

17TH INTERNATIONAL CONFERENCE OF THE
RESEARCH INSTITUTE OF OPHTHALMOLOGY

RIO 2025

*Anterior Segment Eye Diseases
Current Status & Future Directions*



Keratoconus Uncovering The Role Of Inflammation

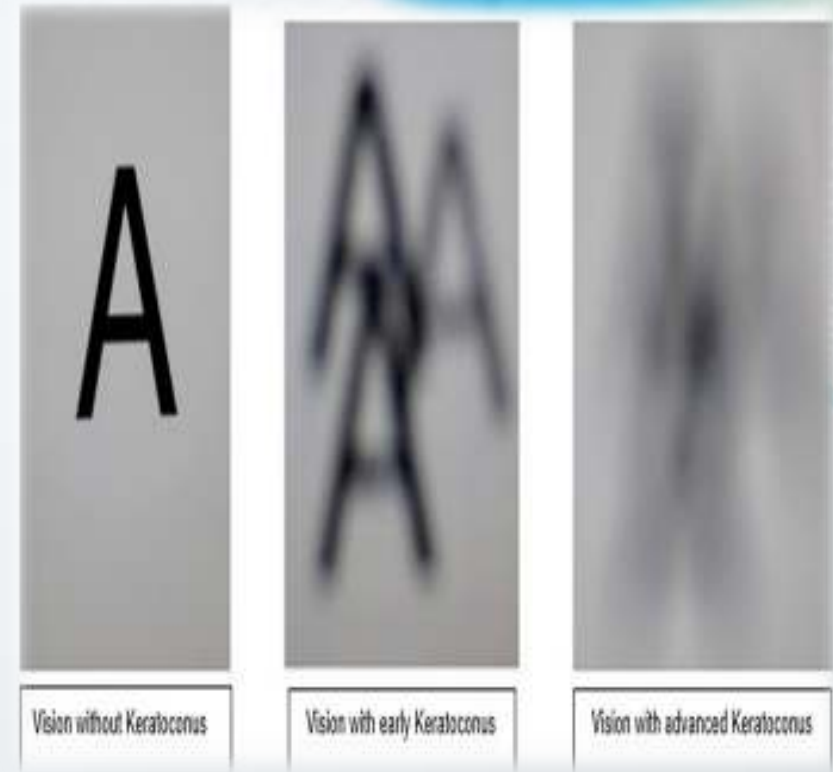
Mai Al Kaffas, MD

Head Of Clinical Microbiology, Allergy and
Immunology



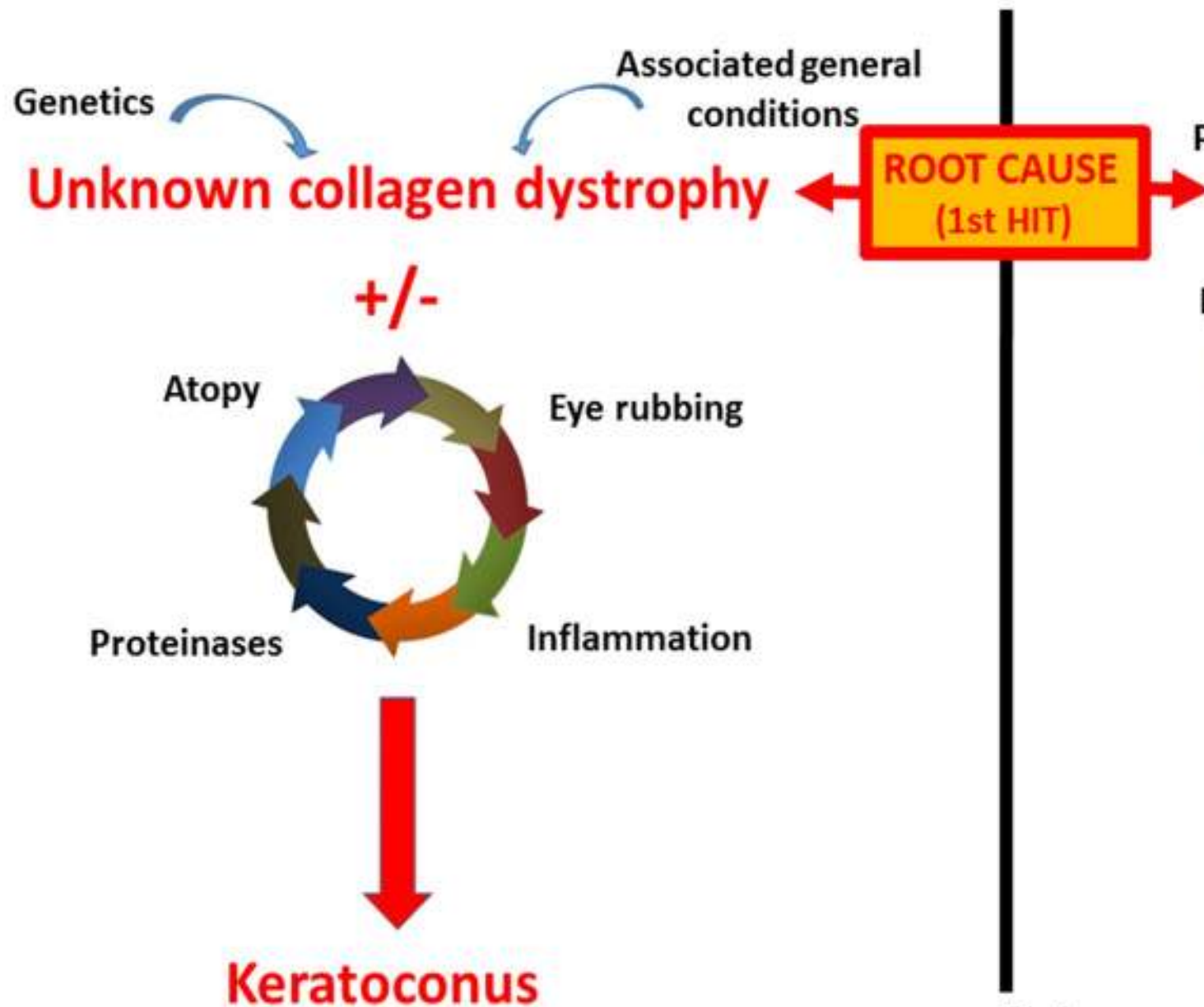
Definitions

- ▶ Non-inflammatory, progressive condition in which cornea gets thinner and gradually bulges into a cone shape leading to impairing of vision
- ▶ **Kerato** = cornea and **Conus**= Cone
- ▶ Clinical features as *irregular astigmatism*, *corneal scarring*, *sensitivity to light* contribute to visual impairment
- ▶ Inflammation occurs when the body releases chemicals that trigger an immune response to fight off infection or heal damaged tissue

