

Filamentary Keratitis: A Case Series

Mridula Pentapati, Suchi Shah

Department of Ophthalmology, Bangalore Medical College and Research Institute, Bangalore, India

Abstract-

Introduction:

Filamentary keratitis describes a condition in which filaments which are adherent complexes of mucus and corneal epithelium are present on the corneal surface. Filaments appear as small, gelatinous strands on the anterior surface of the cornea and may differ in size, shape, composition, and distribution. We hereby report five different cases of filamentary keratitis due to various ocular conditions and their respective management.

Aim:

To report a case series of five patients with filamentary keratitis due to various ocular conditions resulting in severe dry eye and management of the same.

Materials and methods:

Five cases of filamentary keratitis were consecutively selected over a period of six months at a tertiary care hospital. The patients were treated according to the causal factors and a follow up was maintained.

Result:

Filamentary keratitis as seen in our cases results from severe dry eye due to various conditions like meibomian gland disease, corneal anaesthesia, post cataract surgery and systemic chemotherapy. Filamentary keratopathy in patients with corneal anaesthesia demand a high index of suspicion from the clinician's side as the presenting symptoms are very mild due absent corneal sensations. All patients require removal of filaments and frequent preservative free lubricating eye drops along with specific treatment for the causal factor. Topical cyclosporin eye drops are useful in refractory cases.

Conclusion:

Filamentary keratitis is a long standing and recurrent condition which needs long term followup. Underlying cause needs to be identified and long remissions are possible when treatment is aimed at the root cause.

Index Terms- Filamentary keratitis, dry eye, corneal filaments, aqueous deficient dry eye.

I. INTRODUCTION

Filamentary keratitis describes a condition in which filaments which are adherent complexes of mucus and corneal epithelium are present on the corneal surface. Filaments consist of a variable combination of degenerated epithelial cells and mucus that are firmly attached to the corneal surface at one end.¹ Filaments appear as small, gelatinous strands on the anterior surface of the cornea and may differ in size (as small as 0.5 mm and as long as 10 mm), shape, composition, and distribution.² A lack of tear production may result in the increased production of mucus by conjunctival goblet cells. Since mucus serves as a disposal system for exfoliated epithelial cells, the requisite elements for filament formation may be present in dry eye states.³ Tanioka et. al.⁴ hypothesized that filament generation starts due to an injury to the surface epithelium as result of various disease conditions. Further, blinking or movement of the eye causes friction between the palpebral conjunctiva and the injured epithelium and produces the filament core. This core then interweaves with mucin, conjunctival epithelium and inflammatory cells building up the filament. This phenomenon is sometimes associated with inflammation and the detachment of basal cells from the Bowman's layer due to blink or eye movement related mechanical friction. Aqueous-deficient dry eye is characterized by excessive abnormal epithelial debris and mucus strands, which adhere firmly to the damaged areas of epithelium and basement membrane, forming corneal filaments.⁵

We hereby report five different cases of filamentary keratitis due to various ocular conditions and their respective management.

II. MATERIALS AND METHODS

Five cases of filamentary keratitis were consecutively selected over a period of six months at a tertiary care hospital. The patients were treated according to the causal factors and a follow up was maintained.

III. CASES

Case 1:

A 52 year old female presented with complaint of redness and mild foreign body sensation in right eye since one week. She had right eye esotropia of 30 degrees along with lateral rectus palsy since 6 months. Patient was a known case of carcinoma of larynx with CNS metastasis. She underwent two cycles of chemotherapy four months back and then discontinued all treatment and took some ayurvedic medicines later.

Best corrected visual acuity in both eyes was 6/12. Right eye anterior segment examination showed circumcorneal congestion, corneal filaments superiorly and punctate epithelial erosions all over.(Figure 1) Left eye had a normal ocular surface. Both eyes had a posterior subcapsular cataract. There were no corneal sensations in the right eye while corneal sensations in left eye were normal all over the cornea.

