

## Conjunctival Relaxing Incisions with a Bare Bed: An Overlooked Privilege in Contracted Sockets

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### ABSTRACT

**Introduction:** The aim of reconstruction of a contracted socket is to retain a satisfactory prosthesis. Simple procedures to modify the socket architecture as first line options could avoid multiple staged procedures, increased surgical time, harvesting tissues or use of allografts. The objective of this study was to evaluate the outcome of modifying the socket architecture by making conjunctival relaxing incisions leaving it bare to re-epithelialize and compare it to dermis-fat graft.

**Materials and methods:** A retrospective review of all socket reconstruction surgeries in our hospital over a period of 10 years (July 2009 to June 2019) was done. The two procedures which were compared were dermis-fat graft (DFG) and conjunctival relaxing incisions (CRI) without a graft. In the latter, the split conjunctiva was left bare under a conformer and temporary tarsorrhaphy. The conjunctiva was allowed to re-epithelialize under cover of topical antibiotic and steroid.

**Results:** The patients included had a mean age of 24 years (n=8) in the DFG group and 36 years (n=10) in the CRI group. The most common cause of anophthalmic socket was enucleation for tumour and evisceration for trauma in the two groups, respectively. Six patients (75%) in the DFG group and six (60%) in the CRI group achieved good prosthesis retention (P = 0.51). None had post-operative infection.

**Conclusion:** Transverse conjunctival relaxing incisions with tissue stretching can be a safe first line option to rehabilitate a contracted socket.

**Key words:** Conjunctival relaxing incision, Contracted socket, Dermis-fat graft.

Financial Interest : Nil

Received : 03.06.2020

Conflict of Interest : Nil

Accepted : 12.11.2021

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Access this article online

Website: [www.nepjol.info/index.php/NEPJOPH](http://www.nepjol.info/index.php/NEPJOPH)

DOI: <https://doi.org/10.3126/nepjoph.v14i1.29240>

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ISSN: 2072-6805, E-ISSN: 2091-0320



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## INTRODUCTION

A contracted socket is one that does not hold an artificial eye and has always been a disquieting problem to treat. Apart from the social concerns of not having an eye, it is most embarrassing for the patient when the prosthesis keeps falling out of the socket. The contraction is said to occur as a natural course and stabilises after a period of time. It is usually of the highest grade in chemical injuries and aggravated following socket infections, radiation, multiple orbital surgeries, etc (Krishna, 1980; Kronish et al,1990; Ibrahiem & Abdelaziz, 2016). We have come a long way with exploring rehabilitation techniques from glass spheres to 3D printing (Schmitzer et al, 2014; Dave et al, 2018; Kuijten et al, 2018 ). However, simple techniques of reconstruction or socket modifications still have a significant role in achieving a satisfactory outcome with respect to prosthetic retention.

The standard approach is a volume augmentation consisting of an implant and prosthesis in an ideal ratio of 80% and 20% respectively. An ideal implant is chemically and biologically inert, non-traumatic and cheap. They can be natural implants like dermis fat, mucosa, hard palate, forearm flap etc., or artificial which may be porous or non-porous (Paris & Spohn, 1980; Murchison & Bernardino,2006; Schmitzer et al, 2014; Galindo-Ferreiro et al, 2018). Andrews (2016) and Bhattacharjee et al (2014) states that Dermis-fat graft (DFG) has perfect biocompatibility. It can expand the contracted socket both in terms of volume

and surface area. However, small grafts lead to under correction and large grafts run the risk of central necrosis. Grafting procedures also need the patient to be under general anaesthesia, additional instrumentation, surgical skill, time and additional procedure apart from an additional wound on the donor site and the required wound care. Porous implants such as teflon, nylon mesh, ceramic and porous polyethylene allow ingrowth of tissue from the orbit. This reduces the migration risks and gives good motility but has shown significant risk of infection and implant extrusion. Additional steps like pegging which is done to improve motility can come with complications as high as 45%. Moreover, most patients are satisfied with the motility achieved with a well fitted prosthesis on a good implant alone (Nunery et al 1993;Edelstein et al 1997; Holck et al, 1999; Lee et al, 2002; Trichopoulos & Augsburger, 2005; Catalu et al, 2018). Non porous implants such as silicone, polymethylmethacrylate, acrylic etc, on the other hand, allow neither ingrowth of granulation tissue nor attachments for the extraocular muscles. This runs a risk for the implant to slip and migrate with limited motility into the bargain (Oestreicher et al, 1997; Klett & Guthoff, 2003; Miola and Perara, 2014; Kuijten et al, 2018).

