



ACUTE HYDROPS IN KERATOCONIC EYE – POST CORNEAL COLLAGEN CROSS LINKING :- A CLINICAL PARADOX

Ophthalmology

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ABSTRACT

Background: Acute corneal hydrops is an uncommon but visually debilitating complication of keratoconus. It arises from a spontaneous break in Descemet's membrane, allowing aqueous humour to flood the corneal stroma, resulting in sudden corneal oedema, pain, and significant vision loss. Early identification and tailored treatment are essential to minimize complications and optimize visual outcomes. **Case History:** We report a case of a 16 year old male patient presented with acute hydrops in right eye with bilateral keratoconus. Patient had diminution of vision of both eyes for the past five years and had underwent collagen crosslinking procedure in both eyes 2 years back. Clinical examination showed decreased visual acuity, acute corneal hydrops, positive Munson's sign and Rizzutti phenomenon. Anterior segment OCT showed focal rupture of Descemet's membrane, associated stromal oedema & marked increase in local corneal thickness. Pachymetry showed advanced keratoconus with acute hydrops. **Conclusion:** Although most cases of acute hydrops resolve over time, appropriate conservative management can alleviate symptoms and support corneal recovery. Recent innovations such as intracameral gas injection have shown promise in accelerating resolution. For cases with persistent scarring, surgical options including keratoplasty may be necessary. Preventive strategies, particularly timely corneal cross-linking, are key to reducing the incidence of this complication in patients with progressive keratoconus.

KEYWORDS

Keratoconus, Acute hydrops, Descemet's membrane rupture, Corneal oedema, Gas injection, Cross-linking, Keratoplasty

INTRODUCTION

Keratoconus is the most common corneal ectatic disorder. It is a non-inflammatory disease that typically affects both eyes, though the severity can vary between them. The hallmark features include progressive thinning and outward bulging (ectasia) of the cornea, with the thinnest region usually aligning with the tip of the cone-shaped distortion. This cone is most often found below the central part of the cornea. These structural changes result in irregular astigmatism and increased myopia, leading to a gradual decline in visual clarity.

Acute corneal hydrops can occur as a complication in advanced stages of keratoconus. It results from a sudden break in Descemet's membrane, allowing aqueous humour to enter the corneal stroma, leading to significant stromal swelling.

Patients typically experience a sudden decline in vision, along with eye cloudiness, and may also report pain. Although this condition is self-limiting and often resolves over several weeks to months, it generally leaves behind corneal scarring. This scarring can sometimes lead to a natural flattening of the previously steepened corneal cone.

CASE HISTORY

A 16 year old male patient presented to ophthalmology OPD in Shri M P Shah government Medical College & GGG hospital with diminution of vision in both eyes for the last 5 years and acute onset worsening of diminution of vision in the right eye of one day duration. There was no history of redness, pain, photophobia, metamorphopsia or floaters. There was no history of trauma or any major systemic illness.

Past History:-

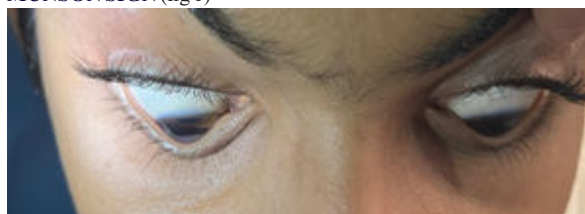
The patient had history of diminution of vision in both eye for the last 5 years; which was gradual in onset and slowly progressive; not associated with pain or redness. Patient consulted GGG hospital for the same and was diagnosed with bilateral keratoconus. The patient was then referred to higher centre at Civil Hospital Ahmedabad for further workup. The patient was evaluated and underwent bilateral collagen cross linking (transepithelial + isotonic riboflavin – 6 cycles of riboflavin in 5 min interval given) under topical anaesthesia.

On Examination:-

	Right eye	Left eye
Vn (without glasses)	6/36	6/18
Vn (with glasses)	6/18	6/9
Lenso	-1.25/-3.50 @66	-1.00/-3.25 @106
Digital tension	normal	normal

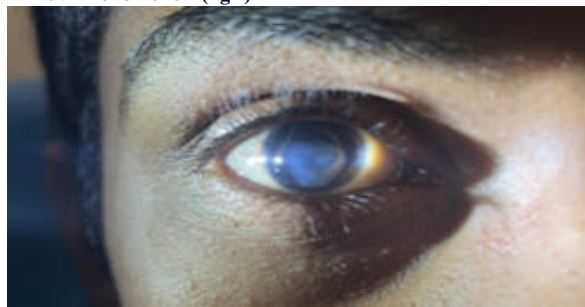
K1	Error	K1-45.25
K2		K2-51.25
		Ax-127

ANTERIOR SEGMENT FINDINGS MUNSON SIGN (fig 1)



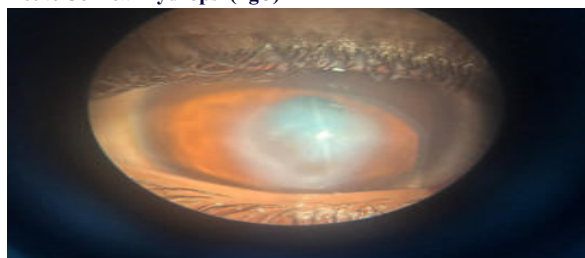
On downgaze V shaped angulation seen

Rizzuti Phenomenon-(fig 2)



When pen torch shown from temporal aspect of cornea bright focus seen on the nasal limbus.

