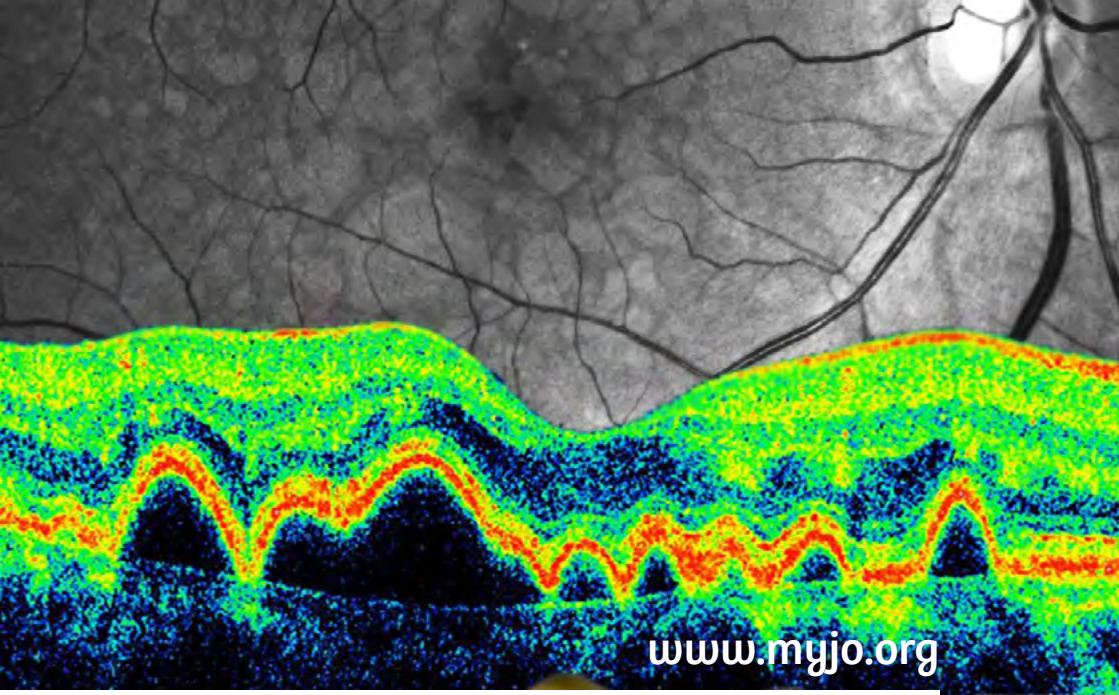

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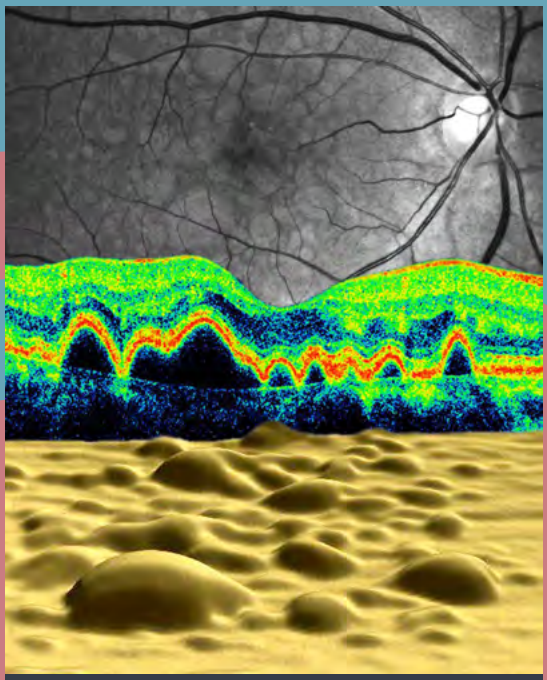

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The Desert Path, by Mr. John Leo from the Tun Hussein Onn National Eye Hospital.

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Malaysian Journal of Ophthalmology

Editorial

Population-based study on axial ocular dimensions and corneal astigmatism

Khairidzan Mohd Kamal

International Islamic University Malaysia, Kuantan, Malaysia

As cataract surgery has evolved over 50 years, there have been changes in the current clinical ophthalmic practice to improve safety and efficacy in order to achieve perfect postoperative outcomes. Since the 1990s, technological advances such as ocular biometry, phacoemulsification, and intraocular lens (IOL) formulas, as well as many others, have undergone numerous incremental upgrades aiming to produce predictable and reproducible quality results. However, the financial burden of adopting all these proven yet costly technologies in ophthalmological practice, especially in rural areas, has to be justified. In this issue, an epidemiological study on ocular biometrics conducted by the Ministry of Health at the Kuala Pilah Cluster Program has shed some light on a possible strategy to incorporate advanced tools and technology into our public service.

As suggested by the findings from the National Eye Survey II study, untreated cataract accounts for more than half the cases of blindness in our country.[1] The prevalence of cataract among the population 60 years of age and over verifies that the screening program should be targeted to this age group. Although this is not a novel finding, this hospital-based, cross-sectional study could well be the evidence that the current screening program has achieved significant mileage in addressing the issue. Loss of opportunity in detecting cataract can be reduced further if the screening program is carried out at every possible occasion. Improvements to the existing screening program should then be implemented internally to other departments in the public hospitals targeting the same age group.

The rapid progress in the advancement of IOL formulas and calculations can add to the complexity and ambiguity among surgeons in choosing their IOL. It has been proven that most of the available formulas provide adequate and predictable results to average axial length between 22 and 24 mm.[2] The relevancy of the SRKT formula usage in the majority of public institutions in Malaysia has now been substantiated by this study. The need for optical biometer measurements to incorporate the latest IOL formulas into the public practice may not be the highest priority at the moment. Utilization of the appropriate nomogram-based formula to deal with shorter or

longer eyes in public practice is more practical and cost effective.

The incidence of corneal astigmatism among cataract patients has been well documented.[3] More than a third of patients from Kuala Pilah cluster study found to have corneal astigmatism of more than 1D based only on anterior surface curvature measurement. If these data were subjected to the latest IOL formula calculations, nomograms or measurements that incorporate the effect of posterior corneal curvature, it is expected that more than half of this population would require astigmatic correction during cataract surgery4. The paradigm shift of targeting postoperative visual outcome from clarity of vision to spectacle independence and better quality vision has slowly infused in the public health system. As we are aiming to achieve postoperative spectacle freedom for our patients, this data highlighted that the need to invest on the training and proper equipment to address the corneal astigmatism management issue among cataract population.

The Kuala Pilah Cluster Cataract study was designed to look at ocular biometry epidemiological data. The results in this study might provide normative data for cataract patients and a useful reference for multiple purposes. It does suffer from few limitations but the value of its findings certainly go beyond establishing the normative data for clinical usage. It will be used to guide and help the Ministry of Health and other relevant authorities to direct our screening, training as well as cataract facility developmental program accordingly.

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Original article

Axial ocular dimensions and corneal astigmatism: The Kuala Pilah Cluster Cataract Study

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Abstract

Introduction: The Kuala Pilah Cluster Project involves Kuala Pilah Hospital as the lead hospital and the Jempol Hospital and Tampin Hospital as the district hospitals, serving as a single entity to provide ophthalmology services to the local population.
Purpose: To evaluate the distribution of ocular biometric parameters and corneal astigmatism in patients presenting for cataract surgery within the Kuala Pilah Cluster Hospital System.
Study design and methods: A cross-sectional study conducted on 273 consecutive patients presented for cataract surgery between January and June 2017. Ocular biometry measurements, including axial length (AXL), lens thickness (LT), and anterior chamber depth (ACD) of each right eye were measured using immersion A-scan ultrasound. Keratometric (K) readings were obtained via auto keratometer.
Results: The mean values for AXL, ACD, and LT were 23.40 ± 0.90 mm, 3.17 ± 0.49 mm, and 4.45 ± 0.96 mm, respectively. The average K-reading was 44.40 ± 1.59 D, with a mean corneal astigmatism of 0.82 ± 0.62 D. In this population, the females have significantly shorter AXL and ACD, but steeper K compared to the males ($P < 0.001$). The local Malays have higher AXL and ACD values compared to the Chinese and Indians. A total of 35.5% patients exhibited a corneal astigmatism greater than 1 D. The magnitude of preoperative astigmatism positively correlated with age ($P < 0.001$).
Conclusions: Ocular dimensions vary with gender and race in cataract patients from the Kuala Pilah cluster population. The probability of a patient requiring astigmatic

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correction increases with age. The average profile of ocular biometric data and corneal astigmatism may help local ophthalmologists to predict intraocular lens selections prior to cataract outreach projects.

Keywords: astigmatism, axial length, cataract, keratometry, ocular biometry

Dimensi aksial dan astigmatisma kornea: Kajian Katarak Kluster Kuala Pilah

Abstrak

Pengenalan: Projek Kluster Kuala Pilah melibatkan Hospital Kuala Pilah sebagai hospital utama, Hospital Jempol dan Hospital Tampin sebagai hospital daerah, yang berfungsi sebagai entiti tunggal untuk menyediakan perkhidmatan oftalmologi kepada penduduk setempat.
Tujuan: Untuk menilai liputan parameter biometrik okular dan astigmatisma kornea pada pesakit yang menjalani pembedahan katarak di Sistem Hospital Kluster Kuala Pilah.
Reka bentuk dan kaedah kajian: Kajian keratan rentas yang dilakukan pada 273 pesakit yang dijadualkan untuk pembedahan katarak antara Januari dan Jun 2017. Pengukuran biometri okular, termasuk panjang paksi (AXL), ketebalan lensa (LT), dan kedalaman ruang anterior (ACD) setiap mata kanan diukur dengan menggunakan ultrasound A-scan imersi. Bacaan Keratometrik (K) diperoleh melalui auto keratometer.
Keputusan: Nilai min bagi AXL, ACD, dan LT masing-masing adalah 23.40 ± 0.90 mm, 3.17 ± 0.49 mm, dan 4.45 ± 0.96 mm. Purata bacaan K adalah 44.40 ± 1.59 D, dengan min astigmatisma kornea ialah 0.82 ± 0.62 D. Dalam populasi ini, wanita didapati lebih pendek AXL dan ACD, tetapi K lebih curam berbanding dengan lelaki (P <0.001). Melayu tempatan mempunyai nilai AXL dan ACD yang lebih tinggi berbanding kaum Cina dan India. Sebanyak 35.5% pesakit mempamerkan astigmatisma kornea yang lebih besar daripada 1 D. Besarnya astigmatisma pra-operasi positif berkorelasi dengan usia (P <0.001).
Kesimpulan: Dimensi ocular berbeza dengan jantina dan kaum pesakit katarak dari populasi kluster Kuala Pilah. Kebarangkalian pesakit yang memerlukan pembetulan astigmatik meningkat dengan usia. Profil data biometrik okular dan astigmatisma kornea boleh membantu pakar mata tempatan untuk meramalkan liputan kuasa kanta intraokular diperlukan sebelum projek pengesanan katarak luar bandar dijalankan.

Kata kunci: astigmatisma, biometri okular, katarak, keratometri, panjang axial

Introduction

The Kuala Pilah Cluster Program is part of the Hospital Cluster Concept implemented by the Ministry of Health Malaysia. As one of the initiatives under the programme 'Transformasi Sistem Kesihatan' (Health Care Transformation System), this cluster system involves collaboration between government hospitals within the same state and geographical area.[1] Together, the hospitals work as a single entity by sharing resources and facilities to provide specialist services to the local population. The Kuala Pilah Cluster Program comprises our centre, Tuanku Ampuan Najihah Kuala Pilah Hospital, as the lead hospital, along with two other district hospitals, Tampin Hospital and Jempol Hospital.

In 2014, the National Eye Survey II identified untreated cataract as the commonest cause of visual impairment in Malaysia, accounting for 58.6% of the total blindness.[2] Accessible eye care with prompt cataract surgery is the key ophthalmology service provided by the Kuala Pilah Cluster Program as an initiative to combat cataract blindness in this region. Accurate measurements of ocular biometry and keratometry before cataract surgery are crucial for obtaining the precise power of intraocular lens in order to achieve good postoperative outcomes. Ocular biometric parameters are known to have racial variations.[3,4] The Singapore Epidemiology of Eye Diseases (SEED) study reported ethnic variation in the ocular dimensions measured by IOLMaster (Carl Zeiss Meditec AG, Jena, Germany) among the three major ethnic groups – Chinese, Malays and Indians – in the urban area.[5] However, there are no population-based studies available in Malaysia to compare demographics and ocular biometric trends in cataract patients from our multiethnic society and largely suburban dwellers with different socioeconomic background from our neighbouring country.

In this study, we aim to obtain an overview of the biometric characteristics across different gender and ethnic groups within the local population, and to determine the prevalence of corneal astigmatism before cataract surgery in the Kuala Pilah Cluster Hospital System.

Materials and methods

This is a prospective cross-sectional study conducted in the Kuala Pilah Cluster Hospital System. This study was approved by the institutional review board and adhered to the tenets of the Declaration of Helsinki. Consecutive patients who underwent cataract surgery between January and June 2017 were recruited. Exclusion criteria included history of refractive surgery, intraocular surgery, corneal

disease and trauma. Ocular biometry measurements including axial length (AXL), lens thickness (LT), and anterior chamber depth (ACD) of each right eye were obtained using immersion A-scan ultrasound (Quantel Compact Touch A/P/B, Quantel Medical, Cournon d'Auvergne Cedex, France). Meanwhile, keratometry (K) readings were obtained via auto-kerato-refractometer (Autoref/keratometer ARK-1/ARK-1a/ARK-1s, Nidek, Japan). Keratometry (dioptres) was measured in flat and steep meridians. The K value was calculated as the mean of these two meridians; Keratometric astigmatism calculated as the difference between these two meridians.

All statistical tests were performed using the IBM SPSS for Windows statistical software package (version 24.0; SPSS Inc., Chicago, Illinois, USA). Chi square was used for categorical variables, while the independent-sample t-test was used for continuous variables that are normally distributed and the Mann-Whitney U test was used when the distribution was not normal. An ANOVA (analysis of variance) test was used to analyse different means among the variable group. Meanwhile, Pearson correlation was used to measure the strength of a linear association between two variables. P values less than 0.05 were considered statistically significant.

Results

This study evaluated 273 eyes of 273 patients with a mean age of 67.99 ± 8.74 years. The majority of the patients were male (55.7%) and ethnic background showed predominantly Malays (57.1%), followed by Chinese (28.6%), Indians (13.6%), and others (0.7%).

The mean AL was 23.40 ± 0.90 mm. The mean values for ACD and LT were 3.17 ± 0.49 mm and 4.45 ± 0.96 mm, respectively. The average K-reading was 44.40 ± 1.59 D, with a mean corneal astigmatism of 0.82 ± 0.62 D. Figure 1 shows the distribution of corneal astigmatism in the study population. A total of 35.5% patients exhibited a corneal astigmatism greater than 1 D.

In this population, females have significantly shorter AL and ACD than males (23.17 ± 0.92 mm and 3.03 ± 0.45 mm respectively, $p < 0.001$). However, females have steeper K compared to males (44.83 **± 1.48** D, $p < 0.001$) (Table 1). In terms of ethnicity, Malays have significantly longer AL (23.48 ± 0.87 mm, $p = 0.027$**)** and ACD (3.26 ± 0.48 mm, $p < 0.0001$), whereas Indians have greater LT (4.66 ± 0.84, $p = 0.003$) (Table 2).

Pearson correlation analysis showed that lens thickness increases with age ($p = 0.046$), while ACD decreases with age ($p < 0.0001$). Moreover, the magnitude of preoperative astigmatism also positively correlates with age ($p < 0.001$). There was no significant association between axial length and age (Fig. 2).

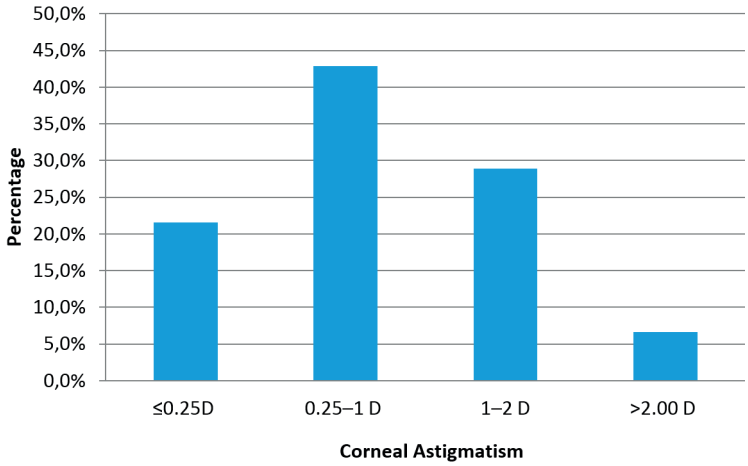

Fig. 1. Distribution of corneal astigmatism in the study population.

