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CASE REPORT

The Use of Cyanoacrylate Tissue Adhesive to Seal Descemet's Membrane Perforation During Deep Anterior Lamellar Keratoplasty: Report of Complications

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Abstract:

Purpose: Descment's membrane (DM) micro-perforation is a common intra-operative complication during lamellar keratoplasty. Cyano-acrylate based glue has been used widely in ophthalmic surgery. It is rapidly polymerize on the surface of any tissue in the presence of water or weak bases. However the mass in situ created by the glue can cause localized inflammation with secondary vascularization, but no clear reports in the literature for such complication after application over micro-perforation during DALK. Methods: Retrospective observational case report of two cases developed severe corneal vascularization, one with associated inflammation and melting. Conclusion: Cyano-acrylate glue application is an interesting method to seal up Descemet's membrane perforation during DALK especially in small size perforations but the risk of inducing severe corneal vascularization and melting should be considered in individual cases.

Keywords: *Cyanoacrylate, Descemet's membrane perforation, DALK*

INTRODUCTION

Descemet membrane (DM) perforation is one of the unique complications associated with Deep Anterior Lamellar Keratoplasty (DALK). One of the suggested management of Intraoperative DM perforation is application of tissue adhesives like cyanoacrylate or fibrin glue [1]. Although it is effective in sealing perforations, synthetic glue is known to cause inflammation and induce corneal neovascularization [1], but there are no clear reported cases of such complications after cyanoacrylate application to seal DM perforation in DALK. Hereby we report two cases with such complication in patients after DALK.

Case 1:

23-year-old male referred to King Khaled Eye Specialist Hospital (KKESH) as a case of keratoconus. He had poor vision in both eyes (OU) and hard contact lens (HCL) intolerance. Corrected Distance visual acuity (CDVA) 20/70 right eye (OD) and 20/100 left eye (OS). Slit lamp examination (SLE) revealed signs of keratoconus (OU) with otherwise normal eye exam. He underwent (DALK) OS. Intra-operatively while dissecting the stroma layer-by-layer, small perforation in DM was noticed inferiorly and was managed by air injection into the anterior chamber (AC) and Histoacryl blue glue [Braun Aesculap Tuttlingen, Germany] application. The patient had un-eventful post-operative follow up and was discharged on prednisolone acetate 1%, topical antibiotics. Three weeks postoperatively, the CDVA OS was 20/40 OS with clear graft. Four months post-operatively, he presented with blurry vision OS with Uncorrected distance visual acuity (UDVA) 8/200, CDVA 20/30 OS. SLE revealed ciliary injection, graft edema and peripheral corneal vascularization OS with no clear view to the AC. The impression was acute graft rejection OS and the patient was started on prednisolone acetate drops 1% every 1 hour with significant improvement of graft edema with treatment. The patient lost follow-up and showed up 8 month later with CDVA 20/50 OS. SLE revealed aggressive, localized area of deep graft vascularization started from the limbus inferio-nasaly at the site of applied glue [figure 1].

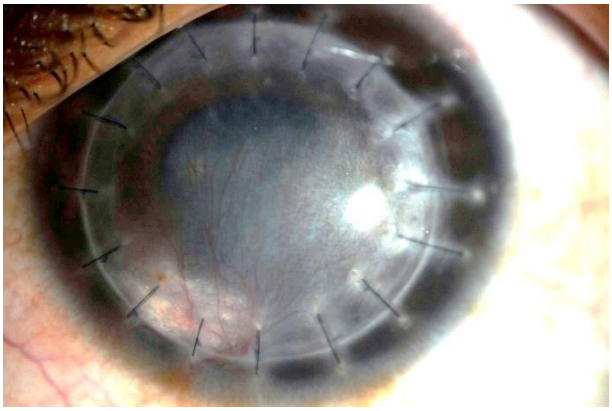

Figure 1: eight months' post operatively, extensive deep stromal vascularization started from the site of glue with associated haze, sutures and glue in place.

He underwent sutures removal and a total of three sub-conjunctival bevacizumab 2.5 mg/0.1 ml at 2 months' intervals. Upon his last follow up; the vascularization persisted and started to develop significant corneal haze and lipid keratopathy with CDVA 20\40 OS. The decision was to observe and to consider penetrating keratoplasty if vision significantly deteriorates.

