

Comparison of Schirmer I Test with And without Topical Anesthesia in Normal Eyes

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Abstract:

Aim: To evaluate the effect of topical Anesthesia on the results of Schirmer's I Test (S I t) in normal Eyes.

Methods: Totally, 200 eyes in 100 Normal individuals, male (34) and female (66), (with a mean age of 59 years) were examined. S I t without anesthesia was performed firstly, and 15 minutes later it was applied in the same person after topical anesthesia with 0.5% Proparacaine Hydrochloride eye drops.

Results: The wetting length in S I t after topical anesthesia was significantly lower than that in S I t without anesthesia ($P < 0.05$).

Conclusion: Schirmer I test is used to detect the true basal secretion of tears and this study shows that topical anesthesia usage is better in detecting true basal secretion as Schirmer's I test without anesthesia shows an apparently increased wetting due to some amount of reflex secretion.

Keywords: Schirmer I test, with and without topical anesthesia

Date Of Submission: 25 -10-2017

Date Of Acceptance: 02-11-2017

I. Introduction

The most common means of measuring tear production has been Schirmer's test, the details of which were first published in 1903. Jones later advocated the use of topical anesthesia combined with a Schirmer's test strip for 5 minutes to reduce the stimulating effect of the filter paper strip – the 'basal' tear secretion test. Inconsistencies in its application limit repeatability in DES (Dry Eye Syndrome), but it still enjoys widespread use because of the ease of technique. Schirmer investigated the extent of wetting of a 5x35 mm blotting paper strip after folding 5 mm from one end and placing it in the lower fornix, at the junction of outer one-third and inner two-thirds for 5 minutes. ⁽¹⁾He found the normal secretion varied from 0.50 to 0.67 ml of tears per day and more than 15 mm of wetting on 5 minutes, measured from the folded end, was normal. Later, Whatman filter paper number 41 was standardized for this test. ⁽¹⁾This test became popular as Schirmer I (or simply Schirmer) test and gives the value for both basic and reflex secretion of tears. ⁽¹⁾

A basal secretion test has been described in which the conjunctiva is anaesthetized before performing the test in a similar manner as above ⁽²⁾. The difference between Schirmer I test and this test is a measure of basal secretion of tears. No statistical data supports this test as it is believed that conjunctiva is not fully anesthetized to block reflex secretion. To know the reflex secretion of tears, a Schirmer II test was described. It is performed in the same way, after rubbing the unanesthetized nasal mucosa with a dry cotton and note the wetting after 2 minutes. ⁽⁴⁾Schirmer extended his observations to know the reflex secretion and described a Schirmer III test, which required the patient to look directly in the sun. ⁽¹⁾ It has no diagnostic value and is potentially dangerous.

Estimating the prevalence of dry eye syndrome is complicated by the absence of consensus on a single reliable diagnostic test. Several population-based epidemiologic studies have utilized questionnaires to assess prevalence of dry eye symptoms. American and Australian studies have revealed a prevalence of 5–16%, while Asian studies have revealed a higher prevalence of approximately 27–33%. ⁽⁵⁻¹⁶⁾ Hence this study has been taken up to assess whether topical anesthesia is useful in improving the accuracy of Schirmer's I test in detecting the tear production.

Aim: To evaluate the effect of topical Anesthesia on the results of Schirmer's I Test in normal individuals

Subjects And Methods: Totally 200 eyes of 100 normal people who attended to the patients admitted in Government Regional Eye Hospital, Visakhapatnam from January 2017 to April 2017 were recruited for the study. There were 34 males and 66 females with a mean age of 59 years. Informed consent was obtained from the subject prior to undertaking the study.

People suffering from the below listed conditions have been excluded from the study:

- Diagnosed cases of Dry Eye or Having symptoms of dry eye

- Thyroid Eye Disease
- Diabetes Mellitus
- Allergies
- Pregnancy
- Connective Tissue Disorders (Systemic Lupus Erythematosus, Rheumatoid Arthritis)
- Sjogren's Syndrome
- Pterygium
- Post Refractive Corneal Surgeries
- Active Corneal and Conjunctival Inflammations
- Vitamin-A deficiency
- Usage of Drugs: OCP's (Oral Contraceptive Pills), Anti-Histamines, Anti-Depressants, HRT (Hormone replacement Therapy)

