Section: Ophthalmology

Original Research Article

CYANOACRYLATE GLUE EFFECTIVE FOR SMALL CORNEAL PERFORATION (<3 mm) IN CONNECTION WITH INFECTIOUS KERATITIS

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Abstract

Background: A prospective, randomized clinical study conducted in Bihar, India aimed to assess the use of cyanoacrylate tissue adhesive for sealing corneal perforations. The study presented a simple and repeatable method with minimal risk of complications. **Materials and Methods:** It offered the advantage of a smooth corneal surface compared to other techniques. The study included participants aged 17 to 67, with a higher prevalence of corneal ulcers observed in older individuals. Men were more affected by keratitis than women, which may be attributed to labour-intensive occupations. Left eye laterality was more common among the cases studied. **Result:** Fungal and bacterial infections were the main causes of corneal ulcers, with fungal infections being more prevalent. The most common size of corneal perforations observed was 1mm. The use of cyanoacrylate adhesive was successful in 70% of cases, preventing immune cell migration and inhibiting collagenases. Visual acuity outcomes improved after using cyanoacrylate glue, with a significant correlation between preoperative vision and visual acuity after one week. Other studies have shown similar positive outcomes using cyanoacrylate glue, including increased visual acuity and preservation of ocular surface integrity. The patching of corneal defects with cyanoacrylate glue consistently improved best-corrected visual acuity without significant side effects. **Conclusion:** The study suggests cyanoacrylate glue can be a suitable treatment for corneal defects fewer than 3 mm in diameter, potentially avoiding more invasive procedures like full-thickness penetrating keratoplasty.

INTRODUCTION

According to the World Health Organization (WHO), approximately 45 million individuals are bilaterally blind, and over 135 million have severely decreased vision in both eyes, meeting the criteria for blindness.[1,2] The prevalence of infectious causes of blindness has decreased recently, but cataracts and corneal disease have become more widespread. Corneal disease remains the second most significant cause of blindness globally, following cataracts.[3] The number of corneal blindness cases varies across countries and demographic groups, influenced by factors such as access to eye care and healthcare standards.[4-6] Infectious keratitis, a leading cause of corneal opacities and the fourth most common cause of blindness, accounts for ten percent of preventable vision loss in underdeveloped nations. In India alone, more than 2 million people experience corneal ulcers each year.[7,8]

Immediate medical attention is necessary for corneal disorders, including perforations. Surgery for irritated or diseased eyes is not ideal due to a higher risk of infection, synechia formation, and future glaucoma.[9] Corneal perforation, which can occur due to traumatic or nontraumatic causes, is a medical emergency that can lead to severe vision loss and ocular morbidity.[10,11] Nontraumatic causes of perforation can be infectious or noninfectious, with conditions like keratoconjunctivitis sicca, Sjogren syndrome, and peripheral ulcerative keratitis being associated with corneal perforation.[12,13] Several factors, including bacterial infections, inflammation, trauma, ocular surface dryness, and corneal degeneration, can contribute to corneal perforation.[10]

Infectious causes of corneal perforation include herpetic keratitis, bacterial keratitis, and fungal keratitis. Microbial keratitis is a significant cause of monocular blindness worldwide, resulting in an estimated 1.5 to 2 million individuals losing their vision annually. Severe cases can cause significant

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eye damage, and persistent infections often lead to corneal perforation, requiring immediate treatment to preserve the eye's integrity.[14] Failure to address corneal perforation appropriately can lead to serious complications such as endophthalmitis, suprachoroidal bleeding, vision loss, and even the need for enucleation.[10,11]

Treating the underlying pathogenic organism with oral and topical medications is crucial in preventing further tissue loss. Tissue adhesives, which aid in wound healing and closure, can be used as an alternative to other temporary or permanent treatments.[9] Tissue adhesives can be derived from nature or artificially made and have been used in ophthalmologic procedures since the 19th century. They offer advantages such as faster surgery times, less postoperative pain, and comparable incision strength while potentially being more cost-effective than sutures. Biological adhesives like fibrin glue and synthetic adhesives like cyanoacrylate are the main types in use.[15,16]

