

## Incidence of angle recession after blunt trauma- A longitudinal study

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### Abstract

**Introduction:** Ocular injury is an important cause of avoidable visual impairment specially in young age group worldwide.

**Materials and Methods:** 82 patients having blunt trauma to one eye attending ophthalmology department (outpatient, inpatient and emergency patients) are enrolled. Baseline investigation with fundus evaluation, intraocular tension assessment with applanation tonometry and anterior chamber angle evaluation done with gonioscopy on 1, 3 and 6 months. Statistical Analysis was performed with help of Epi Info.3.5.3.

**Results:** The mean age (mean  $\pm$  s.d.) of the patients was 32.53 $\pm$ 11.86 years with range 4 - 55 years and the median age was 33.0 years. Male: Female 2.4:1 though there was no correlation of age and sex. Incidence of angle recession was 24.3% in 1<sup>st</sup> month of follow up. In patients with hyphema the incidence is 71%. 5% of patient with traumatic angle recession have increased intraocular pressure till last follow up but it is not related to degree of angle-recession.

**Conclusion:** Recession of the anterior chamber angle is a common finding following concussive ocular trauma. This cohort of patients should be followed up for development of glaucomatous optic neuropathy and vision loss.

**Keywords:** Angle recession, Blunt trauma, Post traumatic glaucoma.

### Introduction

Ocular injury remains an important cause of avoidable and predominantly, monocular visual impairment and blindness.<sup>1,2</sup> Management of ocular trauma has always been a challenge to ophthalmologist.<sup>3</sup> Young adult males are more prone to ocular trauma as they indulge in high risk behaviors. A good proportion of work related, assault and sports related eye injuries were reported in young adult males.<sup>4</sup> A review of the relevant literature shows that rates vary widely and can be between 1.7% and 21.1%. The prevalence rates of ocular trauma worldwide vary considerably. For example, the prevalence is 3.97% in Southern India,<sup>5</sup> 4.5% in the rural population of Southern India,<sup>6</sup> 6.98% in the US,<sup>7</sup> and 21.1% in Australia.<sup>8</sup> Angle recession, with or without glaucoma, is a common sequel of blunt ocular trauma and one characterized by a variable degree of cleavage between the circular and the longitudinal fibers of the ciliary muscle.<sup>9</sup> It has been reported that up to 60% of eyes with non-penetrating or concussive trauma will develop some degree of angle recession.<sup>10</sup> Angle recession is also strongly associated with traumatic hyphema with studies reporting a 60-100% incidence.<sup>11</sup>

Following blunt trauma, glaucoma may occur early (acute), either with or without haemorrhage (hyphema). Glaucoma also may occur late (chronic), either with or without angle recession.

The aim of this study is to find out the incidence of angle recession and intraocular pressure changes after blunt trauma in a tertiary hospital in eastern India.

### Materials and Methods

It was a hospital based prospective, comparative study. 82 Patients of blunt trauma to one eye attending OPD and eye emergency of NRS Medical College and Hospital were enrolled after written consent. Only eye having blunt trauma to single eye was examined. No control group is required as the non-traumatized fellow eye will serve as control.

**Inclusion Criteria:** Patients having blunt trauma to one eye attending ophthalmology department (outpatient, inpatient and emergency patients) are enrolled.

**Exclusion Criteria:** Patients having history of glaucoma and /or undergoing treatment for any previous glaucoma, grossly damaged eye ball compromising the integrity detailed history of their age, gender, family history, medical history, personal history and incident of ocular trauma was taken. The uncomplicated eyes were assessed immediately. Patients with hyphema were treated with rest in bed, cycloplegics and patching of the injured eye, for 4 days. Topical antibiotics were used in the presence of a corneal abrasion. Uncooperative children were sedated for examination. On the fourth post-traumatic day, in uncomplicated cases, the patients were mobilized, and both eyes were assessed. Parameters assessed were age, sex, visual acuity, anterior segment evaluation (by slit lamp microscopy), fundus examination (by direct ophthalmoscopy and 90 D lens), applanation tonometry and gonioscopy.

