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CORNEAL TOPOGRAPHIC CHANGES IN PATIENTS WITH VERNAL KERATOCONJUNCTIVITIS BEFORE AND AFTER SUPRATARSAL TRIAMCINOLONE INJECTION

By

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ABSTRACT

Background: Vernal keratoconjunctivitis is a very common bilateral inflammation of the cornea and conjunctiva that can lead to vision threatening problems such as shield ulcer and corneal opacity. Variable treatment modalities were tried such as topical and systemic anti-histaminics, topical steroids and mast cell stabilizers. Supratarsal injection of triamcinolone acetonide was proved to be a safe and effective method for treatment of vernal keratoconjunctivitis.

Objective: To evaluate changes in corneal topography indices before and after supratarsal injection of triamcinolone acetonide in patients with vernal keratoconjunctivitis.

Patients and methods: This study included 30 eyes of 15 patients with vernal keratoconjunctivitis who visited Al-Azhar University Hospitals and Alexandria Ophthalmology Hospital during in the period from June 2020 to December 2020. The patients were treated with supratarsal triamcinolone injection and corneal topography was done for them before and after injection.

Patients were evaluated pre and postoperatively. This included history taking and full clinical examination. Follow up visits 1 day, 1 month and 4 months after injection to assess signs of recovery. Corneal topography with Sirius pentacam was done before injection, 2 months and 4 months after injection to assess corneal topographic changes.

Results: There were statistically significant changes in the degree of astigmatism, corneal asphericity and surface asymmetry in some cases after injection. No statistically significant differences were recorded in K readings, corneal thickness or visual acuity.

Conclusion: Vernal keratoconjunctivitis was proved to cause changes in corneal topography and lead to changes in visual acuity and patient's refraction. Supratarsal injection of triamcinolone acetonide was an effective way to treat cases of Vernal Keratoconjunctivitis (VKC), and decrease the topographic changes related to this disease.

Keywords: Corneal Topographic Changes, Vernal Keratoconjunctivitis, Supratarsal Triamcinolone Injection.

INTRODUCTION

VKC include severe itching, photophobia, redness, tearing and ropy discharge *(Qamar et al., 2010)*. Important clinical signs in conjunctiva include cobblestone papillae in the upper tarsal conjunctiva, limbal conjunctival thickening and Tranta's spots. Corneal involvement can occur in the form of punctate keratitis, shield ulcer, scar and pannus formation. Frequent rubbing may weaken the cornea and lead to keratoconus *(Kansakar, 2011)*.

Trauma provoked by giant papillae induces a silent and chronic inflammatory process leading to progressive loss of stromal mass and consequently to less biomechanical resistance and thus to anterior corneal steepening and decreased optical competence of the anterior corneal surface *(Elhers and Donshik, 2010)*.

Corneal topography is a method of computer-assisted examination of the cornea in which multiple concentric light rings are projected on the cornea. The reflected image is captured on a charge-coupled device (CCD) camera. Computer software analyzes the data and displays the results to generate a topographical map of the cornea *(Karnowski et al., 2011)*.

Changes in corneal topography indices to be studied changes in effective refractive power, asphericity, corneal asymmetry index and visual performance *(Gautam et al., 2015)*. Management of VKC can be achieved with the use of topical antihistamines, mast cell stabilizers, topical and systemic steroids and cyclosporine *(Kumar et al., 2010)*. Supratarsal injection of corticosteroids is an adjurent in treatment of severe refractory cases of VKC *(Qamar et al., 2010)*.

The aim of this work was to evaluate the changes in corneal topography indices before and after supratarsal injection of triamcinolone acetonide in patients with vernal keratoconjunctivitis.

PATIENTS AND METHODS

This was an interventional case series prospective study that conducted at Al-Azhar University Hospitals and Alexandria Ophthalmology Hospital during the period from June 2020 to December 2020. The included patients were 15 patients with vernal keratoconjunctivitis. Vernal keratoconjunctivitis diagnosis was made based on symptoms of itching, photophobia, burning sensation, ropy mucoid discharge and clinical findings of conjunctival hyperemia, presence of large or giant papillae of the upper palpebral conjunctivae and/or limbal papillary hypertrophy with or without Horner-Trantas dots.