Cyanoacrylate derivatives, specifically cyanoacrylate tissue adhesive (CTA), have been widely used since the 1960s for the treatment of severe corneal thinning and perforation. CTA provides temporary structural support to the damaged corneal tissue. It consists of liquid monomers that polymerize upon contact with tissue anions, facilitating its adherence to the tissue. CTA has been shown to be effective in treating corneal perforation, including cases caused by microbial keratitis.[17-19]

However, there is limited research on the effectiveness of CTA treatment for keratitis cases with different causes. This retrospective case series examines the use of cyanoacrylate tissue adhesive for treating small corneal perforations measuring up to 3.0mm. The study evaluates the effectiveness of this adhesive in the context of infectious keratitis.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based prospective randomized clinical study was conducted for approximately two years from February 2021 to December 2022 at the Department of Ophthalmology, Darbhanga Medical College, Bihar, India. Following inclusion and exclusion criteria the patients were set for the study. This study was approved, and Institutional Ethics Committee has recommended it.

Inclusion Criteria

The inclusion criteria for the study were as follows: First, patients of age 10 years and above were included, encompassing a wide range of individuals, including adolescents and adults. Second, the study focused on cases of small corneal perforation specifically caused by infectious keratitis. This ensured that only patients with this specific condition were included in the study. Finally, there was no gender bias, and both male and female patients were eligible to participate. This approach aimed to gather data from a diverse range of patients, allowing for a more comprehensive understanding of the effectiveness of the treatment under investigation. By setting these inclusion criteria, the study aimed to ensure that the results would apply to a broader population and provide insights into treating small corneal perforations caused by infectious keratitis in patients aged 10 years and above, regardless of their gender.

Exclusion Criteria

- Age less than 10 years.
- Corneal perforation due to any other aetiology apart from infectious keratitis.
- Patients with concomitant endopthalmitis.
- Patients who has undergone glue application for corneal perforation before.
- Patients not ready for regular and timely follow ups.
- Patients who is a known case of glaucoma and iridocorneal synechiae.
- Pregnant and lactating females.

Methodology

This study enrolled patients with small corneal perforations caused by infectious keratitis from the outpatient department of Darbhanga Medical College and Hospital in Leheriasarai. Informed consent was obtained from each participant, ensuring their understanding and agreement to participate in the study. Demographic data, such as age, gender, occupation, and medical history, were recorded. A comprehensive systemic examination was conducted, followed by a detailed ocular examination and assessment of visual acuity for all subjects. The patients were closely monitored for three months to observe any complications and track the outcomes of the treatment. The success of the treatment was determined by factors such as the resolution of the corneal perforation into a scar, improvement in visual acuity, or the maintenance of the anterior chamber. These measures allowed a comprehensive evaluation of the treatment's efficacy in managing small corneal perforations caused by infectious keratitis.

Surgical Procedure

In the operation theatre, after the eye is prepared and covered with drapes, the glue was applied under sterile conditions. The procedure was conducted with the patient under topical or peribulbar anesthesia. Using an operation microscope, the corneal perforation was identified, and any necrotic tissue and epithelium were carefully removed. The surface of the perforation was thoroughly dried. The glue was then drawn into a sterile 1 ml syringe and applied to the perforation, allowing it to set for approximately 30 seconds. To minimize the risk of premature dislodgment of the tissue adhesive, a bandage contact lens was placed on the eye. For postoperative care, topical broad-spectrum antibiotics was administered with one drop every two hours for three days, followed by four times daily for six weeks. Depending on the individual

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case, topical antifungal, antiviral, artificial tear substitutes, cycloplegics, and anti-glaucoma drugs may also be used as necessary. All patients were scheduled for follow-up visits at 15 days, 1 month, 2 months, and 3 months to monitor for complications and evaluate treatment outcomes.

Statistical Method

The data collected during the study was entered into an Excel spreadsheet. To analyze the data, the researchers used SPSS software (Statistical Package for Social Sciences, version 22, SPSS Inc, Chicago, IL). The statistical data were presented in terms of means ± standard deviations (mean ± SD). Descriptive statistics were used to express the frequency and percentage of variables. To determine the association between categorical variables and the outcome (sealed or non-sealed) and the morphological and functional outcomes of the glue application in corneal perforation, the Pearson Chi-square test (or Fisher exact test for 2-tailed analysis) was employed. A comparison of best-corrected visual acuity (BCVA) before and after the glue application was conducted using the Paired T test. A p-value of less than 0.05 was considered statistically significant, indicating a significant difference or association.