Biprism is placed in the holder - 180° marking aligned with white line on the holder and tension nob is set at 1g. Cornea is anesthetized with a topical preparation. Tear film is stained with sodium

fluorescein - paper strip or fluorescein solution of 0.25%. The tonometer tip is cleaned with disinfecting solution. Cornea and biprism illuminated by a cobalt blue light from the slit lamp, the angle between the biprism and the illumination is 60 degree. Low magnification and slit beam is opened maximally. Patient looks straight. Lids are held against the bony orbit. Gentle contact of biprism is made with the corneal apex while observing through the slit lamp- Mono ocular view. Two semicircles of equal size are seen. The rings should be approximately 0.25 to 0.30 mm in thickness. The tension knob is rotated until the inner borders of the fluorescein ring touch each other at the midpoint of their pulsations. Reading on the dial is multiplied by 10 to get the IOP in millimetres of mercury. IOP is measured first in one eye until three successive readings are within 1 mm Hg and then measured in the other eye.

The normal range of IOP is 11mm of hg to 21mm of hg.<sup>13</sup> The difference of IOP of 6mm of hg between two eyes of a patient considered abnormal.<sup>14</sup>

**Gonioscopy:** Indirect Gonioscopy was done with all the patients. The patient is positioned in a comfortable fashion. A drop of topical anaesthetic is then applied to the conjunctiva of both eyes. Using the Goldmann 2 mirror lens, contact gel is placed in the concave part. The patient is then asked to open both eyes and look upwards. Lower lid then pulled down slightly and the lens is placed on the surface of the eye. The patient is then asked to look straight ahead. Starting with the inferior angle as it is usually a bit more open, and the pigmentation of the trabecular meshwork is slightly more prominent allowing for easier identification of the angle structures. Continue identifying all angle structures in all 4 quadrants, and then repeat with the other eye. Gonioscopy, is used as a diagnostic test for making the clinical diagnosis of angle recession. When gonioscopy is performed, asymmetry of the angle recess is noticed between the affected and the non-traumatized eye or in different quadrants of the involved eye. Widening of the ciliary body band is taken as the sign of angle recession and degree of recession is noted. Degree of angle recession is graded as less than 180°, 180° to 360° and 360°.<sup>33</sup>

**Data Analysis:** Statistical Analysis was performed with help of Epi Info<sup>(TM)</sup> 3.5.3. EPI INFO is a trademark of the Centres for Disease Control and Prevention (CDC). Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (s.d.). Test of proportion was used to find the Standard Normal Deviate (Z) to compare the difference proportions and Chi-square test was performed to find difference between qualitative data.  $p < 0.05$  was taken to be statistically significant.

## Results

The mean age (mean  $\pm$  s.d.) of the patients was  $32.53 \pm 11.86$  years with range 4 - 55 years and the median age was 33.0 years (table 1). Test of proportion showed that proportion of males (70.7%) was higher than that of females (29.3%) but was not significant ( $Z = 5.93$ ;  $p < 0.0001$ ). The ratio of male and female was 2.4:1.0.

Test of proportion showed that the proportion of the patients in the age  $< 40$  years (70.7%) were significantly higher than other age group ( $Z = 7.10$ ;  $p < 0.0001$ ). Only 9.8% were with age  $\geq 50$  years.

Corrected Chi-square test showed that there was no significant association between age groups and gender of the patients ( $p = 0.56$ ).

Proportion of patients with higher IOP (9.8%) of traumatic eye was significantly higher at 1 month in comparison to non-traumatic eye (0.0%) ( $Z = 2.90$ ;  $p = 0.00374$ ). Though proportion of patients with higher IOP of traumatic eye was higher at 3 month (3.7%) and 6 month (2.4%) in comparison to non-traumatic eye (0.0%) but it was not significant ( $Z = 1.74$ ;  $p = 0.08$ ).

Also in traumatic eye proportion of higher IOP decreased significantly at 3 month and 6 month in comparison to at 1 month ( $Z = 1.98$ ;  $p = 0.0477$ ).

Table 3 shows proportion of angle recession increased for the patients with hyphema in subsequent visits (71.4%) in comparison to at presentation (60.7%) but it was not significant ( $Z = 1.49$ ;  $p = 0.13$ ).