While there is a vast body of literature on the various orbital implants, the tissue mechanics per se in an anophthalmic socket is rather understudied. The anophthalmic socket leads to sagging of the levator complex while the

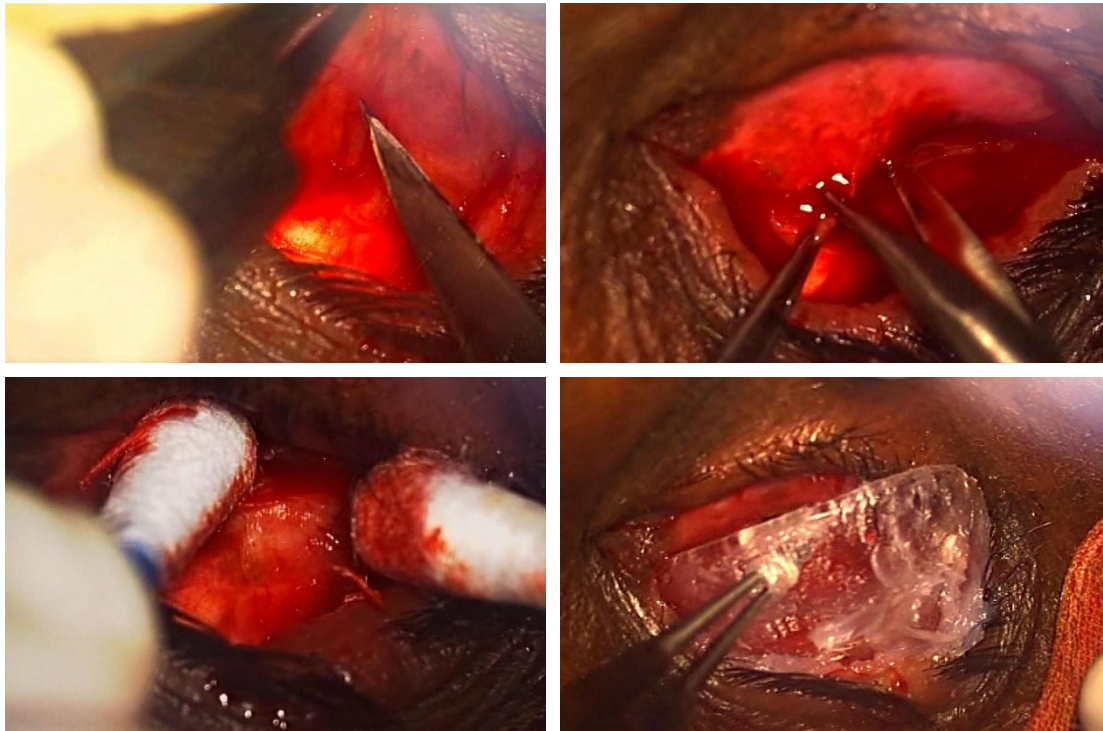
orbital fat migrates anteriorly and inferiorly. Fat atrophy in anophthalmic sockets was ascribed to as a cause for this change; however, this lacks convincing proof. On the contrary, animal models have in fact shown an increase in orbital fat compartment in such sockets ( Conn et al, 1980; Sergott and Vistnes, 1987; Kronish et al,1990). It may be prudent to first correct this underestimated shift in the architecture of the orbital contents than to overzealously embark upon volume augmentation surgeries. Deepening the fornix pushes the anteriorly migrated fat posteriorly (Figure 1). This transmits to add fullness of the superior orbit and corrects the sulcus deformity (Neuhaus and Hawes, 1992; Krásný, 2015;Ibrahiem and Abdelaziz, 2016 ). There are various techniques described to achieve this by fixing the inferior fornix using sutures, wires, fascia lata, etc. While performing these, to expand the surface area, the conjunctiva is split and the defect is either covered with mucous membrane or amniotic membrane (Bosniak, 1987; Ibrahiem & Abdelaziz, 2016; ). In this study we observe the outcomes of a markedly less time consuming and fairly undemanding fornix deepening technique by conjunctival relaxing incisions (CRI) without a membrane graft and compare it to socket reconstruction with DFG.