Case 2:

23-year-old male referred to our institute as a case of keratoconus OU with poor vision and HCL intolerance. At Initial evaluation CDVA was 20/30 OD and CDVA was 20/300 OS. SLE showed signs of keratoconus, with otherwise normal eye exam. The patient underwent DALK OS. Intra-operatively at the end of layer-by-layer dissection, there was DM perforation that was managed through injection of air into the AC and application of Histoacryl glue. The first postoperative week was uneventful and the patient was discharged. Four month post-operatively, his CDVA was 20/125 OS. SLE showed clear graft with vascularization inferiorly at the site of applied glue. The decision was to give sub-conjunctival injection of bevacizumab 2.5 mg/0.1 ml. At Six months follow-up, patient presented with pain and foreign body sensation OS for 1 week duration, his CDVA dropped to 6/200 OS. SLE revealed three loose sutures at the site of glue, exposed part of glue, mucus plug and

associated thinning with vascularization inferiorly OS. The impression was glue related inflammatory reaction, melting and vascularization. Patient was admitted and managed by loose sutures removal, excision of exposed part of glue and sub-conjunctival bevacizumab 2.5 mg/0.1 ml. Post-operatively; patient was kept on prednisolone acetate 1%, and topical antibiotics [figure 2].

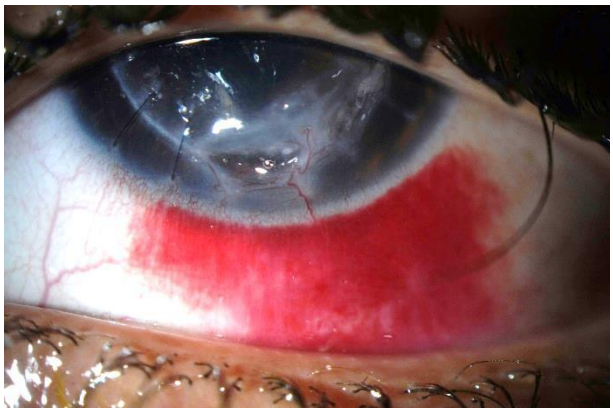

Figure 2: six months post operatively, loose sutures were removed at the site of glue application, peripheral corneal vascularization, peripheral corneal stromal melting and glue extrusion.

One month later he presented with pain and foreign body sensation OS. Vision was CDVA was 6/200, SLE showed inferior epithelial defect, corneal thinning, and remnants of glue at the interface between 4-7 clock hours, vascularization and associated flare in the AC. He underwent glue removal and amniotic membrane transplantation. At last follow-up, his CDVA improved to 20/160 OS. SLE showed good corneal thickness at the area of previous melting, thinning and no signs of AC inflammation. However, he had persistent inferior vascularization in the interface at the same area.

DISCUSSION

Keratoplasty is required in approximately 10 – 15% of patients with keratoconus. Deep Anterior lamellar keratoplasty (DALK) is a partial thickness corneal transplant that involves removal of the diseased part of the corneal stroma with preservation of corneal endothelium.

DM perforation is one of the main intra-operative complications associated with DALK. Its frequency depends on surgeon's experience and surgical technique with the highest rate in Layer-by-Layer manual dissection (26.3%) [2].

There are Variable techniques implemented in the management of intraoperative DM perforation. Tissue adhesive application is one of the suggested modalities to manage a micro-perforation of 3 mm or less and it can be left in the interface for at least 3 years, and probably indefinitely [3].

Cyanoacrylate is synthetic glue made of esters of cyano-acrylic acid that polymerize and form a strong bond with tissue. There is paucity of data related to the safety of cyanoacrylate use in DM perforation during DALK. However, it is known to induce an inflammatory reaction and secondary neo-vascularization, mostly when left for more than 6 weeks [4]. Histopathologic evidence on animal studies suggests that the angiogenesis effect of cyanoacrylate is the result of interaction between the cornea and cyanoacrylate which result in generation of lipid hydro-peroxides that stimulate prostaglandin and thromboxane synthesis [5]. In addition, the release of formaldehyde (a toxic degradation of cyanoacrylate) might increase the outcome of angiogenesis [6].

Other histopathologic studies showed that the degree of tissue inflammation is directly proportional to the amount of the glue used [7].

Cyanoacrylate glue is an option to seal intraoperative DM perforation. However, it is of paramount importance for surgeons to consider glue related complications like severe corneal inflammation, melting or even vascularization which might jeopardize possible future keratoplasty.

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