II. Methods

- Slit Lamp examination of Anterior Segment of both the eyes is done.
- Schirmer's I test:
 - Initially done without Anesthesia:
 - The person is seated comfortably at rest
 - 35mmx5mm sized, Whatman 41 filter paper is used
 - The filter paper is folded at 5mm distance from one end and placed over the lower lid margin taking care not to touch the cornea during the procedure
 - The filter paper is placed at the junction of medial 2/3rd and lateral 1/3rd of the lower lid for a period of 5 minutes
 - The person is asked to keep his eyes closed for the 5 minutes
 - The wetting of the strip is recorded at the end of 5 minutes
 - Schirmer's I test with Anesthesia:
 - Person is comfortably seated at rest
 - Done 15 minutes after doing the test without Anesthesia
 - Proparacaine Hydrochloride 0.5% is instilled into the lower conjunctival cul-de-sac
 - 1 drop, is instilled 1 minute apart for 2 times
 - The excess anesthetic solution in the lower conjunctival cul-de-sac is gently wiped off with a cotton tipped applicator 1 minute after instillation of the last drop of Proparacaine
 - The Whatman 41 Filter paper is placed in the same manner as done for the procedure without Anesthesia for 5 minutes
 - The wetting of the strip is recorded at the end of 5 minutes

III. Statistical Analysis

The data was presented as mean of the wetting lengths with and without anesthesia. Paired-sample t Test was chosen to compare the wetting length without topical anesthesia and with topical anesthesia. Significance level was set at $P < 0.05$. The calculations were done using Graphpad.com paired t test calculator.

Results

- The wetting length of 15mm or less was considered to be abnormal with and without usage of topical anesthesia.⁽¹⁾
- Totally, 200 eyes in 100 Normal individuals, which included 34 male and 66 female individuals, with a mean age of 59 years were examined.
- Of the 200 eyes subjected to testing, there was reduction in the wetting of the filter paper after administration of topical anesthesia in 132 eyes, no change in 15 eyes and increase in wetting in 53 eyes.
- The mean wetting length without anesthesia is 19.01 mm and with topical anesthesia is 15.27mm

Table 1

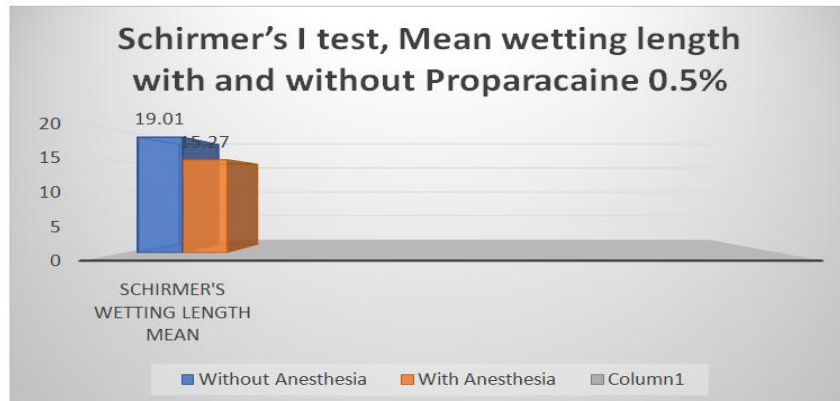


Table 2: Comparison of Wetting Lengths over various ranges with and without topical Anesthesia:

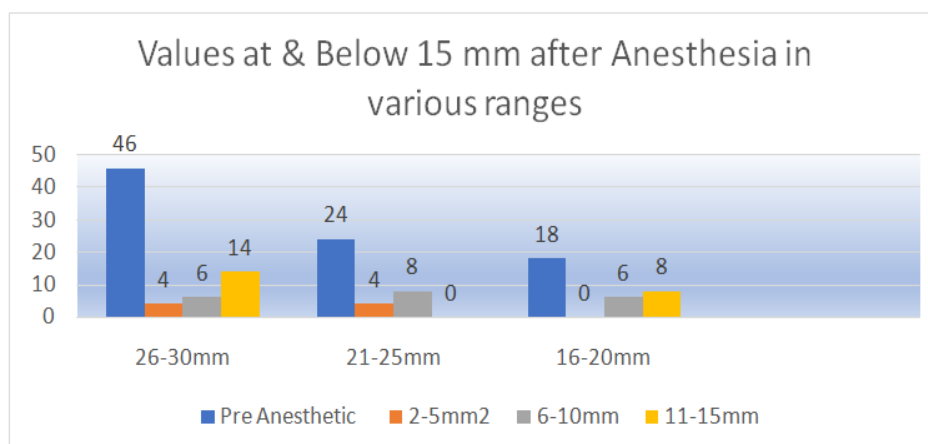
Pre Anesthetic Value in millimetres	No. of Eyes	Post anesthetic value in millimeters						
		26-30mm	21-25mm	16-20mm	11-15mm	6-10mm	2-5mm	0-1mm
26-30mm	46	2	16	4	14	6	4	0
21-25mm	24	2	4	6	0	8	4	0
16-20mm	18	0	0	4	8	6	0	0
11-15mm	38	8	2	6	10	12	0	0
6-10mm	38	6	2	6	8	6	10	0
2-5mm	36	0	0	4	2	10	16	4
0-1mm	0	0	0	0	0	0	0	0