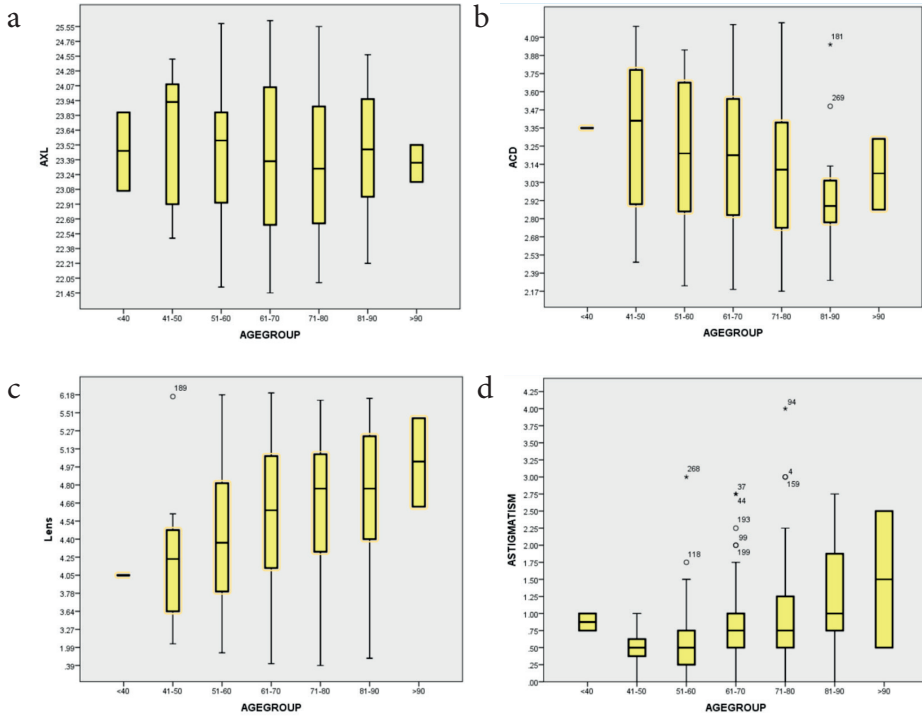

Fig. 2. Box-plot showing correlation between age group and AL (*a*), ACD (*b*), LT (*c*), and corneal astigmatism (*d*).

Table 1. Ocular biometry distribution by gender

Variables	Total (n = 273)	Male (n = 152)	Female (n = 121)	P value
AXL, mm	23.40 ± 0.90	**23.58 ± 0.83**	23.17 ± 0.92	< 0.0001
ACD, mm	3.17 ± 0.49	**3.28 ± 0.49**	3.03 ± 0.45	< 0.0001
LT, mm	4.45 ± 0.96	4.42 ± 0.99	4.47 ± 0.95	0.661
Average K, D	44.41 ± 1.59	44.07 ± 1.59	**44.83 ± 1.48**	< 0.0001
Astigmatism, D	0.82 ± 0.62	0.86 ± 0.67	0.77 ± 0.56	0.203

ACD: anterior chamber depth; AXL: axial length; LT: lens thickness; D: dioptre
AXL, ACD, LT: independent t-test; average K, astigmatism: Mann-Whitney U test
p-values < 0.05 considered significant

Table 2. Ocular biometry distribution by ethnicity

Variables	Total (n = 273)	Malay (n = 156)	Chinese (n = 78)	Indian (n = 37)	p
AXL, mm	23.40 ± 0.90	**23.48 ± 0.87**	23.41 ± 0.93	23.00 ± 0.84	0.027
ACD, mm	3.17 ± 0.49	**3.26 ± 0.48**	3.03 ± 0.44	3.01 ± 0.48	< 0.0001
LT, mm	4.44 ± 0.97	4.38 ± 0.96	4.52 ± 0.94	**4.66 ± 0.84**	0.003
Average K, D	44.41 ± 1.59	44.30 ± 1.50	44.50 ± 1.53	44.71 ± 2.05	0.454
Astigmatism, D	0.82 ± 0.62	0.78 ± 0.59	0.92 ± 0.60	0.77 ± 0.76	0.405

ACD: anterior chamber depth; AXL: axial length; LT: lens thickness; D: dioptre
ANOVA test used to calculate difference between groups
p-values < 0.05 considered significant

Discussion

Our study reports cross-sectional data on demographic and ocular biometric characteristics for a multiethnic population in the Kuala Pilah Cluster Hospital Program presenting for cataract surgery. Patients presenting for cataract surgery in Kuala Pilah were predominantly elderly, male, of Malay ethnicity, and with corneal astigmatism less than one D. Although there are similar studies conducted in other South East Asian countries, to our knowledge, our study is the first to provide normative data for ocular dimensions in Malaysian population.

The ocular dimensions of the eye have been known to be influenced by ethnicity and racial factors. Table 3 summarises the ethnic group differences between our population and other major population-based studies. The mean AL of our population is 23.40 mm, shorter than Singaporeans (23.88 mm),[5] longer than Burmese (23.14 mm),[6] Chinese (23.11 mm),[7] Mongolian[8] (23.13 mm), and Auckland Caucasians (23.14mm),[9] but similar to the Latinos (23.38 mm).[10] It is worthwhile to dissect our findings by ethnic groups, where we found the Malays have significantly longer AXL and deeper ACD compared to the local Chinese and Indians.

Table 3. Comparison of demographic features between the present study and other published studies

	Present study	**SINDI[12]**	**TPS[13]**	**SIMES[11]**
Location	Kuala Pilah cluster	Adult Indian Singapore	Adult Chinese-Singapore	Adult Malay Singapore
Eyes/patients	273/273	2785/2785	1004/1004	2788/2788
Age (y) Mean	67.99 ± 8.74	57.8 ± 10.1	NA	57.3
Range	28, 94	40, 83	40, 81	40, 80
Male/Female	152/121	1406/1379	457/547	1333/1455
AXL (mm)				
All	23.40 ± 0.90	23.45 ± 1.10	23.23 ± 1.17	23.55
Male	23.58 ± 0.83	23.68 ± 1.06	23.54 ± 1.10	23.75
Female	23.17 ± 0.92	23.23 ± 1.10	22.98 ± 1.16	23.38
ACD (mm)				
All	3.17 ± 0.49	3.15 ± 0.36	2.90 ± 0.44	3.08
Male	3.28 ± 0.49	3.19 ± 0.36	2.99 ± 0.45	3.13
Female	3.03 ± 0.45	3.10 ± 0.35	2.81 ±0.47	3.03
Keratometry	K-reading (D)	K-reading (D)	Corneal radius (mm)	Corneal radius (mm)
Male	44.07 ± 1.59	43.88	7.73 ± 0.29	7.71
Female	44.83 ± 1.48	44.63	7.59 ± 0.24	7.59

ACD: anterior chamber depth; AL: axial length; D: dioptre

Similar findings were shown in population-based studies in Singapore, namely, the Singapore Malay Eye Study (SIMES),[11] Singapore Indian Eye Study (SiNDI),[12] and Tanjong Pagar Survey (Singapore Chinese).[13] It is interesting to note that Chinese adults among our local population have longer AXL and deeper ACD compared to the Singapore Chinese[13] and Liwan Chinese.[7] Meanwhile, Indians among our local population have shorter AXL than the Singaporeans, but much longer than the Indians from Central India (22.6 mm). These findings are in line with emerging evidence that biometric parameters are influenced by anthropometric measurements and socioeconomic backgrounds, rather than by genetic ancestry.[14-17] Urbanisation is believed to contribute to the elongation of AXL by increasing the demand of near-sighted work and less exposure to sunlight.[18,19]

In this population, females were shown to have significantly shorter AXL and ACD. Other ocular biometry studies have produced similar results.[7,8,10,15] This shows that ocular dimensions correlate well with human anthropometrics, where females have smaller body stature compared to males. The shorter AXL and ACD in females contribute towards a shallower ACD, predicting a higher risk for angle-closure glaucoma. LT was shown to increase with age; conversely, ACD had a negative correlation with age. Naturally, with the occurrence of cataract, the LT increases, thus reducing the ACD. Cataract surgery is proven to significantly deepen the anterior chamber.[20] We postulate that early cataract surgery in older women from our local population may reduce the incidence of angle-closure glaucoma.

The results of this study also show the positive correlation between preoperative corneal astigmatism ($P < 0.001$) with age. The prevalence of corneal astigmatism and its association with age have been well documented in the literature.[21-24] Hayashi *et al.* has shown that irregular corneal astigmatism tends to increase from middle to older age groups regardless of cataract surgery.[23] It is hypothesised that changes in upper lid tension and corneal degeneration contribute to this changes.[25] We have found that 35.5% of the cataract patients have a corneal astigmatism greater than 1 D. This figure is almost identical to that of Hoffmann *et al.* from Germany, who reported 36%[26] and Ferrer-Blasco from Spain (34.8%).[27] Oher major studies have shown a slightly higher percentage, with De Bernardo *et al.* from Italy reporting 41.4%[28] and Wakefield *et al.* from England reporting 44.2%.[22] Patients with more than 1 D of astigmatism should be considered for surgical correction during surgery for better postoperative visual outcomes and spectacle independence.

The limitation of our study is that this is a hospital-based study, and therefore more susceptible to selection bias. Population-based data with cluster samples will provide a more accurate illustration of normative data in Malaysia. We also recommend for our National Eye Registry for Cataract Surgery to include ocular biometry data to pave ways for future studies on ocular anatomical differences.

In conclusion, in the Kuala Pilah Cluster population, females have significantly shorter AL, ACD, and steeper K compared to males. Moreover, Malays among the local population have higher AXL and ACD values compared to Chinese and Indians

in the same population. This study also shows that the probability of a patient requiring astigmatic correction increases with age. The information regarding the average profile of ocular biometric data and corneal astigmatism may help local ophthalmologists to select intraocular lens more precisely prior to cataract outreach projects within this population.

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Original article

Efficacy of selective laser trabeculoplasty in primary open-angle glaucoma: HKL experience, one-year results

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Abstract

Introduction: Selective laser trabeculoplasty (SLT) has been demonstrated to lower intraocular pressure (IOP) and reduce the number of topical medications used in patients with primary open-angle glaucoma (POAG).
Purpose: The purpose of our study was to investigate the sustainability and efficacy of SLT in treating POAG at one year following laser. To our knowledge, this is one of the first studies to be published based on local data in Malaysia.
Study design: This was a retrospective study conducted in a specialist eye clinic, Hospital Kuala Lumpur, from July 2017 until January 2019. Data was collected from the medical notes of the patients.
Materials and methods: The study recruited cases of POAG patients who were using topical antiglaucoma medications. Inclusion criteria were patients with unilateral or bilateral POAG aged 50 years and above. Exclusion criteria were secondary open-angle glaucoma and all forms of angle-closure glaucoma. Patients who had undergone trabeculectomy or glaucoma drainage devices were excluded in our study. A single session of 360° SLT using a Q-switched Nd:YAG laser with an initial energy of 0.8 mJ was performed. IOP and number of antiglaucoma medications were recorded at prestudy, 1 week, 1 month, 3 months, 6 months, and 12 months.
Results: In 17 eyes, mean prestudy IOP was 19.3 ± 3.3 mmHg while on 2.18 ± 0.7 eye drops. At 12 months after SLT, mean IOP was 13.3 ± 3.5 mmHg while on 1.88 ±

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0.9 IOP-lowering eye drops. This represented a 31% reduction of IOP compared to prestudy levels. However, the reduction of number of medications was not statistically significant.
Conclusion: A single session of 360° SLT treatment for POAG patients is able to lower IOP by 31% at one year following laser. SLT is a safe and effective procedure for reducing IOP. It may be used as adjuvant therapy, especially in noncompliant patients; patients who have difficulty applying topical eye drops or who are intolerant to topical medication.

Keywords: intraocular pressure (IOP), primary open-angle glaucoma (POAG), selective laser trabeculoplasty (SLT)

Keberkesanan laser trabeculoplasti khusus dalam glaukoma sudut terbuka utama: pengalaman satu tahun HKL

Abstrak

Pengenalan: Laser trabeculoplasty khusus (SLT) telah menunjukkan penurunan tekanan intraokular (IOP) dan pengurangan bilangan ubat-ubatan topikal yang digunakan pada pesakit dengan glaukoma sudut terbuka utama (POAG).
Tujuan: Tujuan kajian kami adalah untuk mengkaji kemampanan dan keberkesanan SLT dalam merawat POAG dalam satu tahun laser berikut. Dalam pengetahuan kami,kajian ini adalah kajian pertama yang diterbitkan berdasarkan data tempatan di Malaysia.
Reka bentuk kajian: Ini adalah kajian retrospektif yang dijalankan di klinik mata pakar, Hospital Kuala Lumpur, dari Julai 2017 hingga Januari 2019. Data dikumpul dari rekod perubatan pesakit.
Bahan dan kaedah: Kajian ini merekrut kes-kes pesakit POAG yang menggunakan ubat titis antiglaukoma. Kriteria inklusi adalah pesakit dengan POAG sebelah atau dua belah mata dan berusia 50 tahun ke atas. Kriteria pengecualian adalah glaukoma terbuka sudut sekunder dan semua bentuk glaukoma sudut tertutup. Pesakit yang telah menjalani trabeculektomi atau peralatan saliran glaukoma tidak termasuk dalam kajian kami. Sesi tunggal 360° SLT menggunakan Q-switched Nd: YAG laser dengan tenaga awal 0.8 mJ dilakukan. IOP dan bilangan ubat antiglaukoma dicatat pada prakajian, 1 minggu, 1 bulan, 3 bulan, 6 bulan, dan 12 bulan.
Keputusan: Dalam 17 mata, min IOP prestudy adalah 19.3 ± 3.3 mmHg manakala min bilangan botol ubatan titis ialah 2.18 ± 0.7. Pada 12 bulan selepas SLT, Min IOP adalah 13.3 ± 3.5 mmHg manakala paras bilangan ubat titis mata ialah 1.8 ± 0.9.

Ini menunjukkan pengurangan IOP sebanyak 31% berbanding tahap prakajian. Walau bagaimanapun, pengurangan bilangan ubat tidak signifikan secara statistik. *Kesimpulan:* Satu sesi rawatan 360T SLT untuk pesakit POAG dapat mengurangkan IOP sebanyak 31% pada satu tahun selepas laser. SLT adalah prosedur yang selamat dan berkesan untuk mengurangkan IOP. Ia boleh digunakan sebagai terapi tambahan, terutama pada pesakit yang tidak patuhsetia kepada ubatan; pesakit yang mengalami kesukaran menggunakan titisan mata topikal atau yang tidak bertoleransi terhadap ubat topikal.

Kata kunci: tekanan intraokular (IOP), glaukoma sudut terbuka utama (POAG), trabeculoplasty laser terpilih (SLT)

Introduction

Lowering intraocular pressure (IOP) is the mainstay of glaucoma treatment in an attempt to halt the characteristic progressive optic neuropathy and prevent irreversible visual field loss. This goal can be achieved either by medical, laser, or surgical modalities.

The glaucoma laser trial demonstrated that laser trabeculoplasty plays a vital role in glaucoma treatment. The trial proved that initial treatment with argon laser trabeculoplasty (ALT) was at least as efficacious as initial treatment with topical IOP-lowering medication.[1] Selective laser trabeculoplasty (SLT) was approved by the FDA in 2001. It uses a frequency-doubled, Q-switched, 532 nm Nd:YAG laser that is able to deliver a short pulse of 3 ns duration which limits the conversion of energy to heat. The IOP-lowering effect of SLT is mediated through an increase in outflow facility. Transmission electron microscopy has demonstrated that SLT selectively targets pigmented trabecular meshwork cells, results in fracturing of melanin granules and rupturing of lysosomal membranes in the pigmented cells, but spares adjacent tissue from collateral thermal damage.[2]

The efficacy of SLT in patients with primary open-angle glaucoma (POAG) has been demonstrated in various studies. In terms of IOP-lowering effect, SLT is at least comparable to that of topical medications. SLT is a viable treatment option when considering potential local and systemic adverse effects as well as compliance issues associated with long-term topical medication use.[3] The purpose of our study was to investigate the sustainability and efficacy of SLT in treating POAG at one year following laser. To our knowledge, this is one of the first studies to be published based on local data in Malaysia.

Materials and methods

We conducted this retrospective study in the ophthalmology clinic at Hospital Kuala Lumpur from July 2017 until January 2019. This study adhered to the tenets of the Declaration of Helsinki. The authors declared no financial or conflicting interest.

Inclusion criteria were patients with unilateral or bilateral POAG aged 50 years and above. Most of them were intolerant to the local side effects of topical medications, showing conjunctival hyperaemia and allergic reaction to the eye drops. The IOP of all subjects was less than 25 mmHg on topical IOP-lowering agents. All the participants were not listed for any intraocular surgery for at least one year after SLT treatment in order to reduce bias and to observe the IOP trend.

Exclusion criteria were secondary open-angle glaucoma and all forms of angle-closure glaucoma. Patients who had undergone trabeculectomy or glaucoma drainage devices were excluded in our study.

Data was collected from the medical notes of the patients. The prestudy IOP on IOP-lowering medications and the number of IOP-lowering medications were recorded prior to study enrolment. Fixed-combination eye drops were counted as two types of IOP-lowering medications.

Informed consent was taken prior to SLT treatment. The procedures were carried out by two glaucoma specialists in our clinic. We followed the laser treatment protocol as mentioned in Clinical Practical Guidelines of Management of Glaucoma (Malaysia) and Asia Pacific Glaucoma Guidelines (Third edition). We prepared the patients with topical amethocaine local anaesthesia. All patients received a single session of 360° SLT using a Q-switched Nd:YAG laser with an initial energy of 0.8 mJ. The power was titrated up or down until bubble formation was just visible. Both eyes were treated in the same laser session for those with bilateral disease. In all treated eyes, all subjects were given topical prednisolone forte, four times a day for one week.

Subjects returned for follow up at 1 week, 1 month, 3 months, 6 months, and 12 months after SLT treatment. All the subjects were reviewed by glaucoma specialists in our clinic. Antiglaucoma medications were resumed and titrated based on clinical response to achieve target IOP for each individual. The primary outcome included IOP at the following time intervals: 1 week, 1 month, 3 months, 6 months, and 12 months after SLT. Goldmann applanation tonometry was used to measure IOP. The secondary outcome included the number of IOP-lowering medications used at 1 week, 1 months, 3 months, 6 months, and 12 months after SLT.