Inclusion Criteria:

- Male and female patients more than 6 years of age.
- Patients with chronic vernal keratoconjunctivitis of at least 3 years duration.
- Patients with vernal keratoconjunctivitis not responding to topical treatment.
- Patients with significant signs of vernal keratoconjunctivitis as cobblestone papillae and shield ulcers.

Exclusion Criteria:

- Patients with any associated ocular disease.
- Patients who had any previous ocular surgery or trauma.
- Non-compliant patients.
- Patients with mild vernal keratoconjunctivitis that may respond to topical treatment.

All included patients were subjected to complete ophthalmological evaluation:

Operative measures:

Draping and sterilization. Conjunctiva was anesthetized with Benox (benoxinate hydrochloride 0.4%, EIPICO) eye drops. Upper eyelid was gently everted and a cotton tipped applicator soaked in benoxinate hydrochloride 0.4% was pressed over it for approximately 1 minute. One ml syringe with 26 gauge needle was used. Patient was asked to look down. Needle was inserted through conjunctiva in supratarsal space between the conjunctiva and Muller's muscle, approximately 1mm above the superior tarsal border. Care was taken to avoid peripheral vascular arcade. Successful placement of the injection was indicated by the ballooning of the potential space between the conjunctiva and Muller's muscle. All patients were injected simultaneously in both eyes. 1ml of triamcinolone acetonide 40mg/ml (Epirelefan, EIPICO) was injected. Pressure by pad was applied for 2 to 3 minutes. Tobradex (tobramycin and dexamethasone 3mg/ml, Alcon) eye drops were then instilled *(Forrester et al., 2010)*.

Follow-up:

Patients were followed up for relief of symptoms and for resolution of clinical signs. Each eye was evaluated at intervals of 1day and 1month after injection. All patients were also observed for any side effects of steroid injection as ptosis, infections, motility disturbance, conjunctival scarring and raised intraocular pressure. The outcome of the procedure was evaluated in terms of uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA) and corneal topography. Corneal topography was assessed by the use of CSO SIRIUS pentacam device designed by C.S.O Italia, Florence. Corneal topography indices will include K1, Corneal Asphericity, and Surface Asymmetry Index (SAI) at 2 months, 4 months after injection.

Statistical analysis:

Data were verified, coded by the researcher and analyzed using IBM-SPSS Statistics for windows, version 23.0 *(Copyright IBM Corp., Armonk, N.Y., USA. 2015)*. Descriptive statistics: Means, Standard deviations, ranges and percentages were calculated. Specific calculation of the sample size wes done by ANOVA or Friednen test. A significant p-value was considered when it wes equal or less than 0.05.

RESULTS

The average age at time of presentation was 10.55±3.82 years. 12 patients were males (80%) and 3 were females (20%). None of them suffered from other allergic diseases as atopy.

Table (1): Sex and age distribution of the patients

	N	%
Sex:		
Male	12	80
Female	3	20
Age:		
Mean ± S.D	10.55 ± 3.82	
Range	6 – 18	

Regarding unaided visual acuity (UAVA) and best corrected visual acuity (BCVA), there was no significant statistical difference before and after injection. (P value was 0.774 for UAVA and 0.552 for BCVA). All patients presented with papillae that decreased in 90% of them after 2 months after treatment. In 2 patients papillae started to recur four months after treatment. Half of patients presented with corneal signs such as Tranta's spots and shield ulcers. Seven patients recovered completely after treatment while in the other 3 patients these signs persisted even after four months. There was no significant statistical difference between K1 and K2 before and after injection. (P value was 0.352 for K1 and 0.744 for K2). The study showed significant statistical difference in the degree of astigmatism before and after injection. (P value was 0.003). Regarding corneal thickness, there were no statistically significant differences before and after injection. (P value was 0.835). The study showed significant statistical difference in corneal asphericity (Q) before and after injection. (P value 0.013). There was also a significant statistical difference in Symmetry index front (Sif) before and after injection. (P value is 0.003). However, there was no significant statistical difference in Symmetry index back (Sib) before and after injection. (P value was 0.667) **(Table 2)**.

