

## Research Article

# Astigmatism in relation to length and site of corneal lacerations

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## ABSTRACT

**Background:** Corneal lacerations are the common cause of astigmatism that can prevent a good visual outcome. This was to evaluate Astigmatism in relation to the Length and Site of Corneal Lacerations.

**Methods:** This was a study in the Cornea clinic, Sarojini Devi Eye Hospital and Regional Institute of Ophthalmology, Osmania Medical College, Hyderabad over a period from August 2012 to April 2014. The study group was 25 Patients of corneal lacerations. The data of age and sex, the length of corneal lacerations in terms of corneal diameter of  $<1/3$ rd and  $>1/3$ rd and the site of the laceration in the cornea either central or peripheral was noted. All the corneal lacerations were sutured with interrupted 10-0 mono filament nylon. Suture removal was done over a period of 6 -12 weeks following surgery. Astigmatism (Diopters) was estimated by Keratometer after sutures removal.

**Results:** Our study age distribution was 11(44.0%) in  $>10$  -20 yrs, 11 (44.0%) in 21 – 30 yrs and 3(12.0%) in 31 -40 yrs. Sex distribution was 17(68.0%) of males and 8(32.0%) of females. The length of Corneal laceration in terms of corneal diameter was  $<1/3$ rd in 4(16.0%) and  $>1/3$ rd in 21(84.0%). The site of Laceration in the cornea was peripheral in 6(24.0%) and central in 19(76.0%). The Astigmatism in relation to Length and Site of Corneal Laceration showed  $<2.0$  D in 3(12.0%), 2 – 4.0 D in 11(44.0%), 4- 6.0 D in 4(16.0%),  $>6.0$ D in 4(16.0%) and irregular astigmatism in 3(12.0%). The astigmatism in peripheral corneal lacerations of  $<1/3$ rd and  $>1/3$ rd of corneal diameter was  $<2.0$  D in 12.0% and 2-4.0 D in 12.0% respectively. The Astigmatism in central corneal lacerations of  $<1/3$ rd and  $>1/3$ rd of corneal diameter was 2- 4.0D in 4.0% and 2-4.0D in 28.0%, 4-6.0D in 16.0%,  $>6.0$ D in 16.0% and irregular Astigmatism in 12.0% respectively. Time of sutures removal was 80.0% at 6-8 wks, 12.0% at 8-10 wks and 8.0% at 10 -12 wks.

**Conclusions:** The corneal astigmatism depends upon the length and site of corneal laceration. Severity of astigmatism was directly proportion to the length of corneal laceration. The wound was nearer to the centre of the cornea, the greater was the astigmatism.

**Keywords:** Corneal Lacerations, Corneal Diameter, Astigmatism, Length and Site of corneal lacerations

## INTRODUCTION

There are 180 million people in the world today with severe visual impairment, which is a tragic and pathetic situation both socially and economically and 80% of visual impairment is avoidable.<sup>1-3</sup> Corneal blindness is a major health problem worldwide. Corneal blindness is

most commonly caused by the trauma or infection. Corneal laceration injuries are more common in male than females and typically occur in younger age group. The most frequent causes are assault, domestic, occupational and sports. Corneal astigmatism after injuries can prevent a good visual outcome. It arises from many causes like wound factors of length, location and angulations, and suturing factors of the type of suture

material, the number and length of bites and suture tension. Recently, the prognosis for injuries to the globe in general and for corneal lacerations has improved, although ocular trauma is a leading cause of visual loss in young adults.<sup>4,5</sup>

## METHODS

This was a study in the Cornea clinic, Sarojini Devi Eye Hospital and Regional Institute of Ophthalmology, Osmania Medical College (Govt.) Hyderabad over a period from August 2012 to April 2014. The study group included 25 Patients with corneal lacerations. The study was approved by the institute ethical committee. The informed consent was taken from all the patients of the study group.

### Methodology

#### Inclusion criteria

Patients with lacerations of the cornea.

#### Exclusion criteria

Exclusion criteria were the children below the age of 10yrs, lacerations extending to sclera, uveal incarceration, Lens involvement, Vitreous incarceration, Posterior segment involvement and associated injuries of the orbit and lids.