RESULTS

A prospective study was conducted at the Department of Ophthalmology, Darbhanga Medical College in Bihar, India. The study involved 50 patients aged 10 years or older and followed a randomized clinical design. Data was collected between February 2021 and December 2022. The study recorded various factors such as patient demographics, duration of follow-up, size of corneal perforation, pre- and postoperative visual acuity, underlying cause of the condition, laterality of affected eyes, and the success of sealing the perforation. The purpose was to evaluate the effectiveness of using cyanoacrylate glue for corneal perforations, assess its impact on visual acuity, identify associations with age and sex, determine the success rate of sealing the perforation, and gather additional insights into the characteristics and outcomes of corneal perforations in the study population.

Demographic data

Age

Total 50 subjects were included in this study based on inclusion and exclusion criteria. The age of patients was ranged from 17-67 years with mean age 37.66 ± 15.04 years. The patients were grouped in various age groups as shown in Table 1. The higher number 20 (40%) of patients was observed in 17-30 year age group, while lowest incidence 4 (8%) was observed among 41-50 year age group.The p value of the age was statistically significant (p = 0.0001) via one sample Test.

Gender

In this study, out of 50 patients, 33 (66%) patients of total population were male, whereas 17 (34%) were female [Figure 1]. Thus the majority of the total populations suffering from keratitis were male compared to female population. The p value of the gender was statistically significant (p = 0.0001) via one sample Test.

Laterality

Among the total 50 patients, [Table 2] laterality of left eye and right eye (higher refractive error in one eye) were recorded. It was observed that 19 (38%) male patients were recorded with left eye laterality while 14 (28%) male patients were having right eye laterality. Similarly, among female patients it was observed, those 1 (22%) female patients were recorded with left eye laterality while 6 (12%) female patients were having right eye laterality. However, the highest number of patients had left eye laterality 30 (60%) compared to the right eye laterality which was 20 (40%). The p value of the laterality was statistically significant (p = 0.0001) via one sample Test.

Etiology

Severe corneal thinning or perforation caused by an active infectious aetiology that was evaluated microbiologically both fungal or bacterial was examined in the population of 50 patients. The total number of patients examined for bacterial infections were low 17 (34%) as compared to the fungal infection which was 33 (66%). It was also observed that the fungal infection among male patients were higher 22 (44%) as compared to the female patients 11 (22%). Similarly, the bacterial infection among male patients were higher 11 (22%) as compared to the female patients 6 (12%) [Figure 2].

Perforation

The sizes of corneal perforation among the infected individuals were recorded. The size of perforation was recorded in three sizes i.e., 1mm, 2mm and 3mm. Among the total population, the majority of patients 26 (52%) were having corneal perforation 1mm, followed by 2mm of corneal perforation with 19 (38%) number of patients [Table 3]. While the least number of patients were 5 (10%) with 3mm of corneal perforation. Also among male patients, the majority 16 (32%) were recorded in the corneal perforation of 2mm. Similarly, the highest number 12 (24%) of female patients were having corneal perforation of 1mm.

Also, the age based distribution of patients of small corneal perforation (<3 mm) was recorded. It was observed that the highest number of patients were recorded in the age range of 17-30 years, 18% (9) each patients were had corneal perforation of sizes 1mm and 2mm, while only 2 (4%) patients were recorded with 3mm corneal perforation. While the lowest number of patients were there in the age range of 41-50 years with 3 (6%), 1 (2%) and none with the corneal perforation size of 1mm, 2mm and 3mm respectively [Table 4]. However, there is no correlation between age and size and perforation

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with p value of 0.8 which not statistically significant.

Cyanoacrylate glue sealing

The total number of 50 patients with infectious etiology was recorded among sealed and non sealed with Cyanoacrylate glue [Table 3,5]. It was observed that 14 (28%) of patients were sealed while 3 (6%) of patients were not sealed with bacterial infections. Similarly, 21 (42%) of patients were sealed while 12 (24%) of patients were not sealed with fungal infections. Thus the total population with sealed corneal perforation was 35 (70%), while the non sealed population was 15 (30%) [Figure 6]. Chi-square test was performed and the persons chi-square value was recorded (1.872) with a p value of 0.171 (not significant) with correlation to etiology and cyanoacrylate glue sealing and non sealing.