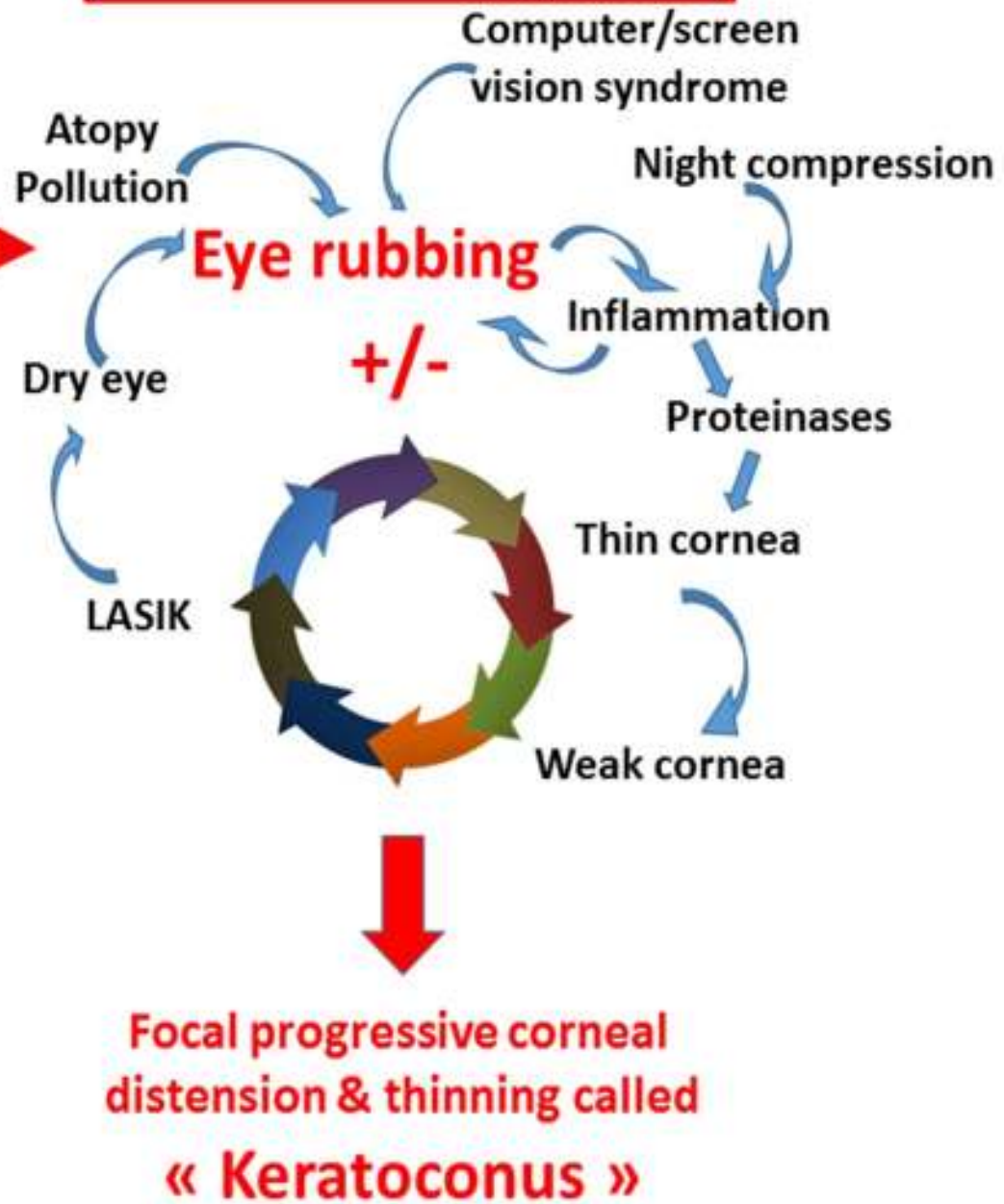


ETIOLOGY OF KERATOCONUS:

« MOLECULAR » Hypothesis

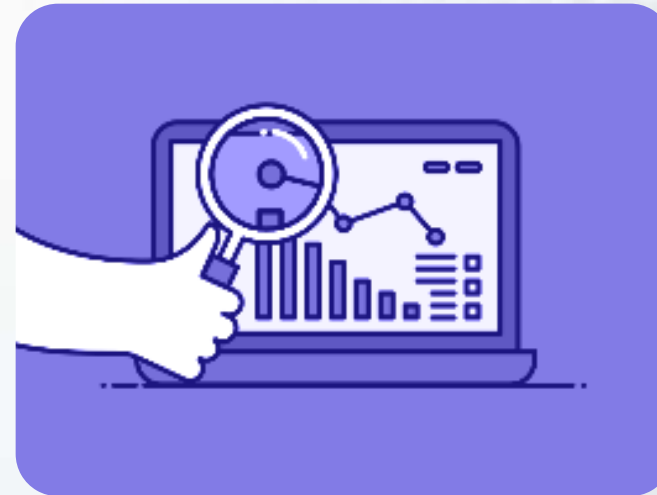


« MECHANICAL » hypothesis



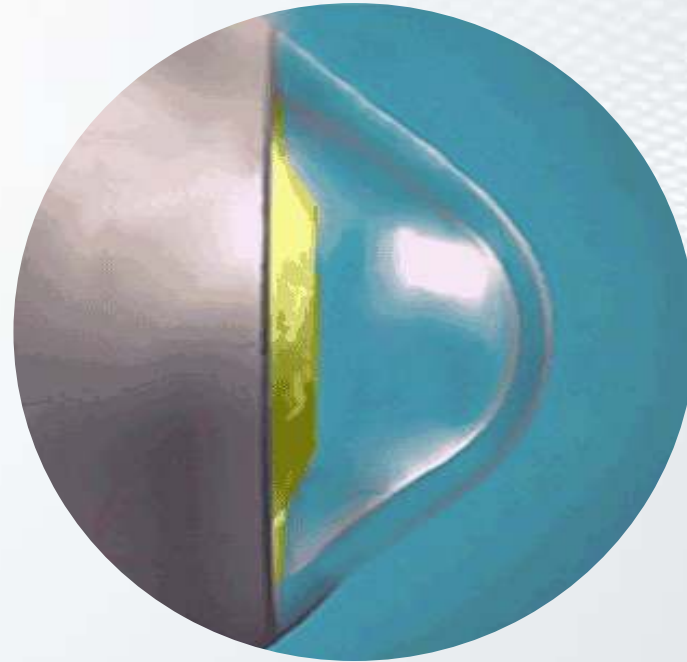
Etiology

1. Environmental
2. Genetic disorders
3. Hereditary
4. Congenital weakness of the cornea
5. Secondary following trauma
6. Contact lens wear
7. Hormonal change
8. Associated medical conditions as downs Syndrome, Sleep apnea, Connective tissue disorder as Marfan Syndrome or Osteogenesis Imperfecta



Re-definition

- Consider the concept that keeping the already demonstrated involvement of **inflammatory mediators** in the pathophysiology of keratoconus classified as a **non-inflammatory** condition may be no longer adequate, Keratoconus could be an *inflammatory disorder*



Epidemiology

- ▶ **Worldwide** estimate that 1 in every 2,000 people develop keratoconus.
- ▶ Prevalence in **Egypt**, the prevalence of KC was 1.12%
- ▶ Prevalence in **Africa** of 10.6%, The onset of KC is usually at puberty and progresses until 40-50 years of age



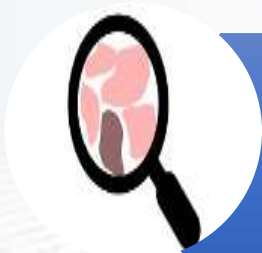
- ▶ Prevalence of keratoconus is variable and affects up to 5% of the population in regions of the world, as the **Middle East**
- ▶ It is more common among **Asian populations** between 5 and 15 %
- ▶ About 30% **Atopy**
- ▶ Total prevalence of KC in **whole population** is~ 1.38 to 54.5 per 1000



**Highlighting the need for targeted
epidemiological studies**

Importance of identifying risk factors

Evaluation of the interplay between keratoconus and inflammation is crucial for identifying *potential therapeutic targets* and *improve patient outcome*