Acute Corneal Hydrops- (fig 3)



Occurs due to the breakdown of Descemet's membrane and stromal oedema due to imbibition of aqueous humour.

Right eye	Anterior segment	Left eye
normal	lid	normal
normal	conjunctiva	normal
normal	sclera	normal
Corneal hydrops	cornea	keratoconus
deep	Anterior chamber	deep
normal	iris	normal
dnp	pupil	Normal size/central/reactive to light
dnp	lens	clear
normal	Ocm,ocp	normal

Central Fundus Examination-

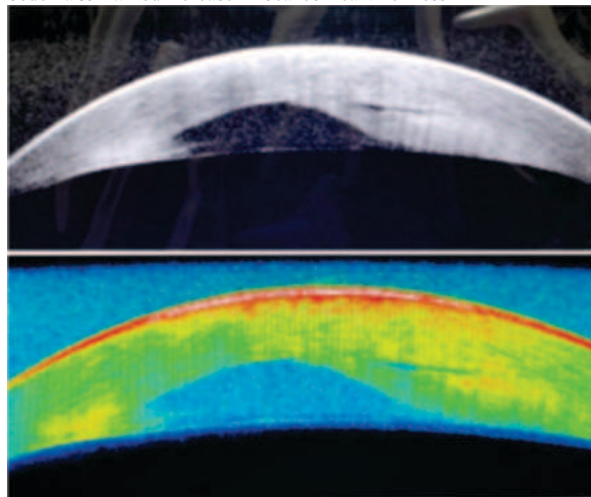
RE- glow seen

Further details not possible

LE-0.3 CDR with normal vessels and foveal fixation; no significant findings in general fundus.

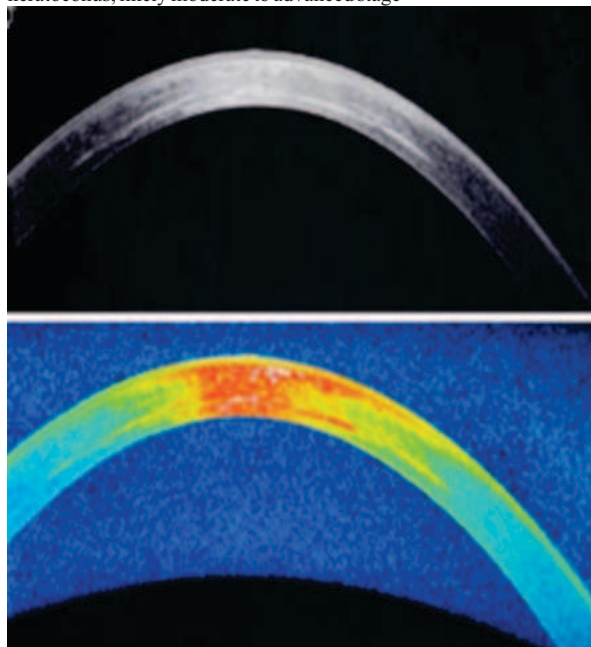
Anterior Segment OCT

RE-Focal rupture of Descemet's membrane, associated stromal oedema & marked increase in local corneal thickness

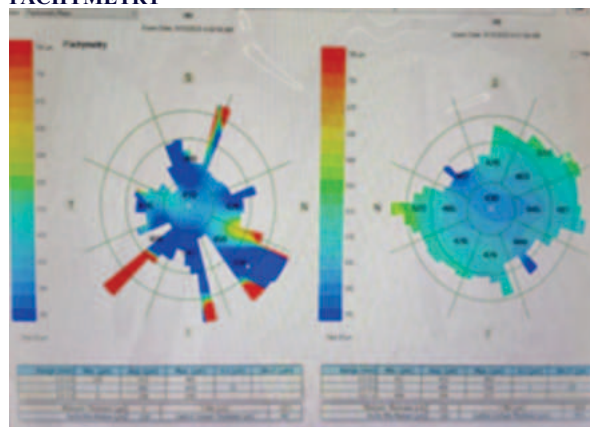


(Fig 4)

LE-Central/inferior corneal thinning anterior ectasia visible on OCT profile marked pachymetric asymmetry (inferior thinning) classic for keratoconus, likely moderate to advanced stage



PACHYMETRY



RE-advanced keratoconus with acute hydrops- the corneal oedema (red/orange patches) and extreme thinning strongly support this.

LE- moderate keratoconus-more regular pattern with symmetric thinning – no evidence of acute oedema.

The prognosis was explained to the patient. The patient was treated with hypertonic saline, cycloplegics and topical betablocker.