Definition of success

Complete success of SLT treatment was defined as an IOP reduction of more than 20% at one year after SLT compared to prestudy without any additional IOP -lowering medications.

Statistics

SPSS software version 20 was used for all analyses. Paired sample t-test was used to analyse the primary and secondary outcomes of the study, namely, IOP at prestudy, 1 week, 1 month, 3 months, 6 months, and 12 months after SLT and number of IOP-lowering medications at prestudy, 1 week, 1 month, 3 months, 6 months, and 12 months after SLT, respectively.

A Kaplan-Meier survival curve was used to represent the need for additional topical IOP-lowering medications or the need of performing glaucoma surgery during the study period. All means were expressed as mean ± standard deviation. Statistical significance was defined as a P value less than 0.05.

Results

A total 17 eyes of 10 subjects were recruited for our study. The mean age of the subjects was 69 ± 9.4 years, with 9 male and 1 female subjects. There were 8 right eyes and 9 left eyes (Table 1). The mean pre-study IOP was 19.3 ± 3.3 mmHg while on 2.18 ± 0.7 antiglaucoma eye drops (Table 2, Table 3, Fig. 1, and Fig. 2).

Subjects returned for follow-up on 1 week, 1 month, 3 months, 6 months, and 12 months after SLT. When using the pre-study IOP for comparison, there was significant IOP reduction at all-time intervals at 1 week, 1 month, 3 months, 6 months and 12 months following SLT ($P<0.05$) (Table 2). However, there was no significant difference in the number of IOP lowering eye drops at pre-study as compared to 1 week, 1 month, 3 months, 6 months, and 12 months following SLT ($P > 0.05$)(Table 3).

At 12 months after SLT, the mean IOP was 13.3 ± 3.5 mmHg while on 1.88 ± 0.9 IOP-lowering eye drops (Table 2, Table 3, Fig. 1, and Fig. 2). This represented a 31% reduction IOP as compared to pre-study levels. There was no significant reduction in the number of IOP-lowering eye drops as compared to pre-study levels. At 1 year, complete success was achieved in 58.8% of eyes (Table 4).

During the study period, the mean survival rate of SLT was 76.5% at 1 year after the procedure (Fig. 3). Based on the Kaplan-Meier survival curve, early intervention was carried out for the subjects who did not respond well to SLT treatment in the first three months. Three eyes required additional of topical antiglaucoma medications and one eye of a subject underwent minimally invasive glaucoma surgery, as SLT failed to achieve target IOP. For those subjects who responded well in the first three months, there was no further intervention needed from three months until one year.

Table 1. Demographics of subjects in SLT

		Number
N = 10		
Mean Age (In years)		69 ± 9.4
Age range		48-77
Race		
	Malay	5
	Chinese	4
	Indian	1
Sex		
	Male	9
	Female	1
Laterality		
	Unilateral	3
	Bilateral	7
	Right eye	8
	Left eye	9

Table 2. Mean IOP before and after SLT

	Pre-study (n = 17)	1 week (n = 17)	1 month (n = 17)	3 months (n = 16)	6 months (n = 16)	12 months (n = 16)
Mean IOP (mmHg)	19.3 ± 3.3	16.1 ± 3.7	14.8 ± 2.6	15.1 ± 3.8	14.5 ± 2.6	13.3 ± 3.5
P value		0.003	0.001	0.001	0.001	0.001

Table 3. Mean number of IOP lowering medications before and after SLT

	Pre-study (n = 17)	1 week (n = 17)	1 month (n = 17)	3 months (n = 16)	6 months (n = 16)	12 months (n = 16)
Mean number of antiglaucoma eyedrops	2.18 ± 0.7	2.24 ± 0.6	2.18 ± 0.7	2.12 ± 0.6	1.88 ± 0.9	1.88 ± 0.9
P-value		0.58	1.00	1.00	0.26	0.26

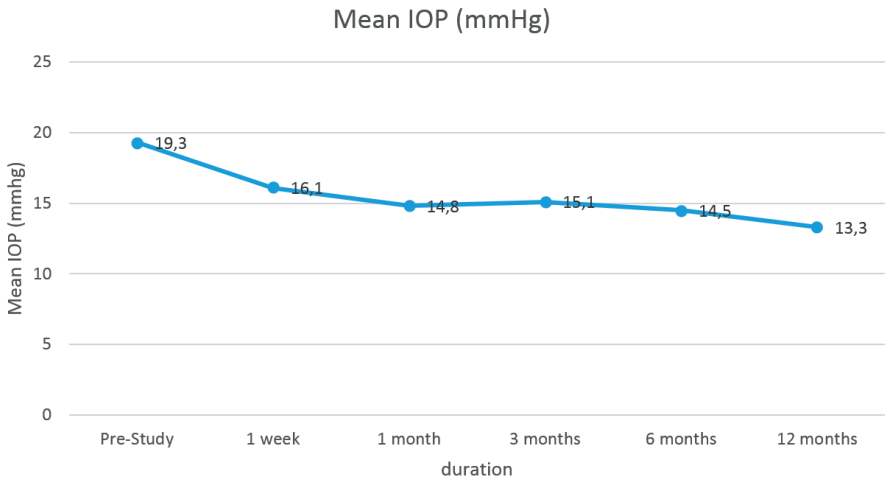

Fig. 1. Changes in mean IOP before and after SLT.

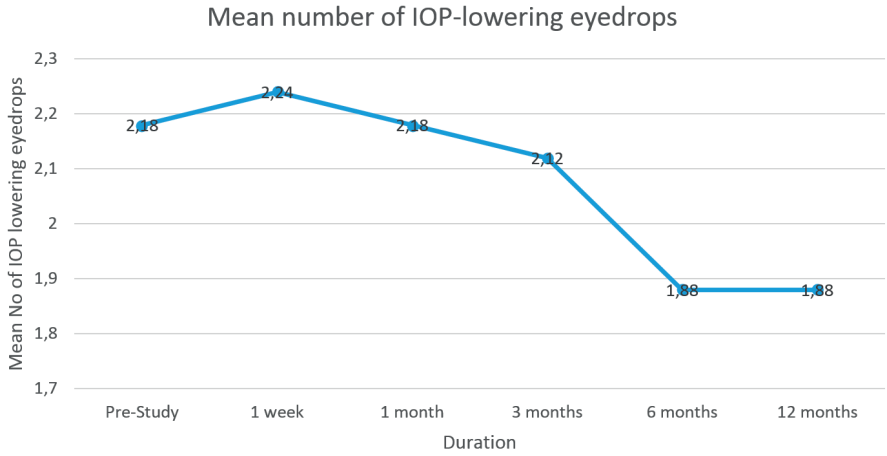

Fig. 2. Changes in mean number of IOP-lowering medications before and after SLT.

Table 4. Comparison of IOP at pre-study and at one year. Mean survival rate and overall success rate

n	IOP at pre-study	IOP at one year	IOP change	IOP change in %	Additional antiglaucoma medications during study period	Success
1	14	18	4	29	No	No
2	20	14	-6	-30	No	Yes
3	18	10	-8	-44	No	Yes
4	18	10	-8	-44	No	Yes
5	19	14	-5	-26	No	Yes
6	18	10	-8	-44	No	Yes
7	11	14	3	27	No	No
8	22	22	0	0	No	No
9	24	14	-10	-42	No	Yes
10	18	12	-6	-33	No	Yes
11	23	16	-7	-30	Yes	No
12	24	16	-8	-33	No	Yes
13	20	11	-9	-45	No	Yes
14	22	10	-12	-54	No	Yes
15	19	10	-9	-47	Yes	No
16	20	11	-9	-45	Yes	No
17	18	*	*	*	*	No
Mean survival rate					13/17 (76.5%)	
Overall success rate						10/17 (58.8%)

* Patient underwent minimally invasive glaucoma surgery implantation at three months after SLT.

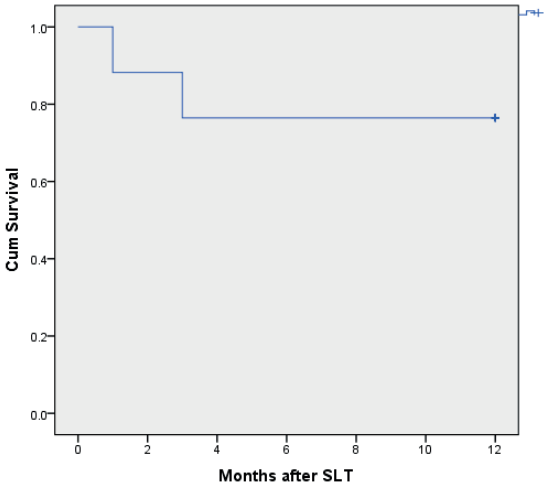

Fig. 3. Kaplan-Meier survival curve following SLT, where mortality = need of additional topical IOP-lowering medications or need of doing glaucoma surgery during the study period.

Discussion

The mainstay of glaucoma therapy involves lowering IOP in order to reduce the rate of glaucoma progression. Eye drops are traditionally the first line of therapy. However, topical agents and its preservatives can produce local and systemic adverse effects.[4] Patients must also tolerate repeat application of drugs and ongoing medical costs.[5] These problems may reduce compliance and adherence to medications.

SLT has been shown to be effective as primary or adjuvant therapy for open-angle glaucoma. Realini demonstrated an immediate and sustained reduction in IOP after SLT therapy in open-angle glaucoma patients that were washed out from all topical medications. Mean IOP reductions ranged from 7.3 to 8.3 mmHg (34.1–38.9%) through 1 year of follow-up.[6] Hence, SLT may be preferred as the first-line therapy or as an alternative treatment when glaucoma patients suffer local adverse effects as well as compliance issues associated with the use of long-term topical IOP-lowering agents.[3]

Based on our study, there was a significant reduction of IOP at 1 week following SLT, followed by a gradual decline in IOP and a plateau from 1 month to 12 months (Table 2, Fig. 1). These findings suggested that the effectiveness of SLT was quite consistent and lasted for up to 12 months after laser. Our study demonstrated that, at 12 months, treated eyes achieved a 31% reduction in IOP as compared to prestudy levels. Most studies define successful SLT treatment as a reduction > 20% in IOP from baseline levels. Our findings were consistent with several studies which

reported more than a 20 % reduction of IOP compared to baseline.[7-10]

Nevertheless, there was no significant difference between the number of medications used before SLT and at 12 months after SLT (P > 0.05)(Table 3, Fig. 2). Our findings were inconsistent with other studies which demonstrated that the number of glaucoma medications were reduced after SLT.[11,12] In our study, mean IOP at 12 months had achieved the target IOP in clinical practice. Hence, the number of medications was maintained.

SLT has been found ineffective in patients who are treated with prostaglandin analogue therapy before SLT,[13] showing a decreased IOP-lowering response following SLT. The diminished effect of SLT on these patients is probably due to fact that both SLT and prostaglandin analogues share common mechanisms of action in decreasing IOP. However, we did not observe this phenomenon in our study. All of our subjects were treated with prostaglandin analogues before SLT and were able to achieve an IOP reduction of 31% at 1 year.

SLT has been shown to be effective in normal-tension glaucoma (NTG), pseudoexfoliation glaucoma (PXFG), and pigmentary glaucoma. SLT produced favourable clinical outcomes in patients with NTG. At 2 years follow-up, there was an 11.5% reduction in IOP and 41.1% reduction in glaucoma medication usage compared with pre-study levels.[14,15] On the other hand, patients with pseudoexfoliation glaucoma who were treated with SLT treatment achieved an IOP reduction comparable to POAG patients at one year follow-up.[16] We did not include other subtypes of open-angle glaucoma in our study to reduce bias.

Our study had limitations. It would have been ideal to avoid using any IOP-lowering medications during the study period in order to observe the IOP-lowering effect of SLT alone. However, patients could have achieved a suboptimal IOP during the study period, putting them at risk of disease progression. We were also limited by heterogeneity of the eyes studied in terms of glaucoma severity. In addition, the timing of IOP measurement was not standardized; thus, diurnal variations of IOP may have influenced the study outcome. For this reason, 24-hour IOP monitoring in future studies would enlighten us on the circadian efficacy of SLT. In addition, a larger sample size and a longer study period would reduce bias and help us better understand the long term effects of SLT.

In conclusion, our study found that a single session of 360° SLT treatment for POAG patients was able to lower IOP by 31% at 1 year following laser. We found no significant adverse effects, pointing toward SLT being a safe and effective procedure for IOP reduction.

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Original article

Infectious keratitis: findings from a retrospective review in the central zone of Sarawak

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Abstract

Introduction: Infectious keratitis is caused by inflammation of the cornea from an infectious pathogen that usually results in corneal scarring. It is a major cause of visual impairment globally. The management of infectious keratitis is challenging, and unfortunately, there is no proper study on this issue in the central zone of Sarawak to date.
Purpose: To identify the demographic characteristics, risk factors, and etiological agents of patients with infectious keratitis in Sibu Hospital, Sarawak, Malaysia.
Design of the study: Retrospective study.
Materials and methods: Data were collected and reviewed from medical records of all patients with infectious keratitis in Sibu Hospital from January 2013 up to May 2018.
Results: A total of 139 patients (143 eyes/cases) were included in the study. The average age of affected individuals was 47.39 years. The most frequently affected patients fell within the age group of 21-30 years (18.9%). The male-to-female ratio was 1.65:1, with 61.5% of patients being males and 38.5% being females. Seventy-four cases were noted to have predisposing factors before the manifestation of symptoms. The commonest predisposing factors were ocular trauma (55.4%), followed by contact lens wear (29.7%), recent ocular surgery (13.5%), and a recent history of swimming (7.4%). At least one pathogen was isolated in 63.1% of the 38 cases that were tested for corneal scraping culture and sensitivity. *Pseudomonas aeruginosa* was identified as the most common causative pathogen in our study.
Conclusion: Ocular injury stood out as the most common risk factor for infectious keratitis in this study and *Pseudomonas aeruginosa* was the most common

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etiological pathogen. A good grasp of local epidemiology and microbial profile of infectious keratitis is essential in aiding and guiding the management of infectious keratitis in hopes of better outcomes for all affected patients.

Keywords: infectious keratitis, Malaysia, ocular injury, *Pseudomonas aeruginosa*, Sarawak

Keratitis berjangkit: penemuan dari kajian retrospektif di zon pusat Sarawak

Abstrak

Pengenalan: Keratitis berjangkit disebabkan oleh keradangan kornea dari patogen berjangkit yang biasanya mengakibatkan parut kornea. Ia adalah penyebab utama kerosakan penglihatan di seluruh dunia. Rawatan keratitis adalah mencabar, dan malangnya, tidak ada kajian yang sewajarnya mengenai isu ini di zon pusat Sarawak hingga kini.
Tujuan: Untuk mengenal pasti ciri-ciri demografi, faktor risiko, dan agen etiologi pesakit dengan keratitis berjangkit di Hospital Sibu, Sarawak, Malaysia.
Reka bentuk kajian: Kajian retrospektif.
Bahan dan kaedah: Data dikumpulkan dan diperiksa dari rekod perubatan semua pesakit dengan keratitis berjangkit di Hospital Sibu dari Januari 2013 sehingga Mei 2018.
Keputusan: Sebanyak 139 pesakit (143 mata / kes) telah dimasukkan ke dalam kajian ini. Umur purata individu terjejas ialah 47.39 tahun. Pesakit yang paling kerap terjejas jatuh dalam kumpulan umur 21-30 tahun (18.9%). Nisbah lelaki-ke-wanita ialah 1.65: 1, dengan 61.5% pesakit lelaki dan 38.5% wanita. Tujuh puluh empat kes telah dikenal pasti mempunyai faktor-faktor risiko tertentu. Faktor kecenderungan yang paling biasa adalah trauma okular (55.4%), diikuti dengan memakai kanta sentuh (29.7%), pembedahan okular yang terkini (13.5%), dan sejarah berenang dalam masa terdekat (7.4%). Sekurang-kurangnya satu patogen telah diasingkan dalam 63.1% daripada 38 kes yang diuji untuk kultur dan sensitiviti kornea. *Pseudomonas aeruginosa* dikenalpasti sebagai patogen penyebab yang paling kerap ditemui dalam kajian kami.
Kesimpulan: Kecederaan mata adalah faktor risiko yang paling kerap untuk keratitis berjangkit dan dalam kajian ini *Pseudomonas aeruginosa* adalah patogen yang paling menonjol. Pemahaman terperinci terhadap epidemiologi tempatan dan profil mikroba keratitis yang berjangkit adalah penting untuk membantu rawatan

keratitis berjangkit dengan harapan akan mendapat hasil yang lebih baik untuk semua pesakit.

Kata kunci: keratitis berjangkit, Malaysia, trauma okular, *Pseudomonas aeruginosa*, Sarawak

Introduction

Infectious keratitis is caused by inflammation of the cornea from an infectious pathogen that usually results in corneal scarring. Infectious keratitis is an important preventable cause of corneal opacity leading to visual impairment and even blindness. Corneal opacities account for approximately 4% of blindness globally, ranking fourth on the list of main causes.[1] It has an annual incidence of 27.6 per 100,000 people in the USA and its trend is increasing.[2] It is a common yet clinically challenging condition, and ophthalmologists frequently face a dilemma when managing it. Severe infectious keratitis warrants hospital admission and intensive treatment, adding to the burden of health care costs. A good grasp of the epidemiology of the condition can often be useful in its management. Unfortunately, there have been no studies regarding infectious keratitis in the central zone of Sarawak to date.