## MATERIALS AND METHODS

This was a retrospective study approved by the Institutional Review Board - Research and Ethics Committee (IRB No 12147, dated 24.7.2019) and followed the Tenets of Declaration of

Helsinki. All those who had undergone either DFG or those who had fornix reconstruction surgeries by CRI without substrate grafts, as techniques of socket reconstruction in the department of Ophthalmology in our hospital over a period of 10 years (July 2009 to June 2019) were included. The decision of having the surgery with or without a membrane graft was taken in consultation with the patient, after discussing the pros and cons of each of the proposed procedures. All those who had fornix reconstruction surgery without splitting of the conjunctiva or those who had a membrane graft placed were excluded. The clinical data was obtained from the medical records, operation notes and the photograph archives.

DFG was done according to the conventional technique of removing the epidermis from the marked donor site which was the upper outer quadrant of the gluteal region. An elliptical area of dermis along with the fat was harvested and sized 25% more than the defect. The residual wound was closed in two layers. The conjunctiva was opened up; and after releasing contractures and achieving haemostasis the graft was embedded in it. The dermis was sutured in place with 5-0 vicryl to the conjunctiva. Fornix forming sutures were placed as required. A central temporary tarsorrhaphy was done over a well-fitting conformer and the eye was padded for 24 to 48 hours. Conjunctival relaxing incision, on the other hand, was done by splaying the conjunctiva open horizontally with a No. 15 BP blade and stretching the opened up conjunctiva towards the fornices with a cotton bud. This

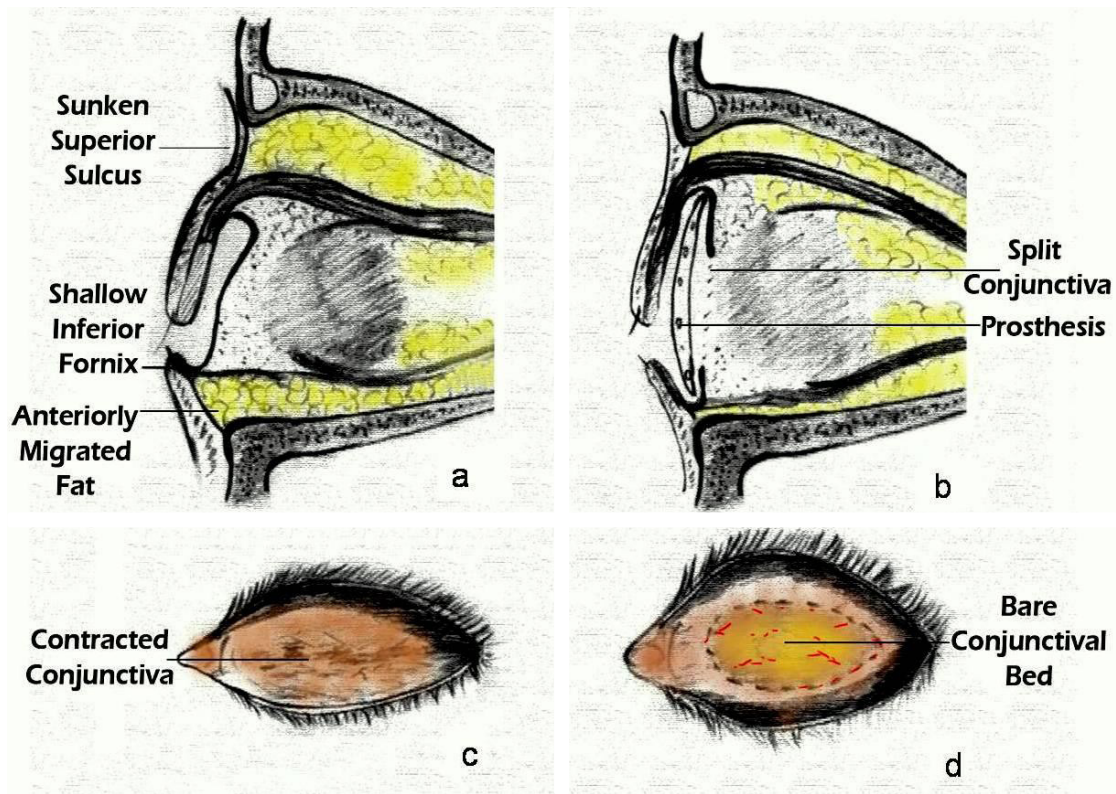


**Figure 1: Photographs of the steps of the procedure showing the relaxing incisions, splitting the conjunctiva horizontally with 15 BP blade (a), releasing the adhesions with conjunctival scissors (b), stretching the conjunctiva towards the fornices with cotton tips (d) and placing the appropriately sized conformer with antibiotic ointment prior to the temporary tarsorrhaphy.**

