

NON-COMPLIANCE TO LENS CARE PROCEDURES IN PATIENTS WITH CONTACT LENS RELATED MICROBIAL KERATITIS

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ABSTRACT

Microbial keratitis is one of the worst complications associated with contact lens wear. A case-control study was carried out to determine the risk factors that are associated with contact lens related microbial keratitis (CLRMK) pertaining to the level of compliance to recommended lens care procedures. The study was conducted in selected government hospitals situated in the Klang Valley over a period of 18 months. Cases were selected from respondents who wore contact lenses and were treated for microbial keratitis while controls were selected from a pool of patients attending the same hospitals who also wore contact lenses, but without keratitis. 94 cases were compared to 94 controls and the compliance level of both groups to lens care procedures was compared and analysed. The level of non-compliance to contact lens care procedures is generally poor in both groups. 85% of cases were found to be overall non-compliant compared to 63.8% of the controls. There is a significant association between overall non-compliance and the occurrence of CLRMK ($\chi^2 = 11.19$, $p = 0.001$). The present study found that non-compliance to lens care procedures is a significant contributing factor in CLRMK.

1.0 Introduction

Microbial keratitis is usually associated with trauma or ocular surface disease on a diseased eye. Microbial keratitis is potentially damaging to the eye and is the most severe reaction that can occur in response to contact lens wear. Patients usually suffer from pain and discomfort due to this condition (Weismann & Mondino, 2001). In a worst-case scenario, the patient can experience partial or complete loss of sight. Contact lenses are widely used as a form of visual correction and they have been linked to microbial keratitis in previously healthy eyes. The wearing of contact lenses is an important public health concern because of the devastating effects to the eye and the potential for visual loss.

Contact lens wear needs thorough care and maintenance, in order to ensure the safety of wear (Young, 2004). There has been less importance placed upon contact lens maintenance due to the use of frequent replacement and disposable lenses, one-step or multipurpose solutions and one bottle lens care systems. Another type of lens which is the daily disposable lenses requires no conventional lens care; these lenses however are not as popular as monthly or biweekly disposable lenses and thus not frequently sought after

(Williams & Stapleton, 2007).

Contact lens care maintenance is important to remove all microorganisms from contact lenses, abolish the possibility of eye infections, remove all biological and non-biological contaminants and restore and maintain the lens. Lens maintenance aims to achieve a ready-to-wear condition after each use and to maintain this condition until the next use. A lens care system should have the functions of cleaning, rinsing, disinfection, maintaining, rewetting, lubrication and removal of tear proteins and other lens contaminants. Emphasis should be stressed on efficacy, safety and convenience of the lens care system. Cleanliness of lens storage case also requires emphasis (Williams & Stapleton, 2007).

There have been no studies so far in Malaysia to look at the associations between compliance to lens care procedures and the occurrence of CLMRK. The present study was carried out as part of a multicentre case-control study to elucidate the risk factors associated with CLMRK. The present study was limited in its analysis of just the associations between specific lens care procedures and CLMRK; elucidation of the other risk factors was carried out in other parts of the study and is not reported here.

2.0 Methods

A case-control study was done on contact lens wearing respondents in various hospitals throughout the Klang Valley namely Hospital (H) Kuala Lumpur, H. Sungai Buloh, H. Serdang, H. Ampang, H. Klang, H. Putrajaya and H. Selayang. All patients with a previous episode of CLMRK were included as “cases” while “controls” were taken from contact lens users without CLMRK from the same eye clinics. Patients were contacted and informed consents were obtained before participating in the study. Ninety four cases and controls were assessed in an 18 month study period with collection of data from January 2008 until July 2009. Almost all cases of microbial keratitis were admitted for treatment requiring intensive antibiotic therapy. Self-administered questionnaires in *Bahasa Malaysia* were used and the questionnaires on the procedures and practices by the respondents in the care of their contact lenses were developed, pre-tested and validated prior to use. Data was analysed using SPSS 16 which included the chi-square test. The level of compliance to lens care procedures was assessed via questionnaires for both cases and controls, where specific procedures were looked at as listed in Table 1.