Schirmer's test values in right eye 0 mm while in left eye was 4 mm. Fluorescein tear film breakup time was 1 second in right eye and 2 seconds in left eye with tear film instability in both the eyes. Grading of the conjunctiva and cornea using the Oxford Scheme revealed panel E or grade 4 staining.⁶

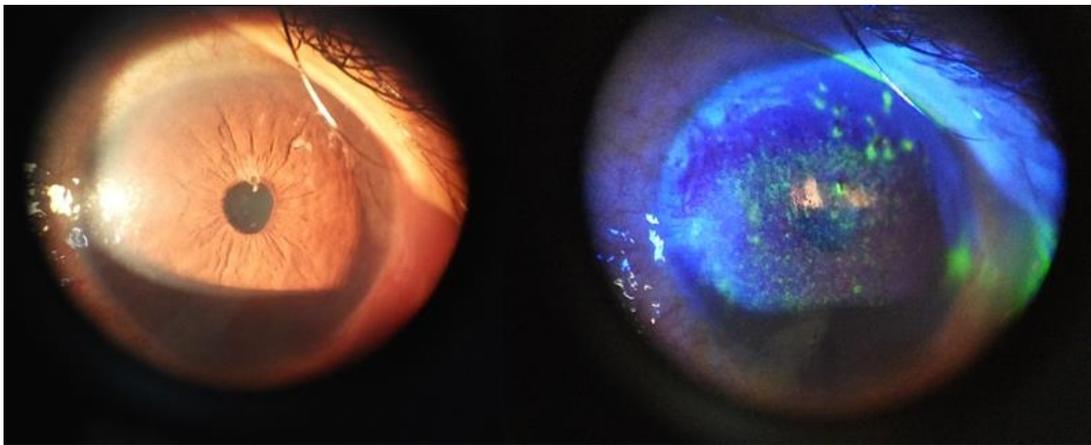


Figure 1 – Right eye shows circumcorneal congestion, corneal filaments superiorly and punctate epithelial erosions all over.



Figure 2 – Right eye slit lamp photograph two weeks after treatment.

Patient was treated with removal of filaments with a straight tying forcep. She was prescribed use of 10% N- Acetylcysteine eye drops four times daily in right eye, hourly instillation of preservative free 1% carboxymethyl cellulose and four times GenTeal Gel (Trademark - Novartis Pharmaceuticals Australia Pvt Limited). She was advised four times instillation of 1% CMC eye drops for the left eye to prevent ocular surface damage. Patient responded with disappearance of pain and filaments.(Figure 2) Few punctate erosions persisted on the first week followup.

There have been certain well recognised side effects of cancer chemotherapy which ultimately lead to dry eye and ocular surface damage. Lacrimal duct stenosis has been reported in a patient who received adjuvant chemotherapy for breast cancer.⁷

It has been observed in a major review that systemic chemotherapy for cancer leads to unique anatomic, physiologic as well as biochemical alterations in the eye.⁸ Several anti-cancer chemotherapeutic drugs are incriminated for the incidence of dry eyes in cancer patients. Few of them are cyclophosphamide, imatinib, nilotinib, pentostatin and busulphan.⁹ Further in this patient, an ocular surface anaesthesia is another contributing factor in addition to deficient aqueous secretion. A low schirmer's reading in both eyes is suggestive of involvement of the lacrimal glands or ducts or a neurological deficit for lacrimal secretion.

Since the use of chemotherapeutic drugs is essential, a thorough ophthalmic evaluation is mandatory for all patients receiving these medicines.

Case 2:

A 38 year old female presented with complaint of redness, pain and watering in right eye since 4 days. The best corrected visual acuity in both eyes was 6/6. Slit lamp examination of right eye showed conjunctival and circumcorneal congestion, punctate erosions, corneal filaments and a 2 x3 mm epithelial defect at 7 o'clock position (Figure 3). The corneal sensations were normal in both eyes. Anterior segment of left eye was within normal limits.

Schirmer's test values were 0mm and 5mm in right and left eye respectively. Fluorescein tear film breakup time was zero second in right eye and one second in left eye with tear film instability in both the eyes. Grading of the conjunctiva and cornea with double staining using the Oxford Scheme revealed panel D(grade 4) and panel C(grade 3) in right and left eye respectively.