A detailed clinical history was obtained with a complete ophthalmic examination for all the patients. The data of age and sex, the length of corneal lacerations in terms of corneal diameter of  $<1/3$ rd and  $>1/3$ rd and the site of the laceration in the cornea either central or peripheral was noted. All the corneal lacerations were sutured with interrupted 10-0 mono filament nylon. Suture removal was done over a period of 6 -12 weeks following surgery. Astigmatism (Diopters) was estimated by Keratometer after sutures removal. The data was analyzed by simple statistical methods.

## RESULTS

**Table 4: Astigmatism (diopters) in corneal lacerations in relation to length in terms of corneal diameter  $<1/3$ rd or  $>1/3$ rd and to the site in central or peripheral cornea.**

S. no	Astigmatism (Diopters)	Length and Site of corneal Laceration								Total No. of patients	%
		$<1/3$ <sup>rd</sup> Corneal diameter				$>1/3$ <sup>rd</sup> Corneal diameter					
		Peripheral Cornea		Central Cornea		Peripheral Cornea		Central Cornea			
		No.	%	No.	%	No.	%	No.	%		
1	$< 2.0$	3	12.0	0	-	-	-	-	-	3	12.0
2	2.0 - 4.0	-	-	1	4.0	3	12.0	7	28.0	11	44.0
3	4.0 – 6.0	-	-	0	-	-	-	4	16.0	4	16.0
4	$>6.0$	-	-	0	-	-	-	4	16.0	4	16.0
5	Irregular	-	-	0	-	-	-	3	12.0	3	12.0
Total		3	12	1	4.0	3	12.0	18	72.0	25	100.0

The study group was 25 patients of full thickness corneal lacerations.

**Table 1: Age distribution.**

Sr. no.	Age group	Males	Females	No of patients	%
1	$>10-20$	6	5	11	44.0
2	21 – 30	10	1	11	44.0
3	31 – 40	1	2	3	12.0
Total		17	8	25	100.0

Table of age distribution was 11(44.0%) in  $>10-20$ yrs, 11 (44.0%) in 21 – 30yrs, and 3(12.0%) in 31 - 40yrs.

**Table 2: Sex distribution.**

S. no.	Sex	No. of patients	%
1	Males	17	68.0
2	Females	8	32.0
Total		25	100.0

Table of sex distribution was 17(68.0%) of males and 8(32.0%) of females.

**Table 3: Length and site of corneal lacerations.**

Sr. no.	Length in relation to corneal diameter	Site		No. of patients	%
		Peri pheral	Central		
1	$<1/3$	3	1	4	16.0
2	$>1/3$	3	18	21	84.0
Total		6	19	25	100.0
%		24.0	76.0	100.0	

Table of length and site of corneal laceration showed the length of Corneal laceration in terms of corneal diameter as  $<1/3$ rd in 4(16.0%) and  $>1/3$ rd in 21(84.0%). The site of Laceration in the cornea was peripheral in 6(24.0%) and central in 19(76.0%).

Table of Astigmatism in relation to Length and Site of Corneal Laceration showed < 2.0D in 3(12.0%), 2 – 4.0 D in 11(44.0%), 4- 6.0 D in 4(16.0%), > 6.0D in 4(16.0%) and irregular astigmatism in 3(12.0%). The astigmatism in peripheral corneal lacerations of < 1/3rd and > 1/3rd of corneal diameter was < 2.0D in 3(12.0%) and 2-4.0 D in 3(12.0%) respectively. The Astigmatism in central corneal lacerations of <1/3rd and >1/3rd of corneal diameter was 2- 4.0 D in 1(4.0%), and 2-4.0D in 7(28.0%), 4- 6.0 D in 4(16.0%), >6.0 D in 4(16.0%) and irregular Astigmatism in 3(12.0%) respectively.

**Table 5: Time of sutures removal.**

S. no.	No. of Weeks	No. of patients	%
1	6 to 8	20	80.0
2	8 – 10	3	12.0
3	10- 12	2	8.0
Total		25	100.0

Table of time of suture removal was 20(80.0%) at 6-8 wks, 3(12.0%) at 8-10 wks and 2(8.0%)

10 - 12 wks.