3.0 Results

A total of 188 respondents comprising 94 cases and 94 controls participated in the study. Out of the 94 cases, 84 cases were using monthly disposable lenses as replacement, 6 used yearly conventional lenses, 2 cases used two weekly and 2 cases used daily disposable lenses. The demographic data of the respondents is shown in Table 2. Contact lens characteristics; wearing mode and lens replacement schedule are shown in Table 3. The majority of cases and controls were in the younger age groups (18-29 years) being 65% and 82% respectively. There were more females i.e. 78% in “cases” and 68% in “controls” than males. Malays formed the majority ethnic group in cases (75%) and controls (43%).

Table 1: Specific Lens Care Procedures

Lens care procedures
1. Wash hands with soap before handling contact lenses
2. Clean contact lenses after lens removal
3. Rinse lenses with lens care solution after cleaning
4. Perform rubbing technique to clean contact lenses
5. Use tap water to clean contact lenses and lens case
6. Fill lens case with adequate disinfecting solution as indicated
7. Rinse lenses with MPS / saline before lens insertion
8. Disinfect contact lenses for time recommended or longer
9. Disinfect lenses with fresh solution on every lens removal
10. Re-disinfect contact lenses if left in the case longer than indicated
11. Discard solution and air dry lens case after lens insertion
12. Clean lens case with MPS / cleaner / saline every day
13. Disinfect lens case weekly
14. Change lens case every three months
15. Re-cap solution bottles every time after use
16. Check the expiry dates of lens care solutions regularly
17. Use MPS containing enzymatic cleaning agent or carry out enzymatic cleaning at least once a week
18. Change contact lenses regularly as indicated
19. Sleep overnight with contact lenses in the eyes
20. Swim/ bathe with contact lenses in the eyes

Table 2: Demographic Data

	Cases	Controls
Total	n=94	n=94
Age (years)		
18-29	61 (64.9)	77 (81.9)
30-39	24 (25.5)	13 (13.8)
40-49	6 (6.4)	1 (1.1)
50-59	3 (3.2)	3 (3.2)
Gender		
Male	21 (22.3)	30 (32)
Female	73 (77.7)	64 (68)
Ethnicity		
Malay	70 (74.5)	40 (42.6)
Chinese	13(13.8)	30 (31.9)
Indian	6 (6.4)	21 (22.3)
Other	5 (5.3)	3 (3.2)

Table 3: Contact Lens Characteristics

	Cases	Controls
	n (%)	n (%)
Total	n=94	n=94
Wearing mode		
Disposable Soft	88(93.6)	46(48.9)
Conventional Soft	6(6.4)	3(3.2)
Conventional RGP	0(0)	45(47.9)
Lens replacement		
Daily	2 (2.1)	7 (7.5)
Two weeks	2 (2.1)	1 (1.1)
Monthly	84 (89.4)	38 (40.4)
Yearly	6 (6.4)	48 (51.1)

A subject was also deemed to be “overall” non-compliant when he failed to comply to six or more of the lens care procedures (Yung *et al*, 2007b).

Among the cases, there were 85.1% overall non-compliant subjects compared to 63.3% among the controls thus demonstrating a significant association between CLRMK and overall non-compliance ($\chi^2=11.19$, $df=1$, $p=0.001$).

Table 4 shows the association between overall non-compliance and CLRMK. These figures showed that most subjects did not adhere to the lens care procedures as

recommended. More than 50% of subjects in the cases and controls groups were considered as overall non-compliant to lens care procedures.

