Original Article

Operation Time for Pterygium Surgery by Ophthalmology Trainees

Kosol Kampitak, M.D.[1*], Ranipha Siriburana, M.D.[1], Nattadet Rattana-aram, M.D.[1], Tayakorn Kupakanjana, M.D.[2], Wichai Leelawongtawun, M.D.[1], Supinda Leeamornsiri, M.D.[1], Suntaree Thitiwichienlert, M.D.[1]

Abstract

Objective: To evaluate the duration time of pterygium surgery performed by the ophthalmology residents in the first and second year of training with different surgical methods.

Methods: Data was collected retrospectively from medical records when the surgeons were first-year residents in 2016 and second-year in 2017. Operation time was compared according to each resident surgeon, year level of training, and surgical techniques.

Results: A total of 131 pterygium surgeries were performed by 5 ophthalmology residents, 93 and 38 pterygium excision procedures were performed by one group of residents in their first and second year of training, respectively. All pterygia were primary type with a single head. The mean pterygium size was 2.8 ± 1.4 mm. The range of operating duration was 52 - 83 minutes for individual surgeons. The mean duration of surgery performed by the first- and second-year residents was 64.1 ± 16.8 and 67.0 ± 22.2 minutes, respectively. The mean duration of surgery operated with amniotic membrane and conjunctival graft techniques were 64.7 ± 7.3 and 65.3 ± 20.4 minutes, respectively. The duration times of pterygium surgery were significantly different ($P < .001$) between surgeons but there were no statistically significant differences with regards to the level of training and method of surgery ($P > .05$).

Conclusions: The duration of pterygium surgery varied between each resident surgeon, but did not differ in the level of training and surgical techniques.

Keywords: Pterygium surgery, Ophthalmology resident, Operation time, Surgical skill, Skill development

Received: 20 October 2021 **Revised: 7 February 2022** **Accepted: 14 February 2022**

[1] Department of Ophthalmology, Faculty of Medicine, Thammasat University, Pathum Thani, Thailand

[2] Department of Ophthalmology, St. Peter Eye Hospital, Mueang Chiang Mai District, Chiang Mai, Thailand

***Corresponding author:** Kosol Kampitak, M.D., Department of Ophthalmology, Faculty of Medicine, Thammasat University, Pathum Thani, Thailand

Email: kosolkampitak@yahoo.com

Introduction

Pterygium is an overgrowth of fibrovascular tissue on the corneal surface of the eyes. It is commonly found in countries near the equator.[1] The pathogenesis is multifactorial including ultraviolet radiation, tear film changes, inflammation, genetic mutations, and viral infections.[2-4]

Pterygium can cause symptoms such as eye irritation, burning, itching, and tearing. In advanced cases, it can induce corneal astigmatism and obscure the optical center leading to blurred vision.

In the early stages of pterygium, patients are usually treated with artificial tears to reduce dryness and irritation of the eyes. If the pterygium is inflamed, steroid eye drops may be prescribed.

Surgical excision of pterygium is considered when patients do not respond to conservative treatment. In addition, removal of pterygium is a basic surgery in ophthalmology residency program, allowing the surgeons to obtain experiences and practice in the use of surgical microscopes.

The present study aimed to evaluate the duration time of pterygium surgery performed by ophthalmology residents in the first and second year of residency and using different surgical techniques. Assuming that the surgical time performed by second-year residents may be less than that of first-year residents due to the greater experience. Conjunctival autograft technique and amniotic membrane grafting technique are commonly used for pterygium surgery. According to different graft preparation methods, the total surgical time may vary. Data were collected during the residents' first year of training and were followed up until their second year of training.

Methods

Study Designs and Participants

This study was approved by Thammasat University Ethic Committee and was conducted in accordance with the Declaration of Helsinki. In this retrospective study, the medical records of all patients, who had pterygium excision performed by first-year residents (in academic year 2016) and second-year residents (in academic year 2017) at Thammasat Hospital, were reviewed. The recurrent or double-head ptergia were excluded. The data including age and gender of patients, pterygium characteristics, methods of surgery, academic year of resident surgeon, and pterygium surgical time were analyzed. The duration time of surgery was determined by the surgeon. The timer was started when the lid speculum was placed and stopped when the speculum was taken off. One-way ANOVA was used to compared surgical time among resident surgeons. Unpaired t-test was used to compared surgical time, according to the surgeon's level of training and method of surgery. A *P*-value less than .05 was considered statistically significant.

