

Mini Review

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Extrusion of Intrastromal Corneal Ring Segments in Keratoconus; How to Avoid?

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Introduction

Implantation of intrastromal corneal ring segments (ICRS) is an effective and reversible refractive procedure for keratoconus management [1]. the main advantages of ICRS in treatment of keratoconus are safety, reversibility and stability [2,3]. Ring segments extrusion is one of the postoperative complications of ICRS implantation which leads to ring explantation [4].

Causes and Predisposing Factors

Ring extrusion is one of the most common complications of ICRS implantation; extrusion is associated with melting and vascularization [5]. many causes have been implicated as an etiology including ring segment migration and corneal melting which precede full ring segment extrusion [6].

Technique of Tunnel Creation and Extrusion

Ring tunnel creation by mechanical dissection showed more common extrusion than tunnel creation performed by femtosecond laser (FS) [7]. The mechanism of ring extrusion is still unclear but spontaneous focal severe thinning with biomechanical stress effect on the stroma induced by the ring segment and ocular surface dryness [8]. Lastly, chronic eye rubbing in cases of ocular allergy may be a predisposing factor.

Effects of Ring Segments Extrusion

Ring segment explanation due to extrusion results in worsening of corneal topography indices due to loss of the flattening effect of rings [9]. however; Recently, preserved topographic effect have been reported after explanation of ICRS in patients with keratoconus who had undergone corneal collagen crosslinking in the same-day at the time of ICRS implantation [10] (Figure 1).



Figure 1: A case of ring segment extrusion.

How to Avoid?

The use of the FS laser in corneal tunnel creation is an effective technique to avoid late ring segment extrusion as it made the corneal ring implantation operation faster, easier, and safer with precise depth of implantation [11]. this procedure avoids rough ring implantation in mechanical dissection which may lead to inaccurate ring segment depth.

Conclusion

Intrastromal corneal ring segments extrusion is one of the common complications of ring segments implantation in keratoconus management, extrusion leads to loss of ring segments flattening effect, FS laser tunnel creation together with normal ocular surface can lead to decrease the occurrence of this complication.

Acknowledgment

None.

Conflicts of Interest

No conflicts of interest.

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