Similarly, crosstabulation was recorded with sealed and non sealed patients with respect to the size of perforation [Table 6]. It was observed that among the total population of 50 patients, total 15 patients were not sealed while 35 patients were sealed. The highest number of patients (14n) which were not sealed were observed with corneal perforation of 2mm, while the highest number of patients (25n) which were sealed were observed with 1mm of corneal perforation. Chi-square test was performed and the pearson's chi-square value was recorded (27.877) with a p value of 0.001 (statistically significant) with correlation to size of perforation and cyanoacrylate glue sealing and non sealing.

Table 1: Age wise distribution of patients

Age in years	No. of patients	Percent (%)
17-30	20	40
31-40	14	28
41-50	4	8
51-60	6	12
61-70	6	12
Total	50	

Table 2: Laterality of the total infected population

	Male		Female		Total		P
Laterlity	No. of patients	Percent (%)	No. of patients	Percent (%)	No. of patients	Percent (%)	value
Left Eye (%)	19	38	11	22	30	60	0.0001
Right Eye (%)	14	28	6	12	20	40	

Table 3: Size of corneal perforation among total population

	Male		Female		Total		P
Size of perforation	No. of patients	Percent (%)	No. of patients	Percent (%)	No. of patients	Percent (%)	value
1mm	14	28	12	24	26	52	0.000
2mm	16	32	3	6	19	38	2
3mm	3	6	2	4	5	10	

Table 4: Size of corneal perforation of age wise distribution of patients

Size of perforation	1mm		2mm		3mm	
AGE	No. of patients	Percent (%)	No. of patients	Percent (%)	No. of patients	Percent (%)
17-30	9	18	9	18	2	4
31-40	8	16	5	10	1	2
41-50	3	6	1	2	0	0
51-60	3	6	2	4	1	2
61-70	3	6	2	4	1	2

Table 5: Infected patients with Cyanoacrylate glue sealing and non sealing

	Bacterial		Fungal		Total	
	No. of patients	Percent (%)	No. of patients	Percent (%)	No. of patients	Percent (%)
Sealed	14	28	21	42	35	70
Not sealed	3	6	12	24	15	30
Chi-Square test						
	Value	df	Asymptotic Significance [p value]		Exact Sig. [p value]	
Pearson Chi-Square	1.872a	1	.171			
Continuity Correctionb	1.086	1	.297			
Likelihood Ratio	1.981	1	.159			
Fisher's Exact Test					.209	
N of Valid Cases	50					

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Table 6. Sealed or Not sealed crosstabulation with size of perforation

		Size of perforation			Total
		1mm	2mm	3mm	
Sealed or Not sealed	Not sealed	1	14	0	15
	Sealed	25	5	5	35
Total		26	19	5	50

Chi-Square Tests			
	Value	Df	P value
Pearson Chi-Square	27.877	2	<.001
Likelihood Ratio	30.709	2	<.001
N of Valid Cases	50		

Table 7: Pre-Operated vision of the total population

Visual acuity	Pre-Operated Vision	
	N	%
Finger Counting Close to Face	6	12
1 /60	12	24
2 /60	7	14
3 /60	11	22
4 /60	4	8
5 /60	0	0
6 /60	10	20
Mean	3.22	
Standard Deviation	1.753	
Standard Deviation Error	0.248	
P value	0.00008	

Table 8: Visual acuity after 1 week of the total population

Visual acuity	Visual Acuity 1 week after glueing	
	N	(%)
Finger Counting Close to Face	6	12
1 /60	4	8
2 /60	9	18
3 /60	4	8
4 /60	3	6
5 /60	3	6
6 /24	7	14
6 /36	3	6
6 /60	11	22
Mean	5.32	
Standard Deviation	2.759	
Standard Deviation Error	0.390	
P value	0.00026	