stretch helped in relaxing the contractures and further fibrous bands were released by sharp dissection (Figure 1). This increased the surface area of the anterior face of the contracted socket as shown in figure 2. Additional incisions were made parallel to the fornices if needed. The bare area was not covered with graft, but left bare to epithelialize. A snugly fitting conformer was placed following the procedure and a central temporary tarsorrhaphy was done which was left in place for six to eight weeks. This was done so as to provide the required stretch of the conjunctiva and eyelids to prevent the anticipated post-operative contracture. Any suspicion of infection or undue pain or discharge

was watched for to release the tarsorrhaphy earlier. However, none of our patients had any such issues to warrant early release than planned.

The patients were prescribed topical antibiotic-steroid combination of chloramphenicol and dexamethasone every six hours for one month and then tapered by one drop every 2 weeks. In both the groups a prosthesis fitting was done after eight weeks. A satisfactory fit was documented if the prosthetic shell fit well without falling off and if the patient was comfortable and satisfied with the appearance. Any gross asymmetries and lid malpositions were documented as a complication.



**Figure 2: (a) Shallow fornix with sunken levator complex and anterior migration of fat inferiorly. (b) Prosthesis keeps incised conjunctiva stretched at the fornix and pushes fat posteriorly. (c) Anterior surface of contracted socket d) Increased surface area following horizontal relaxing incision.**

## RESULTS

Twenty-four patients had undergone socket rehabilitation surgery out of which eight had a DFG. Fornix reconstruction with CRI was done in 16 patients out of whom four patients who did not follow-up and five who had an additional substrate/lamellar graft were excluded. Table 1 provides the baseline data of the enrolled patients in both the study groups. All the demographic data were comparable in

the two groups and the differences were not statistically significant. The most common cause of anophthalmic socket in our study was enucleation for malignant tumour involving the eye in the DFG group and evisceration for trauma in the CRI group; and the duration of anophthalmia was significantly longer in the CRI group. Table 2 gives the information on the follow up details of the study patients of both the groups.

**Table 1: Demographic details of patients, eye operated, cause of anophthalmia, duration of being anophthalmic and history of prosthetic use in both groups.**

	DFG (n=8)	CRI group (n=10)	P value
Mean age in years	24.12 ± 12.75	36 ± 11.89	0.2
Male : Female ratio	5:3	3:7	0.18
Right eye : Left eye	1:7	7:3	0.01
Cause for anophthalmos	Enucleation for tumour- 4 Evisceration for endophthalmitis-1 Evisceration after trauma-1 Congenital-1 Not documented- 1	Enucleation for tumour- 2 Evisceration for endophthalmitis- 3 Evisceration after trauma- 4 Phthisis after retinal detachment- 1	
History of prior use of prosthesis	Yes- 6 (75%) No- 1 Not documented- 1	Yes-8 (80%) No- 2	0.80
Mean duration since loss of eye in months	12.85 ± 6.47 (n=7, 1- missing data)	14.81 ±5.27	0.03

**Table 2: Number of patients who retained prosthesis post-operatively, follow up period, post-operative complications and secondary procedures done.**

	DFG group (n=8)	CRI group (n=10)	P value
Prosthesis retained post surgery	Yes - 6 No – 2	Yes - 6 No- 4	0.51
Secondary procedure done in those that did not retain prosthesis	Fornix deepening – 1 Deferred surgery- 1	DFG – 1 Deferred surgery –3	
Satisfactory fit after secondary procedure	Yes	Yes	
Post-operative infection	Nil	Nil	
Other post op complications	Nil	Nil	
Mean follow up duration in those that fit (in months)	12.66 (n=6)	16.16 (n=6)	0.76

## DISCUSSION

Loss of an eye may be sequelae to trauma, tumour, infection or most unfortunately congenital anophthalmia. Surgical removal of the eye may have been done to save life, relieve pain or for better aesthetics which

leaves the patient with an immense stigma to live with. The choice of technique to rehabilitate these sockets depends on various factors such as surface contracture, volume loss, grade of the socket, patient's expectations, etc. The common causes of anophthalmic sockets are eviscerations following trauma or

endophthalmitis, enucleation for a malignant eye tumour, congenital anophthalmia, etc (Aryasit and Preechawai, 2015; Ibrahim and Abdelaziz, 2016 ). Our study reflected this spectrum of causes (Table 1).