Early detection and timely intervention



Halt disease progression



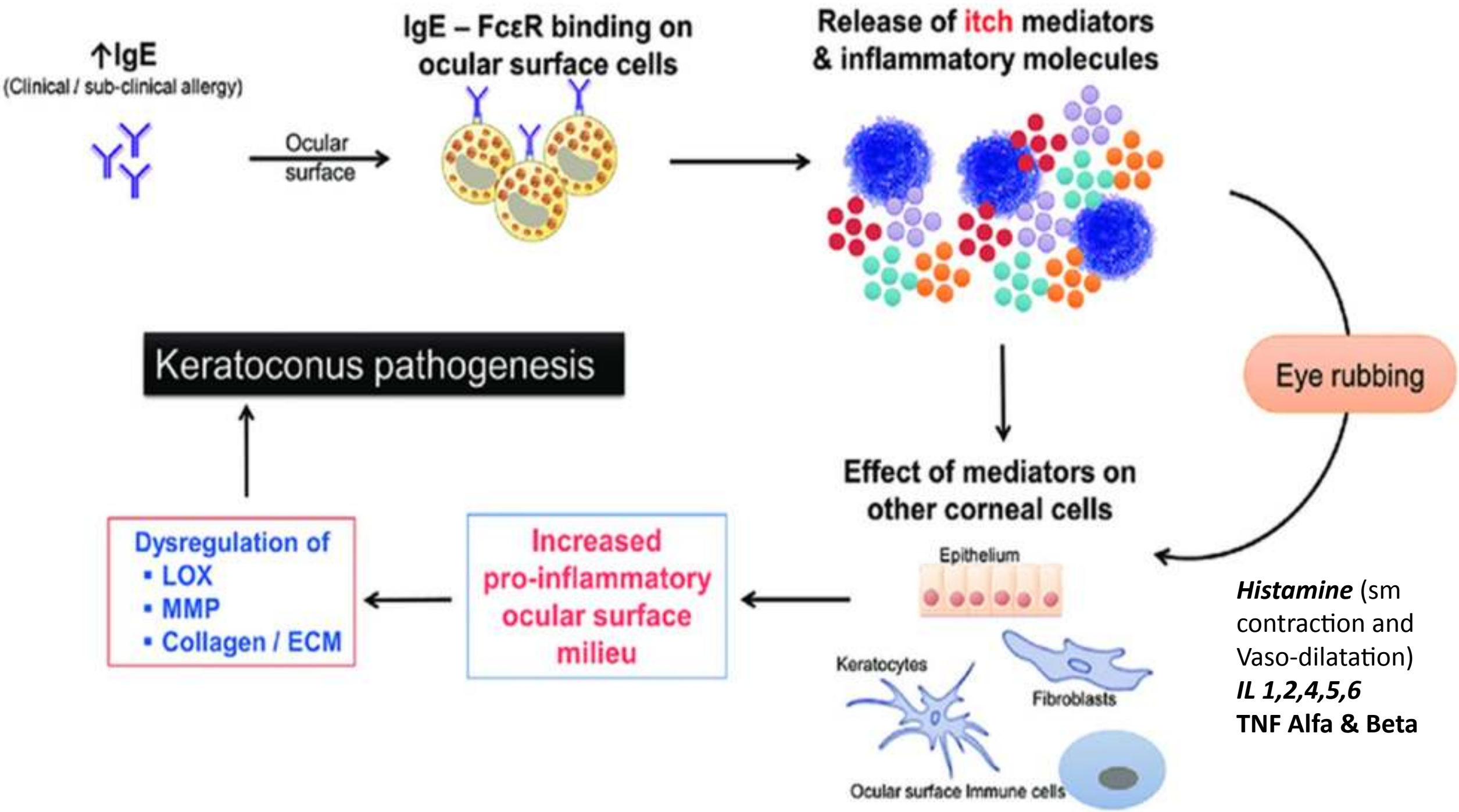
Maintain visual correction option and prevent more aggressive ttt options

KC relative risk

1.9 x for
Asthma
patients

1.4 x for
Allergy
patients

3.0 x for
Eczema
patients



Role Of Allergy in KC

- ▶ VKC patients have more abnormal corneal topographic patterns than non-VKC control
- ▶ Although allergy may not hasten KC progression, it definitely increases the chances of complications
- ▶ In addition younger age, history of eye rubbing, and atopy patients have higher risk corneal hydrops developing
- ▶ Patients of KC who had VKC required corneal transplant surgery earlier as compared to primary KC cases



**What Makes Atopy, ocular
Allergy / VKC more linked to
Keratoconus ??**



Eye Rubbing

- ▶ Frequent behavior as a reaction to eye irritation, exhaustion, eye dryness and emotional stress induces a mechanical change in the cornea
- ▶ 3 x's who had eye rubbing on daily basis and 50% corneal changes
- ▶ Atopy and allergies are the most prevalent risk factors for the persistent behavior of inappropriate eye rubbing causes corneal mechanical change and progressive ectasia
- ▶ Important Pathway that potentially causes or worsens KC through corneal micro trauma by pro-inflammatory cytokines release