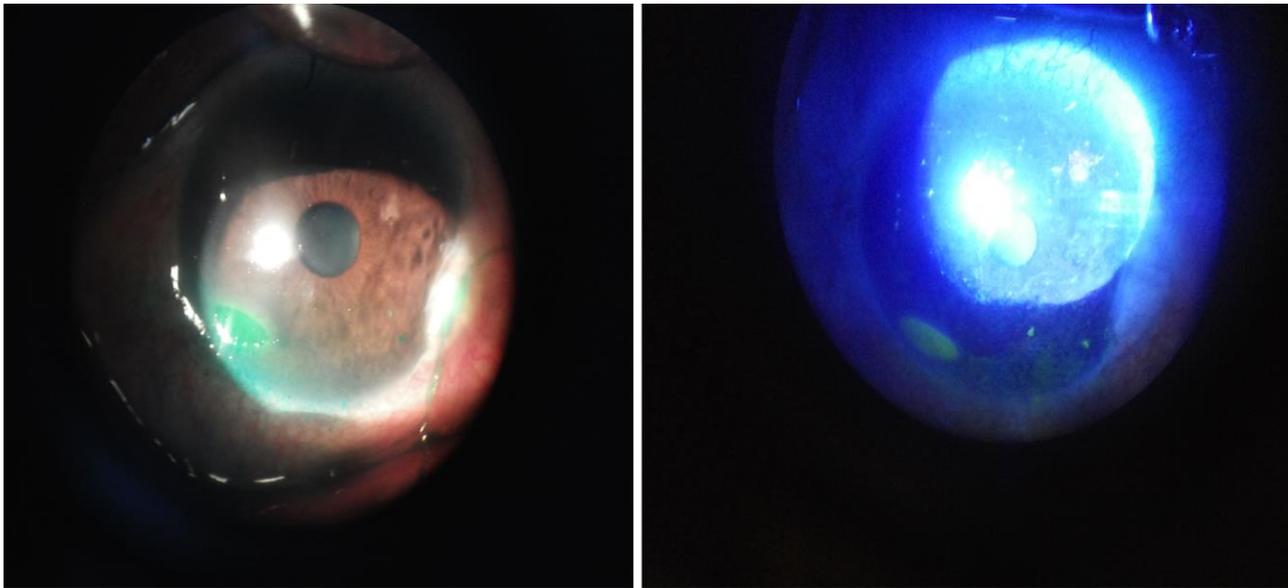


Figure 3 – Right eye slit lamp examination shows conjunctival and circumcorneal congestion, punctate erosions, corneal filaments and a 2 x3 mm epithelial defect at 7 o'clock position

She responded well to removal of filaments, 10% N- acetylcysteine, Systane ultra eye drops (Alcon) (active ingredients Polyethylene Glycol 400 0.4%, Propylene Glycol 0.3%) and GenTeal gel.

After 1 month of follow up, the epithelial defect had completely healed, filaments had subsided with remnant punctate erosions.

