

Caring with CAIRS

Armed with an illustrious career in ophthalmology, Dr. Soosan Jacob offers new approaches to reshaping vision by Chow Ee-Tan

With over 21 years of experience in the fields of refractive surgery, keratoconus management, glaucoma, and complex cataracts, Dr. Soosan Jacob is renowned for her innovative work in ophthalmology. CAKE Magazine sat down with the “Power Lister” ophthalmologist to talk about corneal allogenic intrastromal ring segments (CAIRS), as well as her exemplary contributions to the industry.

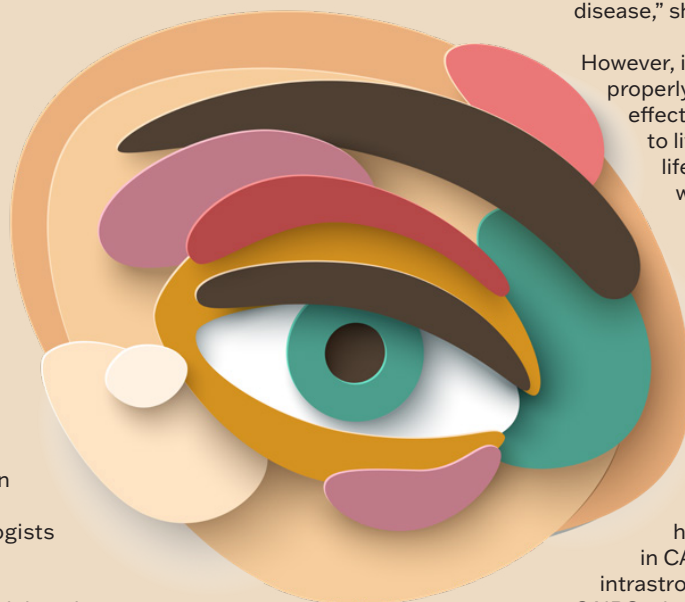
Dr. Soosan Jacob serves as the director and chief of Dr. Agarwal’s Refractive and Cornea Foundation (DARCH) and is a senior consultant at Cataract and Glaucoma Services at Dr. Agarwal’s Group of Eye Hospitals in Chennai, India. A prolific researcher, writer, and keynote speaker, it comes as no surprise that Dr. Soosan Jacob earned recognition and was listed as part of the Top 100 ophthalmologists worldwide.

However, Dr. Jacob shared that she did not actually dream of becoming an ophthalmologist. She did consider pursuing a career in medicine because it seemed to be a secure path toward a stable and fulfilling life.

But during her third year at Medical College Kottayam in Kerala, a

professor pointed out that she could make use of her hands and brain while performing surgery.

“This was probably my ‘eureka moment’ for ophthalmology,”



she shared. “Here was surgery without bloodshed and with instant gratification.” Once her interest was piqued, everything else fell into place—and her journey in ophthalmology had begun.

Conquering keratoconus

Dr. Jacob’s primary area of research has been keratoconus, a disease that, she notes, is more commonly prevalent than previously believed.

“In the past, the prevalence of keratoconus was thought to be low. However, with the availability of improved diagnostics, it has become evident that its prevalence is actually much higher than we thought it was,” she shared.

She cited a study conducted in central India, which showed the high prevalence of keratoconus in patients, including some who are very young.

“This is a very common disease, particularly among the young. It affects patients in the prime of their lives, who are actively working and need good vision. Without treatment, this can become a devastating disease,” she continued.

However, if the disease is treated properly, it can be controlled effectively, allowing the patient to live an active and fruitful life. Dr. Jacob admits this was the reason she got interested in the disease, because one can really make a lot of difference in the lives of many young individuals.

CAIRS: A new approach to reshaping vision

In recent years, Dr. Jacob has been actively involved in CAIRS or corneal allogenic intrastromal ring segments. CAIRS, she said, is a procedure in which ophthalmologists place a ring of allogenic tissue into the eye.

“Corneal tissue is the most easily available, allogenic source and so we started out with this. It should be noted though that CAIRS can be performed with other sources

as well. CAIRS is inserted into the mid-periphery of the patient's eye in a specific manner and form. This process brings about a change in the shape of the patient's eye," she explained.

According to Dr. Jacob, as keratoconus is a disease characterized by the deformed shape of the cornea, patients would generally have a conical protrusion. This distortion leads to various refractive irregularities across the cornea, resulting in distorted vision, higher-order aberrations, and poor quality of vision.

"CAIRS uses the Barraquer thickness law. If you put in tissue in the mid-periphery you can achieve a flattening of the center. That's exactly what we try to do," she explained. "But the challenge lies in the type of material that was being implanted - PMMA used to create synthetic ICRS. This limits going beyond a certain thickness because these [materials] are not biocompatible. If you keep too much of it, especially in patients with pre-existing corneal thinning disorder, it can result in complications, such as extrusions, intrusions, migrations, and so on," Dr. Jacob continued.

This is where CAIRS created a paradigm shift by allowing implantation of allogenic tissue which is extremely biocompatible and takes away many of the risks associated with implanting synthetic tissue. In addition, we also found that CAIRS gives greater effect than synthetic segments like INTACS and others.