Table (2): UAVA & BCVA, K1 & K2, Cylinder, Corneal Thickness, Corneal asphericity (Q), Sif and Sib before and after injection (N=30 eyes)

Value		Range			Mean	±	S. D	p. value
UAVA	**Before**	0.05	–	0.9	0.43	±	0.31	0.774
	2 Months	0.05	–	0.8	0.43	±	0.28	
	4 Months	0.05	–	0.9	0.47	±	0.30	
BCVA	**Before**	0.7	–	1	0.93	±	0.08	0.552
	2 Months	0.8	–	1	0.95	±	0.06	
	4 Months	0.8	–	1	0.95	±	0.06	
K1	**Before**	39.52	–	43.66	41.90	±	1.36	0.352
	2 Months	39.82	–	43.83	42.15	±	1.19	
	4 Months	40.2	–	43.9	42.31	±	1.28	
K2	**Before**	41.63	–	44.84	43.69	±	1.04	0.744
	2 Months	41.06	–	45.19	43.48	±	1.24	
	4 Months	40.92	–	45.43	43.59	±	1.38	
Cylinder	**Before**	-3.22	–	-0.79	-1.80	±	0.82	0.003
	2 Months	-2.43	–	-0.28	-1.34	±	0.62	
	4 Months	-2.65	–	-0.13	-1.27	±	0.72	
Corneal Thickness	**Before**	522	–	621	557.50	±	31.13	0.835
	2 Months	519	–	601	553.83	±	28.83	
	4 Months	520	–	604	557.23	±	31.45	
Q	**Before**	-0.49	–	-0.07	-0.27	±	0.12	0.013
	2 Months	-0.48	–	-0.14	-0.25	±	0.11	
	4 Months	-0.4	–	-0.07	-0.20	±	0.09	
Sif	**Before**	-1.12	–	3.46	0.81	±	1.40	0.003
	2 Months	-0.57	–	1.39	0.22	±	0.50	
	4 Months	-0.34	–	1.3	0.18	±	0.41	
Sib	**Before**	-0.11	–	1.22	0.17	±	0.32	0.667
	2 Months	-0.12	–	0.78	0.13	±	0.21	
	4 Months	-0.1	–	0.73	0.13	±	0.19	

DISCUSSION

All subjects included in our study were cases with no control group. The age of patients in our study ranged between 6 to 18 years. In the study of *Dantas et al. (2010)* the mean age was 10 years while in *Gautam et al. (2015)* the mean age was 10.9 years.

The male to female ratio was 4:1 in this study while this ratio ranged between 2:1 and 4:1 respectively in *Dantas et al. (2010)* and *Gautam et al. (2015)*. We used Sirius pentacam to evaluate changes in corneal topography. Topographic indices to be studied were K1, K2, topographic astigmatism, corneal asphericity, symmetry index front, symmetry index back and central corneal thickness.

In our study, we injected triamcinolone acetonide 40mg/ml, while in *Xavier et al. (2017)* triamcinolone acetonide was injected. Patients were examined before injection, 2 and 4 months after injection in our study, and in *Xavier et al. (2017)*, while in *Douglas et al. (2014)* patients were followed up to four years to identify the side effects.

About 40 % of patients in our study were of mixed type, while in *Xavier et al. (2017)* 41.2% were of the palpebral form and 58.8% were mixed form (palpebral and limba).

Moreover, in *Xavier et al. (2017)*, the disease was successfully controlled for an average of 3.6 months (range: 1-16), during which allergy symptoms and signs were significantly improved, with complete resolution of lid edema and conjunctival chemosis, significant decline of pannus and keratitis, and reduction of giant papillae size. In our study, 10 patients showed complete relief of symptoms and signs for 6 months, 3 patients showed recurrence of symptoms 3 months after treatment while the other 2 patients did not improve clinically after injection.

Our study used the Sirius pentacam to assess corneal topographic changes. Certain topographic indices were assessed such as corneal asphericity, corneal asymmetry indices and K readings.

