Severe Complicated Corneal Ulcer Resulting in Loss of the Eye

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Abstract

Purpose: To identify the prevalence of complicated corneal ulcers resulting in evisceration or enucleation and review predisposing factors, clinical manifestations and microbiological characteristics in complicated corneal ulcers.

Methods: A retrospective review of cases with clinically diagnosed corneal ulcers who underwent evisceration or enucleation at Thammasat University Hospital was performed from medical records, over a period of 5 years between January 2015 and December 2019.

Results: A total of 41 patients were included in this study. Thirty-three patients (80.49%) underwent evisceration, and 8 patients (19.51%) underwent enucleation. The mean age was 63.54 ± 15.82 years. Most patients were male (60.96%). The average duration of onset of symptoms to prompt treatment by a primary doctor was 4.90 ± 4.07 days, and the average duration of prompt treatment to evisceration or enucleation was 23.17 ± 25.30 days (range: 1-90 days). Initial BCVA at presentation varied from 20/200 to no light perception (no PL) with the majority reporting hand motion (HM). Most patients had a history of ocular trauma (53.66%) but only one patient (2.44%) had a history of contact-lens use. Most of the patients had no associated ocular disease. Hypertension and diabetes mellitus were the most common systemic underlying diseases. Pseudomonas aeruginosa (31.71%) and Fusarium species (14.63%) were the most causative organism of bacteria and fungi respectively.

Conclusion: Severe complicated corneal ulcers can lead to loss of the eye due to uncontrolled infection. Bacterial infection, especially by Pseudomonas aeruginosa was the most common cause and ocular trauma was the most common risk factor.

Keywords: Corneal ulcer, Evisceration, Enucleation, Blindness

Ethics: This study was approved for ethical research in human with the human research ethics committee of Thammasat university, Thailand (Research ID: MTU-EC-OP-0-204/62).

EyeSEA 2021;16(2): 47-53

https://doi.org/10.36281/2021020202

Background

Corneal ulcer is a common ocular infectious disease. It is also one of major global causes of visual impairment and blindness[1-3]. In practice, corneal ulcer affects quality of life because it requires long term treatment. There are variations in causative organisms depending on geographic location, climate and risk factors such as immune status, history of trauma, contact-lens use and occupation[4-10]. The causes of corneal ulcer are important because they may impact the outcome of the disease. The severity and outcome of corneal ulcer depends on many factors such as causative organisms, duration from onset of disease to prompt treatment and response to treatment[4-10] such as contact lens related corneal ulcer may be less aggressive and more responsive to medication than post traumatic corneal ulcers. A previous study in Thailand by Tananuvat el al [9] found that the most common causative pathogens

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Received : August 13, 2021
Accepted : August 13, 2021
Published : December 31, 2021

were bacteria (49.3%) and fungi (46.3%). Pseudomonas aeruginosa (14.90%) and Fusarium spp. (26.90%) were the most common bacterial and fungal pathogens respectively.

Treatment in corneal ulcer depends on severity of the disease and varies from topical medication, systemic medication and surgery. In severe cases, evisceration or enucleation can be the treatments of choice to prevent spreading of infection to nearby structures[11]. The indications of evisceration or enucleation from severe corneal ulcer are non-healing corneal ulcer in a blind eye, corneal perforation that cannot be treated with corneal gluing, endophthalmitis and panophthalmitis[11-13].

The purpose of this study was to identify prevalence of complicated corneal ulcers resulting in evisceration or enucleation and review predisposing factors, clinical manifestations and microbiological characteristics in complicated corneal ulcers.

Material and methods

This study was approved for ethical research in human with the human research ethics committee of Thammasat university, Thailand (Research ID: MTU-EC-OP-0-204/62).

A retrospective review of 41 cases with clinically diagnosed corneal ulcers who underwent evisceration or enucleation at Thammasat University Hospital was performed from medical records, over a period of 5 years between January 2015 and December 2019.