DISCUSSION

Acute corneal hydrops is a vision-threatening complication most commonly associated with advanced keratoconus. It is characterized by a sudden rupture of Descemet's membrane, allowing aqueous humor to enter the corneal stroma, leading to severe stromal edema and acute loss of visual acuity (1,2). Clinically, patients present with ocular pain, photophobia, tearing, and a rapid decrease in vision. Slit-lamp examination typically reveals corneal haze, edema, and occasionally fluid clefts or bullae (3).

The pathogenesis is thought to result from chronic biomechanical stress on a progressively thinned and ectatic cornea, culminating in a break in the posterior corneal layers (4). This structural failure allows for unregulated ingress of aqueous fluid into the corneal stroma, disrupting the regular collagen architecture and inducing marked edema. Although hydrops can resolve spontaneously over 6 to 12 weeks, the reparative process often results in scarring, corneal flattening, and irregular astigmatism (5).

Conservative management remains the mainstay of treatment in the acute phase. Hypertonic saline (5% sodium chloride) is widely used to reduce stromal edema by osmotic dehydration (6). Cycloplegic agents such as atropine or cyclopentolate are prescribed to relieve ciliary spasm and associated discomfort (7). Topical corticosteroids may be used judiciously to control inflammation and reduce the risk of stromal neovascularization, though caution is warranted due to the risk of delayed epithelial healing (8).

Recent advances have introduced intracameral gas injection as an adjunctive therapy. Injections of expansile gases like perfluoropropane (C3F8) or sulfur hexafluoride (SF6) into the anterior chamber help reposition the edges of the Descemet tear and accelerate resolution of stromal edema (9). Several studies have demonstrated that gas tamponade can shorten the clinical course and improve corneal clarity when compared to conservative management alone (10).

Despite resolution, many patients are left with significant central scarring. In such cases, surgical intervention such as penetrating keratoplasty (PK) or deep anterior lamellar keratoplasty (DALK) may be required to restore visual function (11). Interestingly, some patients may experience post-resolution corneal flattening and improvement in visual acuity, occasionally delaying or negating the need for surgical intervention (12).

Preventative strategies are vital and centre on early diagnosis and management of keratoconus. Corneal collagen cross-linking (CXL) has become the standard for halting ectatic progression and is believed to reduce the risk of hydrops when applied before advanced thinning occurs (13).

In conclusion, acute corneal hydrops is a significant and sudden

complication of keratoconus, necessitating timely diagnosis and management. While conservative therapy is effective in most cases, surgical interventions and emerging treatments like gas tamponade offer promising outcomes. Preventive care with early CXL remains critical in reducing its incidence and long-term impact.

REFERENCES-

1. Tuft SJ, Gregory WM, Buckley RJ. Acute corneal hydrops in keratoconus. *Ophthalmology*. 1994;101(10):1738–44.
2. Basu S, Vaddavalli PK, Ramappa M, Murthy SI. Acute hydrops in keratoconus: a review. *Indian J Ophthalmol*. 2013;61(8):460–4.
3. Krachmer JH, Mannis MJ, Holland EJ, editors. *Cornea: Fundamentals, Diagnosis and Management*. 4th ed. St. Louis: Elsevier; 2017.
4. Rabinowitz YS. Keratoconus. *Surv Ophthalmol*. 1998;42(4):297–319.
5. Panda A, Vanathi M, Kumar A, Dash Y, Priya S. Corneal hydrops in keratoconus. *Indian J Ophthalmol*. 2007;55(5):383–6.
6. Romero-Jiménez M, Santodomingo-Rubido J, Wolffsohn JS. Keratoconus: a review. *Cont Lens Anterior Eye*. 2010;33(4):157–66.
7. Dua HS, Gomes JA, Singh A. Corneal hydrops: pathogenesis and management. *Eye (Lond)*. 1999;13(Pt 3b):466–72.
8. Zarei-Ghanavati S, Hashemian H, Akbari M, Baradaran-Rafii A. Management of acute corneal hydrops with topical corticosteroids and cycloplegics. *Middle East Afr J Ophthalmol*. 2011;18(4):301–5.
9. Basu S, Vaddavalli PK, Vemuganti GK, Murthy SI. Intracameral perfluoropropane gas in acute corneal hydrops. *Ophthalmology*. 2011;118(5):934–9.
10. Sharma N, Maharana PK, Vajpayee RB. Management of acute corneal hydrops in keratoconus. *Clin Exp Optom*. 2012;95(6):503–7.
11. Watson SL, Ramsay A, Dart JK, Bunce C, Craig E. Penetrating keratoplasty for keratoconus: visual outcome and complications. *Cornea*. 2004;23(6):541–9.
12. Leccisotti A. Corneal hydrops after collagen cross-linking for keratoconus. *J Cataract Refract Surg*. 2010;36(4):733–6.
13. Wittig-Silva C, Chan E, Islam FM, Wu T, Whiting M, Snibson GR. A randomized controlled trial of corneal collagen cross-linking in progressive keratoconus: 3-year results. *Ophthalmology*. 2014;121(4):812–21.