Sibu is a major river port city in the central region of Sarawak, which is located in the tropical island of Borneo. It covers an area of 129.5 square kilometres. The climate in Sibu is classified as tropical, with an average temperature of 27°C and relative humidity. The region consists predominantly of alluvial plains and peat swamp forests.

This study aims to determine the demographic characteristics, predisposing factors, microbial profile, and final outcomes of patients with infectious keratitis in the central zone of Sarawak. Furthermore, it probed into the understanding of patients' attitude and health awareness.

Materials and methods

Sibu Hospital is the second largest government hospital in Sarawak, Malaysia. It serves as the tertiary referral centre for the central zone of Sarawak and provides medical services to a population of about 500,000, including suburban populations. Cases of infectious keratitis are managed by ophthalmologists in Sibu, but complicated cases are referred to Kuching or Kuala Lumpur for subsequent management. Nursing care is provided by experienced staff in the hospital and investigations such as corneal specimen culture and sensitivity are performed by a microbiological laboratory to assist in management.

This study was approved by the Malaysian National Institute of Health and was

registered in the National Medical Research Registry (NMRR-18-1621-42441). This is a retrospective descriptive study which targeted all patients treated for infectious keratitis in Sibu Hospital from January 2013 until May 2018. Patients came from Sibu and neighbouring areas such as Kapit, Dalat, Mukah, and Matu. Data were collected from medical and laboratory records.

Cases with missing medical records were excluded from this study. Data on demography, predisposing factors, presentation interval, admission, duration of hospital stay, clinical manifestation of infectious keratitis, biological specimen cultures and sensitivity, visual outcome, and management of the condition and its complications were collected and analysed.

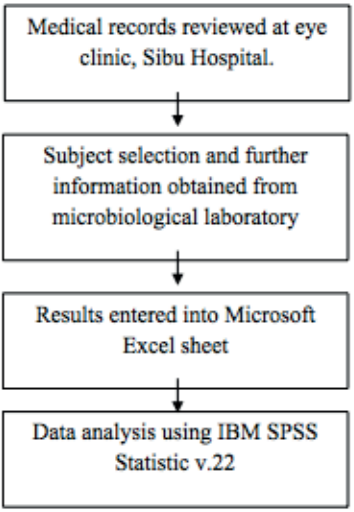

Fig. 1. Flow chart of the study.

Both descriptive analysis and specific tests were performed using IBM SPSS Statistic v.22. The Chi-square test was used to analyse the significance of association between two categorical data, whereas the Wilcoxon Signed Rank test was used to compare the ordinal data of a similar group. The Mann-Whitney test was performed to test associative factors with best-corrected visual acuity (BCVA) at diagnosis. A p-value of < 0.05 indicates statistical significance. A flow chart is shown in Figure 1.

Results

Sociodemographic

A total of 139 patients were enrolled in this study from January 2013 to May 2018. This study demonstrated that from the total of 143 eyes (cases) collected, 97.2% had unilateral eye involvement, whereas 2.8% (4 patients) had bilateral eye involvement. The mean age of cases was 47.39 ± 20.3 years, with a range of patients from 11 to 91 years old. The peak age group fell at 21-30 years of age (18.9%), whereas the least patients were in the 91-100 age group (1.4%), as shown in Figure 2. Eighty-eight cases (61.5%) were male and 55 (38.5%) were female, with a male-to-female ratio of 1.65:1.

Most of the cases were among local populations (98.6%), with Iban (40.6%) being the majority, followed by Chinese (25.9%), Melanau (16.8%), Malay (12.5%), and others (6.2%). A higher percentage of cases, 51.8%, were from rural areas, mainly Kapit, Dalat, and Daro, as compared to 48.2% from the urban area.

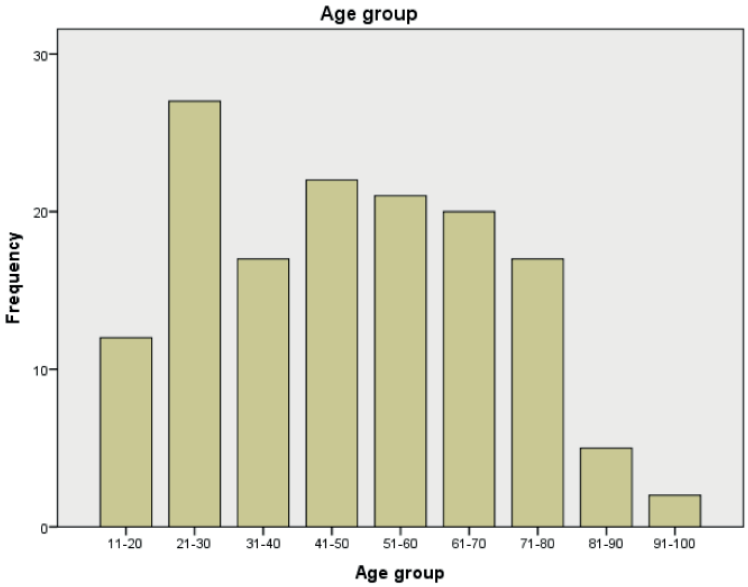

Fig. 2. Distributions of patients with infectious keratitis according to age group in Sibu Hospital.

Seventy-four cases (51.7%) were identified to have predisposing factors prior to the onset of infectious keratitis. The most common was a history of recent ocular trauma (55.4%), followed by contact lens wear (29.7%), recent eye surgery (13.5%) – most of which were related to cataract extraction –, and recent history of swimming in the river (1.4%).

The complete data regarding demographics and predisposing factors is shown in Table 1.

Clinical features

Among the 135 cases presented in the eye clinic, 44.4% came within 5 days of onset, whereas the remaining 55.6% came after 5 days. Sixty-four cases (44.7%) were hospitalized and, among these, 38 (59.4%) had prolonged hospitalisation, whereas 26 (40.6%) had a hospital stay of less than 7 days.

More than half, 57.6% had a large corneal epithelial defect (> 2mm). Of the cases, 78.8% involved a centrally localized, while only 21.2% involved the peripheral cornea. Approximately one-third (30.7%) had hypopyon. Recurrence of infectious keratitis was observed in 5.6% of cases.

BCVA was assessed upon diagnosis with Snellen chart and was subcategorized into good (better than 6/18), mild-to-moderate visual impairment (6/18 to 3/60), and severe visual impairment (worse than 3/60). Of the cases, 46.4% had severe

Table 1. Demographic characteristics and predisposing factors of cases with infectious keratitis in Sibu Hospital

Demographic characteristics	N
Age (years)	143
Age group (years)	143
11-20	12 (8.4%)
21-30	27 (18.9%)
31-40	17 (11.9%)
41-50	22 (15.4%)
51-60	21 (14.7%)
61-70	20 (14%)
71-80	17 (11.9%)
81-90	5 (3.5%)
91-100	2 (1.4%)
Gender	143
Male	88 (61.5%)
Female	55 (38.5%)
Ethnicity	143
Malay	18 (12.5%)
Chinese	37 (25.9%)
Iban	58(40.6%)
Melanau	24 (16.8%)
Others	6 (4.2%)
Nationality	143
Malaysian	141(98.6%)
Non-Malaysian	2 (1.4%)
Geographical area	139
Urban	67 (48.2%)
Rural	72 (51.8%)
Predisposing factors	74
Contact lens wear	22 (29.7%)
Recent trauma	41 (55.4%)
Recent eye surgery	10 (13.5%)
Recent swimming	1 (1.4%)

visual impairment upon diagnosis, followed by 31.9% with good visual acuity, and 21.7% with mild-to-moderate visual impairment. The complete data of clinical features and BCVA upon diagnosis, 1 month, and 3 months were tabulated in Table 2.

A total of 41 cases had recent ocular trauma prior to the development of infectious keratitis. Most common age groups were between 51-60 years and 61-70 years. Male patients were more commonly affected, accounting for 82.9%.

Table 2. Clinical features of infectious keratitis cases in Sibu Hospital

Clinical features	N
Presentation interval to Sibu Hospital eye clinic	135
5 days or less	60 (44.4%)
More than 5 days	75 (55.6%)
Duration of hospital stay	64
7 days or less	26 (40.6%)
More than 7 days (prolonged)	38 (59.4%)
Laterality	143
Right	67 (46.9%)
Left	76 (53.1%)
Size of keratitis	132
Small (< 2 mm)	56 (42.4%)
Large (> 2mm)	76 (57.6%)
Location	132
Peripheral	28 (21.2%)
Central	104 (78.8%)
Hypopyon	137
Present	42 (30.7%)
Absent	95 (69.3%)
Recurrence	142
Yes	8 (5.6%)
No	134 (94.4%)
BCVA upon diagnosis	138
Good (> 6/18)	44 (31.9%)
Mild-moderate impairment (< 6/18; ≥ 3/60)	30 (21.7%)
Severe impairment (< 3/60)	64 (46.4%)
BCVA after 1 month	123
Good (> 6/18)	54 (43.9 %)
Mild-moderate impairment (<6/18; ≥ 3/60)	26 (21.1%)
Severe impairment (< 3/60)	43 (35%)
BCVA after 3 months	82
Good (> 6/18)	30 (36.6%)
Mild-moderate impairment (< 6/18; ≥ 3/60)	18 (22%)
Severe impairment (< 3/60)	34 (41.5%)

BCVA: best corrected visual acuity

Patients who presented within 5 days of severe visual impairment upon diagnosis were shown to be statistically significant (Z-score -2.082, p = 0.037), as seen in Table 3. This may illustrate that patients in Sibu and neighbouring areas tend to only seek medical attention when their vision deteriorates severely. This study also showed statistical significance in regards to BCVA at time of diagnosis and keratitis that is located centrally (p = 0.000), of larger size (p = 0.000), and with the presence of hypopyon (p = 0.000).

There was no significant association between predisposing factors and BCVA at diagnosis of infectious keratitis (Table 4).

In this study, 32 cases (25.2%) with large infiltrate had hypopyon, whereas 10 cases (7.9%) with small infiltrate had hypopyon. There was a statistically significant association between the size of corneal infiltration and the presence of hypopyon, showing that larger corneal infiltration tends to be accompanied with hypopyon (N = 127, p = 0.001). On the other hand, 40 cases with centrally located infiltrate had hypopyon, while only 2 peripheral infiltrate cases had hypopyon. Hence, centrally located corneal infiltration had a higher association with presence of hypopyon (N = 127, p = 0.001).

There was a statistically significant visual improvement between the presenting BCVA and post-treatment BCVA at 1 month (N = 120, Z = -4.777, $p < 0.05$).

Investigations

Only 39 cases had a full blood count test and 33.3% of them had an elevated white cell count (> 12 x 10^3/uL). Among the 47 cases which were investigated for Gram staining of a corneal specimen, detection of Gram-negative and Gram-positive organisms was 12.8% and 10.6%, respectively. No organisms were detected in 59.6% of the cases, while 17% were not available due to an unsatisfactory smear. Details of the investigations are shown in Table 5.

Fifty-seven (63.1%) cases tested for corneal scraping culture and sensitivity revealed bacterial growth, while mixed growth and fungi contributed 1.8% each. *Pseudomonas aeruginosa* was the most common pathogen (22 cases, 57%), followed by *Streptococcus pneumoniae* (3 cases, 7%), coagulase-negative *Staphylococcus* sp. (2 cases, 5%), and *Staphylococcus aureus* (1 case, 2%). Other less common pathogens, such as *Acinetobacter* sp., *Aeromonas* spp., *Brevundimonas vesicularis, Cronobacter* sp., *Enterobacter* sp., *Moraxella* sp., *Serratia marcescens, Corynebacterium* sp., and *Fusarium* sp. were isolated. Only one case had mixed growth of *Streptococcus pneumonia* and *Enterobacter* sp.

Contact lens-related corneal ulcer

There were 22 cases of contact lens-related corneal ulcer (CLRCU). Most contact lenses, contact lens solutions, and casings were sent for culture and sensitivity to investigate microorganism growth. Twelve (54.5%) cases grew *Pseudomonas aeruginosa* and one grew *Staphylococcus aureus*.

Table 4. Association between BCVA at diagnosis and predisposing factors in infectious keratitis in Sibu Hospital

BCVA at Diagnosis		
	N	**p**
Presentation interval to Sibu Hospital eye clinic (N = 135)		
Within 5 days More than 5 days	60 (44.4%) 75 (55.6%)	0.037
Size of infiltrate (N = 128)		
Small (< 2mm) Large (> 2mm)	55 (43.0%) 73 (57.0%)	0.000
Location of infiltrate (N = 128)		
Central Peripheral	100 (78.1%) 28 (21.9%)	0.000
Hypopyon (N = 133)		
Present Absent	41 (30.8%) 92 (69.2%)	0.000

	Visual acuity, n (%)			**p**
	Good	**Mild-Moderate**	**Severe**	
Predisposing factors				0.773
Contact lens	6 (8.1%)	2 (2.7%)	14 (18.9)	
Recent ocular trauma	11 (14.9%)	10 (13.5%)	20 (27.0%)	
Recent ocular surgery	3 (4.1%)	2 (2.7%)	5(6.8%)	
Recent swimming	0 (1.6%)	0 (0%)	1 (0%)	

Table 5. Investigations performed on infectious keratitis cases in Sibu Hospital

Investigations	
White cell count	39
Elevated (> 12 x 103/uL) Within normal range	13 (33.3%) 26 (66.7%)
Gram stain of corneal scraping	47
Gram-positive organism Gram-negative organism No organism seen Unsatisfactory smear	5 (10.6%) 6 (12.8%) 28 (59.6%) 8 (17.0%)
Smear for KOH preparation	14
Positive Negative Contaminated	0 (0%) 13 (92.9%) 1 (7.1%)
Corneal scraping cultures	57
Bacteria Mixed growth Fungi Sterile	36 (63.1%) 1 (1.8%) 1(1.8%) 19 (33.3%)

potassium hydroxide

Management

Only 51 cases (36.4%) completed the full treatment course and 89 cases (63.6%) defaulted treatment or follow-up. Most cases were commenced on topical antibiotics (81.1%), 24.5% on topical antivirals, and 9.1% on antifungals.

Complications

Fifteen cases (10.5%) were identified to be complicated with a corneal perforation (Table 6). Amongst these, 7 cases proceeded with an evisceration, 6 cases (40%) underwent gluing bandage contact lens, and 1 case (6.67%) had a tarsorrhaphy. There was a patient in this study who refused any form of surgical intervention whom developed *phthisis bulbi* as a complication of infectious keratitis.

Discussion

Risk factors and causative agents for infectious keratitis may vary from time to time, depending on the climate, geography, and population of an area.[1] Low socioeconomic status and geographical location are other factors to consider. Patients with low socioeconomic status are more prone to malnutrition and poor hygiene.

Table 6. Complications and further management of infectious keratitis cases in Sibu Hospital

Complications and further management	N
Perforation	15 (10.5%)
Evisceration	7 (4.9%)
Gluing with bandaged contact lens	6 (4.2%);
Tarsorrhaphy	1 (0.7%)
Phthisis bulbi	1 (0.7%)

Delayed presentation for a medical consultation is more likely in this group of patients. Ravinder *et al.* evidenced this in 2016, reporting that 60% of the cases were of low socioeconomic status.[2] Without adequate infrastructure and road systems in rural areas, patients have difficulty seeking medical treatment as they must travel for hours or even days. This is usually commonly seen in developing countries. However, it is inconclusive in this study and this limitation may be reduced by having a larger sample size in future studies.

Ocular trauma, which comprised 27.6% of all cases, was a common cause of corneal ulcers in the younger population and in males.[1] A study by Dandona and Dandona showed similar findings.[3] Nonsurgical ocular trauma is the major predisposing factor in corneal ulcers in developing countries, 65.4%[4]. This was found to be consistent with our results that illustrated ocular trauma to be the most common factor, accounting for 55% of cases, of which patients were predominantly male (82.9%). However, a study done by Omar *et al.* in Malaysia found that the contact lens wear contributed to corneal ulcers more than other factors.[3] This is probably due to the fact that the aforementioned study involved an urban population, whereas our patients were mostly from suburban areas. Keshav *et al.* found that only a few patients developed corneal ulcer after surgery (8 of 1198).[5] There were only two foreigners involved in this study and both had corneal injury prior to the development of infectious keratitis. This is not consistent with the results by Ratnalingam *et al.* in 2017, who reported that most cases in East Malaysia were related to contact lens.[6]

Diabetes is shown to be a mild predisposing factor in other studies. It was reported that there was a low incidence of diabetes mellitus among similar cases.[4,7] This study showed that only 20 patients had diabetic mellitus, accounting for only 13.9% of the cases. Only two patients, who were on long-term steroid therapy, had infectious keratitis. This suggests that immunosuppression may contribute minimally to the occurrence of infectious keratitis.

Slightly more than half the cases (55.6%) in our study presented after 5 days of onset of symptoms; this is longer than the presenting time in two local studies, 4.67 days and 4.7 days in Omar *et al.* and Hooi and Hooi, respectively.[1,8] This delay can

probably be attributed to the difficulty faced by patients travelling to Sibu Hospital eye clinic as a result of underdeveloped infrastructure in Sarawak.

Of the cases, 57.6% had infectious keratitis with an infiltrate larger than 2 mm. This is comparable with the findings by Omar *et al.* and Kadir *et al.*, who reported 60.9% and 75.8%, respectively.[1,9] This may reveal that, in Malaysia, most cases presented at a more severe stage; this should alert health care providers to increase awareness regarding ocular health in the community. Hypopyon was observed more frequently in infectious keratitis with a large and central infiltrate; these results are consistent with two local studies.[1,8] Hence, the presence of hypopyon can be considered as an indicator for severity.