Surgical Technique

Tetracaine hydrochloride 0.5% was applied as topical anesthesia before an injection and then Lidocaine 2% with 1:100,000 epinephrine was injected under the pterygium. The pterygium was dissected and tenon tissue was excised using sharp westcott scissors. The bipolar cautery was then used to stop bleeding. The conjunctival autograft was harvested, placed and sutured using nylon 10-0 in the cases using the conjunctival autograft technique, alternatively, amniotic membrane was placed and sutured using nylon 10-0 in the cases using the amniotic membrane grafting technique.

Results

A total of 131 patients with pterygium had undergone surgical excision performed by five ophthalmology residents. Each resident surgeon performed a range of 17 to 34 cases of pterygium surgery. Ninety-three of these patients were operated in the first year of residency program and 38 patients were performed during the second year. Eighty eyes underwent pterygium excision with amniotic membrane grafting technique and 51 eyes with the conjunctival autograft technique. No adjuvants were used (Mitomycin C, Beta radiation) in the operation.

Eighty-two cases (63%) were female and 49 cases (37%) were male. The mean age was 55.4 ± 2.2 years. There were no statistically significant differences in age and gender of patients between the group of patients according to each resident surgeon, level of training and methods of surgery (Tables 1-3).

All pterygia were of the primary type and had only one head. The mean horizontal size of pterygium was 2.8 ± 1.4 mm. There were no statistically significant differences in size of pterygium

between the group of patients according to each resident surgeon, level of training and method of surgery (Tables 1-3). The duration of pterygium surgery and size of pterygium were not found to be correlated, Pearson's Correlation Coefficient, r (129) = 0.14, P = .124.

Table 1 Demographic data according to each resident surgeon

	Resident surgeons					***P* value**
	A (n = 17)	**B (n = 34)**	**C (n = 31)**	**D (n = 23)**	**E (n = 26)**	
Sex of patients, n (%)						
Male	6 (35)	11 (32)	8 (26)	13 (57)	11 (42)	.196[a]
Female	11 (65)	23 (68)	23 (74)	10 (43)	15 (58)	
Age of patients (years), Mean ± SD	56.9 ± 8.8	56.2 ± 13.3	53.0 ± 11.9	54.2 ± 14.4	57.5 ± 11.1	.628[b]
Size of pterygium (mm), Mean ± SD	3.2 ± 1.1	2.8 ± 1.5	2.6 ± 1.4	2.7 ± 1.4	2.7 ± 1.3	.670[b]

[a] Pearson's chi-square
[b] ANOVA

Table 2 Demographic data according to academic year of resident surgeons

	Surgery performed in		***P* value**
	First year of training (n = 93)	**Second year of training (n = 38)**	
Sex of patients, n (%)			
Male	34 (37)	15 (39)	.754[a]
Female	59 (63)	23 (61)	
Age of patients (years), Mean ± SD	56.7 ± 12.3	52.5 ± 11.5	.072[b]
Size of pterygium (mm), Mean ± SD	2.8 ± 1.3	2.8 ± 1.5	.976[b]

[a] Pearson's chi-square test
[b] Unpaired t-test

Table 3 Demographic data according to methods of surgery

	Methods of surgery		***P* value**
	AMT (n = 80)	**CAG (n = 51)**	
Sex of patients, n (%)			
Male	29 (36)	20 (39)	.732[a]
Female	51 (64)	31 (61)	
Age of patients (years), Mean ± SD	55.9 ± 11.2	54.8 ± 13.8	.603[b]
Size of pterygium (mm), Mean ± SD	2.7 ± 1.3	3.0 ± 1.5	.236[b]

Abbreviation: AMT = Amniotic membrane grafting technique, CAG = Conjunctival autograft technique
[a] Pearson's chi-square test
[b] Unpaired t-test

The mean operation duration was evaluated for individual surgeons and for each surgical technique. The mean operation duration for each of the 5 surgeons for cases with the amniotic membrane grafting technique was 54.2 ± 13.0, 59.2 ± 10.8, 64.4 ± 20.2, 66.3 ± 12.4, and 82.9 ± 16.1 minutes. On the other hand, the mean operation duration for each of the 5 surgeons with cases conjunctival autograft technique was 49.1 ± 2.1, 56.4 ± 8.9, 74.9 ± 17.9, 81.9 ± 23.2, and 86.8 ± 9.0 minutes respectively. The operation duration for pterygium surgery was significantly different ($P < .001$) between each surgeon as shown in Table 4.