Data collected included demographic profiles; age, sex, occupation, predisposing factors; ocular and systemic underlying diseases, history of trauma, history of contact lens-use, clinical presentation; initial BCVA at present, laterality of corneal ulcer, duration from onset of disease to prompt treatment, duration from prompt treatment to evisceration or enucleation, microbiological characteristics; culture results from corneal scrape and/or corneal tissue and antimicrobials used in corneal ulcer cases. All data were recorded via clinical record forms and analyzed using SPSS program (version 23.0, IBM, NY, USA).

Results

A total of 41 patients that underwent enucleation or evisceration over a period of 5 years between January 2015 and December 2019 at Thammasat University Hospital was included in this study. Thirty-three patients (80.49%) underwent evisceration, and eight patients (19.51%) underwent enucleation. The mean age was 63.54 ± 15.82 years. Twenty-five patients were male (60.96%) and sixteen patients were female (39.02%). Right eyes (46.34%) and left eyes (53.66%) were almost equally affected. The majority of the patients were retired or had indoor occupations (48.78%) while some patients worked outdoors such as laborers (31.70%), merchants (9.76%), and farmers (9.76%) respectively. The average duration of onset of symptoms to prompt treatment by a primary doctor was 4.90 ± 4.07 days, and the average duration of prompt treatment to evisceration or enucleation was 23.17 ± 25.30 days (range: 1-90 days) (Table1). Initial BCVA at presentation were varied from 20/200 to no light perception (no PL). Major patients had BCVA at hand motion (HM) (36.59%), poor light projection (poor PJ) (17.07%), light perception (PL) (17.07%), no light perception (no PL) (14.63%), good light projection (good PJ) (7.32%), finger counting (FC) (4.88%) and 20/200 (2.44%) respectively (Table2).

Table 1. Demographic data of corneal ulcer cases leading to evisceration or enucleation

Demographic data \ Procedure	Evisceration (N = 33)	Enucleation (N = 8)	Total (N = 41) (%)
Sex			
Male	21	4	25 (60.96%)
Female	12	4	16 (39.02%)
Age (Mean±SD)	63.82 ± 16.46	62.38 ± 13.82	63.54 ± 15.82
Time from onset to prompt treatment (Mean±SD)	5.36 ± 4.29	3 ± 2.33	4.90 ± 4.07
Time from prompt treatment to surgery (Mean±SD)	24.64 ± 24.25	17.13 ± 30.31	23.17 ± 25.30
Occupation			
Employee	11	2	13 (31.70%)
Retired/Indoor job	16	4	20 (48.78%)
Merchant	4	0	4 (9.76%)
Farmer	2	2	4 (9.76%)
Laterality			
Right	14	5	19 (46.34%)
Left	19	3	22 (53.66%)
History of Trauma			
Yes	18	4	22 (53.66%)
No	15	4	19 (46.34%)
Contact lens- related			
Yes	1	0	1 (2.44%)
No	32	8	40 (97.56%)

Table 2. Initial BCVA at presentation of corneal ulcer cases leading to evisceration or enucleation

Initial BCVA	Evisceration	Enucleation (N = 8)	Total (N = 41) (%)
20/200	1	0	1 (2.44%)
FC	2	0	2 (4.88%)
HM	11	4	15 (36.59%)
Good PJ	2	1	3 (7.32%)
Poor PJ	5	2	7 (17.07%)
PL	6	1	7 (17.07%)
No PL	6	0	6 (14.63%)

The associated factors such as history of trauma and history of contact-lens are shown in Table1. Most patients had a history of ocular trauma (53.66%) but surprisingly, only one patient (2.44%) had a history of contact-lens use (Table1). Most of the patients had no associated ocular disease (78.05%) while glaucoma and persistent epithelial defect were the second most associated ocular disease (7.32%). Hypertension (26.83%) and diabetes mellitus (21.95%) were the most common systemic underlying diseases (Table3).

Investigations were done in all patients, including corneal and tissue culture. The results showed positive 87.80% and not identified 12.20%. The positive results were Bacteria (48.78%) and Fungi (41.46%). The most common bacterial organism was *Pseudomonas aeruginosa* (31.71%) and *Fusarium species* (14.63%) was the most causative organism of fungi. One patient had mixed organisms of *Pseudomonas aeruginosa* and Candida species as shown in Table4 and Figure1.