Table 9: Pre operated vision crosstabulation with Visual acuity after 1 week

Count											
		Visual Acuity 1 week after glueing									Total
		1 /60	2 /60	3 /60	4 /60	5 /60	6 /24	6 /36	6 /60	Finger Counting Close to Face	
Pre Operated Vision	1 /60	0	5	3	0	0	0	0	0	4	12
	2 /60	0	1	0	3	3	0	0	0	0	7
	3 /60	0	3	1	0	0	0	0	7	0	11
	4 /60	0	0	0	0	0	0	0	4	0	4
	6 /60	0	0	0	0	0	7	3	0	0	10
	Finger Counting Close to Face	4	0	0	0	0	0	0	0	2	6
Total		4	9	4	3	3	7	3	11	6	50

Chi-Square Tests			
	Value	df	P value
Pearson Chi-Square	158.711a	40	0.0004
Likelihood Ratio	129.503	40	0.00026
N of Valid Cases	50		

Table 10: Visual acuity after 1 month of the total population

Visual acuity	Visual Acuity one month after glueing	
	N	(%)
Finger Counting Close to Face	2	4
2 /60	9	18

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3 /60	10	20
6 /12	7	14
6 /18	3	6
6 /24	11	22
6 /36	3	6
6 /60	5	10
Mean	3.72	
Standard Deviation	2.138	
Standard Deviation Error	0.302	
P value	0.00013	

Table 11: Pre operated vision crosstabulation with Visual acuity after 1 month

Count									
		Visual Acuity one month after glueing							**Total**
		2 /60	**3 /60**	**6 /12**	**6 /18**	**6 /24**	**6 /36**	**6 /60**	**Finger Counting Close to Face**	
Pre Operated Vision	1 /60	9	2	0	0	0	0	1	0	12
	2 /60	0	0	0	0	0	3	4	0	7
	3 /60	0	4	0	0	7	0	0	0	11
	4 /60	0	0	0	0	4	0	0	0	4
	6 /60	0	0	7	3	0	0	0	0	10
	Finger Counting Close to Face	0	4	0	0	0	0	0	2	6
Total		9	10	7	3	11	3	5	2	50

Chi-Square Tests			
	Value	**df**	**P value**
Pearson Chi-Square	159.988a	35	0.0066
Likelihood Ratio	132.402	35	0.0003
N of Valid Cases	50		

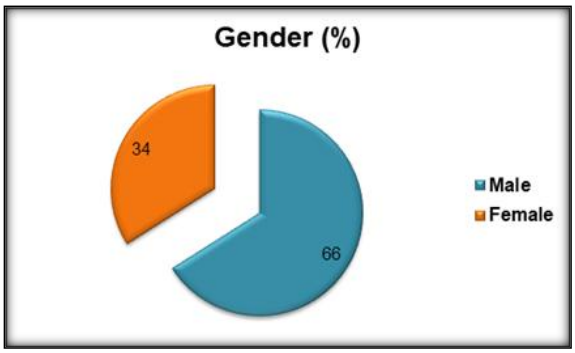

Figure 1: Gender based distribution of patients

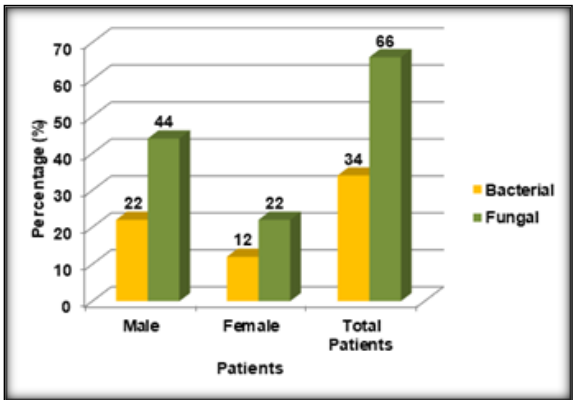

Figure 2: Infectious etiology among male, female and total population

Visual Acuity

Pre operated vision

Among the total population of 50 patients, pre operated vision were recorded in each of the patients [Table 7]. The mean value of pre operated visual acuity of the total population recorded was 3.22 ± 1.75 with the standard error deviation of 0.248. The highest number of pre operated patients 12 (24%) was recorded with the visual acuity of 1/60 while the lowest number 4 (8%) of patients were with the visual acuity of 4/60 [Figure 5]. The p value (p = 0.00008) of the pre operated visual acuity was statistically significant via one sample T test.

