■ ***Original article***

Fine needle diathermy – A choice for managing corneal vascularization

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Abstract

Introduction: Corneal vascularization develops as a result of various corneal diseases. Fine- needle diathermy (FND) is one of the methods to occlude corneal vessels.

Objective: To evaluate the efficacy and safety of this method in a series of patients with corneal vascularization.

Materials and methods: Twenty eight patients with corneal vascularization were treated with FND. The patients were divided into four groups according to etiological factors like pre-keratoplasty (high risk patients), increased keratopathy, recurrent inflammation and post-keratoplasty rejection .The FND was performed under local anaesthesia with the help of a corneal needle of 10-0 monofilament nylon suture. The success of treatment was evaluated in terms of regression and occlusion of corneal vessels.

Results: The main aim of a complete occlusion of blood vessels was achieved in all patients. The most frequent complication seen was a transient whitening of the cornea especially around the needle entry in nine cases, which cleared within 24 hours.

Conclusion: FND is a simple safe, inexpensive and effective treatment. It can be repeated and used as an alternative therapy for corneal vascularization.

Key words: fine needle diathermy, corneal vascularization, occlusion of vessels, pre-keratoplasty

Introduction

The transparent cornea is avascular. Avascularity of the cornea not only maintains the transparency but also provides an immune privilege (Niederkorn, 1990). Vascularization of the cornea develops in response to corneal injury or infection. It helps in the healing process or acts as a warning sign of corneal distress. To repair and regenerate corneal insult, these vessels provide cellular and humoral immunological defence and also help the administered antibiotics reach the site of infection. If these vessels persist after the healing process, they may interfere with the transparency of the cornea. Such patients may not respond to medical treatment and there is an increased chance of recurrent inflammation. Corneal vascularization promotes the development of lymphatics. These lymphatics disrupt the immune privilege and also act as a risk factor (Lindstrom, 1986) for graft rejection, as corneal grafts are required to restore vision in such situations.

Occlusion of vessels has been practised over centuries. Different modalities of treatment have been used to occlude the vessels directly or indirectly, including the use of steroids, radiation, cryotherapy, conjunctival resection (Alldredge et al 1981, Ainslie et al 1962), argon lasers (Reed et al 1975; Marsh & Marshall, 1982) and yellow dye laser (L'Esperance, 1983 & 1985). The yellow dye laser is the most effective (L'Esperance, 1983 & 1985) but its lack of availability, high cost and inaccessibility to ophthalmologist requires the need for an alternative therapy. The alternative therapy should be simple, inexpensive, and provide good results without compromising conjunctival and scleral architectural integrity. This study is an attempt to evaluate the efficacy of FND in a series of patients with corneal vascularization.

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Materials and methods

Twenty eight patients with vascularised corneal opacity were included in this study. Out of these, eighteen were male and ten female. Patients with associated ocular conditions other than vascularised corneal opacity like associated glaucoma, uveitis or posterior segment pathology were excluded from the study. Patients were grouped according to etiological factors. Group 1 consisted of six high-risk, pre-keratoplasty patients. The nine patients in Group 2 had a history of increased keratopathy. Group 3 had ten patients with corneal vascularization and recurrent inflammation. Group 4 consisted of three patients with post- keratoplasty rejection and graft vascularization (Table 1).

A detailed history of the cause, duration and prior treatment were noted. Nine patients had received prior treatment with steroids. Details of corneal vascularization in terms of involvement of the quadrant (Table 2) (Fig 1, Fig 2, Fig 3 and Fig 4), depth of vessels and stage of vascularization, active or quiescent, were recorded after slit-lamp examination and photography of each patient.