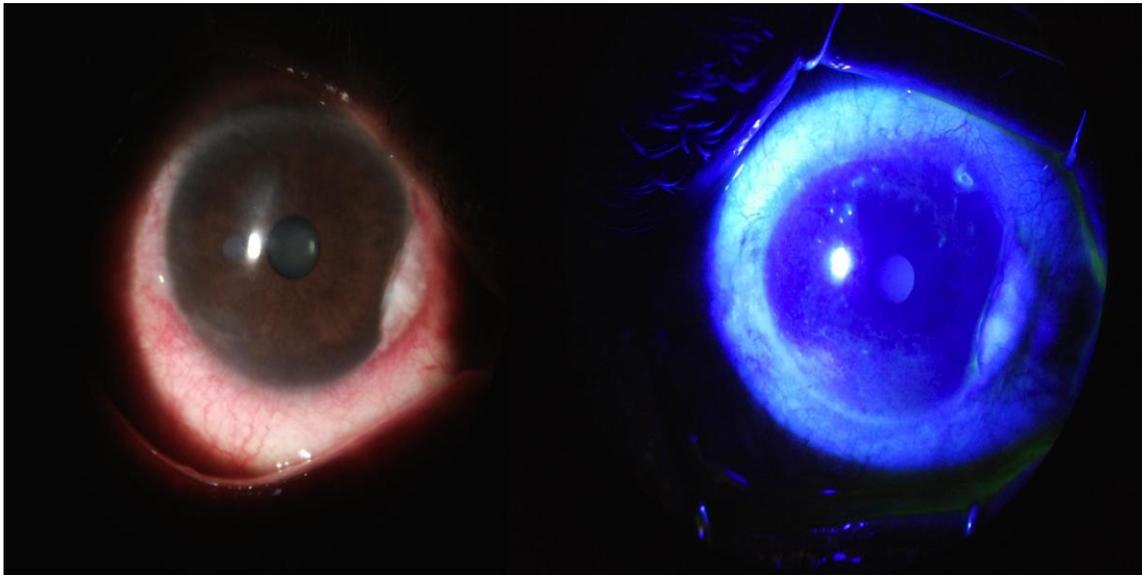


Figure 4- Right eye slit lamp photographs after one week of treatment

Since the Schirmer's readings were persistently low, she was started on cyclosporine 0.05% eye drops twice daily. On further followups, the patient was symptom free with use of lubricants and cyclosporine eye drops.

Investigations like ESR, CRP and RA factor were done and were found to be within normal limits. The cause for aqueous deficiency in this patient remained unknown, but patient did well with regular use of lubricants and cyclosporine eye drops.

Case 3:

A 57 year old male patient came for a routine followup 10 days post cataract surgery with complaints of foreign body sensation, pain and watering in the operated eye right eye. His best corrected visual acuity was 6/12 in right eye and 6/9 in left eye. Slit lamp examination of the anterior segment revealed corneal filaments in the superonasal quadrant, conjunctival congestion and occasional cells in the anterior chamber.(Figure 5) Rest of the anterior segment examination was within normal limits.

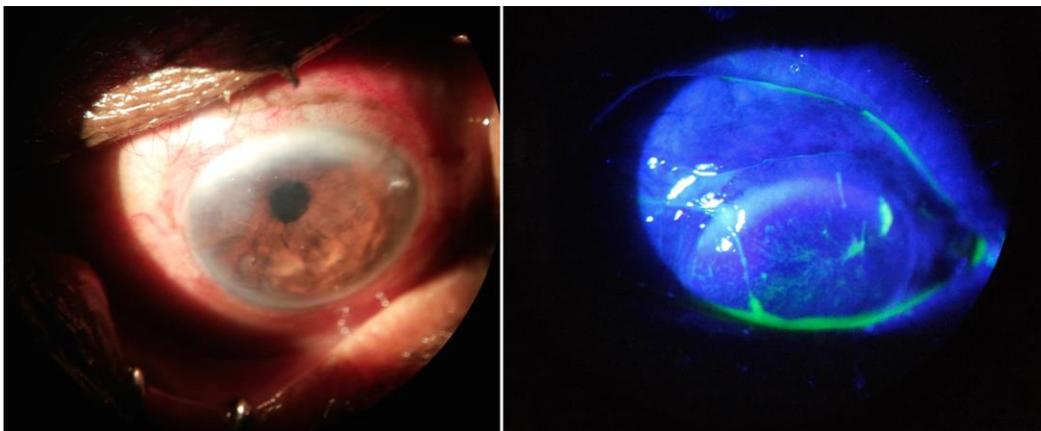


Figure 5 – Right eye slit lamp images show corneal filaments in the superonasal quadrant, conjunctival congestion and a sclerocorneal tunnel incision covered by conjunctiva.

As a part of treatment, the corneal filaments were removed and patient was advised post cataract steroid tapering, 1% carboxy methyl cellulose eye drops one hourly and four times instillation of 10% N- Acetyl cysteine eye drops. Patient responded to the treatment with disappearance of filaments and reduction of pain on the next followup visit after four days.

Case 4:

A 61 year old male patient was operated for left eye small incision cataract surgery. One month post surgery patient presented with pain, foreign body sensation and redness of the operated eye. His best corrected visual acuity was 6/12 and 6/24 in the right and left eye respectively.

On slit lamp examination of the anterior segment the left eye showed filaments in the superior quadrant of the cornea, punctate epithelial erosions all over the cornea, few descemet's folds and plus two anterior chamber reaction.(Figure 6) The sclero-corneal tunnel was sutured with a 10-0 nylon suture and its knot was exposed.