Impact on corneal structure

► *Potential triggers :*

Eye rubbing

Allergens

Environmental pollution

► **Chronic inflammation** disturb corneal architecture leading to **collagen disorganization** which exacerbates the **progression of keratoconus** and **worsen visual consequences**

All may exacerbate inflammatory process in
keratoconus



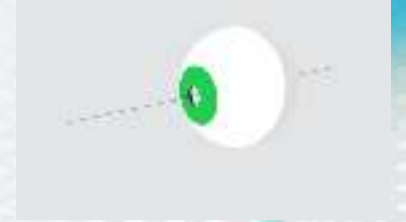
Potential complications of keratoconus include

- ✓ Corneal scarring
- ✓ Corneal hydrops
- ✓ Vision loss



Therapeutic approaches

- ▶ **Conventional treatment** involving prescription of corrective lens especially in early stages
- ▶ **Surgical** involving cross linking or transplant especially in late stages
- ▶ **Emerging therapies and future perspective** involving immunotherapy ,gene therapy or stem cell therapy may offer innovative pathways to manage keratoconus more effectively

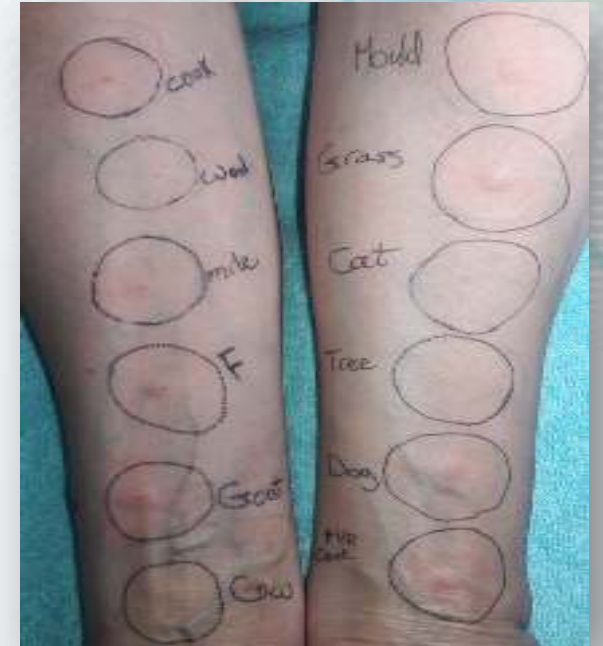


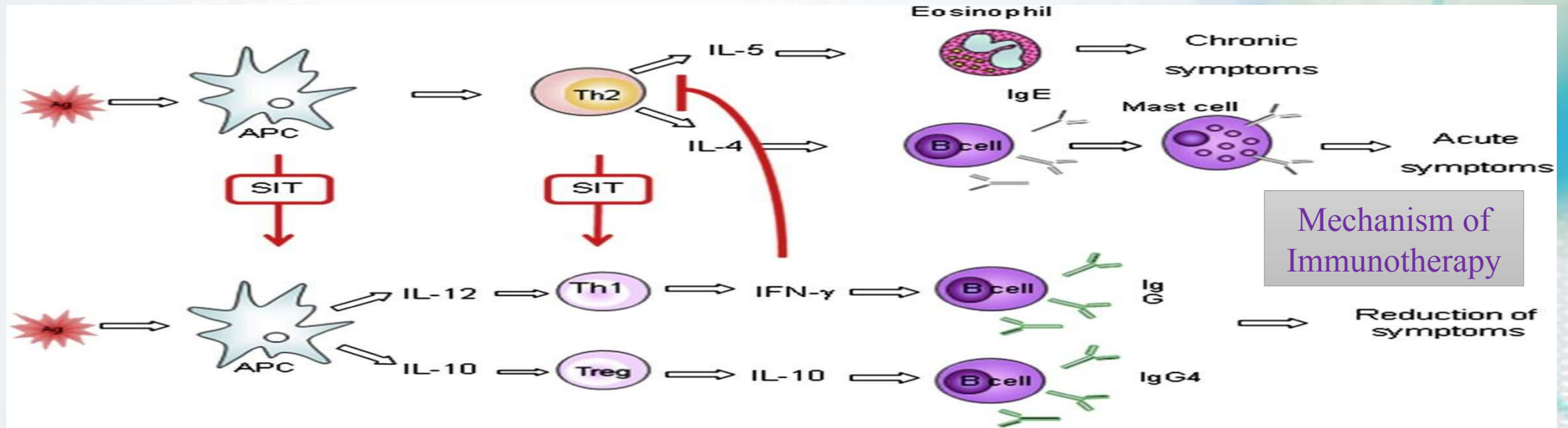
Immunotherapy

The only treatment that interferes with the basic pathological mechanism of the allergic disease

Immunotherapy

- RIO, Allergy Unit performing: Skin prick testing as the **primary method** for diagnosis of IgE mediated allergies & considered **the gold standard method**
- The **most widely method** used as for **high sensitivity & specificity, easy to perform, rapid** results (15–20 min), **low cost & clear demonstration**