## DISCUSSION

The incidence of injuries is increasing in this era of high speed traffic and industrialization. Like any other part of the body, eyes are not exempted from injuries, though they are well protected by the lids, projected orbital margins, the nose and a cushion of fat from behind. The Cornea is the fore most part of the eyeball and it is likely to be involved in all types of injuries like mechanical, chemical, radiation etc. A corneal laceration is a partial- or full-thickness mechanical injury. A partial-thickness injury does not penetrate the cornea (abrasion) and a full-thickness injury completely penetrates through the cornea.<sup>4-6</sup> This study was to know the astigmatism in the full-thickness corneal laceration.

The study included 25 patients of full thickness corneal lacerations. Our study Sex distribution showed male preponderance with 68.0% males and 32.0% females. The studies of Sannapaneni Krishnaiah et al,<sup>7</sup> Nirmalan PK et al,<sup>8</sup> Dandona Let al,<sup>9</sup> and Li WernVoon et al,<sup>10</sup> showed higher incidence among males. In the study of Zigelbaum BM et al,<sup>11</sup> 70% were males and 30% were females. In the study of Klopfer J et al,<sup>12</sup> Males were three times more than females.

Our study age distribution was 44.0% between >10 - 20yrs, 44.0% between 21 – 30yrs and 12.0% between 31 -40yrs. In the study of Dandona L et al,<sup>9</sup> the majority of the trauma occurred during childhood and young adulthood. In the study of Li Wern Voon et al,<sup>10</sup> most were younger than 40 years of age. In the study of

Zigelbaum BM et al,<sup>11</sup> the average age was 30.5yrs. In the study of Klopfer J et al,<sup>12</sup> the highest peak was in adolescents and young adults.

In our study, the length of corneal laceration in terms of corneal diameter was < 1/3rd in 16.0% and >1/3rd in 84.0%. The site of laceration in the cornea was peripheral in 24.0% and central in 76.0%.

The Astigmatism in relation to Length and Site of Corneal Laceration showed < 2.0D in 3 (12.0%), 2 – 4.0 D in 11 (44.0%), 4-6.0 D in 4 (16.0%), > 6.0D in 4 (16.0%) and irregular astigmatism in 3(12.0%). The astigmatism in peripheral corneal lacerations of < 1/3rd and > 1/3rd of corneal diameter was < 2.0D in 12.0% and 2-4.0 D in 12.0% respectively. The Astigmatism in central corneal lacerations of <1/3rd and >1/3rd of corneal diameter was 2- 4.0 D in 4.0%, and 2-4.0D in 28.0%, 4- 6.0 D in 16.0%, >6.0 D in 16.0% and irregular Astigmatism in 12.0% respectively. Time of sutures removal was 80.0% at 6-8 wks, 12.0% at 8-10 wks and 8.0% at 10 -12wks.

Our study showed that the severity of the astigmatism depends not only upon the length of corneal laceration similar to the study by Eagling EM,<sup>13</sup> who reported that the principle factor contributing to astigmatism was wound size, with laceration involving < 1/3rd of corneal diameter had a low incidence of astigmatism and while those with laceration >1/3rd of corneal diameter had more astigmatism and also on the site of the corneal laceration similar to the study by M.J. Roper-Hall et al,<sup>15</sup> who stated that nearer the wound to the centre of the cornea, the greater was the astigmatism, with lacerations involving the central cornea causing gross and often irregular astigmatism and with lacerations near the corneal periphery usually causing regular astigmatism with flattening of meridian at right angle to the scar. The study of Navon SE et al,<sup>15</sup> which showed corneal lacerations that were within 2.0 mm of the line of sight were more likely to have > 2.00 D of final astigmatism and the study of Gargi K. Vora, MD et al,<sup>16</sup> which showed corneal lacerations near central axis were more likely to have >2.00 D of final astigmatism, correlate with our study.

So, our study correlates with the above studies that the astigmatism depends upon the length and site of the corneal laceration.

## CONCLUSION

The corneal astigmatism depends upon the length and the site of corneal laceration. Severity of astigmatism was directly proportional to the length of corneal laceration as Corneal Laceration of <1/3rd of corneal diameter had a low astigmatism and >1/3rd of corneal diameter had significant gross astigmatism. The wound nearer to the centre of the cornea, the greater was the astigmatism.

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