For pterygium excision with the amniotic membrane grafting technique, the mean duration time of surgery performed by the first- and second-year residents was 63.1 ± 16.8 and 68.4 ± 18.3 minutes, respectively. The mean duration taken for pterygium surgery with conjunctival autograft technique was 65.6 ± 16.9 minutes while the residents were in the first year and 64.4 ± 29.0 minutes during their second year of the training program. There were no statistically significant differences ($P > .05$) in surgical time between the year of training as shown in Table 5.

The operation duration of pterygium surgery between amniotic membrane grafting technique and conjunctival autograft technique was also compared. The mean operation duration for cases of amniotic membrane and conjunctival graft techniques was 64.7 ± 17.3 and 65.3 ± 20.4 minutes, respectively in all patients. For the operation conducted in the first academic year, the mean operation duration using amniotic membrane and conjunctival graft methods was 63.1 ± 16.8 and 65.6 ± 16.9 minutes, respectively, and for the operation conducted in the second academic year, the mean operation time for amniotic membrane and conjunctival graft technique was 68.4 ± 18.3 and 64.4 ± 29.0 minutes, respectively. There were no statistical differences ($P > .05$) between both methods of surgery as shown in Table 6.

Table 4 Pterygium surgical time (minutes) of each resident surgeon (both academic year)

Surgeon	Methods of surgery								
	All Type of Surgery			AMT			CAG		
	n	Mean ± SD	*P* value (ANOVA)	n	Mean ± SD	*P* value (ANOVA)	n	Mean ± SD	*P* value (ANOVA)
All	131	65.0 ± 18.5		80	64.7 ± 17.3		51	65.3 ± 20.4	
A	17	72.3 ± 14.8		12	66.3 ± 12.4		5	86.8 ± 9.0	
B	34	51.8 ± 12.7		18	54.2 ± 13.0		16	49.1 ± 12.1	
C	31	58.3 ± 10.2	< .001	21	59.2 ± 10.8	< .001	10	56.4 ± 8.9	< .001
D	23	82.6 ± 18.0		16	82.9 ± 16.1		7	81.9 ± 23.2	
E	26	69.6 ± 19.5		13	64.4 ± 20.2		13	74.9 ± 17.9	

Abbreviation: AMT = Amniotic membrane grafting technique, CAG = Conjunctival autograft technique

Table 5 Pterygium surgical time (minutes) according to academic year of resident surgeons

Methods of surgery	Surgery performed in		*P* value (Unpaired t-test)
	First year of training	Second year of training	
Total (n = 131)	n = 93	n = 38	
Mean ± SD	64.1 ± 16.8	67.0 ± 22.2	.473
AMT (n = 80)	n = 55	n = 25	
Mean ± SD	63.1 ± 16.8	68.4 ± 18.3	.207
CAG (n = 51)	n = 38	n = 13	
Mean ± SD	65.6 ± 16.9	64.4 ± 29.0	.888

Abbreviation: AMT = Amniotic membrane grafting technique, CAG = Conjunctival autograft technique

Table 6 Pterygium surgical time (minutes) according to methods of surgery

Surgery performed in	Methods of surgery		*P* value (Unpaired t-test)
	AMT	CAG	
Total (n = 131)	n = 80	n = 51	
Mean ± SD	64.7 ± 17.3	65.3 ± 20.4	.867
First year of training (n = 93)	n = 55	n = 38	
Mean ± SD	63.1 ± 16.8	65.6 ± 16.9	.476
Second year of training (n = 38)	n = 25	n = 13	
Mean ± SD	68.4 ± 18.3	64.4 ± 29.0	.607

Abbreviation: AMT = Amniotic membrane grafting technique, CAG = Conjunctival autograft technique

Discussion

The average operation time of pterygium surgery performed by ophthalmology residents from previous literature was 50-76 minutes. Akrapipatkul et al. reported the operation duration for pterygium excision with amniotic membrane transplant technique; performed by first-year ophthalmology residents, was 50.4 ± 13.9, range 28-100 minutes.[5] Kositphipat et al. previously studied pterygium surgery in ophthalmology trainees but did not account for the level of training of the surgeons. The results showed that the surgical time of pterygium excision with conjunctival autograft technique was 51.5 ± 11.6, range 20-75 minutes.[6] Furthermore, a report of Phrueksaudomchai et al. demonstrated the surgical time for pterygium excision (with amniotic membrane transplant or conjunctival autograft technique) performed by first-year resident, which was 75.7 (range 39.0-129.1) minutes.[7] Nevertheless, these studies did not compare the differences in duration of surgery between surgeons in different levels of their training program.