- local conjunctival immunotherapy as **eye drops** for treating patients with allergic conjunctivitis has been used in **RIO** since **year 2000 for the first time in Egypt.**





Applying increasing doses of the causative allergens prepared from natural allergenic extracts in our Allergy Lab at (RIO) from crude extracts

Decrease symptoms & signs these allergens and thus create tolerance

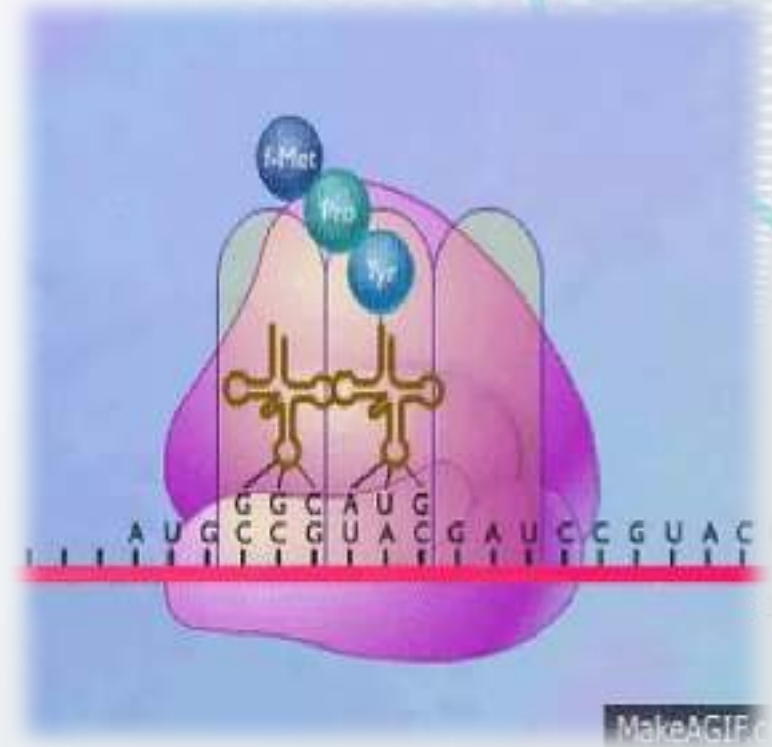
Therapeutic approaches

- ▶ Anti inflammatory medications
- ▶ Life style modification: avoidance of known allergens
- ▶ Role of nutrition



ForKhead Box Protein

- ❑ Transcription factor that **regulates apoptosis**, cell cycle progression, oxidative and stress resistance
- ❑ Many studies have shown **association** of FOX proteins with **corneal thickness**
- ❑ **Altered** FOX regulation in KC corneas could be potentially responsible for the observed **decreases in collagen and fibronectin**
- ❑ Multiple molecules and drugs targeting FOXO3a have been reported to have the potential for the treatment of KC, but further clinical trials are needed



Patient Education and Support

Empowering Patients



Importance of Patient Awareness

Educating patients on keratoconus and its inflammatory aspects empowers them to make informed decisions and adhere to treatment recommendations.