Gautam et al. (2015) stated that subjects with VKC were selected for the videokeratography and topographic indices were analyzed. Keratoconus-like topography was present in 11.3%. The keratoconus predictive index, the opposite sectoral index and the differential sectoral index were found to be significantly associated with VKC subjects.

Regarding corneal asphericity, *Dantas et al. (2010)* showed a significant statistical difference between cases and controls ($p<0.05$). In the majority of the cases, patients with VKC presented more prolate corneas (more negative Q) than the controls, meaning discrepancy between steeper central cornea and flatter periphery. In patients with VKC and keratoconus, this difference became pathologic, meaning steeper central cornea, due to the cone in 81.25% with Q> -1.27. Two patients (12.5%) with paracentral keratoconus presented more oblate corneas (Q= 1.99). Only one patient with VKC and keratoconus presented normal corneal asphericity (Q= -0.14). This agreed with the results of our study that showed changes in corneal asphericity in patients that improved significantly after injection. Values before injection ranged between -0.49 to -0.07 with mean value of -0.27 and standard deviation of ±0.12. Three months post injection the corneal asphericity values ranged between -0.48 to 0.14 with mean value of -0.25 and standard deviation of ±0.11. Four months after injection, the Q value ranged between -0.4 to -0.07 with mean value of -0.2 and standard deviation of ±0.09.

In our study before injection, the corneal astigmatism ranged between -3.22 to -0.79 with mean value of -1.80 and standard deviation of ± 0.82. 2 months after injection the corneal astigmatism ranged between -2.43 to -0.28 with mean value of -1.34 and standard deviation of ±0.62. After 4 months, corneal astigmatism ranged between -2.65 to -0.13 with mean value of -1.27 and standard deviation of ±0.72. P value was 0.003 indicating a statistically significant change. The mean axis of the cylinder before injection was 113° with a standard deviation of ±71.94°. This changed to 91.45 with standard deviation of ±71.34° about 2 months after injection. Four months after injection, the axis of cylinder changed to 79.88° with standard deviation of ±80.25°. The change of the axis of

cylinder may be explained by the improvement of papillae caused by VKC and exerting some pressure over the cornea leading to astigmatism which is usually of with-the-rule type.

The corneal symmetry index front (SIF) before injection ranged between -1.12 to 3.46 with mean value of 0.81 and standard deviation of ±1.4. Two months after injection Sif ranged between -0.57 to 1.39 with mean value of 0.22 and standard deviation of ±0.5. After 4 months, the Sif ranged between -0.34 to 1.3 with mean value of 0.18 and standard deviation of ±0.41. P value was 0.003. These data indicate that there is a statistically significant difference between corneal asymmetry values before and after injection.

The mean value of the unaided visual acuity (UAVA) before injection was 0.43 before injection. This value did not show significant change two and four months after injection. This agreed with the results of *Xavier et al. (2017).*

The best corrected visual acuity (BCVA) before injection ranged between 0.7 and 1 with mean value of 0.93 and a standard deviation of +/- 0.08. These results showed no statistically significant changes after injection with P value of 0.552. This was found in other studies as *Douglas et al. (2014).*

According to the results of our study, the K readings did not show statistically significant changes before and after injection as the P value for K1 was 0.352 and for K2. This coincided with the results shown by *Douglas et al. (2014)* and *Xavier et al. (2017)* as there were also no statistically significant differences regarding the corneal thickness before and after injection.

CONCLUSION

Vernal keratoconjunctivitis caused changes in corneal topography and led to changes in visual acuity and patient's refraction. Supratarsal injection of triamcinolone acetonide was effective to treat cases of VKC, and decrease the topographic changes related to this disease.