Secondary implants, artificial or natural like a DFG, can be quite cumbersome and cause relatively more discomfort to the patient. Various other volume expanders studied are sub-periosteal vulcanised silicone, hydrophilic osmotic self-expanders, K wire with silicon fixative etc (Edelstein et al 1997; Lee et al 2002; Mazzoli et al 2004; Mavrikakis et al, 2006). But these lack long term follow up results of their safety, retention and cosmetic acceptance. Krásný (2015) and Neuhaus & Hawes (1992) have shown that fornix reconstructions alone without volume augmentation can improve prosthesis retention in a significant proportion of patients. However, these have been done with amniotic membrane grafts, which may not be available in many hospitals; and mucous membrane grafts which are not without donor site complications. The low rigidity of membrane grafts lead to contracture and recurrence of the foreshortened conjunctival fornices (Neuhaus et al, 1982; Mandour et al, 2016; Borrelli et al, 2020). Hynes (1959) described lining of the defect with non contractile tissue like eyelid skin; however the technique of creating full thickness fistula of the lid to pull the skin through and suturing it to the conjunctiva can be quite tedious. Each patient needs an individually tailored plan depending on various factors, the grade of contraction being only one of them.

Studies have shown that there is no gender or age predisposition for acquiring an anophthalmic socket neither do they significantly affect the outcome (Bhattacharjee et al, 2014; Galindo-Ferreiro et al, 2018 ). In our study, the patients who underwent CRI without a membrane graft had similar mean age, gender distribution and history of prosthesis use as compared to those in the DFG group. The overall success rate in our DFG group was 75% which is similar to that described in literature (Bhattacharjee et al, 2014; Aryasit and Preechawai, 2015). The number of patients who retained a satisfactory prosthesis in the CRI group was comparable to the DFG group ( $P = 0.51$ ) with a good mean follow-up duration which was similar as well to the DFG group (Table 2). Patients who required a secondary procedure in either group retained a prescribed prosthesis successfully thereafter, with no complications. More than 70% of patients in both the groups in our study had history of using a prosthetic eye prior to undergoing the reconstruction which could have prevented the socket from severe grades of contraction (Table 1), as use of a prosthetic eye soon after evisceration/enucleation is thought to retard the contraction of the socket. However, use of prosthesis is not conclusively shown to correlate with surgical outcome following a socket reconstruction surgery. Moreover, if the prosthesis was ill fitting, it can cause more inflammation leading to fibrosis which may contract the socket further (Krishna, 1980; Betharia and Kumar, 1988).

Wei Xin et al (2013) have reported a technique of dissecting between the conjunctiva and tenon's layer of the socket and meshing of the conjunctiva to expand the surface area, but it can be time consuming and needs meticulous surgical skill. Diffuse surface scarring may also restrict further placement of grafts if needed. Compared to this, our technique is simpler, easy-to-perform and there may be a lower risk of vascular compromise. A limitation in our study is that we could not analyse the outcomes separately in various grades of contracture mainly due to limited sample size. Theoretical limitations include persistent epithelial defects and scarring by secondary intention. One should have discussed the possible options with the patients prior to the surgery with an informed consent for on-table change of surgical plan and additional procedures later if required.

Reconstructive techniques for congenital anophthalmia with skeletal hypoplasia of the orbit is different from adults and may include bone grafts, osteotomies, local flaps, hydrogel

socket expanders, etc, and the technique described in this study may not suffice. Hence patient selection for each procedure is important. The advantage of our technique is that it is quick; it does not require general anaesthesia or harvesting of donor tissue; it does not require special instrumentation and has an easy learning curve. Fornix deepening sutures in addition may be placed as felt appropriate. Further randomised studies may be able to match favourable socket features/grades to the type of reconstruction techniques preferred.

## CONCLUSION

A simple technique of modifying the architecture of an anophthalmic socket by making relaxing incisions on the conjunctiva, without a membrane graft, is safe. It can be used as a first line option before embarking on cumbersome surgeries such as a DFG or other secondary implants for socket rehabilitation.



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