We found that there was no single predisposing factor that resulted in worse visual impairment upon diagnosis, which is consistent with another local study by Omar *et al.*[1] Therefore, the information on precedent risk factors could be helpful in educating the local population for preventing infectious keratitis, but not for predicting its impact on visual impairment.

Significant diversity of pathogens is implicated in infectious keratitis, and it is suggested that climate, environment, economy, and other risk factors contribute to the variations seen across nations.[4,10-13]

A Malaysian study on CLRCU shows that 84.6% of corneal scraping cultures grew *Pseudomonas aeruginosa*.[14] This is consistent with our results, which showed 59% of CLRCU grew the same bacteria. In developed countries, such as Australia, New Zealand, and the United Kingdom, as well as in developing countries, such as Brazil and Malaysia, studies have shown that *Pseudomonas aeruginosa* is a commonly isolated bacterium in corneal ulcers.[6,8,10,15,16] However, Gram-positive bacteria are more common according to studies in Canada, North America, Nepal, Paraguay, Europe, United Kingdom, United States, and New Zealand.[17-26] Other common bacteria include *Staphylococcus epidermidis, Staphylococcus aureus, Streptococcus pneumoniae, Acinetobacter baumannii*, and *Serratia marcescens*. Our study showed a wide range of isolated microorganisms, and less common pathogens were implicated.

Fungi were reported as a major cause of infectious keratitis in Asia, ultimately leading to blindness, accounting for 44% of central ulcers.[27] Two studies in India described fungi as the leading causative organism, at 26.4% to 34.4%.[28,29] Fungal keratitis is common in developing countries, especially in tropical countries.[11-13] Filamentous fungi, *e.g. Fusarium* sp. and *Aspergillus* spp., were found to be the most common fungi responsible for fungal keratitis.[4,6,12,13,28] However, in our study, only one patient was found to have fungal keratitis proven by culture, caused by *Fusarium* sp. Despite low detection of fungal infection in cultures, 13 cases (9.1%) were commenced on topical antifungals and 8 cases (5.6%) with systemic antifungals empirically due to severe corneal infiltration. Poor culture findings of fungi in our study can be attributed to poor corneal scraping technique leading to unsatisfactory samples.

Three patients, treated as keratitis caused by *Acanthamoeba* were treated with

topical propamidine, chlorhexidine, and covered with topical ciprofloxacin for months. Only one of them was contact lens-related. Two patients who completed treatment had severely impaired vision and achieved 6/9–6/12, while another patient, who presented late with impending perforation, ended with *phthisis bulbi*.

Empirical broad-spectrum treatment using dual therapy of gentamicin and second- or third-generation cephalosporin is the primary management.[5,30] Therapy can later be tailored to culture and sensitivity of corneal scraping and clinical response. Considering the significant diversity of implicated microorganisms, treatment guidelines are not applicable universally, but must be tailored to geographical location.[8] In Malaysia, most cases are started on ceftazidime and fortified gentamicin eyedrops.[8] Monotherapy using a fourth-generation fluoroquinolone for small peripheral ulcers is practised in some centres, including Sibu Hospital, but may not be as effective as the aforementioned therapy and may carry the risk of antibiotic resistance.[30,31]

Severe infectious keratitis may require surgical intervention such as penetrating keratoplasty. It is indicated in large corneal perforations or any perforations with persistent deterioration despite antibiotic therapy.[32] This is described in a study by Dandona *et al.* in 12.2% of cases that had penetrating keratoplasty. In contrast, small perforations can be managed with a glue adhesive to help restore the integrity of the anterior segment temporarily.[32] In our study, seven patients underwent evisceration, whereas six patients underwent gluing of the small perforation. No patients had penetrating keratoplasty. This is likely due to loss of data, as medical records were dispensed to patients referred for surgical interventions in ophthalmology centres with corneal transplantation services.

Our study did not show any statistically significant good visual outcome for any predisposing factors. This is different from the study by Hooi and Hooi showing that CLCRU have a better visual outcome compared to other predisposing factors.[8] Cases in our study generally had severe visual impairment at diagnosis (46.4%) and approximately 35% of cases remained severely visually impaired after a month of treatment. This is much higher than the results shown in a study done by Ismail *et al.*, which found that approximately 10% of cases remained blind after treatment, while 9.6% remained visually impaired. This can possibly be attributed to the lack of health awareness among the residents in our study population. Reluctant to seek medical attention, patients in suburban areas tend to get treatment only when their condition has become severe enough to cause poor vision. This explains why more patients in our study had poor vision at diagnosis as well as a poorer prognosis.

Infectious keratitis was complicated with corneal perforation in 10.5% of the cases in our study, a percentage similar to the one reported by Hooi and Hooi in 2005, who found that 12.9% of affected eyes were complicated with corneal perforation and were more commonly related to *Pseudomonas aeruginosa* infections[8]. Infection by pseudomonal organisms is rapid and can progress rapidly as they possess lytic enzymes. If left untreated, descemetocele forms within 2-5 days, leading to

perforation.[33] The same study showed that 1% of cases developed endophthalmitis related to *Citrobacter diversus*. Our study did not report any affected eyes with complicated endophthalmitis.

Conclusion

Ocular injury was identified as the primary risk factor for infective keratitis in this study, with *Pseudomonas aeruginosa* being the most common isolated pathogen. A proper understanding of the latest epidemiology and microbiological profile of infectious keratitis in the central zone of Sarawak is crucial in aiding the management of these cases in hopes of a better final visual outcome.

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Brief report

23-G trocar-assisted cyclopexy: scleral sparing method as a new modality for large cyclodialysis repair

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Abstract

Cyclodialysis cleft results from separation of longitudinal ciliary muscle fibres from the scleral spur. The separation increases the uveoscleral outflow, leading to severe hypotony. Complexity in managing such condition relies on the extent of the injury and its collateral damage. We reported an alternative method of surgical repair for large cyclodialysis. The procedure was less invasive utilizing a scleral sparing technique. A 66-year-old gentleman presented with severe blunt trauma injury to the globe secondary to shuttlecock injury while playing badminton. He presented with a vision of hand motion. There was hyphaema (filling up half of the anterior chamber), complete posterior dislocation of the crystalline lens, and minimal vitreous haemorrhage. Posterior globe rupture was excluded with further imaging of the orbit. Despite significant amount of hyphaema, intraocular pressure (IOP) remained low several days post injury. Further investigations revealed the presence of almost 270° of cyclodialysis. Surgical repair was indicated. In order to avoid an extensive cut on the sclera, the treating surgeon decided to explore a less invasive method utilizing a small gauge vitrectomy trocar. The main instruments used were the trocar, a straight prolene needle, and a bent 25-G needle. The direction of trocar insertion plays a pivotal role in bringing the detached ciliary body back to its original position. The simplified technique did not require the creation of a scleral flap or direct

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visualization of the ciliary body. The technique was fast and less invasive, with early improvement of IOP post intervention.

Keywords: hypotony, scleral sparing, traumatic cyclodialysis cleft

Siklopeksi dibantu trokar 23-G: kaedah tanpa melalui sklera sebagai modaliti baru untuk merawat siklodialis yang besar

Abstrak

Rekahan siklodialisis berlaku akibat pemisahan gentian otot ciliari membujur dari pangkal skleral. Pemisahan itu meningkatkan aliran keluar uveoscleral, yang membawa kepada hipotoni yang teruk. Kerumitan dalam menguruskan keadaan sedemikian bergantung pada tahap kecederaan dan kerosakan sekitarnya. Kami melaporkan kaedah alternatif pembedahan untuk siklodialisis yang besar. Prosedur itu kurang invasif menggunakan teknik tanpa melalui skleral. Seorang lelaki berusia 66 tahun yang mengalami kecederaan yang teruk pada mata semasa bermain badminton. Visual akuiti beliau ialah gerakan tangan. Terdapat hyphaema (mengisi separuh ruang anterior), dislokasi sepenuhnya kanta kristal kebahagian posterior, dan pendarahan vitreus yang minimum. Pengimejan orbit selanjutnya telah memastikan tiada pecah pada bahagian belakang mata. Walaupun pendarahan dalam ruang anterior adalah banyak, tekanan intraokular (IOP) kekal rendah beberapa hari selepas kecederaan. Siasatan lanjut sterusnya mendedahkan berlakunya hampir 270° siklodialisis. Pembedahan pembedahanadalah dipelukan. Untuk mengelakkan pemotongan besar pada sklera, pakar bedah yang merawat memutuskan untuk meneroka kaedah yang kurang invasif dengan menggunakan trocar vitrectomi kecil. Alat utama yang digunakan ialah trokar, jarum prolene lurus, dan jarum 25-G yang bengkok. Arah penyisipan trokar memainkan peranan penting dalam membawa kembali jasad siliari yang terpisah ke kedudukan asalnya. Teknik mudah ini tidak memerlukan penciptaan flap skleral atau visualisasi langsung jasad ciliari. Teknik ini cepat dan kurang invasif, dengan penambahbaikan awal IOP selepas prosedur.

Kata kunci: hypotonik, scleral, rekahan siklodialisis akibat trauma

Introduction

We report a case of extensive cyclodialysis due to blunt trauma that was treated successfully with surgical cyclopexy. In this case report, we share the optional technique of ciliary body suturing without the need to perform a scleral cut down, which has not been described previously.

Case presentation

A 66-year-old man suffered a shuttlecock injury over the right eye while playing badminton. He presented immediately to the eye clinic with visual acuity (VA) of counting fingers in the right eye (OD). He sustained traumatic mydriasis with hyphaema (Fig. 1). Reverse relative afferent pupillary defect (RAPD) was negative. There was a small conjunctival laceration with localized subconjunctival haemorrhage. Vitreous was present in the anterior chamber (AC) touching the inferior half of the corneal endothelium. His lens was completely dislocated posteriorly into the vitreous with concurrent vitreous haemorrhage. He had ocular hypotony OD with intraocular pressure (IOP) of 3 mmHg. Gonioscopic examination revealed a cyclodialysis cleft in the 1–5 o'clock position. View was limited due to the presence of a blood clot in the AC angle. Despite the presence of hyphema, his IOP remained very low for a few days after the injury. Anterior segment optical coherence tomography (AS-OCT) and ultrasound biomicroscopy (UBM) revealed almost 270° of cyclodialysis sparing only the 10-11 o'clock area (Fig. 2). Apart from the posteriorly dislocated crystalline lens and vitreous haemorrhage, gentle B scan did not reveal any retinal elevation or posterior globe rupture. Computer tomography scan of the orbit was also suggestive of an intact globe with no orbital injury.

Since there was no evidence of retinal detachment and the posterior condition was not in need of urgent intervention, the treating surgeon chose to normalise the IOP before posterior segment intervention by doing a two-staged surgery. The first surgery was aimed at stabilising IOP by repairing the cyclodialysis. Anterior vitrectomy with 23-G trocar-assisted cyclopexy was performed under general anaesthesia. Some amount of viscoelastic was left *in situ* to avoid early postoperative ocular hypotony. At day 1 post-operation, his IOP improved to 16 mmHg and remained stable up until three weeks post-operation. Repeated AS-OCT showed reattachment of the ciliary body to the sclera (Figs. 3 and 4). Finally, the patient underwent a second procedure to remove the vitreous haemorrhage and dislocated lens, placing an encircling buckle for retinal dialysis as well as implanting a sutureless, scleral-fixated intraocular lens (IOL). His visual acuity improved to 6/18 postoperatively.

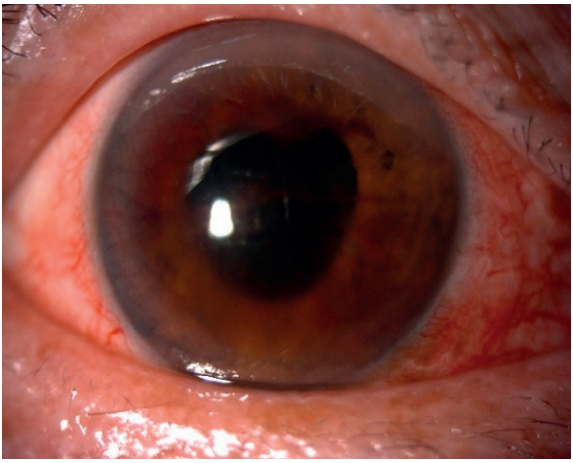

Fig. 1. Anterior segment photo OD shows vitreous and blood clots in the AC with absence of lens (dislocated posteriorly).

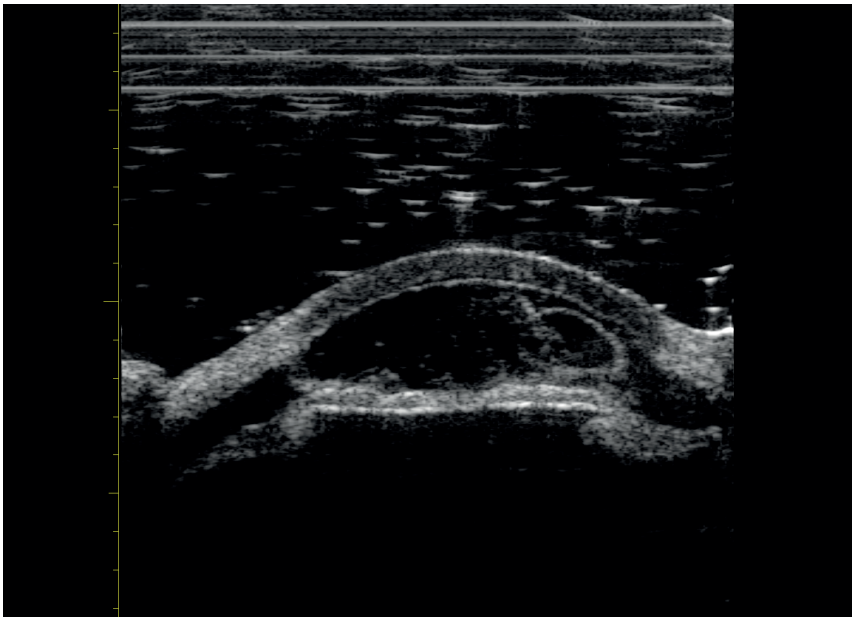

Fig. 2. UBM OD shows large cyclodialysis cleft.

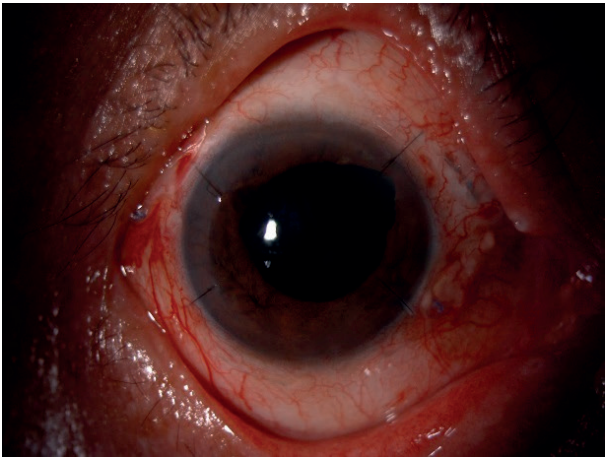

Fig. 3. Anterior segment photo OD after cyclodialysis repair with aphakia.

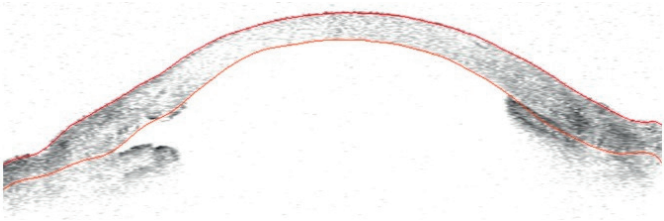

Fig. 4. AS-OCT OD shows reattachment of ciliary body to sclera after cyclopexy.

Surgical technique of scleral-sparing cyclopexy

The surgery was performed under general anaesthesia; the surgical technique is shown in Figures 5 and 6. Multiple points of entry into the AC were made at the 1, 5, 7, and 11 o'clock positions (opposite to the area of the intended cyclodialysis repair). An AC maintainer was used throughout the surgery. Triamcinolone-assisted anterior vitrectomy was performed at the beginning of the surgery to remove the prolapsed vitreous.

Limited conjunctival peritomy was performed in three quadrants of the eye (corresponding to the cyclodialysis cleft area). A 23-G trocar was used for the repair. The direction of the trocar insertion was not performed in the traditional way of placing a port for posterior vitrectomy, in which the entry point is supposed to be 3-4 mm behind the limbus and traversing the sclera parallel to the limbus before complete entry into the vitreous. Instead, the trocar was inserted closer to the limbus; 1mm from the limbus as the entry point then passed inside the sclera 3-4 mm posteriorly and later directly entered the eye at the *pars plana* area as the exit point.