Table 3: Comparison of Wetting Lengths that have decreased after application of Topical Anesthesia:

Pre Anesthetic Value in millimetres	No. of Eyes	Post Anesthetic Value in millimeters						
		26-30mm	21-25mm	16-20mm	11-15mm	6-10mm	2-5mm	0-1mm
26-30mm	46	2	16	4	14	6	4	0
21-25mm	24	NA	6	6	0	8	4	0
16-20mm	18	NA	NA	4	8	6	0	0
11-15mm	20	NA	NA	NA	8	12	0	0
6-10mm	10	NA	NA	NA	NA	0	10	0
2-5mm	14	NA	NA	NA	NA	NA	10	4
0-1mm	0	NA	NA	NA	NA	NA	NA	0

NA-Not Applicable

Table 4: Comparison of Wetting Lengths that have fallen to 15 mm or below after application of Topical Anesthesia:



50 Eyes out of 88 Eyes (56% Eyes) showed decrease in readings from normal to 15 mm and below after application of anesthesia.

IV. Discussion

This study shows significant reduction in wetting length of the Schirmer's filter paper after instillation of topical anesthesia. Totally 200 eyes in 100 Normal individuals were tested which included 34 male and 66 female individuals, with a mean age of 59 years. Of the 200 eyes subjected to testing, there was reduction in the wetting of the filter paper after administration of topical anesthesia in 132 eyes and there was no change in wetting length after application of topical anesthesia in 15 eyes and there was increase in wetting length in 53 eyes after application of topical anesthesia, but the increase was in the range of 1 to 2 mm which was found to be statistically insignificant. The mean wetting length without anesthesia is 19.01 mm and with topical anesthesia is 15.27mm.

The wetting length in Schirmer's I test after topical anesthesia is significantly lower than that without anesthesia ($p=0.014835$) (paired t test is used). The result is significant at $p<0.05$. (TABLE 1). The wetting length in 50 eyes has come down below 15mm when Proparacaine was applied which was more than that without anesthesia. (TABLE 2,3,4). The no.of eyes that showed reduction in wetting length after application of topical anesthesia was more in the range of 26-30mm (pre-anesthetic value), amounting to 24 eyes(48%) compared to other ranges of pre anesthetic wetting.

The fall in the wetting length was statistically significant with a p value of less than 0.05 50 Eyes out of 88 Eyes (56% Eyes) showed decrease in readings from normal to 15 mm and below after application of anesthesia. (TABLE 2,3,4) In a similar study conducted by Na Li, Xin-Guo Deng, and Mei-Feng He in Zhongshan Ophthalmic Center, China, on people diagnosed with Dry Eye Disease, the wetting length was significantly lower after topical anesthesia and they concluded that Schirmer's I test after topical anesthesia is more objective and reliable in reflecting the status of dry eye and especially in Aqueous deficient dry eye. In another study conducted by José M. Herreras, Soledad Pérez, Helena Pérez, Margarita Calonge & J. Carlos Pastor, in 56 normal people, 62 blepharitis patients and 15 patients having blepharitis associated dry eye syndrome, mean values of Schirmer's test decreased 24.8% ($p<0.01$) when performed after application of topical anesthesia in normal people and 25.33% and 24.19% respectively, ($p<0.001$) in the other two groups.(5) They concluded that performing diagnostic tests after topical anesthesia instillation could be useful in detecting dry eye associated with blepharitis. Schirmer tests that were conducted on 265 eyes without instillation of 0.5% proparacaine hydrochloride and on 466 eyes with proparacaine showed that topical anesthesia reduced mean test values by 40%.⁽¹⁹⁾

V. Conclusion

Schirmer I test is used to detect the true basal secretion of tears and this study shows that topical anesthesia usage is better in detecting true basal secretion as Schirmer's I test without anesthesia shows an apparently increased wetting due to some amount of reflex secretion.

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*Dr. V. Meenakshi MS. "Comparison of Schirmer I Test with And without Topical Anesthesia in Normal Eyes." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 16.11 (2017): 01-05