A (not so) new option for safely correct moderate myopia in patients with thin corneas

Uma (não tão) nova opçao para correçao segura da miopia em pacientes com córneas finas

Sandro Coscarelli[1], **Paulo Ferrara**[2], **Leonardo Torquetti**[3]

[1] Clínica de Olhos Ennio Coscarelli, Belo Horizonte, MG, Brazil.
[2] Centro de Saúde Ocular Dr. Paulo Ferrara, Belo Horizonte, MG, Brazil.
[3] Centro de Excelência em Oftalmologia, Pará de Minas, MG, Brazil.

How to cite:
Coscarelli S, Ferrara P, Torquetti L. A (not so) new option for safely correct moderate myopia in patients with thin corneas [editorial]. Rev Bras Oftalmol. 2022:e0015.

doi:
https://doi.org/10.37039/1982.8551.20220015

Received on:
Jun 29,2021

Accepted on:
Oct 3, 2021

Corresponding author:
Sandro Coscarelli
Avenida Brasil, 1312 – Funcionários
CEP 30140-001 – Belo Horizonte, MG, Brazil
E-mail: sandrocoscarelli@gmail.com

Institution:
Clinica de Olhos Ennio Coscarelli.

Conflict of interest:
no conflict of interest.

Financial support:
the authors received no financial support for this work.

The recent rise in myopia called the "myopia boom" is a problem to be solved. It has been worsened by the amount of digital screen time during the coronavirus disease 2019 (COVID-19) pandemic. There is evidence of a strong association between measures of education and the prevalence of myopia. And the incidence of this condition tends to increase year by year, in the following years, if not decades.

Myopia classically has been corrected with glasses and contact lenses. Myopia correction can be achieved by several surgical procedures nowadays. However, high myopia limits the number of safe and effective surgical options. Phakic intraocular lenses (pIOL) have been proposed as the procedure of choice for higher myopic corrections. As phakic intraocular lenses implantation is an intraocular procedure, it may pose some risks, including cataract formation with even a small touch of the phakic lens during placement, endothelial cell loss, and long-term cataract formation caused by a progressive increase of the crystalline lens thickness, what would be a concern especially in young patients.

Many patients who are candidates to refractive surgery frequently do not present safe conditions for the procedure, such as thin corneas with high ametropias or keratoconus suspicion. In these cases, a new procedure to reduce the dependence or eliminates the need for glasses would be highly desirable.

The reduction of corneal thickness in these cases may pose a risk of postoperative ectasia. Based on it, Sandro Coscarelli began to associate intracorneal ring segments (ICRS) implantation followed by photorefractive keratectomy (PRK) for myopia correction.[1]

The first implanted intrastromal corneal rings were implanted for low myopia treatment and were a full ring, with 360-arch length. After the introduction of Excimer laser for corneal refractive surgery, the rings were abandoned as a refractive procedure, because of their low predictability. Intracorneal ring segments have been used to correct ectatic corneal diseases to reduce the corneal steepening and the irregular astigmatism and to improve the visual acuity. Many studies have demonstrated the efficacy of intrastromal rings to treat many corneal conditions like keratoconus, post-laser in situ keratomileusis (LASIK) corneal ectasia, post-radial keratotomy ectasia, astigmatism, and myopia.

The mostly used ring in Brazil and worldwide, Ferrara ICRS, presents an apical diameter of 5.0mm. Aiming to correct residual myopia after ICRS implantation, Sandro Coscarelli performed many PRK procedures in these cases. However, due to the small OZ of implanted ICRS, the ablation was done over the ICRS itself, with subsequent

induction of haze and aberrations. The author realized the need for a larger optical zone to solve such complications, which led to the idea of creating a new ICRS.

The goal is to have a tissue-saving procedure and an alternative surgical option for correction of moderate to high myopia, by the association of these two techniques.

This ICRS was initially named ICRS-HM (HM for high myopia), as it was thought it could be used for correction of high degrees of myopia. Clinical studies showed that the myopia reduction ranged, on average, from 3.0 to 5.0D. Despite of that, the name remained ICRS-HM, which stands for a refractive device very useful for low to moderate myopia.

The Ferrara ICRS-HM is a new ICRS; it has a fusiform shape, a long arch length (320), a diameter of 5.7mm and is 400μm thick. This model can correct most of myopia, in addition to allowing for subsequent PRK procedure to safely correct the residual ametropia.

The first Ferrara HM was implanted by the author in August 2017. In 2020, the author (SC) published the first study describing clinical outcomes, topographic and refractive results in patients implanted with HM and subsequent PRK.

Sandro Coscarelli was the first to perform PRK after the implantation of Ferrara HM, as he had a large experience with this association of procedures in conventional ICRS.

We published a study evaluating the first 42 eyes of 23 patients with high myopia, implanted with Ferrara HM. The PRK procedure was performed at least 6 months after ICRS implantation. The surgical procedures were performed in both eyes simultaneously.

The mean preoperative uncorrected distance visual acuity (UDVA) improved from 20/800 preoperative to 20/100 after ICRS and 20/35 after PRK. The mean preoperative corrected distance visual acuity (CDVA) was 20/25 (range from 20/30 to 20/20) and remained unchanged after HM implantation. Following the PRK, the mean CDVA was 20/25 (range from 20/30 to 20/20). The mean spherical equivalent decreased from -7.25±1.12 (range -5.00 to -9.00) preoperatively to -3.32±1.0 (range -2.00 to -5.00) postoperatively ($p<0.001$) after Ferrara HM implantation and decreased to 0.32±0.45 (range -0.625 to 1.875; $p<0.001$) after PRK.

The average simulated corneal ablation in case of a single procedure (if the patient had PRK without previous ICRS implantation) was 109±22.4μ (range 72μ to 141μ). The real average corneal ablation (PRK after ICRS implantation) was 34±10.8μ (range 20μ to 60μ; 70% tissue saving).

All patients reported being very satisfied with the clinical outcomes. No patient required reversion of the procedure (removal of the ICRS).

Ferrara HM implantation followed by PRK is an alternative in reducing spectacle dependence in moderate to high myopes with low complication rates. Possibly, about 20% to 25% of candidates to refractive surgery that would not be referred to this procedure (due to keratoconus suspicion or thin cornea) can have the benefit of this novel ICRS followed by PRK. In several cases, with low degrees of myopia, the ICRS implantation is enough for full correction.

We believe that Ferrara HM could be a safe and effective option for myopia correction in patients with thin or irregular corneas who would not be eligible for laser refractive surgery. It is an additional option in the toolbox of the refractive surgeon, allowing for the treatment of many patients that otherwise would not have an alternative for myopia correction.

The constant evolution of ICRS, associated with the surgeon's innovative expertise, lead to new horizons for a group of patients that could not have a safe and effective option for correction of moderate myopia.

REFERENCES

1. Coscarelli S, Rodrigues P, Rocha G, Torquetti L. Preliminary results of a new intrastromal corneal ring segment as a tissue-saving procedure in photorefractive keratectomy to correct moderate to high myopia. Int J Ophthalmic 2020;13(12):1955-60.