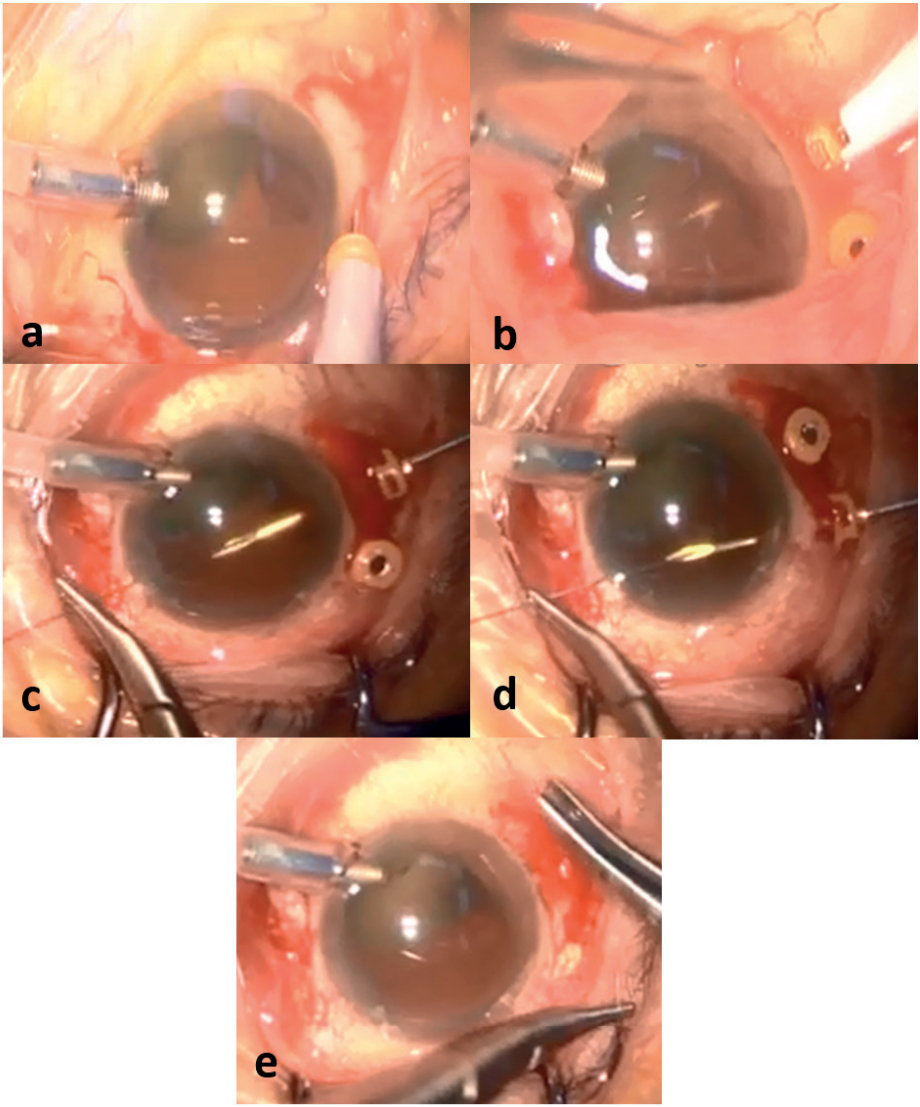

Fig. 5. Intraoperative photos of the of scleral-sparing cyclopexy surgical technique. A pair of trocars inserted 1 mm behind the limbus directed posteriorly (*a*, *b*); double-ended prolene suture treadled through trocars (*c*, *d*); and mattress suture to reattach the ciliary body (*e*).

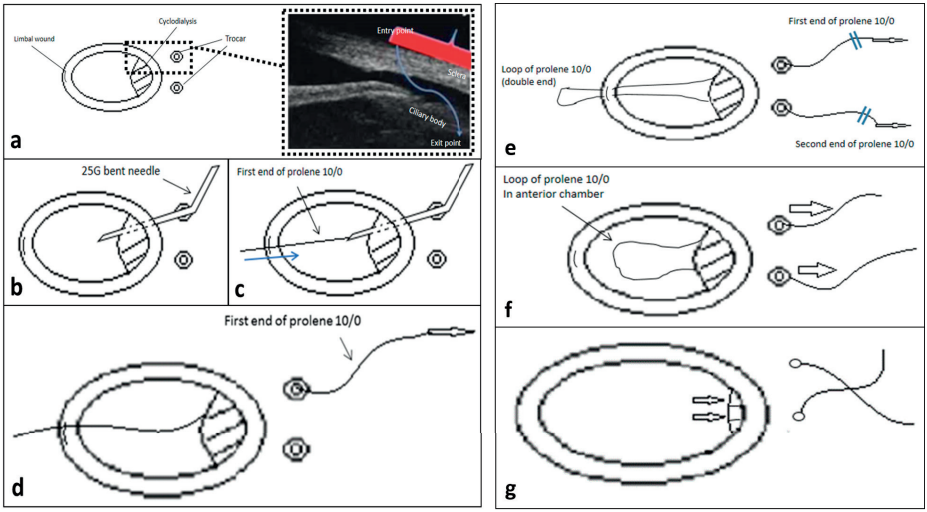

Fig. 6. Schematic diagrams of the scleral-sparing cyclopexy surgical technique. (*a*) Limited conjunctival peritomy was performed, followed by placement of a trocar at the area of intervention. A small limbal wound was created opposite to the area of interest. This limbal wound was used as the entry point for the double-ended prolene suture. The trocar was inserted 1 mm behind the limbus (entry point) and directed posteriorly, passing along the sclera for at least 3-4 mm before a direct entry point into the vitreous cavity was made (exit point of the trocar inside the vitreous cavity). (*b*) A 25-G needle was bent at 45°. The bent needle was then inserted through the trocar passing through the cyclodialysis area. (*c*) The double-ended 10/0 prolene suture (straight needle) was passed through the limbal wound and the tip of the prolene needle was partially inserted into the 25-G bent needle. (*d, e*) The prolene suture was externalised by pulling out the bent 25-G needle, known as the handshake technique. (*f*) Once both ends of the prolene sutures were externalised, the preplaced trocars were removed, leaving only the prolene sutures in place. The ends of the sutures were tied together. Tightening of both sutures then retracted the detached ciliary body back to its original position. The knot was buried into the scleral pocket that was created during the initial insertion of the trocar.

A second trocar was placed 1 o'clock hour away from the first trocar and inserted using the same direction as the first trocar. A straight, double-ended prolene 10/0 suture was used, with one end treadled through the first trocar from the opposite paracentesis wound, followed by another end of the suture treadled through the second trocar. The trocars were then removed and both suture ends were tied together. This manoeuvre automatically reapposed the detached ciliary body onto the sclera in posterior-anterior direction. Suture knots were buried into the scleral pocket that had been created by the longitudinal scleral entry of the initial trocar. The same steps were repeated in other quadrants. Using this technique, a wider area of cyclopexy was made without the need to create a partial scleral-thickness flap and completely avoiding the risk of bleeding while suturing the ciliary body into place. Cryotherapy was also performed in between the suture side.

Cryotherapy has been previously described for the repair of small cyclodialysis. Therefore, in our case, cryotherapy alone would not have been the best option. Hence, we combined intermittent suturing and cryotherapy to secure the large area of cilliary body detachment.

Discussion

Extensive cyclodialysis clefts are rare. They should be considered as one of the causes for persistent hypotony after trauma or surgery. Slit-lamp examination using a gonioscope is the most common method to detect the condition.[1] However, with the presence of hyphaema, gonioscopy might not be the best option. AS-OCT and UBM, which are noninvasive, provide a high-resolution image of the cyclodialysis. Both imaging methods provide accurate and reproducible images of the anterior segment,[2] not only helping to identify the condition, but also the extent of damage. The exact disinsertion point can be clearly identified using these two methods. AS-OCT produces high-resolution images with limited depth of penetration, whereas UBM allows deeper penetration of the anterior segment structures, even with presence of hyphema or corneal opacity. In our case, both methods were able to assist us in making the diagnosis as well as monitoring the resolution of the detached space postsurgery.

Cyclodialysis clefts cause persistent hypotony, corneal oedema, shallowing of the AC, refractive changes, cataract, choroidal effusion or detachment, retinal and choroidal folding, optic disc swelling, and maculopathy.[3]

The management of ciliary body detachment depends on the severity and associated intraocular abnormalities. Small clefts can be managed by medical therapy *e.g.* cycloplegic drugs. These medications cause relaxation of the ciliary muscle tone and dilatation of the ciliary body ring, thus opposing the detached muscle fibres to the sclera.[4] If medical therapy by itself fails to close a cyclodialysis cleft, argon laser can be applied deep in the cleft, first to the sclera and then to

the exposed ciliary muscle as well as to peripheral iris. Laser therapy functions by inducing local inflammation and seals the cleft by promoting adhesion between the choroid and sclera.[5] Cryotherapy to the sclera is another noninvasive procedure to treat small cyclodialysis clefts with limited success rate.[6]

Clefts that respond poorly to nonsurgical treatment should be identified early and treated appropriately with feasible surgical strategies.[7] Direct cycloplexy, which was previously described as being the gold standard for treatment of large clefts, involves creation of a limbal-based, partial-thickness scleral flap, followed by a stab incision over the area of cyclodialysis to incarcerate the iris, and subsequently, cryotherapy.[8] Alternatively, some surgeons reported the technique of direct ciliary body suturing under the partial-thickness scleral flap to attach the cleft.[9] Various reported techniques have their own limitations, such as severe intraoperative hypotony, damage to vascular structures with bleeding, disrupted filtering bleb function after trabeculectomy, and long recovery periods after surgery.[10]

Another reported surgical option is to combine vitrectomy and endophotocoagulation with silicone oil endotamponade (VEE).[11] However, the intraocular surgery potentially leads to cataract, postoperative IOP spikes, and other tamponade-related complications.[11] Cyclodialysis cleft repair can also be done by phacoemulsification combined with internal tamponade using modified capsular tension ring insertion (MCTR). It was postulated that the contact between the eyelets of the MCTR and the iridial posterior surface may lead to uveitis and IOP spikes.[12]

In our case, we describe a 23-G trocar-assisted cyclopexy technique. This method was chosen in view of multiple coexisting intraocular injuries. Minimising the complexity of surgery allows a shorter recovery time and reduces the likeliness of having long-term sequelae. Apart from sparing the sclera, the technique described reduces the chances of bleeding, infection, and intraoperative hypotony, and also results in less scarring over the conjunctiva. The technique we describe also allows early improvement of IOP with less complex surgery for large cyclodialysis repair.

Conclusion

Trocar-assisted ciliary body suturing could be one of the surgical approaches for large cyclodialysis repair. Potentially, this technique is less traumatizing to the eye and provides a broader area of treatment.

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Case report/Case series

Cap-puncturing mechanism for ophthalmic postoperative antibiotic eye drops: friend or foe?

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Abstract

A retrospective case series to highlight two cases of postoperative endophthalmitis, in which similar improper technique of puncturing the antibiotic bottle with a nonsterile needle was noted.

Patient A, a 65-year-old man with three weeks' history of uneventful combined cataract and *pars plana* vitrectomy (PPV) presented with acute painful right eye and vision blurring from 6/12 to 1/60 for two days. Examination showed severe anterior chamber activity and hazy fundal view. B-scan showed dense vitritis. Vitreous sampling revealed gram positive cocci, but no culture growth. Patient B, a 69-year-old man presented with three days' history of right painful red eye and vision dropped to light perception following an uneventful cataract surgery. Examination showed severe anterior chamber activity with hypopyon, raised intraocular pressure, and no fundal view. B-scan detected dense vitritis with loculation. Vitreous sampling cultured *Pseudomonas aeruginosa* in Patient B. In both cases, the patients reported piercing the generic topical ciprofloxacin 0.3% bottle tip with a nonsterile needle instead of the prescribed method of using the sterile, inner aspect of the bottle cap. However, the cultures of the bottle contents were negative in both cases. Both patients received intravitreal, topical, and systemic antibiotics and subsequently underwent PPV. Patient A recovered vision

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to baseline, while Patient B recovered to counting finger vision.

In conclusion, the cap-puncturing mechanism for eye drop bottles is designed to maintain the sterility of the contents. However, this may backfire when patients do not understand the prescribed technique. We postulate that this improper technique predisposed the two cases to endophthalmitis. Measures to overcome this include a detailed explanation alongside a demonstration or immediate instillation from a new bottle opened in theatre, which the patient then takes home after the surgery.

Keywords: cap puncture with needle, contaminated eyedrops, postoperative care, postoperative infective endophthalmitis

Mekanisme teknik tusukan hujung ubat titis antibiotik mata untuk pesakit selepas pembedahan; selamat atau tidak?

Abstrak

Siri kes retrospektif untuk menyerlahkan dua kes endoftalmitis selepas pembedahan mata, di mana teknik tusukan muncung botol antibiotik yang tidak sepatutnya digunakan iaitu dengan menggunakan jarum tidak steril.

Pesakit A, seorang lelaki berusia 65 tahun yang telah menjalani pembedahan gabungan katarak dan vitrektomi *pars plana* (TPPV) tiga minggu sebelumnya datang dengan gejala sakit berserta penglihatan kabur akut dari 6/12 menjadi 1/60 dalam masa dua hari. Pemeriksaan menunjukkan keradangan ruang anterior yang teruk dan pandangan fundus yang sangat kabur. B-scan menunjukkan vitritis padat. Sampel vitreous mendedahkan cocci gram positif, tetapi tiada pertumbuhan pada media kultur. Pesakit B, seorang lelaki berusia 69 tahun yang telah mejalani pembedahan katarak yang lancar sebelumnya mengalami gejala mata merah dan kabur penglihatan yang drastik iaitu hanya melihat cahaya (PL). Pemeriksaan menunjukkan radang aktiviti ruang anterior sangat teruk dengan hypopyon, peningkatan tekanan intraokular, dan tidak ada penglihatan untuk fundus.B-scan mengesan vitritis padat berserta lokulasi. *Pseudomonas aeruginosa* ditemui dalam Pesakit B. Dalam kedua-dua kes, pesakit melaporkan menusuk hujung muncung botol ciprofloxacin topikal generik 0.3% dengan jarum tidak steril dan bukannya dengan kaedah yang ditetapkan menggunakan teknik steril iaitu sepatutnya menggunakan hujung khas yang disediakan pada penutup botol. Walau bagaimanapun, kultur pertumbuhan organisma kandungan botol adalah negatif dalam kedua-dua kes. Kedua-dua pesakit menerima antibiotik intravitreal, topikal,

dan sistemik dan seterusnya menjalani PPV. Pesakit A penglihatan yang pulih ke tahap sebelumnya, manakala Pesakit B hanya pulih sedikit ke tahap penglihatan kiraan jari.

Sebagai kesimpulan, mekanisme tusukan pada muncung botol titis mata direka untuk mengekalkan tahap steril kandungan. Walau bagaimanapun, ini mungkin menjadi satu masalah apabila pesakit tidak memahami teknik yang ditetapkan. Kami berpendapat bahawa teknik yang tidak betul ini telah menyumbang kepada dua kes endophthalmitis ini. Langkah-langkah untuk mengatasi masalah ini termasuk penjelasan terperinci bersama demonstrasi atau instilasi segera dari botol baru yang dibuka di teater, yang kemudiannya dibawa pulang selepas pembedahan.

Kata kunci: endoftalmitis, jangkitan kuman pasca-pembedahan, penjagaan pasca-pembedahan, tusukan penutup botol dengan jarum, ubas titis yang tercemar

Introduction

Postoperative infective endophthalmitis is a potentially vision-threatening complication and is the most devastating ocular infection. Prophylactic usage of topical antibiotic is aimed at preventing this feared complication of ophthalmic surgery.[1]

Some eye drop bottles are manufactured with a cap-puncturing mechanism to maintain the sterility of the bottle before the first instillation.[2] Piercing the bottle tip with a nonsterile instrument not fit for purpose may lead to contamination of the bottle.

Purpose

The purpose is to highlight two cases of postoperative infective endophthalmitis, in which a similar improper technique of puncturing the antibiotic bottle with a nonsterile needle was noted.

Methods

Retrospective case series.

Cases

Patient A, a 65-year-old man with underlying hypertension, dyslipidaemia, and ischaemic heart disease with no known diabetes, presented to eye clinic three weeks

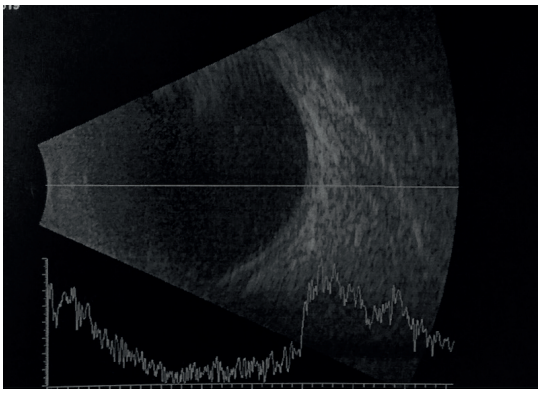

Fig. 1. B-scan of Patient A showed dense vitritis.