Table 4: The Association between Contact Lens Related Microbial Keratitis and Overall Non-compliance to Lens Care Procedures

Overall compliance	Cases	Controls	χ^2	p
	n (%)	n (%)		
Yes	14 (14.9)	34 (36.2)	11.19	0.001 *
No	80 (85.1)	60 (63.8)		

***Significant at the 0.001 level**

Besides the overall compliance to lens care procedures as a whole, the level of compliance to each of the listed lens care procedures was also assessed for both cases and controls as shown in Table 5. There was a significant association between the occurrence of CLRMK and not complying to the following procedures; Hand washing with soap before handling contact lenses, Cleaning of lenses after removal, Rinsing of lenses with lens care solution after cleaning, Performing the rubbing technique to clean contact lenses, Re-disinfecting contact lenses when left in the case longer than indicated, Cleaning lens case with MPS / cleaner / saline every day, Re-capping solution bottles every time after use, Checking of the expiry dates of lens care solutions regularly, Using MPS containing enzymatic cleaning agent or carrying out enzymatic cleaning at least once a week, Changing contact lenses regularly as indicated, Not sleeping overnight with contact lenses in the eyes and Not swimming / bathing with contact lenses in the eyes.

Among the significant associations, the highest percentages of non-compliance in cases were found for the following procedures: Using MPS containing enzymatic cleaning agent or carrying out enzymatic cleaning at least once a week (84%), Cleaning of lens case with MPS / cleaner / saline every day (74.2%), Not swimming / bathing with contact lenses in the eyes (54.3%), Performing the rubbing technique to clean contact lenses (50.5%) and Re-disinfecting contact lenses when left in the lens case longer than indicated (46.2%).

Table 5: The Compliance to Specific Lens Care Procedures and the Association with Contact Lens Related Microbial Keratitis

Lens care procedure	Cases (n=94) n (%)	Control (n=94) n (%)	χ^2	df	p
	Non compliant	Non compliant			
1.Wash hands with soap before handling contact lenses	32 (34)	7 (7.4)	20.22	1	0.001**
2.Clean contact lenses after lens removal	29 (31.2)	16 (17.4)	4.78	1	0.031*
3.Rinse lenses with lens care solution after cleaning	29 (31.2)	16 (17.4)	4.78	1	0.031*
4.Perform rubbing technique to clean contact lenses	47 (50.5)	14 (15.2)	26.11	1	0.001**
5.Use tap water to clean contact lenses and lens case	84 (90.3)	86 (93.5)	0.62	1	0.431
6.Fill lens case with adequate disinfecting solution as indicated	7 (7.5)	12 (13)	1.53	1	0.221
7.Rinse lenses with MPS / saline before lens insertion	20 (21.5)	11 (12)	3.02	1	0.081
8.Disinfect contact lenses for time recommended or longer	8 (8.6)	12 (13)	0.95	1	0.333

9. Disinfect lenses with fresh solution on every lens removal	10 (10.8)	6 (6.5)	1.05	1	0.311
10. Re-disinfect contact lenses if left in the case longer than indicated	43 (46.2)	16 (17.4)	17.72	1	0.001**
11. Discard solution and air dry lens case after lens insertion	54 (58.1)	45 (48.9)	1.56	1	0.211
12. Clean lens case with MPS / cleaner / saline every day	69 (74.2)	38 (41.3)	20.52	1	0.001**
13. Disinfect lens case weekly	76 (81.7)	67 (72.8)	2.09	1	0.152
14. Change lens case every three months	52 (55.9)	39 (42.4)	3.38	1	0.071
15. Re-cap solution bottles every time after use	10 (10.8)	2 (2.2)	5.61	1	0.021*
16. Check the expiry dates of lens care solutions regularly	35 (37.6)	13 (13.8)	13.88	1	0.001**
17. Use MPS containing enzymatic cleaning agent or carry out enzymatic cleaning at least once a week	79 (84)	62 (66)	7.89	1	0.011*
18. Change contact lenses regularly as indicated	21 (22.3)	9 (9.6)	5.71	1	0.021*
19. Sleep overnight with contact lenses in the eyes	30 (31.9)	9 (9.6)	14.27	1	0.001**
20. Swim/ bathe with contact lenses in the eyes	51 (54.3)	32 (34)	7.79	1	0.011*

* Significant at the 0.05 level

** Significant at the 0.001 level

4.0 Discussion

The level of overall non-compliance to the specific contact lens care procedures was studied and it was found to be generally poor. There were 85.1% of non-compliant cases and 63.83% of non-compliant controls.