Visual acuity after 1 week

Among the total population of 50 patients, Visual acuity after 1 week were recorded in each of the patients [Table 8]. The mean value of Visual acuity after 1 week of the total population recorded was 5.32 ± 2.75 with the standard error deviation of 0.39. The highest number of patients 11 (22%) with Visual acuity after 1 week was recorded with the visual acuity of 6/60 while the lowest number 3 (6%) of patients were with the visual acuity of 4/60, 5/60 and 6/36 each [Figure 6]. The p value (p = 0.00026) of the Visual acuity after 1 week was statistically significant via one sample T test.

There was total number of 6 patients required finger counting close to face among the total population of 50 patients. The total number of patients were recorded for each category in the visual acuity of pre-operated vision and vision after 1 week [Table 9] Chi-square test was performed and the pearson's chi-square value was recorded (27.877) with a p value of 0.001 (statistically significant) with correlation to pre-operated vision with Visual acuity after 1 week.

Visual acuity after 1 month

Among the total population of 50 patients, Visual acuity after 1 month were recorded in each of the patients [Table 10]. The mean value of Visual acuity

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after 1 month of the total population recorded was 3.72 ± 2.13 with the standard error deviation of 0.30. The highest number of patients 11 (22%) with Visual acuity after 1 month was recorded with the visual acuity of 6/24 while the lowest number 2 (4%) of patients were with the Finger Counting Close to Face [Figure 7]. The p value (p = 0.00013) of the Visual acuity after 1 month was statistically significant via one sample T test.

There was total number of 2 patients with finger counting close to face among the total population of 50 patients. The total number of patients were recorded for each category in the visual acuity of pre-operated vision and vision after 1 week [Table 11] Chi-square test was performed and the pearson's chi-square value was recorded (159.9) with a p value of 0.0066 (statistically significant) with correlation to pre-operated vision with Visual acuity after 1 week.

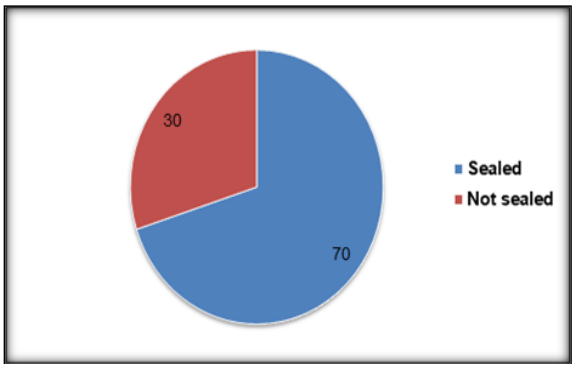

Figure 3: Distribution of total population for sealed and non sealed patients

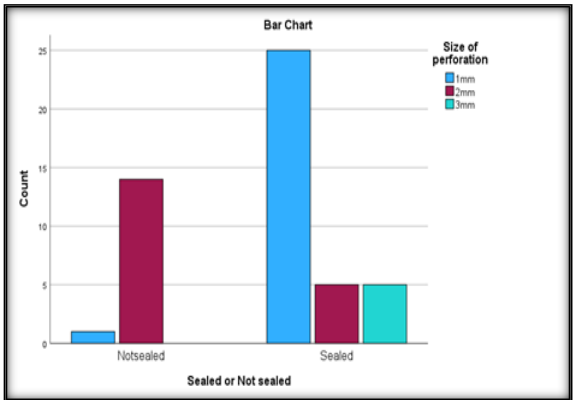

Figure 4: Chart representing sealed and not sealed population with size of perforation

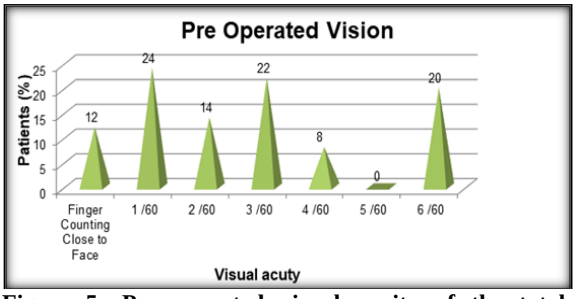

Figure 5: Pre operated visual acuity of the total population

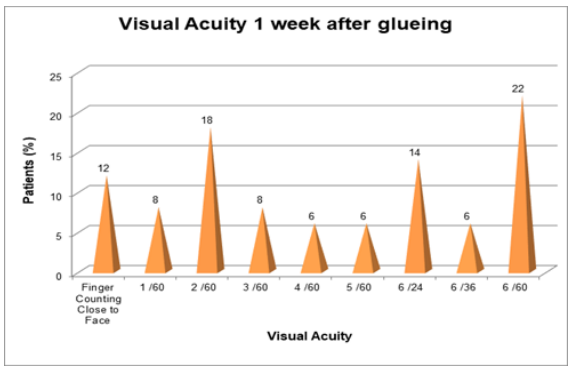

Figure 6: Visual acuity after 1 week of the total population.