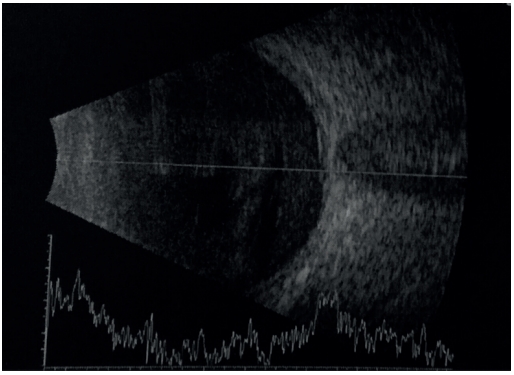

Fig. 2. B-scan of Patient B showed dense vitreous opacities with loculations.

after an uneventful combined cataract and *pars plana* vitrectomy (PPV) for epiretinal membrane removal for his right eye. The patient had been using topical dexamethasone 0.1% every 2 hours and generic topical ciprofloxacin 0.3% every 2 hours postoperatively in the right eye. Preoperative best corrected visual acuity (BCVA) was 6/24, which improved to 6/12 post-operatively. He presented with acute pain, redness, and poor vision for two days in the right eye, recorded at 1/60. Ophthalmic examination revealed a reactive pupil without relative afferent pupillary defect (RAPD), injected conjunctiva, and severe anterior chamber activity, but absence of hypopyon. Posterior segment view was hazy and there was dense vitritis, but no obvious loculation on B-scan (Fig. 1). Acute postoperative infective endophthalmitis was diagnosed and treatment with intravitreal injection of vancomycin 2 mg/0.1 ml and ceftazidime 2 mg/0.1 ml was administered immediately after vitreous sampling. The patient also received intensive instillation of topical antibiotics (gentamicin 0.9% and ceftazidime 5%) and oral ciprofloxacin 750mg twice daily. Vitreous

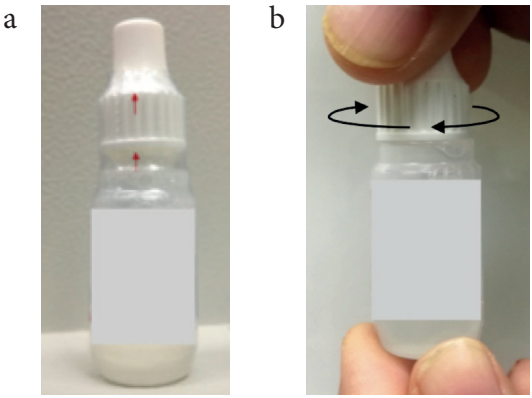

Fig. 3. (*a*) Unopened, new bottle with the cap positioned at a specific distance from the nozzle. (*b*) Method of tightening the cap on the nozzle to pierce the bottle tip before instillation of the eye drops.

sampling revealed gram positive cocci, but there was no culture growth. There was no improvement after 48 hours and the patient subsequently underwent PPV with repeated intravitreal antibiotics injection. Postsurgery, the condition improved, and he recovered to baseline BCVA.

Patient B, a 69-year-old man with underlying hypertension, presented three days after an uneventful right cataract surgery with a painful, red eye and only light perception vision in his right eye. The patient had been using topical dexamethasone 0.1% every 2 hours and generic topical ciprofloxacin 0.3% every 2 hours post-operatively on the right eye. Pupil light reaction was brisk without a RAPD. There was conjunctival and scleral injection with oedematous cornea. The anterior chamber showed severe inflammation with hypopyon, and intraocular pressure was elevated at 35 mmHg. Posterior segment examination revealed no fundal view and B-scan revealed dense vitreous opacities with loculations (Fig. 2). The patient was treated as acute postoperative infective endophthalmitis with standard management, similar to Patient A. He received intravitreal vancomycin 2 mg/0.1 ml and ceftazidime 2 mg/0.1 ml immediately after vitreous sampling, intensive topical gentamicin 0.9% and ceftazidime 5%, and oral ciprofloxacin 750 mg twice daily. *Pseudomonas aeruginosa* was isolated from the vitreous culture and the patient subsequently underwent PPV. The intraocular inflammation resolved postvitrectomy, but visual recovery was limited to counting fingers.

In both cases, the patients reported piercing the generic topical ciprofloxacin 0.3% bottle tip with a nonsterile needle because they were otherwise unable to get the eye drops out of the bottle. This was despite the bottles having been dispensed with written instructions on how to puncture the bottle with the inner aspect of the cap. Both cases occurred just two months apart.

On both occasions, the cases were subsequently reported to the National Eye

Database endophthalmitis notification system, hospital operative theatre administration team, and adverse drug reaction notification system. Investigations were carried out, including culture of the contents of the postoperative eye drops. There was no evidence of cluster endophthalmitis, nor contamination of the batch of eye drops or operation theatre. The occurrence of this rare complication of ocular surgery also prompted a review of patient counselling by the Pharmacy department staff dispensing the medication.

Discussion

There are a number of limitations in our report. First, the two cases did not undergo the same procedure, as one case was as cataract surgery and the other was a combination of cataract and vitrectomy surgery. Cataract and vitrectomy surgery have different risks for endophthalmitis. However, in both cases the cataract surgery resulted in a corneal wound. This meant that Patient A had an increased risk for endophthalmitis, similar to Patient B, compared to a patient undergoing routine PPV alone.

Secondly, vitreous taps suggested different organisms in each case, but bottle cultures were negative in both. A similar organism to the tap could not be demonstrated in either case, which would have strongly suggested a link with the incorrect cap puncturing technique. However, they each received the same perioperative antibiotic and admitted to using non-sterile objects to puncture the bottle caps. We postulate that the antibiotic bottles were contaminated by the nonsterile needle, particularly the bottle tips. The bottle tips were not tested separately in these cases and might have been able to yield the organism.

The aim of perioperative antibiotic prophylaxis is to lower the risk of endophthalmitis after surgery.[1] However, instillation of contaminated eye drops in postoperative cases may lead to adverse effects. The cap-puncturing mechanism for eye drop bottles is designed with an in-built self-piercing mechanism incorporated to ensure sterility of the bottle content up until the first instillation. Before opening the bottle for the first time, the user is required to tighten the cap on the nozzle by turning it clockwise to allow the spike located on the underside of the cap to pierce the tip of the bottle (Fig. 3a and 3b).[2] However, this may backfire when patients do not understand this mechanism despite written instructions and explanatory diagrams, resulting in inadvertent potential contamination of contents[3] due to puncturing of the bottle tip in a non-sterile manner. We are postulating that this improper and risky cap-puncturing technique may have subsequently led to a very rare infection, namely endophthalmitis, as illustrated in these two cases. The only common risk factor found in these two patients was this incorrect technique. Previous studies have found that bottle tips are more often contaminated than the bottle content,[4] which may explain the negative culture of the bottle contents in these two cases

when the whole bottles were sent for the tests. A number of articles on postoperative endophthalmitis secondary to various types of contaminated eye drops or solutions have been described previously,[5,6] but none were related to the cap-puncturing mechanism as in these cases.

Our aim in reporting the two cases is to highlight that the cap-puncturing mechanism for eye drops may be used incorrectly by patients, resulting in increased risk for potentially serious and blinding postoperative infections. To mitigate this risk, we would like to suggest implementing measures to overcome this bottle-related contamination, which includes a detailed explanation alongside a demonstration of the proper cap-puncturing technique or instillation from the new bottle by medical staff immediately after operation, which the patient then takes home after surgery. This will help to avoid misunderstandings and improper cap-puncturing technique due to the patient's inability to understand even written instructions. Prevention is definitely better than cure, as both patients eventually required another operation, namely PPV, and Patient B went on to have a poor visual outcome.

Conclusion

An incorrect cap-puncturing method of the postoperative antibiotic bottle was the common risk factor found in two patients with postoperative endophthalmitis, which may have predisposed them to this sight-threatening postoperative complication.

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Case report/Case series

An atypical presentation of ANCA-associated retinal vasculitis in a young Malay woman

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Abstract

We describe a case of antineutrophil cytoplasmic antibody (ANCA)-associated retinal vasculitis in a 21-year-old previously healthy Malay woman, who presented to us with complaints of sudden painless loss of vision in her left eye. Her vision upon presentation was counting fingers and her fundus examination showed retinal vasculitis and ischemic changes. Fundus fluorescein angiography showed leakage from the vasculitic retinal vessels, resulting in macular oedema. All investigations were normal, except that a full blood test showed eosinophilia and an autoimmune screening revealed positive perinuclear staining-ANCA, which led us to diagnose ANCA-associated retinal vasculitis. The patient was comanaged with the rheumatology team. She was started on a high-dose intravenous steroid followed by a tapering dose of an oral steroid. Improvement was noted from the resolution of macular oedema evident on optical coherence tomography of the macula. However, vision remained poor and unchanged.

Keywords: autoimmune diseases, antineutrophil cytoplasmic antibody (ANCA), retinal vasculitis

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Gejala vaskulitik retina berkait ANCA yang tidak tipikal dalam pesakit wanita muda berbangsa Melayu

Abstrak

Kami menghuraikan satu kes antibodi antineutrofil sitoplasmik (ANCA) yang berkaitan dengan vaskulitik retina pada wanita Melayu yang berusia 21 tahun yang mengadu kehilangan penglihatan tanpa sakit di mata kirinya. Penglihatan beliau semasa mula mendapat gejala ialah kiraan jari (Counting Finger)dan pemeriksaan fundusnya menunjukkan vaskulitik retina dan perubahan iskemia. Angiografi fluoresen fundus menunjukkan kebocoran dari keradangan salur darah retina, menyebabkan bengkak pada makular. Semua penyiasatan adalah normal, kecuali ujian darah menunjukkan eosinofilia dan pemeriksaan autoimun mendedahkan positif perinuklear positif-ANCA, yang menyokong diagnosis vasculitik retina yang berkaitan dengan ANCA. Pesakit turut dirawat bersama dengan pasukan reumatologi. Rawatan bermula dengan steroid intravena dos yang tinggi diikuti dengan dos pengurangan berkala ubat steroid oral. Proses penyembuhan dapat diperhatikan dari pengurangan bengkakan pada makula yang jelas pada tomografi koheren optik makula (OCT macular). Walaubagaimanapun, penglihatan kekal teruk, tidak berubah.

Kata kunci: antibodi antineutrofil sitoplasmik (ANCA), penyakit autoimun, vasculitik retina

Introduction

Antineutrophil cytoplasmic antibody (ANCA) is a serological marker for the diagnosis of a group of small vessel pauci-immune vasculitis, also known as ANCA-associated vasculitis (AAV).[1] It is a rare cause of autoimmune retinal vasculitis, mainly affecting Caucasians in the older age group. This case report highlights a rare case of AAV which includes Asian ethnicity, young age, and presentation of retinal vasculitis without systemic involvement.

Methods

Case report.

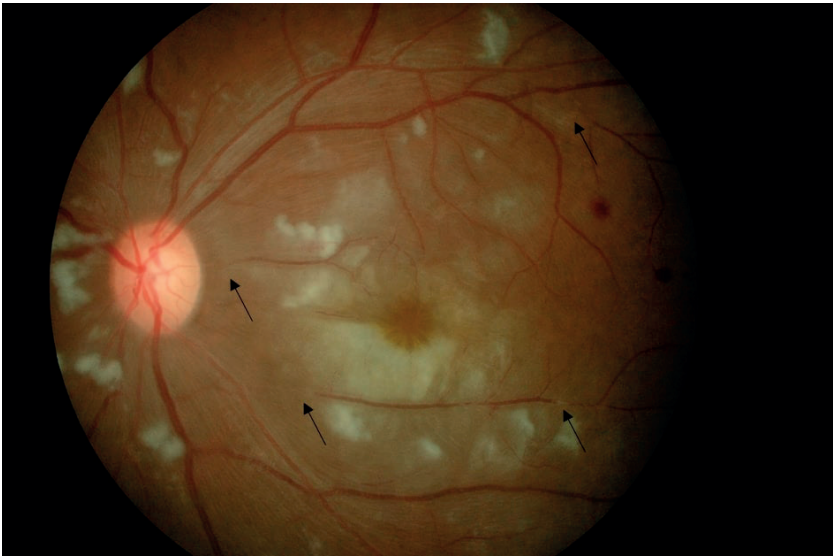

Fig. 1. Left fundus showed multiple cotton wool spots at the macular area and surrounding the nasal portion of the optic disc, with occlusion of both the superior and inferior arcade of the retinal arterioles (*black arrows*), as well as multiple retinal haemorrhages in the superotemporal retina.

Results

A 21-year-old healthy Malay woman presented with sudden onset of painless central scotoma on the left eye for one week. On presentation, her visual acuity was counting fingers in the left eye and 20/20 in the right eye. Anterior segment examination of the left eye was unremarkable. The posterior segment examination revealed moderate anterior vitreous cells. The retina showed cotton wool spots in the macular area and surrounding the optic disc (Fig 1). The retinal arteriole of both the superior and inferior arcade appeared to be occluded, with presence of blot retinal haemorrhages at the superotemporal retina. The macula was swollen, but the optic disc appeared normal. Examination of the right eye was normal. Systemic examinations did not reveal any signs of cardiovascular, pulmonary, or renal abnormalities.

The optical coherence tomography (OCT) of the left macula showed presence of intraretinal and subretinal fluid (Fig. 2). Fundus fluorescein angiography (FFA) of the left eye showed vasculitic changes, with leakage of superior and inferior macular vessels and capillary nonperfusion in the inferior macula and temporal retina (Fig. 3).

Blood autoimmune screening showed raised perinuclear staining ANCA (P-ANCA) levels of 1:20. Other autoimmune screenings including diffuse cytoplasmic ANCA

(C-ANCA), extractable nuclear antigen (ENA) antibodies, antinuclear antibody (ANA), and antidouble stranded-deoxyribonucleic acid (ds-DNA), complement (C) factor C3 and C4, lupus anticoagulant, and anticardiolipin antibody were all normal. Her full blood count showed eosinophilia, as the differential count for eosinophils from the full blood count was 5.5 x 10^8/L. This was confirmed by peripheral blood film, which also showed eosinophilia. Other blood investigations for renal profile, liver function test, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) were all normal. Additionally, the Mantoux test was negative, with normal chest radiography findings. Blood tests for *Treponema pallidum* haemagglutination (TPHA), as well as serology for toxoplasmosis and herpes were also negative. As P-ANCA and eosinophilia were positive, further pulmonary and cardiovascular assessments were performed to rule out the diagnosis of Churg-Strauss syndrome. However, both chest radiography and echocardiography were normal, with no signs of congestive heart failure or pulmonary failure.

The patient was diagnosed to have AAV and she was comanaged together with the rheumatology team. Treatment was initiated with intravenous methylprednisolone 1 gm per day for 3 days, followed by oral prednisolone 1 mg/kg/day. It was tapered by 5 mg every week for 6 weeks and maintained at 10 mg per day.

At month 3 of follow-up, visual acuity in her left eye remained as counting fingers. The fundus examination showed similar ischemic vasculitic changes. Repeated OCT of the left macula showed complete resolution of intraretinal and subretinal fluid. However, there was loss of hyper-reflectivity of the contour of the macular layers and atrophic changes of the photoreceptor and retinal pigment epithelium layers.

Discussion

ANCA is an autoantibody with a specific preference for neutrophil granules and monocyte lysosomes. ANCA is strongly related to systemic vasculitis. There are two main recognisable patterns of ANCA based on the staining properties on the neutrophils, namely, C-ANCA and P-ANCA.[1] C-ANCA is commonly positive in patients with Wegener's granulomatosis (WG), while P-ANCA is more commonly seen in patients with microscopic polyangiitis (MPA) and Churg-Strauss syndrome (CSS).[2]

The incidence of WG is the highest among the three syndromes and constitutes half of the disease population.[3] The incidence of WG is higher in northern Europe compared to MPA, which is more commonly seen in southern Europe and Japan. In terms of ethnicity, the disease occurs predominantly among Caucasians. Despite a known presentation onset in the range of 65-74 years of age, it can, however, occur at any age. Although there is higher prevalence among men, women tend to be diagnosed at a younger age.[4] To date, no studies on the prevalence of AAV in Southeast Asia have been published.

AAV is a multisystemic disease with various systemic presentations. From the

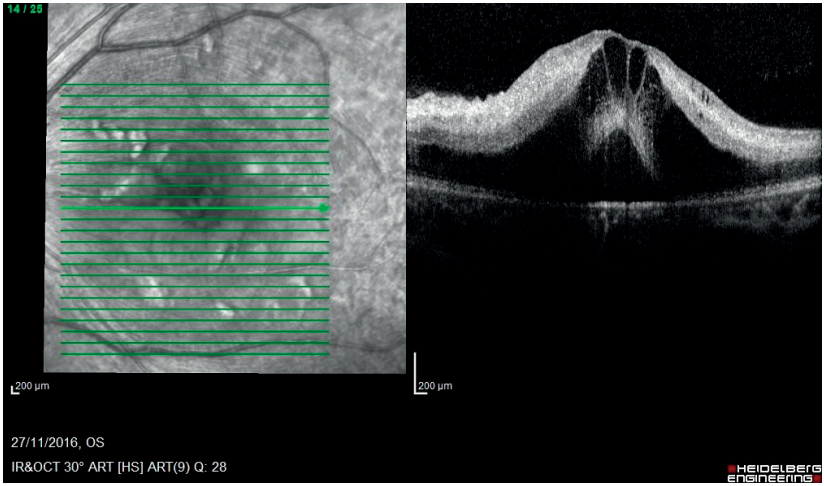

Fig. 2. Left eye OCT showed presence of intraretinal and subretinal fluid.

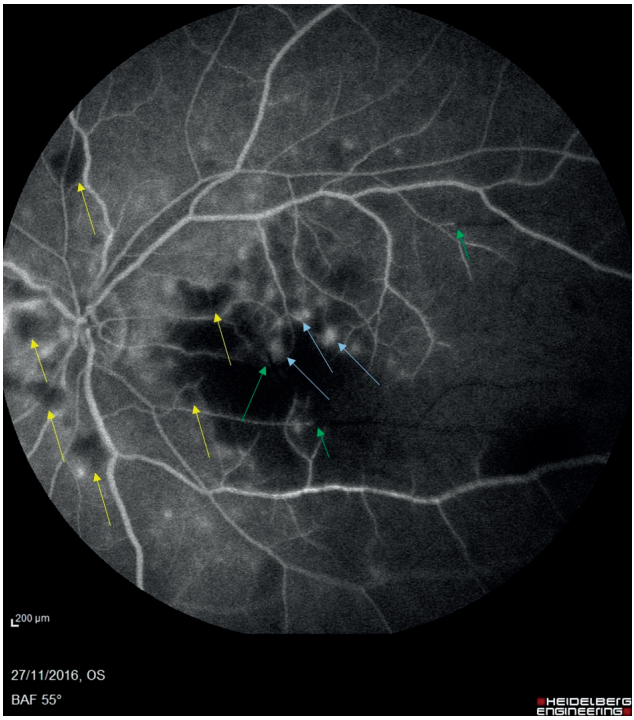

Fig. 3. Left eye FFA at late phase showed interrupted blood flow in arterioles (*green arrows*), masking effect of the rounded cotton wool spots (*yellow arrows*), and fluid leakage from the capillaries due to vasculitis (*blue arrows*).

cases reported, the commonest systemic disease is renal disease, followed by malaise and general weakness; pulmonary haemorrhages; skin rashes and ear, nose and throat-related diseases as well as sinusitis.[5,6] Ocular involvement is highly uncommon in AAV.[5,6] However, the findings could vary between WG, MPA, and CSS.