Fig. 1

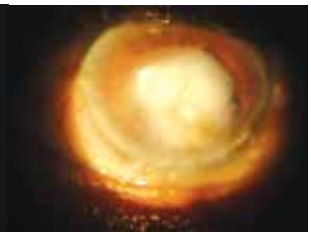

Fig. 2

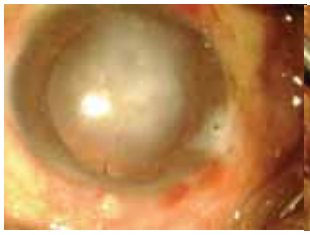

Fig. 3

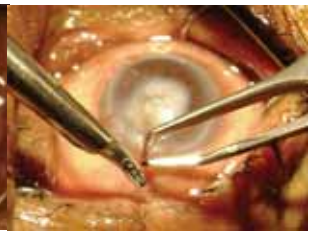

Fig. 4

Procedure

Under topical anaesthesia with xylocain 4%, fine needle diathermy (FND) was undertaken. A wire speculum was inserted. Corneal blood vessels were focused upon with the operating microscope. A stainless steel 3/8 circle side-cutting needle attached to a 10-0 monofilament nylon suture was inserted close to the limbus in the same direction and the same depth of the blood vessel. A diathermy probe was touched with the needle at low intensity till a blanching was seen. Each vessel was treated separately (Fig 5). For the larger vessels, the tip of needle was inserted into the lumen of the vessel (Fig 6). In case of multiple vessels in a bunch near the limbus, the needle was inserted parallel to the limbus (Fig 7) and FND was performed to occlude all the vessels at once. The afferent and efferent vessels were treated the same way (Fig 8).

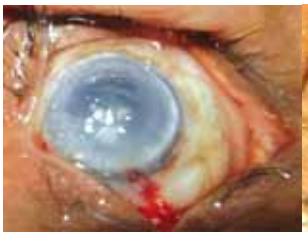

Fig. 5

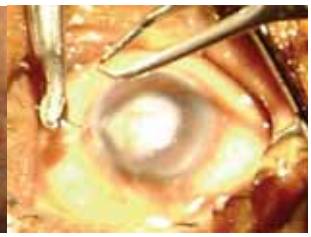

Fig. 6

Fig. 7

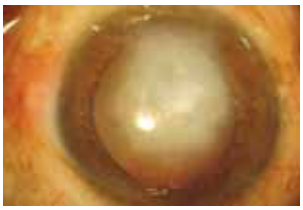

Fig. 8

Post-operatively, patients were treated with an antibiotic and steroid combination and in viral keratitis, antiviral drugs were added. Follow-up was done at two weeks and every two months for six months. Observations were done for vision, intra-ocular pressure (IOP), and for any other complications. On follow-up, slit-lamp examination was done in each patient to assess the patency or occlusion of the vessels. In cases of patency of blood vessels after a month, the vessels were retreated with FND.

Table 1
Etiological groups

Groups	Etiological factor	Number of patients
Group 1	Pre-keratoplasty- First graft	4
	- Regraft	2
Group 2	Increased keratopathy	9
Group 3	Recurrent inflammation	10
Group 4	Post-keratoplasty rejection	3

Table 2
Involvement of quadrants, depth and stage of corneal vascularization

Involvement of quadrant	Depth of vessels	Stage of vessels	Number of patients
4 quadrants	Deep and superficial	Active and quiescent	4
3 quadrants	Deep and superficial	Active and quiescent	6
2 quadrants	Superficial	Active	8
1 quadrant	Superficial	Active	10

Table 3
Success of FND on corneal vascularization

Groups	Success of FND	Number of patients
Group 1	Successful graft	3
	Post-re-graft immunosuppressant	2
	Graft failure (post-keratoplasty glaucoma)	1
Group 2	Decrease in corneal density	5
	No change in corneal density	3
	Increase corneal density (activation of disease)	1
Group 3	Regression of inflammation	8
	Repeat FND	2
Group 4	Decreased graft rejection	3

No major complications were observed. The only common complication seen was a transient whitening of the cornea especially around the needle entry in nine cases, which cleared within twenty four hours. Sub-conjunctival hemorrhage was seen in four patients (Fig10, Fig 11 and Fig 12) and an intra-stromal hemorrhage appeared in one patient. These hemorrhages cleared within ten days (Table 4).