His right eye showed punctate epithelial corneal erosions in the centre. Both eyes had a well placed posterior chamber intraocular lens. The lids in both the eyes had a mild meibomitis. Schirmer's test in both eyes had zero readings while the fluorescein tear film breakup time was two seconds in both eyes. Grading of the conjunctiva and cornea with double staining using the Oxford Scheme revealed panel C(grade 3) and panel E(grade 5) in right and left eye respectively.

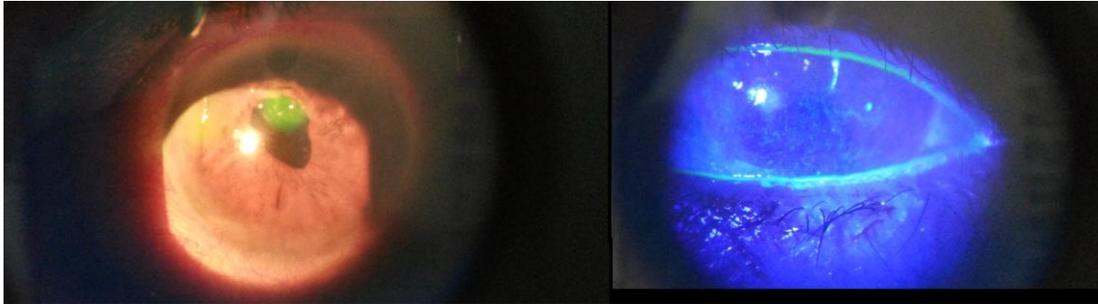


Figure 6 – Slit lamp images of left eye show filaments in the superior quadrant of the cornea and punctate epithelial erosions all over the cornea

Patient was investigated for ESR, CRP, RA factor, ANA profile, fasting and post prandial blood glucose, all of which were found to be within normal limits.

Patient was treated with removal of filaments with tying forceps, 10% N- acetylcysteine in 0.5% carboxymethyl cellulose eye drops, Systane ultra eye drops (Alcon) (active ingredients Polyethylene Glycol 400 0.4%, Propylene Glycol 0.3%), GenTeal gel and ofloxacin with dexamethasone eye drops in rapid tapering dose(as a post operative medication after cataract surgery). Patient responded to the treatment with disappearance of filaments and decrease in the punctate erosions.

On subsequent followup, patient was started on cyclosporine 0.05% eye drops in both eyes in view of persistently low Schirmers' readings and corneal staining. Lid hygiene and oral doxycycline 100mg twice daily were also started for meibomitis. Two months after cyclosporine and other medical treatment his ocular surface improved (though not totally) but the Schirmers' readings continued to be 1mm in both the eyes. For the same reason, patient is treated with punctal occlusion with silicone punctal plugs.

The right eye of this patient had an uneventful surgery and postoperative period was also asymptomatic. In the left eye, sclerocorneal tunnel was sutured with an exposed knot that lead to persistent ocular surface inflammation which in turn precipitated filamentary keratitis.

Case 5:

A 30 year old male patient presented to the out patient department with chief complaints of pain, redness, watering and photophobia in both eyes (more in the right eye) since one month. His distant visual acuity was 6/6 in both eyes.

Slit lamp examination of the anterior segment revealed severe meibomian gland disease with filaments in right eye and moderate meibomian gland disease with few filaments in left eye.(Figure 7,8) In both the eyes, filaments were located in superior cornea. Rest of the anterior segment and posterior segment examination were within normal limits.

Schirmer's readings in both eyes were more than 25 mm after five minutes. Fluorescein tear film breakup time was three seconds in both eyes.

Grading of the conjunctiva and cornea with double staining using the Oxford Scheme revealed panel C(grade 3) in both eyes.