In the present study, 84% of cases failed to carry out enzymatic cleaning at least once a week. The reason could be due to the contact lens wearers who were ignorant of the lens care procedure or they had a low awareness of maintaining the lenses plus a poor attitude to lens care. 74% failed to clean their lens case with multipurpose solution or cleaner daily. The lens case is important for the storage of lenses. Failure to clean the case may introduce microorganisms into the case and thus the potential for infection. Patients who did not clean the cases were probably not aware of the procedure and did not consider it to be an important part of lens care maintenance.

A total of 54.3% of cases swam with lenses in the eye. The reason could be that they were not informed of the danger of swimming with lenses in the eyes and thus did not consider it to be harmful. 46% failed to re-disinfect their lenses after keeping them in the lens case for a long duration. This could be due to the fact that the patients were not aware of the repercussions of their actions and had a poor attitude towards lens care maintenance. The majority could not be bothered with all the lengthy but essential lens care procedures that must be carried out in contact lens wear.

Patients' compliance to lens care procedures has continued to be a growing concern among contact lens practitioners. When contact lens wearers do not adhere to good lens practice, they expose themselves to a higher risk of contact lens intolerance and deposits on lenses due to improper cleaning (Hiti *et al*, 2006), (Stapleton, 2003). The risk of ocular infection ranges from minor irritation to red eyes and infectious keratitis (Gower *et al*, 1994). By definition, a compliant subject is a person who washes his hands before handling contact

lenses, uses an FDA approved care system and in agreement with the published guidelines of the manufacturer and good hygiene while adhering to the recommended wear schedule and has no contaminated solutions or cases (Mondino *et al*, 1986).

The percentage of non-compliant contact lens wearers found in the present study compares well with studies done elsewhere. A study on CLRMK done in Vienna, Austria by Dejac-Ruhswurm *et al* (2001) which comprised all consecutive patients presenting with contact lens presumed microbial keratitis over a one-year period found almost half of the patients to be non-compliant, i.e. 51.8% of patients cleaned their lenses regularly and 22% had no disinfection at all since their lenses were disposed of on removal.

Another study in Hong Kong (Yung *et al*, 2007a) was done to determine the level of compliance of contact lens wearers to identify which procedures had the highest levels of non-compliance and the effectiveness of an enhancement strategy on the level of compliance. There were 60 subjects with 30 in Group 1 (received regular after-care consultations every six months) and 30 in Group 2 (received regular after-care consultations every six months and participated in a compliance enhancement strategy once every three months). The poorest level of compliance was associated with care of lens cases, which were the most frequently contaminated items. Contact lenses and lens care accessories were not maintained by the wearers. Yung *et al* (2007b) stated that regular reviews and reinforcement of lens care procedures for the usage and care of contact lenses are important and essential.

Due to the alarming level of non-compliance detected in the present study, it is advocated that contact lens practitioners spend more time to educate their patients on the proper and correct method of care and maintenance of their lenses and lens cases, in addition to the proper usage of solutions and disinfection of lenses. There is an urgent need to educate the public on the risks involved when using contact lenses especially with regards to complying with the prescribed lens care procedures. The contact lens practitioner should dutifully inform his patient of the importance of adhering to the recommended wear, proper care and maintenance of contact lenses. These simple preventive measures ultimately form an integral part of the intervention in the care of diseases relating to the cornea and contact lens wear, in particular CLMRK.

5.0 Conclusion

The study shows that non-compliance to lens care procedures was significantly associated with CLRMK, of which the proper cleaning of the lenses with the right solution, using the right technique was the leading procedure not complied by contact lens wearers who developed the condition.

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