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تغيرات طبوغرافية القرنية فى مرضى إلتهاب القرنية والملتحمة الربيعى قبل وبعد حقن عقار الترايامسينولون أعلى ترس العين

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خلفيـــة البحـــث: مـــرض التهـــاب القرنيـــة والملتحمـــة الربيعـــي هـــو مـــرض شـــائع يصـــيب قرنيـــة وملتحمـــة العـــين، وقـــد يـــؤدي إلـــى مضـــاعفات تهـــدد الإبصـــار مثـــل القرحـــة الدرعيـــة وعتامـــة القرنيـــة، وقـــد يـــؤدي هـــذا المـــرض أيضـــا إلـــى إحـــداث تغيـــرات فـــي طبوغرافيـــة القرنيـــة مثـــل الأســـتجماتيزم والقرنيـــة المخروطيـــة، ويمكـــن حمايـــة المـــريض مـــن مثـــل هـــذه المضـــاعفات الخطـــرة عـــن طريـــق التشـــخيص والعـــلاج المبكـــر للمـــرض. وقـــد تـــم تجربـــة العديـــد مـــن طـــرق العـــلاج المختلفـــة للمـــرض مثـــل القطـــرات والأقـــراص المضـــادة للهســـتامين وقطـــرات الكـــورتيزون ومثبطـــات الخلايـــا. ويعتبـــر حقـــن عقـــار الترايامســـينولون أعلـــى تـــرس العـــين أحـــد الطـــرق الآمنـــة والفعالـــة فـــي عـــلاج التهاب إلقرنية والملتحمة الربيعي.

الهـــدف مـــن البحـــث: اســـتخدام جهـــاز التصـــوير الخماســـي للقرنيـــة لتقيـــيم ودراســـة التغيـــرات التـــي تحـــدث فـــي طبوغرافيـــة القرنيـــة قبـــل وبعـــد حقـــن عقـــار الترايامســـينولون أعلى ترس العين.

المرضـــى وطـــرق البحـــث: إشـــتملت الدراســـة علـــى 30 عـــين لـــ 15 مريضـــاً مصـــابى بالتهـــاب القرنيـــة والملتحمـــة الربيعـــي الـــذين زاروا مستشـــفيات جامعـــة الأزهـــر ومستشـــفى طـــب وجراحـــة العيـــون بالإســـكندرية خـــلال الفتـــرة مـــن يونيـــو 2020 إلـــى ديســـمبر 2020. تـــم عـــلاج المرضـــى بحقـــن التريامســـينولون فـــوق القـــدمين وتـــم عمـــل طبوغرافيا القرنية. لهم قبل وبعد الحقن.

وتـــم فحـــص المرضـــى وتقيـــيمهم قبـــل وبعـــد الحقـــن عـــن طريـــق معرفـــة التـــاريخ المرضـــي لهـــم والفحـــص الســـريري الشـــامل للعـــين. وتمـــت متابعـــة المرضـــى بعـــد يـــوم ثـــم بعـــد شـــهر مـــن الحقـــن لتقيـــيم علامـــات التحســـن، وتـــم أيضـــا عمـــل تصـــوير خماســـي

للقرنية قبل الحقن وبعد شهرين ثم بعد أربعة أشهر من الحقن لدراسة تغيرات طبوغرافية القرنية.

نتائج البحث: معظم المرضى الذين اشتملت عليهم الدراسة كانوا في العقد الأول والثاني من العمر. متوسط عمر المرضى في هذه الدراسة 10,55 سنوات وأغلبهم من الذكور ضمت الدراسة. أظهرت نتائج البحث وجود تغيرات ذات دلالة إحصائية في درجة الاستجماتيزم و كروية القرنية و عدم التناسق السطحي للقرنية في بعض الحالات قبل وبعد الحقن، في حين لم تسجل أية نتائج ذات دلالة إحصائية فيم يتعلق بسمك القرنية أو القوة الانكسارية للقرنية.

الإستنتاج: يسبب التهاب القرنية والملتحمة الربيعي تغيرات في تضاريس القرنية, ويؤدي إلى تغيرات في حدة البصر وانكسار المريض. يعتبر الحقن أعلى ترس العين لعقار الترايامسينولون أسيتونيد طريقة فعالة لعلاج حالات التهاب القرنية والملتحمة الربيعي وتقليل التغيرات الطبوغرافية المتعلقة بهذا المرض.

الكلمات الدالة: التغيرات الطبوغرافية للقرنية، التهاب الملتحمة القرنية الربيعي، حقن الترايامسينولون أعلى ترس العين.