In the case of MPA, patients can have rapidly progressive renal failure due to severe glomerulonephritis. In addition, patients can also present with dyspnoea and haemoptysis with lung involvement. The commonest ocular presentation in MPA is peripheral ulcerative keratitis, which could lead to corneal perforation. Conjunctival and lid nodules with central ulceration can be seen as well. In addition, patients can have recurrent severe necrotising scleritis and episcleritis, leading to chronic choroidal inflammation. The chronic choroidal inflammation can in turn lead to extensive exudative retinal detachment, thus causing vision loss. There were reported cases of central retinal artery occlusion. However, presentations of retinal vasculitis are rare.[6]

For WG, the classical triad for clinical diagnosis is focal segmental glomerulonephritis, respiratory tract vasculitis, and necrotising vasculitis of the small arteries and veins.[6] Nearly half of the patients will have orbital and ocular inflammation. The presenting signs and symptoms include restrictive extraocular muscle movement, consequently causing diplopia, proptosis due to inflamed orbital content – which in turn can lead to exposure keratopathy –, and compressive optic neuropathy, occlusive retinal vasculitis, choroiditis, scleritis, episcleritis, and ischemic optic neuritis.[6]

Eosinophilic granulomatosis with polyangiitis or CSS is an allergic granulomatous angiitis. Clinically, the patient can have systemic cardiac involvement and present with congestive heart failure and restrictive cardiomyopathy. In terms of ocular involvement, patients can have granuloma nodules over the lid, conjunctivitis, episcleritis, marginal ulcerative keratitis, branch retinal vein occlusion, optic disc vasculitis, retinal infraction, and ischemic optic neuropathy. Moreover, patients can also present with cranial nerve palsy and ocular myositis, which could affect ocular motility.[6] The ocular and systemic presentations of AAV are summarized in Table 1.

Conclusion

AAV is a rare vasculitic disease, especially in Southeast Asian countries. It can occur in young patients, even though the age of onset is usually 64-75 years old. Patients presenting with clinical features similar to the ones outlined in this case report should be investigated with a high grade of suspicion for AAV. Serology ANCA can help to diagnose the disease. Following diagnosis, patients diagnosed with AAV should be managed with multidisciplinary follow-ups.

Table 1. Clinical features and investigations for ANCA associated vasculitis[7]

	Microscopic polyangiitis (MPA)	Wegener's granulomatosis (WG)	Churg-Strauss syndrome (CSS)
Systemic involvement			
Renal	+	+	
Pulmonary	+	+	
Cardiovascular			+
Ocular involvement			
Orbital mass		+	
Myositis		+	+
Conjunctivitis	+	+	+
Scleritis		+	
Episcleritis		+	+
Peripheral ulcerative keratitis	+	+	+
Retinal vasculitis	+	+	+
Neuro-ophthalmic involvement		+	+
Specific investigation			
P-ANCA	+		+
C-ANCA		+	
Eosinophilia			+
Chest radiography		+	+
Echocardiography			+

Acknowledgements

The authors report no conflicts of interest and are solely responsible for the content and writing of the paper. Informed consent was obtained from the patient for publication of this case report and any accompanying images.

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Case report/case series

A surgical cause of pseudopapilloedema

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Abstract

We report a case of vitreopapillary traction mimicking optic disc swelling in a 73-year-old female with pseudophakia in the left eye and satisfactory postoperative vision of 6/6 and N5 two years prior. She presented with insidious onset of blurred vision in her left eye for two months. She was referred to Universiti Kebangsaan Malaysia Medical Centre (UKMMC) for further investigations of apparent optic disc swelling in the left eye by a general ophthalmologist. Her left eye vision was 6/18, pin hole 6/12, with near vision at N6. There was no relative afferent pupillary defect and anterior segment examination was normal. Examination of the posterior segment revealed a pink optic disc with blurred and elevated margins without hyperaemia. Vessels of the optic nerve head appeared normal and a lamellar macular hole was present with dull foveal reflex clinically. Right eye examination was normal. Optical coherence tomography (OCT) of the left eye using the raster line scan showed vitreopapillary traction surrounding the optic disc and vitreomacular traction (VMT) with lamellar macular hole. The patient was counselled for surgical release of VMT, however, she opted for conservative management.

Peripapillary vitreoretinal traction is a rare cause of pseudo-optic disc swelling. Thorough fundus examination with the help of OCT is crucial in making a prompt diagnosis, preventing unnecessary investigations, and evaluating other retinal pathologies which may benefit from treatment.

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Keywords: pseudo-optic disc swelling, vitreomacular traction syndrome, vitreopapillary traction syndrome

Penyebab surgikal pseudopapilloedema

Abstrak

Kami melaporkan kes tarikan vitreopapillari yang mimik pembengkakan cakera optik berlaku pada wanita berusia 73 tahun, beliau sudah menjalani rawatan katarak di mata kiri dengan memperolehi visual akuiti yang memuaskan 6/6 dan N5 dua tahun sebelumnya. Dia dirujuk pada mulanya ekoran dari aduan penglihatan kabur di mata kirinya selama dua bulan. Beliau telah dirujuk ke Pusat Perubatan Universiti Kebangsaan Malaysia (UKMMC) untuk siasatan lanjut mengenai pembengkakan cakera optik kelihatan di mata kiri oleh pakar mata umum. Visi mata kirinya ialah 6/18, lubang pin 6/12, dengan penglihatan dekat pada N6. Tidak ada kerosakan relatif anak mata aferen dan pemeriksaan segmen anterior adalah normal. Pemeriksaan segmen posterior menunjukkan sempadan cakera optik yang kabur dan bengkak tanpa hiperemia. Salur darah pada saraf optik kelihatan normal dan terdapat lubang makula lamina dengan refleks foveal yang pudar dilihat secara klinikal. Pemeriksaan mata kanan adalah normal. Tomografi koherensi optik (OCT) mata kiri menggunakan imbasan garisan raster menunjukkan daya tarikan vitreopapillari mengelilingi cakera optik dan daya tarikan vitreomakular (VMT) dengan lubang makula lamellar. Pesakit disarankan untuk pembedahan pembedahan VMT, namun dia memilih untuk rawatan konservatif.

Daya tarikan vitreoretinal peripapillari sebagai punca pembengkakan cakera pseudo-optik sangat jarang berlaku. Peperiksaan fundus menyeluruh dengan bantuan OCT adalah penting dalam membuat diagnosis segera, mengelakkan penyiasatan yang tidak perlu, dan menilai semula patologi retina lain yang mungkin mendapat manfaat jika dirawat.

Kata kunci: bengkak cakera pseudo-optik, sindrom daya tarikan vitreomakular, sindrom daya tarikan vitreopapillari

Introduction

Vitreomacular traction (VMT) and vitreopapillary traction (VPT) syndrome have been well described in the literature,[1] but less attention has focused on the clinical effects of mimicking optic disc swelling. This may lead to unnecessary or invasive investigations on patients misdiagnosed with optic disc swelling, increasing

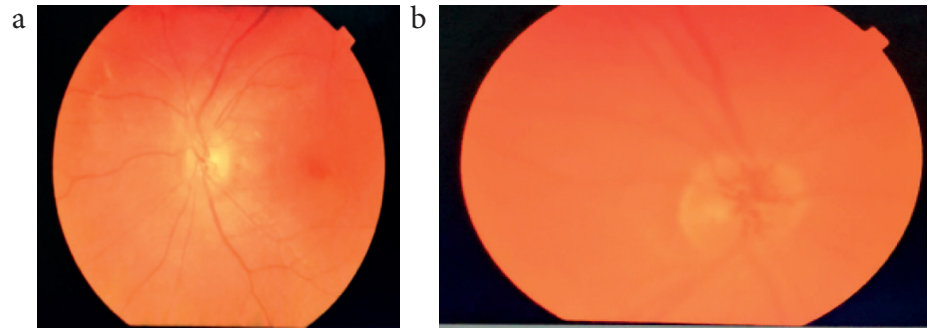

Fig. 1. (*a*) LE optic disc appeared swollen with blurred optic disc margin at all quadrants. (*b*) RE optic disc was normal.

medical costs and causing anxiety in patients. We report a case of VPT mistaken for optic disc swelling.

Case report

A 73-year-old, nondiabetic female presented with insidious onset of painless blurring of vision in her left eye for two months. She underwent uncomplicated cataract operation in her left eye two years prior with postoperative vision of 6/6, N5. She was referred by a general ophthalmologist to our centre for optic disc swelling in her left eye. She denied metamorphopsia, visual field defect, or history of ocular trauma. Symptoms and signs suggestive of raised intracranial pressure were negative. There was no headache, nausea, vomiting, or neurological deficit. Symptoms of optic neuritis, such as recurrent eye redness or painful eye movement, were absent. Other history suggestive of anterior ischaemic optic neuropathy, cat-scratch, SLE, or multiple sclerosis was absent. Her left eye vision was 6/18, ph 6/12, and N6, without relative afferent pupillary defect (RAPD). Anterior segment was normal with clear cornea, deep and quiet anterior chamber, and stable intraocular lens. Fundus examination revealed a pink left optic disc with a blurred and elevated optic disc margin in all quadrants without disc hyperaemia (Fig. 1a). Th retinal vessels surrounding the optic disc appeared normal. A lamellar macular hole was present with negative Watzke-Allen test. Right eye examination was unremarkable (Fig. 1b). Colour vision and contrast sensitivity test of the left eye was normal. OCT raster line scan (Heidelberg Engineering, OCT SPECTRALIS) of the left eye (Fig. 2a) showed VMT with lamellar macular hole, VPT surrounding the optic disc in all quadrants (Fig. 2b-d), and elevation of retinal nerve fibre layer (RNFL) thickness in the superior and temporal quadrants. Normal optic disc vascular integrity with no leakage was observed on fundus fluorescein angiography (Fig. 3). OCT of the

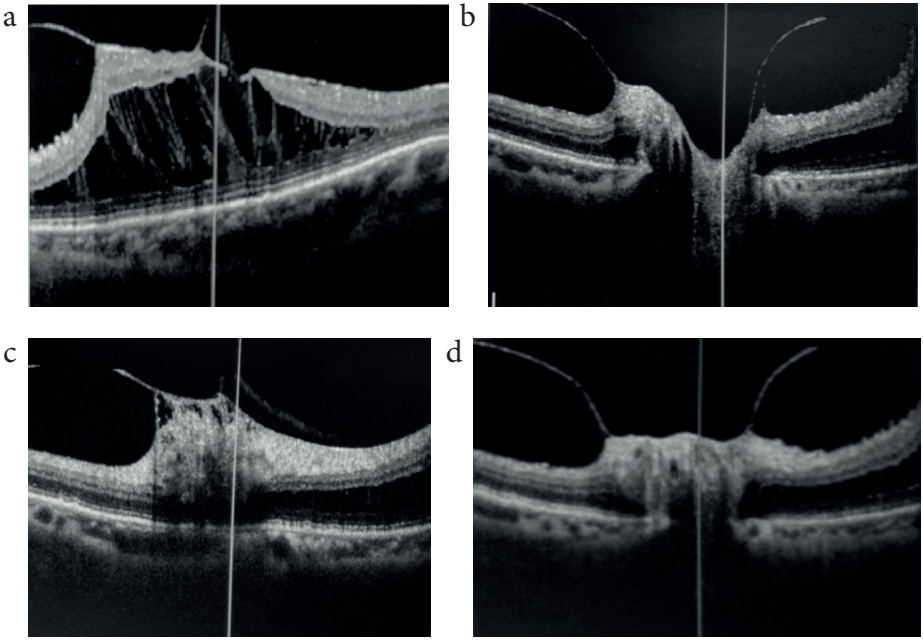

Fig. 2. (*a*) OCT of left macula illustrating retinoschisis as a result of focal VMT (size of area attachment < 1500 µm) with lamellar macular hole. (*b-d*) OCT of the left eye optic disc at three levels including: (*b*) optic cup level, (*c*) superior optic disc margin, and (*d*) inferior optic disc margin showed VPT surrounding the optic disc causing tractional elevation of optic disc.

Fig. 3. LE fundus fluorescein angiography showed no hot disc or vascular leaking.

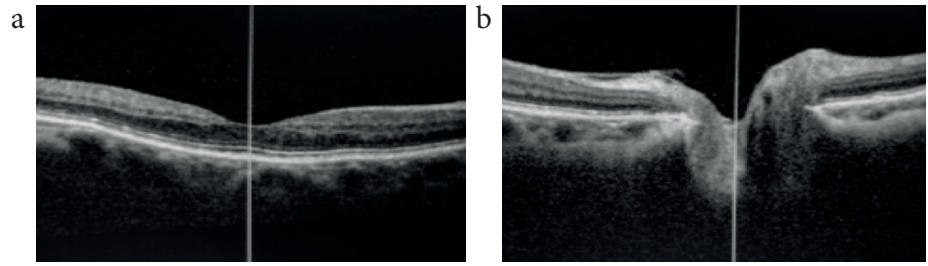

Fig. 4. OCT of the right eye showed (*a*) normal macular architecture and (*b*) normal optic disc architecture.

RE macula (Fig. 4a) and optic disc (Fig. 4b) were normal. The patient was referred to the vitreoretinal team for surgical intervention; however, the patient opted for conservative management. For the subsequent monthly follow-up until now, her vision was stable without progression of VMT and VPT on OCT.

Discussion

VPT in adults is associated with diabetic retinopathy, central retinal vein occlusion, macular hole, nonarteritis anterior ischemic optic neuropathy, and epiretinal membrane.[2] It presents in 40% of eyes with ERM.[3]

VPT has been well reported as a cause of pseudo-optic disc swelling. Elizabeth *et al.* reported that VPT at the optic nerve head caused elevation of the optic disc,[4] obscuration of the disc margins, and peripapillary haemorrhage and can be mistaken for optic disc swelling.

Thomas *et al.* used OCT imaging to diagnose VPT,[5] while Shikha *et al.* conducted further studies using spectral-domain OCT (SD-OCT).[6] Qualitative parameters of papillary elevation and RNFL thickness were used by Shikha *et al.* The authors concluded that normal RNFL thickness in all four quadrants was in keeping with pseudopapilloedema, as none of the patients with true papilloedema had normal RNFL thickness. Apart from that, increased nasal RNFL thickness had a high diagnostic ability for true papilloedema. They described the difference between optic disc appearance on OCT and the hyporeflective spaces to distinguish between the two conditions. The triangular space in pseudopapilloedema was smaller and had minimal anterior reflection compared to true papilloedema (Table 1). In our case, we also used the quantitative RNFL thickness measurement guide from the study by Ahnul Ha *et al.*[7] as a comparison (Table 2).

Peter *et al.* also reported a case of VPT in proliferative diabetic vitreoretinopathy which had similar findings to our case.[8] There was presence of traction on the nasal side of the optic disc that caused margin elevation on OCT. However, our patient was nondiabetic and nasal RNFL was not elevated (Table 2).

Table 1. Comparison between true and pseudopapilloedema[6]

True papilloedema	Pseudopapilloedema
Elevated RNFL thickness in all four quadrants	RNFL thickness can be normal or elevated
Increased nasal RNFL thickness	Nasal RNFL thickness not increased
Larger hyporeflective triangular space above RPE peripapillary	Smaller hyporeflective triangular space above RPE peripapillary
No buried drusen in optic nerve head	Buried drusen can usually be found under optic nerve head
With initiation of treatment, serial OCT showed decreased RNFL thickness	With initiation of true papilloedema treatment, serial OCT showed no improvement in RNFL thickness

OCT: optical coherence tomography; RNFL: retinal nerve fibre layer; RPE: retinal pigment epithelium

Table 2. Peripapillary RNFL thickness for all four quadrants of the left eye compared to healthy RNFL[7]

Parameters (µm)	Left eye (OS)	Healthy RNFL[7]
Superior RNFL	178	129.78
Inferior RNFL	95	145.56
Temporal RNFL	104	85.25
Nasal RNFL	44	79.51
Average RNFL	117	110.03
Inferior TRT	474	526.5
Superior TRT	601	544.4

OCT: optical coherence tomography; RNFL: retinal nerve fibre layer; TRT: total retinal thickness

In our case, OCT was used to confirm the diagnosis of VPT with a normal nasal RNFL thickness (Table 2). The appearance of an elevated optic disc also precluded the diagnosis of lamellar hole due to VMT as the true cause of decreased vision. Vitrectomy will be beneficial in this case, as it can eliminate the tangential forces at the vitreoretinal interface that might lead to progression of the lamellar hole or retinoschisis, as stated in the study by Romano *et al.*[9] However, Hoyt *et al.* described eight VPT patients who did well with stable vision without surgery during their six-month follow-up.[10] Our patient was not keen for vitrectomy. Her vision and VPT remained stable without progression during her six-month follow-up until the time of this writing.

Conclusion

VPT is an uncommon cause of pseudo-optic disc swelling. Thorough fundus examination with adjunctive OCT imaging aids in arriving at the correct diagnosis. With the correct diagnosis, we can not only prevent unnecessary investigations, but also deliver more targeted treatment.

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