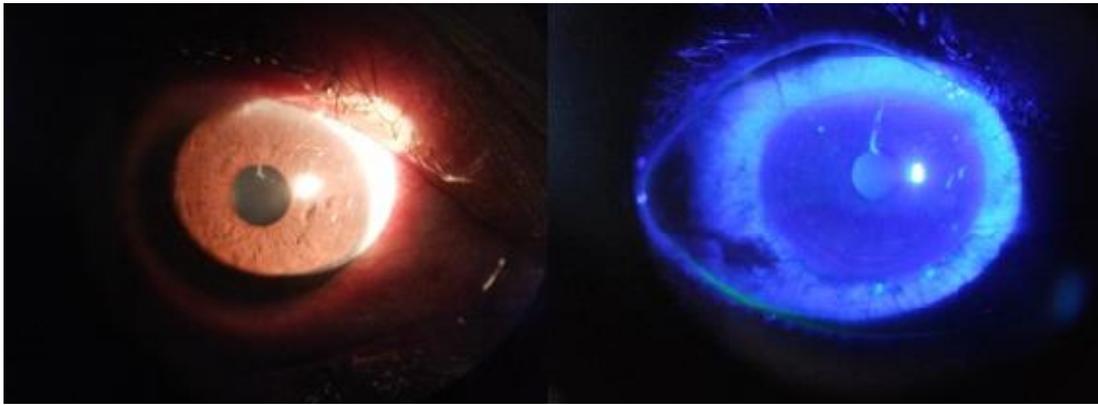


Figure 7 – Right eye slit lamp photograph shows a central corneal filament.



Figure 8 – Left eye image shows inflamed lid margins secondary to severe meibomian gland disease.

Patient responded with removal of filaments with tying forceps, 10% N- acetylcysteine in 0.5% carboxymethyl cellulose eye drops, Systane ultra eye drops (Alcon) (active ingredients Polyethylene Glycol 400 0.4%, Propylene Glycol 0.3%), GenTeal gel, oral tablet doxycycline 100mg twice daily for six weeks, hot fomentation, lid hygiene and lid massage. On subsequent weekly followup, filaments had resolved and the meibomitis was under control. Patient was advised to continue Systane ultra eye drops and maintain lid hygiene.

Six months later patient discontinued the lubricating drops and came back with filamentary keratopathy with meibomitis. He was again managed on similar lines. Since meibomian gland disease was the causal factor for dry eye, patient was kept on oral tablet doxycycline for another four weeks. In the last followup, patient had a relatively stable ocular surface, a clear cornea and fluorescein tear film breakup time of five seconds in both eyes.

This patient too was investigated for ESR, CRP, RA factor, ANA profile, fasting and post prandial blood glucose which were found to be within normal limits.

As defined by the international workshop on meibomian gland dysfunction (MGD), MGD is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.¹⁰ Another study has found MGD as the most common cause of evaporative dry eye.¹¹

IV. DISCUSSION

Surgical conditions have also been associated with filament formation. Dodds and Laibson reported several cases of filamentary keratitis after extracapsular cataract extraction.¹² The same was noted in our study (Cases 3 and 4) in which the patient had undergone a manual small incision cataract surgery. One of the reasons for this may be a pre-existing asymptomatic dry eye which aggravates following surgery and use of epitheliotoxic eye drops in postoperative period. Further it has been shown previously that corneal epithelial edema is one of the predisposing factors of filamentary keratopathy.¹³ The same could be correlated with this postoperative

cataract patient where corneal edema was present in the early postoperative period which gave rise to filamentary keratitis in an already predisposed eye. This necessitates a preoperative evaluation of cataract patients with use of simple tests like fluorescein tear film break up time and Schirmer's test. Ocular surface inflammation and local drug toxicity can precipitate filamentary keratitis which was observed in these two postoperative cases.

All patients with low Schirmers' readings depicting an aqueous deficient state were investigated for RA factor as untreated rheumatoid arthritis can lead to severe filamentary keratopathy.¹⁴

Keratoconjunctivitis sicca or aqueous deficiency remains the most common cause of filamentary keratitis¹⁵, which was observed in our study too with most of the cases showing low Schirmers' reading.

Patients with corneal anaesthesia and filamentary keratitis may present with only redness as the other symptoms usually associated with this condition like pain, foreign body sensation, watering, photophobia may be absent (Case 1). Clinician should have a high index of suspicion to diagnose these cases.