Table 3. Ocular and systemic underlying diseases (N=41)

Ocular underlying diseases		Systemic underlying diseases	
	Number of cases (%)		Number of cases (%)
None	32 (78.05%)	None	2 (4.88%)
Glaucoma	3 (7.32%)	Hypertension	11 (26.83%)
Persistent epithelial defect	3 (7.32%)	Diabetes mellitus	9 (21.95%)
Previous herpes simplex keratitis	1 (2.44%)	dyslipidemia	7 (17.07%)
Peripheral ulcerative keratitis	1 (2.44%)	Gout	2 (4.88%)
Bullous keratopathy	1 (2.44%)	Asthma/COPD	1 (2.44%)
Total	41 (100%)	Chronic kidney disease	3 (7.32%)
		Thyroid	1 (2.44%)
		Total	41 (100%)

Table 4. Organisms isolated from cases with corneal ulcers (N=41)

Bacteria	Number of cases (%)	Fungi	Number of cases (%)
Gram positive bacteria		**Filamentous fungi**	
Coagulase-negative staphylococci	3 (7.31%)	*Fusarium species*	6 (14.63%)
Streptococcus pneumonia	1 (2.44%)	*Aspergillus species*	3 (7.32%)
Gram negative bacteria		*Pythium species*	2 (4.88%)
Pseudomonas aeruginosa	13 (31.71%)	*Bipolaris species*	1 (2.44%)
Klebsiella pneumoniae	1 (2.44%)	**Dematiaceous fungi (pigmented hyphae)**	
Proteus mirabilis	2 (4.88%)	*Cladosporium species*	3 (7.32%)
Not identified	5 (12.20%)	**Yeast**	
		Candida species	2 (4.88%)

*1 eye had mixed organisms of *Pseudomonas aeruginosa and Candida species*

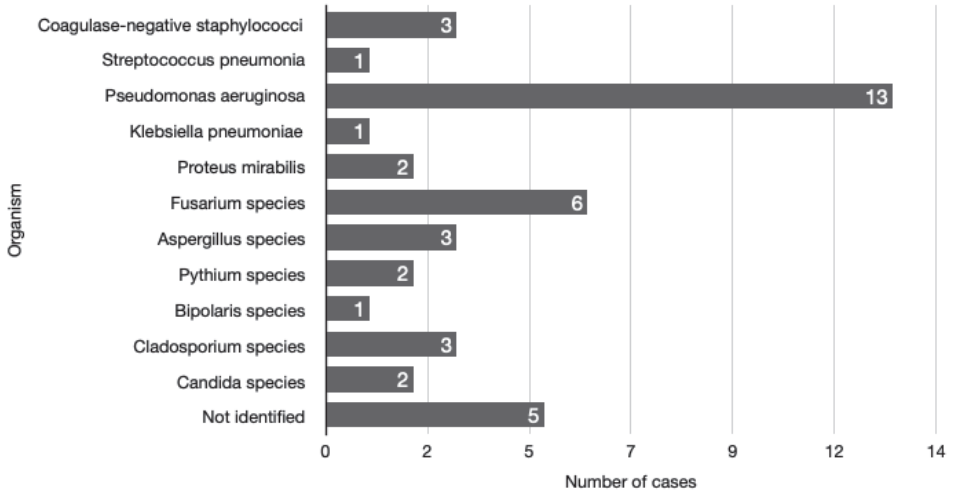

Figure 1. Bar graph shows organisms isolated from cases with corneal ulcers (N=41)

The list of antimicrobial drugs used and number of drugs in corneal ulcer cases were shown in Table5 and 6 respectively. For the majority of these cases, management consisted of intensive topical antimicrobial drugs with or without systemic antimicrobial drugs. Amikacin eye drop (39.02%) was the most common antibiotics used in corneal ulcer cases and Natamycin eye drop (41.46%) was the most common antifungal drug used in cases. Most of the cases were treated by a combination of more than four drugs.