Resources for Patients

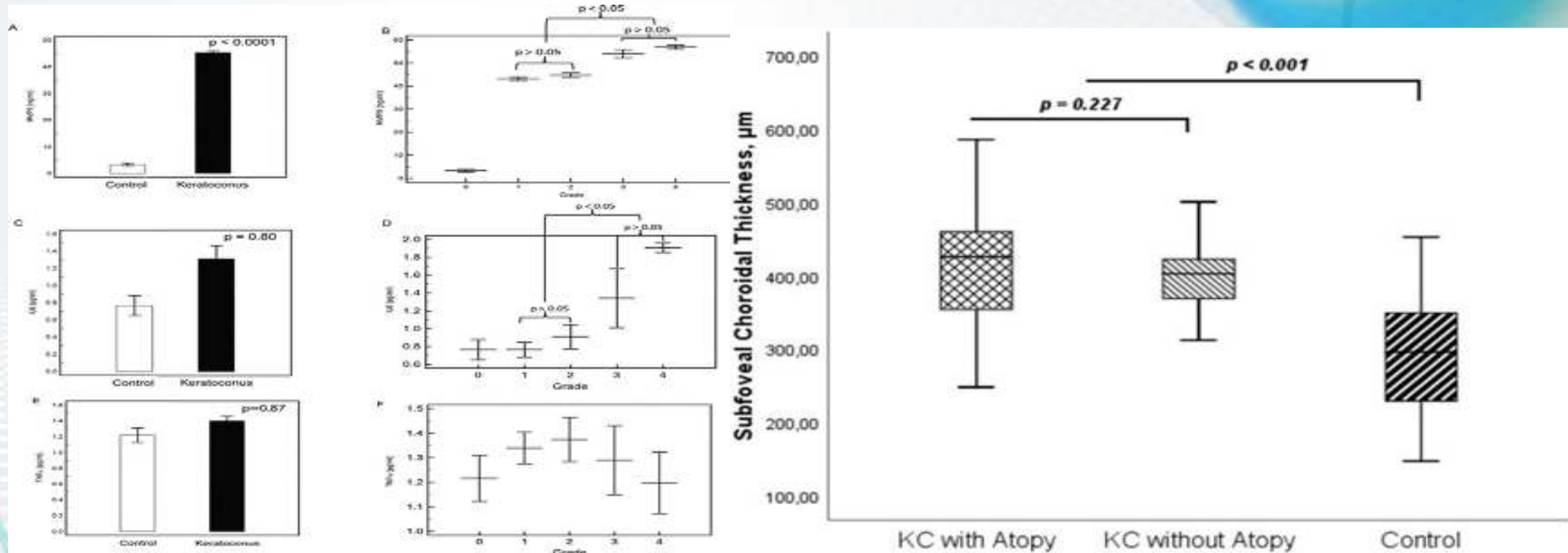
Numerous organizations and websites provide valuable information and support systems to guide patients through their keratoconus journey.



Support Groups and Networks

Connecting with others facing similar challenges can provide emotional support, share experiences, and foster a sense of community among keratoconus patients.

Case studies



- ▶ 2024 RIO, ongoing study evaluate the role of inflammation in KC and the extent of increase was found to be associated with the severity and the staging of KC

Take home message



1. Inflammation have a crucial role in pathogenesis, disease progression, and treatment outcome in KC
2. Control of inflammation with avoidance of eye rubbing may offer the best means of KC prevention
3. Future studies are to evaluate the cost-effectiveness of early screening, using corneal topography, and referral to allergy units
4. Immunotherapy and gene detection can be future lines for early detection and better outcome

A close-up photograph of a person's eye, looking directly at the camera. The person is wearing contact lenses that display a vibrant rainbow gradient, transitioning from red at the top to blue at the bottom. The eye is framed by dark, well-defined eyelashes. The background is a soft, out-of-focus light blue.

THANK YOU