Result

All patients showed complete regression of vessels (Fig 9). In Group1, three patients had a successful graft and both re-graft cases required immunosuppressant therapy. One large graft failed due to post-keratoplasty glaucoma. In Group 2, five patients had a decrease in corneal density, three had a complete regression of vessels with no change in corneal density and one patient had a increase in the density in spite of a complete regression of vascularisation. This increase in density was due to a reactivation of the primary disease. In Group 3, regression of inflammation was seen in eight patients; two patients showed a patency of blood vessels and required a repeat FND. After a repeat FND, all the vessels regressed within two weeks. In Group 4, all three patients showed decreased graft rejection in the form of an improvement in graft oedema (Table 4).

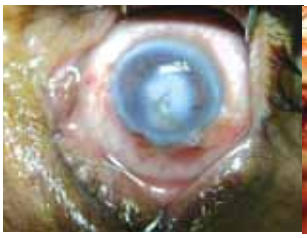

Fig. 9

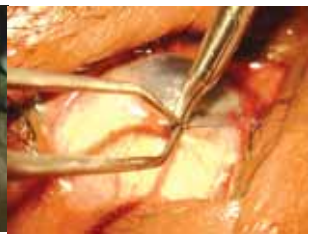

Fig. 10

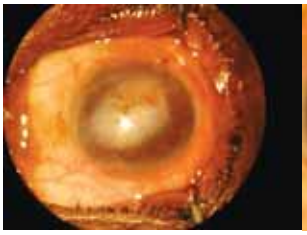

Fig. 11

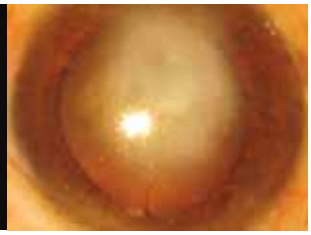

Fig. 12

Table 4
Post FND complications

Complications	Number of patients
Transient whitening of cornea	9
Sub-conjunctival haemorrhage	4
Intra-stromal haemorrhage	1

Discussion

Corneal vascularization is essential in corneal insult for repair and regeneration, but disadvantages of persistence of corneal vessels are also well known. Various methods have been tried to occlude these corneal vessels but they have some or other disadvantages. The commonly used treatment is

topical steroids but it has the risk of cataract and glaucoma with long-term use. Other methods such as radiotherapy, cryotherapy and conjunctival resection have limited clinical value (Ainslie et al 1962). Photocoagulation of vessels (Marsh, 1982; Cherry et al 1973) has been shown to be an effective alternative to the above methods. Argon laser photocoagulation of corneal vessels has been effective and easy for corneal efferent vessels, but for afferent vessels, it is difficult as afferent vessels are narrow and deeper. There is also a risk of iris atrophy and macular burn (Chidambara et al 2000). Yellow dye laser 577 nm has been found to be effective for reversal of graft rejection and significant reduction in the area of vascularisation (Baer et al 1992). But it is very expensive and unavailable to many ophthalmologists.

The technique of FND is very simple, inexpensive and can be performed by any ophthalmologist. It does not require any special instruments and does not have any learning curve. It can occlude vessels at any depth. It has an equal efficacy for efferent and afferent vessels. A bunch of vessels can be occluded in a single shot.

No major complication like needle perforation was observed in this series. Only a whitening around the needle entry at the cornea, sub-conjunctival and intra-stromal haemorrhages were seen which completely resolved on follow-up. FND can also be repeated without any change in conjunctival or scleral architecture.

Conclusion

FND is a simple, safe, effective and alternative treatment for corneal vascularization. In pre-keratoplasty patients, it shows its effectiveness by a successful graft. It helps in reducing the density of corneal opacity and improvement in visual acuity. In early-graft rejection with vascularization, it helps to reverse the process of graft rejection. Recurrent inflammation caused by corneal vascularization is controlled after FND. Re-canalization or patency of vessels can be treated with a repeat FND. The FND is found to be successful modality in arresting corneal vascularization.

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