Following uniform thickness CAIRS, Dr. Jacob developed customized CAIRS, employing a similar technique for cornea treatment, but using customization or personalization for each patient. This journey has been highly rewarding because they have progressed from using a uniform thickness to implementing customized CAIRS—which means they are tailoring the procedure to each patient.

"Keratoconus is a disease that exhibits different characteristics among different patients. There is a gradation of powers within the cone, and the position and shape of the cone may differ, along with the morphology and phenotype of the

cone. There are various thicknesses, and each variation is different—thus making each patient unique," she added.

When Dr. Jacob performs customized CAIRS, she tailors the segment for each patient based on factors such as topographic map, refractive error, thickness and so on.

"We have finely honed the technique to the point where we can translate it to the patient. We have observed that it really improved the patient's visual quality, which serves as a validation for the techniques we use," she enthused.

A promising future in eye care

Several ongoing studies on CAIRS are published or pending publication. With more than 600 eye patients who have undergone CAIRS, they have managed to obtain a large database of a wide range of keratoconus patients, all of whom will be included in the studies for publication.

Dr. Jacob added that CAIRS has an exciting future. So far, the procedure has been accepted by many ophthalmologists all over the world, in multiple centers in the US, Canada, Australia, Lebanon, Turkey, Israel, Germany, South Africa, the Dominican Republic, and Iraq, among many others.

"This is very encouraging because it's one thing to develop a technique, but it takes the game to a completely different level when you find out your colleagues are also doing it on an international scale," she shared.



"We now have patients who seek out this treatment, having heard about it from peer support groups, or read about the technique. They are part of the younger patient population who are very active online and are actively seeking treatments that can benefit them," continued Dr. Jacob.

There is already a substantial body of literature on CAIRS, both in medical books and online resources. Dr. Jacob has her own YouTube channel where she shares videos, ranging from the beginning of customized CAIRS to the latest video that has won multiple awards at various conferences—providing detailed explanations about customized CAIRS.

Looking forward, Dr. Jacob believes ophthalmologists can customize this technique even further and bring it into places where treatments are still not widely available, such as some African countries. In these areas, according to literature, the prevalence of keratoconus is approximately 9% among male patients and around 5% to 6% among female patients.

"They may not have femtosecond lasers available in those areas, so this would be a place where we could make manual channel creation even in the remotest of countries or locations. Any well-trained surgeon could then do CAIRS," she shared.

Dr. Jacob has also worked on femtosecond laser cut CAIRS. These, as well as the trephine cut CAIRS with the use of the CAIRS customizer that she designed give great precision to customization. In fact, the trephine cut CAIRS allows the surgeon to exactly plan and translate plans to the patient's eye.

A true trailblazer

When asked about her vision for the future of ophthalmology, Dr. Jacob said several changes are important for the field. These include the need for more inclusivity, increasing diversity, empowering more women, encouraging greater collaboration between various groups, and fostering increased teamwork.

Dr. Jacob has relished every moment of her journey as an ophthalmologist. Her innovative career has been marked by various accomplishments, ranging from her first innovation which was in the field of oculoplasty (supra-brow single stab incision frontalis sling surgery for enhanced cosmesis) to anterior segment transplantation, and glued capsular hook and supracapsular glued IOL in the cataract field.

Her contributions also extend to corneal innovations, such as contact lens-assisted crosslinking, immediate primary pre-Descemetic deep anterior lamellar keratoplasty (DALK) for acute hydrops, air pump-assisted pre-Descemetic endothelial keratoplasty (PDEK), host Descemetic scaffolding, and, of course, CAIRS.

“Each of these [endeavors] is like a baby to me, and seeing them help patients brings me immense happiness and pride,” Dr. Jacob concluded. 🍼

Contributing Doctor



Dr. Soosan Jacob, MS, FRCS, DNB, MNAMS, the director and chief of Dr. Agarwal’s Refractive and Cornea Foundation (DARCF) and a senior consultant at Cataract and Glaucoma Services at Dr. Agarwal’s Group of Eye Hospitals in Chennai, India. She is a renowned speaker widely respected for her innovative techniques and management of complex surgical scenarios. Dr. Jacob has been featured as one of the five most influential female figures in ophthalmology at a virtual roundtable, and has been listed as part of the Top 100 ophthalmologists worldwide. Dr. Jacob has a special interest in cutting-edge cataract, cornea, glaucoma, complex anterior segment reconstruction, and

refractive surgery. Many of her innovations have earned international awards. She has received numerous prestigious international awards for her surgical videos, as well as Best Paper of Session awards for her innovations at international conferences in the United States and Europe. She is actively involved in conducting courses and delivering lectures at numerous national and international conferences. She has authored over 110 peer-reviewed publications and more than 200 chapters in 34 textbooks. Dr. Jacob also serves as the chairperson of the Multimedia Editorial Board AAO-ISRS (American Academy of Ophthalmology - International Society of Refractive Surgery) and council member of many societies and journals.

dr_soosanj@hotmail.com



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