In the present study, we compared the operation duration of pterygium surgery between first- and second-year residents, and hypothesized that the surgical time performed by second-year residents may be less than that of first-year residents due to the assumed greater experience in surgical procedures. However, our study found that there was no statistically significant difference ($P > .05$) in operation duration for pterygium surgery performed by first- and second-year residents (Table 5).

A study by Koranyi et al. also showed no difference in operation duration between inexperienced and experienced surgeons. They investigated the pterygium excision time, using conjunctival autograft technique with fibrin adhesive glue, and found that the operation duration of the first 120 cases, subsequently followed by another 120 cases operated by one surgeon, were 12.6 (range, 5-23) and 12.8 (range, 7-21) minutes, respectively.[8] In our study, the duration of pterygium surgery was longer than Koranyi et al.'s study because the surgeons used suturing technique in all cases, of which suturing procedures take longer than gluing.[9]

The operation duration for pterygium surgery was not different between the year of residency training due to the short learning curve. Phrueksaudomchai et al. found that the surgical time seemed to be more stable after an experience build-up of five consecutive cases.[7]

Furthermore, in the aspect of surgical technique, the results revealed no significant difference ($P > .05$) of operation duration for pterygium excision using conjunctival autograft and amniotic membrane grafting technique (Table 6). The operation duration of pterygium excision with conjunctival autograft technique was approximately equal to that of amniotic membrane grafting technique in our study. We assumed that the time duration of graft harvesting from donor conjunctiva in conjunctival autograft method and preparation of amniotic membrane in amniotic membrane grafting method was nearly equal.

In our study, the duration time of pterygium surgery were statistically significant differences ($P < .001$) between each surgeon. The individual mean operation time of each surgeon widely varied, from 54 to 83 minutes with amniotic membrane grafting technique, and with conjunctival autograft technique was range from 49 to 87 minutes (Table 4). Therefore, the operation duration of pterygium surgery should be considered with regards to the

individual skill level, method, and pace of each resident surgeon. This result was in line with Koranyi et al.'s study, which stated that the differences in average operation time is more representative of the personal character of a surgeon than the difficulty of the surgical method.[8]

In conclusion, from the present study, there were no significant differences ($P > .05$) in duration of operation for pterygium surgery, with respect to surgical skill of ophthalmology residents in the first and second year of training. The operation duration of pterygium excision with conjunctival autograft technique was not statistically different ($P > .05$), compared to the amniotic membrane grafting technique. However, there were significant differences ($P < .001$) with regards to individual mean operation duration for each resident surgeon.

Acknowledgements

Financial support: None reported.

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

References

1. Singh SK. Pterygium: epidemiology prevention and treatment. *Community Eye Health.* 2017;30(99):S5-S6.
2. Nangia V, Jonas JB, Nair D, Saini N, Nangia P, Panda-Jonas S. Prevalence and associated factors for pterygium in rural agrarian central India. The central India eye and medical study. *PLoS One.* 2013;8(12):e82439.
3. Malozhen SA, Trufanov SV, Krakhmaleva DA. Pterygium: etiology, pathogenesis, treatment. *Vestn Oftalmol.* 2017;133(5):76-83.
4. Wanzeler ACV, Barbosa IAF, Duarte B, et al. Mechanisms and biomarker candidates in pterygium development. *Arq Bras Oftalmol.* 2019;82(6):528-536.
5. Akrapipatkul K, Kupakanjana T, Charoenphol P. Efficiency in skill development of pterygium excision with amniotic membrane transplantation among the 1st year ophthalmology residents at Thammasat Eye Center. *EyeSEA.* 2019;14(2):70-81.
6. Kositphipat K, Tananuvat N, Choovuthayakorn J. Results of pterygium excision adjunct with conjunctival autograft transplantation for primary pterygium by ophthalmology trainees. *Int Ophthalmol.* 2016;36(5):615-621.
7. Phrueksaudomchai P, Patarajierapan P, Leelawongtawun W, et al. Surgical time aspect of learning curve in primary pterygium excision by ophthalmology trainees. *EyeSEA.* 2021;16(1):94-103.
8. Koranyi G, Artzén D, Wijk T. Learning curve in the Cut and Paste method for surgery of primary pterygium. *Acta Ophthalmol.* 2013;91(5):463-468.
9. Karalezli A, Kucukerdonmez C, Akova YA, Altan-Yaycioglu R, Borazan M. Fibrin glue versus sutures for conjunctival autografting in pterygium surgery: a prospective comparative study. *Br J Ophthalmol.* 2008;92(9):1206-1210.