Table 5. Antimicrobial drugs used in corneal ulcer cases (N=41)

Antibiotic medications	Number of cases (%)	Antifungal medications	Number of cases (%)
Vancomycin eye drop	8 (19.51%)	Amphotericin B eye drop	15 (36.59%)
Cefazolin eye drop	7 (17.07%)	Natamycin eye drop	17 (41.46%)
Ceftazidime eye drop	15 (36.59%)	Voriconazole eye drop	3 (7.32%)
Amikacin eye drop	16 (39.02%)	Oral Ketoconazole	1 (2.44%)
Gentamicin eye drop	11 (26.83%)	Oral Itraconazole	8 (19.51%)
Moxifloxacin eye drop	2 (4.88%)		
Oral Ciprofloxacin	12 (29.27%)		

Table 6. Number of topical antimicrobial drugs used in corneal ulcer cases (N=41)

Number of drugs	Number of cases (%)
More than 4 drugs	17 (41.46%)
4 drugs	7 (17.07%)
3 drugs	8 (19.51%)
2 drugs	5 (12.20%)
Single drugs	4 (9.76%)

Discussion

Corneal ulcer is one of the important causes of visual impairment and blindness. In our study, we found 41 cases of severe complicated corneal ulcer which underwent evisceration 33 cases (80.49%), and enucleation 8 cases (19.51%) over a period of 5 years between January 2015 and December 2019.

In this study, Pseudomonas aeruginosa was the most common causative pathogen. This result was similar to the findings of previous studies.[9,11,12,14] It is a genus of gram-negative bacteria and commonly found in contact-lens wearer. Pseudomonas aeruginosa has structural virulence factors including polar flagella, adhesins, surface pili. It also can secrete toxins that disrupt protein synthesis and proteases that degrade corneal stromal extracellular matrix. Surprisingly, in our study found that only one patient had a history of contact-lens use. The culture from corneal scrape in this case tested for Pseudomonas aeruginosa. The probable reasons were that the majority of our patients were aged more over 60 years while the contact lenses were commonly used by teenagers in urban parts. Moreover, contact lens related infectious keratitis may be less aggressive and more responsive to medication than post traumatic corneal ulcers. The lesions may be improved before coming to our hospital.

In our study, we also found that most of the cases had no associated ocular diseases but had a history of ocular trauma before developed corneal ulcers. Thus ocular trauma was the most common risk factor. These results were similar to the findings by Teeravee H. et al.[14] The average duration of onset of symptoms to prompt treatment by a primary doctor was 4.90 ± 4.07 days that was shorter than previous study.[14] whereas the average duration of prompt treatment to evisceration or enucleation was 23.17 ± 25.30 days (range 1-90 days) that was longer than the findings reported by Teeravee H. et al.[14] Possible reasons included the fact that Thammasat hospital is a tertiary hospital, and thus, receives a lot of severe and complicated corneal ulcer cases. The second reason was the process of corneal donors in our country that we have to wait for corneal donors from Thai Red Cross Eye Bank. There was about 1-3 months for tectonic or therapeutic corneal transplantation.

There were some limitations in our study due to the retrospective chart reviews. Firstly, the small sample sizes was attributed to missing data. Secondly, our hospital is a tertiary hospital, and thus, some patients might have had previous treatments prior to referral, which could affect the result of the organism culture or drug sensitivity. Our study found 5 cases (12.20%) which did not yield any growth in the culture media.

In conclusion, severe complicated corneal ulcer can lead to loss of the eye due to uncontrolled infection. Bacterial infection, especially by *Pseudomonas aeruginosa* was the most common cause and ocular trauma was the most common risk factor. It is crucial to promote strategies to minimize avoidable blindness resulting from corneal ulcers such as educating patients about corneal ulcers and the importance of seeking early ophthalmologists to minimize corneal damage, encouraging patients to wear protective eye wear when doing outdoor jobs, agricultural works, or other jobs that carry a high-risk of eye injury.

Acknowledgement

Financial support. None reported.

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article.

The authors wish to thank the Department of Ophthalmology, Faculty of Medicine, Thammasat University for research funding and provision of facilities.

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