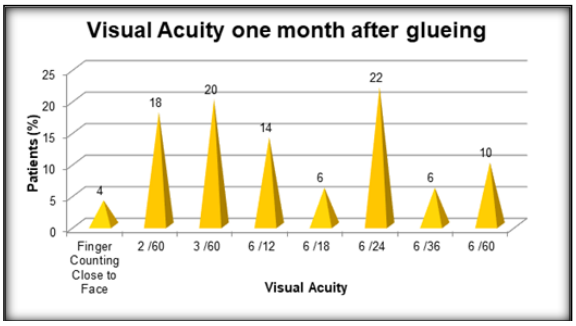

Figure 7: Visual acuity after 1 month of the total population.

DISCUSSION

A prospective, randomized clinical study was conducted at the Department of Ophthalmology of Darbhanga Medical College in Bihar, India, from February 2021 to December 2022. The study aimed to evaluate the use of cyanoacrylate tissue adhesive for sealing corneal perforations. Cyanoacrylate adhesive is a fluid monomer that polymerizes upon contact with tissue surfaces, forming a firm and flexible coating to seal the wound borders. Various successful "direct application" techniques have been reported for small corneal perforations.

The research presented a simple, repeatable method with minimal risk of adhesive-related complications. It offered the advantage of a smooth corneal surface, unlike the uneven surfaces often observed with direct application approaches. Although other adhesives such as fibrin glues may be less hazardous, they are not as widely accessible as cyanoacrylate glue, which is typically available in emergency rooms.[20,21]

Regarding age, the study included participants aged 17 to 67, with a mean age of 37.66 ± 15.04 years. This age range was comparable to Adepoju et al.'s research, which highlighted that chemical use is common among employed young individuals with a mean age of 31.87 years. Bharathi MJ et al. concluded that patients over 50 had a significantly higher prevalence of corneal ulcers, potentially due to age-related declines in immunity, increasing susceptibility to bacterial infections.[22,23]

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In terms of gender, out of the 50 patients in the study, 66% were men, while 34% were women. Men were more affected by keratitis compared to women. Similar findings were reported in the analysis by VC Poria, where 51% of men and 43% of women among 100 clinically suspected cases of mycotic keratitis were male. Bharathi MJ et al. also observed a higher prevalence of corneal ulcers in men (56.78%) compared to women (43.24%) among 1043 patients. This gender disparity may be attributed to men's higher involvement in labor-intensiveoccupations.[24,25]

Regarding laterality, out of the 50 cases, 60% exhibited left eye laterality, while 40% had right eye laterality. This difference was statistically significant. A case study with similar characteristics found that corneal perforations affected the left eye in five cases, the right eye in two cases, and both eyes in the remaining cases. Different locations of the perforations were observed, with three on the nasal side and four on the temporal side. Additionally, three perforations occurred in the peripheral cornea, while four occurred in the central cornea.[26] However, according to Singh et al.'s study involving 67 patients, corneal perforations were noted in the left eye of 43% of patients and the right eye of 57% of patients.[27]

In the study conducted on 50 cases of corneal ulcers, it was found that 34% of the cases were caused by fungal infections, while 34% were attributed to bacterial infections.[28] The majority of the patients tested positive for fungal infections, which aligns with previous studies conducted in India. The use of antibiotics prior to sample collection and the bacteriostatic effect of the local anesthetic used in the study may have contributed to the lower bacterial pathogen isolation.[29-31]

Regarding the size of corneal perforations, three diameters were recorded: 1mm, 2mm, and 3mm. The most common size observed among the patients was a 1mm perforation, followed by a 2mm perforation. Another study reported a higher prevalence of corneal perforations or thinning centrally or paracentrally compared to the periphery of the cornea. The average size of perforation or thinning was measured to be 3.75 mm^2. The treatment involved the application of cyanoacrylate adhesive (CTA), with an average of 1.48 applications per patient. Some cases required multiple treatments for optimal healing, with 37% of the eyes needing additional applications within a month of the initial application.[31] In terms of age distribution, individuals between the ages of 17 and 30 were most commonly affected by small corneal perforations. There was no significant correlation observed between the extent of the ulcer and the chance of corneal thinning or perforation.

