1 week postoperatively. At 4 weeks the patient received an ocular prosthesis.

Implantation of Non Integrated Implant: The axial length of the eye should be measured prior to surgery, which gives size of the implant. In case of disfigured eye, axial length of contralateral eye gives the size of the implant. Non integrated implant (PMMA) of appropriate size is inserted into the posterior tenon's space and completed by myo-conjunctival technique. Conjunctiva was closed with running mattress suture with 6-0vicryl. A conformer was placed. Post operatively, the patients were treated with oral antibiotics, NSAIDs and topical antibiotic eye drops for one week. Patients were followed up till 6 months.

RESULTS AND DISCUSSIONS

A retrospective review of the records of 50 patients who underwent enucleation with primary orbital implant during the period January 2023-May 2024 was done. Table 1 summarizes the patient demographics. The indications for Enucleation are given in Table 2.

At the end of the followup period, exposure or extrusion of the implant was not seen in any of the patients in our study. A comparative analysis of implant motility was done between the two groups.

Volume replacement was assessed by taking the proptometry reading from the lateral orbital rim to the apex of the prosthesis at the end of follow up period. It was compared with the fellow eye.

There was no exposure of the implant or extrusion of the implant in any of the cases in our study.

Enucleation has been performed for many ocular conditions, such as severe eye trauma end ophthalmitis irresponsive to treatment and painful blind eyes.

The advantages of orbital implantation after enucleation and evisceration include replacement of lost orbital volume, preserved orbital structure, better cosmetic appearance and improved motility of the ocular prosthesis[5].

Use of orbital implant for socket reconstruction can be traced to 1884 when Mules was the first to implant a hollow glass sphere, which he named artificial vitreous[3]. Mazzoli *et al.* in 2004 reported the

use of hydrogel expansile materials for expanding the contracted sockets in the congenitally an ophthalmic orbit[6]. The implants are placed in the sockets in their dry state and then they gradually expand, producing up to a 10-fold increase in volume.

Amongst the autogenous tissues, DFG is most commonly used for socket reconstruction due to its immense advantage of providing a larger volume and surface area. However, DFG has many post-operative complications such as central graft necrosis, central pitting, graft failure, central graft ulceration, graft shrinkage with orbital volume loss and socket infection[7].

Bhattacharjee *et al* reported central graft necrosis in 2 patients and graft necrosis in one patient in their series of patients with DFG implant in the treatment of contracted sockets[8]. Such complications were not seen in our series of patients who received DFG implant.

Bhattacharjee *et al* reported the prosthesis motility in DFG group ranging from 30% to a maximum of 39.2%[8]. Tataru and Pop reported their experience with 42 patients who underwent enucleation for choroidal melanoma and received PMMA implants that were covered with polyethylene terephthalate. The average follow-up duration was not specified, although the investigators noted that the patients were followed up for a maximum of 15 years. An extrusion rate of 7.1% was reported[9].

All the surgeries were performed by a senior skillful surgeon in our series of patients. Skill and experience of the operating surgeon have been noted to be of significance in determining outcomes[10,11]. While surgeon factor has been reported to cause a 12-fold difference in the rate of complication by McElnea *et al.,* this report combined cases of enucleation and evisceration[11]. Enucleation is a more complex surgery and further outside the comfort level of the general ophthalmologist., including enucleation may have skewed the result. There was no exposure of the implant or extrusion of implant in both the study groups. This may be attributed to the meticulous surgical procedure followed in all the cases.

Autologous dermis fat graft (DFG), composed of dermis and an attached subcutaneous fat, is an acceptable volume replacement implant for primary enucleation and evisceration. Advantages are being autologous, it has neither the risk of rejection nor transfer of infection from cadaveric homologous tissue, low morbidity, satisfactory cosmetic result, replacement the lost orbital volume, preserve the conjunctival surface area, maintain normal fornix depth, enhance vascularisation, decrease fat atrophy, barrier against fatty augmentation, no risk of infection, implant extrusion or exposure is not seen. Additionally, this procedure carries no extra cost and offers excellent cosmetic and functional results.

Disadvantages include a certain lack of predictability such as underestimation of volume of graft required and a scar at the donor site. Graft atrophy is usually seen in older patients. Fatty augmentation causing increase in the size of the graft is usually seen in young children, representing the normal proliferation of fat cells seen in the young. This complication is managed by surgical debulking of the graft. Graft failure is usually associated with a compromised orbital vascular supply and suture related complications at the harvested site.

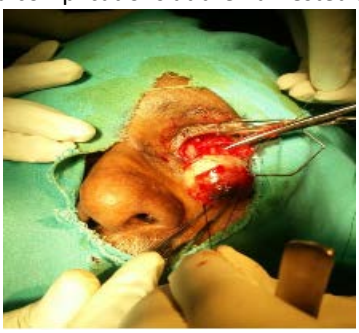

Fig. 1: Removal of Eye Ball

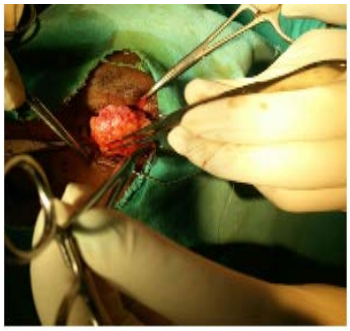

Fig. 2: Harvesting Dermis Fat Graft

Fig. 3: PMMA Orbital Implant

Fig. 4: After insertion of PMMA Implant

Table 1: Patient Demographics

Number of Patients	**50**
Number of Eyes	50
Age Range	28-70 years
Mean Age	55.5 Years
Sex Ratio(Male: Female)	30(60%):20(40) %)
Group A	25
Group B	25

Table 2: Indications for Enucleation

Painful Blind Eye	**28(56%)**
Open Globe Injury	14(28%)
Anterior Staphyloma	8(16%)

Table 3: Motility of Implant

Group A with DFG implant		**Group B with Non Integrated Implant**	
Very Good(6-8 mm)	16(64%)	Very Good(6-8 mm)	15(60%)
Good(4-6 mm)	7(28%)	Good(4-6 mm)	7(28%)
Fair(2-4 mm)	2(8%)	Fair(2-4 mm)	3(12%)

Table 4: Orbital Volume Replacement

Group A with DFG implant		**Group B with Non Integrated Implant**	
Normal Eye(Mean)	Test Eye(Mean)	Normal Eye(Mean)	Test Eye(Mean)
20.33 mm	19.5 mm	20.53 mm	20.50 mm

Non-integrated implants-usually made up of silicone, PMMA, glass spheres. PMMA is transparent thermoplastic and has good degree of compatibility with human tissue., hence it is the implant of choice among various non-integrated implants.

Advantages-Non-integrated implants are smooth, inert and cause little reaction in the host, as they are buried deep in space, chance of exposure is less, ideal for obital volume replacement, cost-effective and offers good cosmetic results.

Disadvantages-they contain no unique apparatus for attachments to the extra-ocular muscles, do not allow growth of fibrovascular tissue into its substance, and have no direct attachment to the overlying prosthesis. Implant migration and extrusion can occur.

CONCLUSION

Enucleation with primary placement of orbital implant is the preferred choice as it avoids the risk of post enucleation socket syndrome and gives better surgical outcome in terms of cosmesis to the patients. Primary orbital reconstruction with DFG is better choice in terms of motility and implant retention. But in terms of orbital volume replacement non integrated implants are preferred choice

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