Preservatives in various eye drops lead to an increase in the cellular exfoliation and cytotoxic changes in the corneal epithelium due to which there is an increase in the filament receptor site, which in turn causes filamentary keratopathy.¹⁶

V. CONCLUSION

Thus, preservative free artificial tear eye drops supplementation after mechanical removal of filaments remains the mainstay of treatment, while cyclosporine eye drops help in reducing the surface inflammation in severe dry eye patients.

Filamentary keratitis is a long standing and recurrent condition which needs long term followup. Underlying cause needs to be identified and long remissions are possible when treatment is aimed at the root cause.

REFERENCES

1. Lohman LE, Rao GN, Aquavella JV. In vivo microscopic observations of human corneal epithelial abnormalities. *Am J Ophthalmol* 1982;93:210-217.
2. Tuberville AW, Wood TO: Filamentary keratitis. In: Fraunfelder FT, Roy FH, ed. *Current Ocular Therapy* 2, Philadelphia: WB Saunders; 1985.

3. Adams AD: The morphology of human conjunctival mucus. *Arch Ophthalmol* 1979; 97(4):730-734.
4. Tanioka H, Yokoi N, Komuro A, Shimamoto T, Kawasaki S, Matsuda A, Kinoshita S. Investigation of the Corneal Filament in Filamentary Keratitis. *Invest Ophthalmol Vis Sci* 2009;50(8):3696-702
5. Albietz J, Sanfilippo P, Troutbeck R, et al. Management of filamentary keratitis associated with aqueous-deficient dry eye. *Optom Vis Sci*. 2003;80:420-430.
6. Bron AJ, Evans VE, Smith JA. Grading of corneal and conjunctival staining in the context of other dry eye tests. *Cornea* 2003;22(7):640-50.
7. Stevens A, Spooner D. Lacrimal duct stenosis and other ocular toxicity associated with adjuvant cyclophosphamide, methotrexate and 5-fluorouracil combination chemotherapy for early stage breast cancer. *Clin Oncol (R Coll Radiol)* 2001;13:438-40.
8. Al-Tweigeri T, Nabholz JM and Mackey JR. Ocular toxicity and cancer chemotherapy. A review. *Cancer*. 1996; 78:1359-73.
9. Singh P, Singh A: Ocular adverse effects of Anti-cancer Chemotherapy. *Journal of Cancer Therapeutics and Research* 2012.(Available online: <http://www.hoajonline.com/journals/pdf/2049-7962-1-5.pdf>) (Accessed on 4th Feb 2015)
10. Nelson JD, Shimazaki J, Benitez-del-Castillo JM, Craig JP, McCulley JP, Den S et al. The international workshop on meibomian gland dysfunction: report of the definition and classification subcommittee. *Invest Ophthalmol Vis Sci*. 2011;52:1930-1937.
11. Bron AJ, Tiffany JM. The contribution of Meibomian disease to dry eye. *Cornea*. 2004;2:149-164.
12. Dodds H, Laibson P: Filamentary keratitis following cataract extraction. *Arch Ophthalmol* 1972; 88:609-612.
13. Tabery HM. Filamentary keratopathy: A non-contact photomicrographic in vivo study in the human cornea. *Eur J Ophthalmol* 2003;13(7):599-605.
14. Pandit RT. Dendritiform Filamentary Keratopathy. *Cornea* 2009;28(1):123-5.
15. Davidson RS, Mannis MJ. Filamentary Keratitis. In: Krachmer JH, Mannis MJ, Holland EJ, editors. *Cornea*. Vol 1. 3rd ed. Philadelphia: Elsevier/Mosby; 2011. P. 1093-6.
16. Ubels JL, McCartney MD, Lantz WK, et al. Effects of preservative-free artificial tear solutions on corneal epithelial structure and function. *Arch Ophthalmol* 1995;113:371-8.

AUTHORS

First Author –

Dr. Mridula Pentapati, Department of Ophthalmology, Bangalore Medical College and Research Institute.
Email – mridulapentapati@gmail.com

Second Author –

Dr. Suchi V. Shah, Department of Ophthalmology, Bangalore Medical College and Research Institute.
Email – suchi.shah.87@gmail.com

Correspondence Author –

Dr. Suchi V. Shah,
Department of Ophthalmology,
Bangalore Medical College and Research Institute.
Email – suchi.shah.87@gmail.com
+91 9686557587