Sealing corneal perforations with cyanoacrylate glue was successful in 70% of the cases. The use of CTA prevented the migration of certain immune cells to the damaged site and inhibited collagenases, thus preventing corneal melts. Formaldehyde, a by-product of CTA's polymerization process, demonstrated antibacterial properties through alkylation, which disrupts the chemical groups in proteins and nucleic acids of pathogens.[32-34]

In this study, the researchers evaluated the visual acuity outcomes of patients after using cyanoacrylate glue for corneal defects. Preoperative visual acuity assessments showed that eyes with ruptured corneas and flat anterior cavities had worse visual acuity. The average preoperative visual acuity for the entire group was 3.22 ± 1.75, with the highest number of patients having a visual acuity of 1/60 and the lowest number with a visual acuity of 4/60. After one week, visual acuity improved, with the highest number of patients achieving a visual acuity of 6/60. There were 6 patients who required finger counting close to their face. Statistical analysis showed a significant correlation between preoperative vision and visual acuity after one week. There was no overall difference between medical treatment and amniotic membrane grafting in the end visual acuity, symblepharon formation, corneal vascularization, and tear function tests in a research conducted by Tamhane et al with only amniotic membrane transplantation [35]. With the aid of tenoplasty using cyanoacrylate glue, Sharma et al demonstrated increase in visual acuity and preservation of ocular surface integrity [36]. In a different investigation by Kuckelkorn R et al. on tenoplasty for severe chemical injuries, corneoscleral ulceration was avoided in all cases while maintaining the integrity of the ocular surface.[37]

The use of cyanoacrylate glue in various studies has shown advantages in terms of visual acuity and ocular surface integrity. Studies have demonstrated an increase in visual acuity and preservation of ocular surface integrity with tenoplasty using cyanoacrylate glue. In cases of corneal perforations, cyanoacrylate glue has been successful in avoiding the need for additional surgical treatment and improving visual acuity.[38-41]

The procedure of patching corneal defects with cyanoacrylate glue has consistently resulted in improved best-corrected visual acuity without significant side effects. The researchers in this study were able to achieve a best-corrected visual acuity of 6/24, thereby avoiding the need for urgent full-thickness penetrating keratoplasty. The use of cyanoacrylate glue for corneal defects under 3 mm in diameter shows promise as an effective treatment approach.

CONCLUSION

Corneal ulceration, commonly caused by trauma, is more prevalent in men, and mixed ulcers are the most common type of infection. This study emphasizes the importance of microbiological diagnosis in the medical management of corneal

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ulcers. The type of organism and early detection significantly influence ulcer healing. Microbiological identification plays a crucial role in diagnosing infectious keratitis, which can result from bacterial and fungal infections. Targeted administration of potent antibiotics or antifungals has dramatically improved the bacterial and fungal keratitis prognosis. Prompt and comprehensive eye examinations and effective microbiological research and treatment enable specific anti-pathogenic therapy. Patients who delay seeking medical attention or present with large ulcers often have difficulty responding to antibacterial or antifungal treatment, and surgical intervention, such as corneal transplantation, may be necessary. Conducting a microbiological analysis of corneal scraping samples before initiating treatment is crucial in managing corneal ulcers and preventing corneal blindness.

The use of cyanoacrylates in eye surgery, particularly in young infants, offers advantages such as avoiding sutures and waterproof and flexible wound closure. Proper eye hygiene and awareness can contribute significantly to preventing corneal blindness. Cyanoacrylate adhesives have various applications, including potential use as a drug delivery method. Multiple patches can be used to provide additional support to tissue defects. Further research is underway to evaluate the effectiveness of newer adhesives in treating corneal perforations. Long-term clinical trials are needed to validate their use.

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