Table 4 shows Proportion of patients with angle recession was significantly higher for degree of angle recession  $\leq 180^\circ$  (60.0%) than other degree of angle recession ( $Z = 4.26$ ;  $p < 0.001$ ).

Corrected Chi-square test was applied in three group for comparing correction of degree of angle recession with increased intraocular pressure. Image 1 showed that there was no association between degree of angle recession and increased IOP ( $p = 0.88$ ).

**Table 1: Age and Gender distribution of the patients**

Age Group (in years)	Male (n=58)	Female (n=24)	Total
<30	22	9	31
Row %	71.0	29.0	100.0
Col %	37.9	37.5	37.8
30-39	17	10	27
Row %	63.0	37.0	100.0
Col %	29.3	41.7	32.9
40-49	12	4	16
Row %	75.0	25.0	100.0
Col %	20.7	16.7	19.5
50-59	7	1	8
Row %	87.5	12.5	100.0
Col %	12.1	4.2	9.8

Total	58	24	82
Row %	70.7	29.3	100.0
Col %	100.0	100.0	100.0
Mean±s.d.	33.39±12.	30.45±1	
Median	34.5	31.0	
Range	4 - 55	5 - 55	

**Table 2: Distribution of higher IOP**

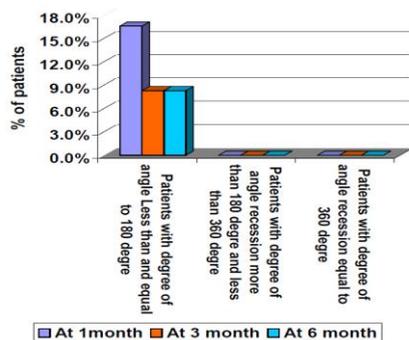
Time Interval	Traumatic Eye (n=82)		Non-traumatic Eye (n=82)	
	Number	%	Number	%
At presentation	0	0.0%	0	0.0%
At 1 month	8	9.8%	0	0.0%
At 3 month	3	3.7%	0	0.0%
At 6 month	2	2.4%	0	0.0%

**Table 3: Distribution of angle recession of the patients with hyphema (n=28)**

Time Interval	Total (n=28)	
	Number	%
At presentation	17	60.7%
At 1 month	20	71.4%
At 3 month	20	71.4%
At 6 month	20	71.4%

**Table 4: Distribution of patients with angle recession according to degree of angle recession**

Degree of angle recession	Patients with angle recession (n=20)	
	Number	%
Less than and equal to 180°	12	60.0%
More than 180° and less than 360°	6	30.0%
Equal to 360°	2	10.0%

**Fig. 1:**

Bar diagram/chart showing percentage of patients showing angle recession of 180 degree, more than 180 but less than 360 degree, 360 degree

### Discussion

Recession of the anterior chamber angle is a common slit lamp and gonioscopic finding following concussive ocular trauma. A small percentage of these people go on to develop glaucomatous optic neuropathy and vision loss days, months or even years later. In our study we have taken patients with blunt trauma to one eye. At presentation we have taken best corrected visual acuity, performed slit lamp examination, gonioscopy, direct ophthalmoscopy and applanation tonometry for both the eyes of these patients. After that patients were followed up in 1 month, 3 month and 6 month. And in each visit above measures are repeated. The incidence of angle recession and intraocular pressure changes in each visit has been determined in each visit and the results are correlated.

We observed the incidence of angle recession after blunt trauma in our study to be 24.3 %. At 1<sup>st</sup> presentation it was 20.7 % which is subsequently increased to 24.3% at 1<sup>st</sup> month. Salmon et al in their study determined the incidence of angle recession to be 14.6%.<sup>39</sup> Y M et al evaluated the anterior segments of 212 eyes (205 patients) for one to 14 years after contusional eye injuries. Anterior chamber angle recession was the commonest complication, occurring in 153 of 190 eyes examined (80.5%).<sup>38</sup> Kelvin kampmortensen et found Angle-recession was observed in 17 (57%).<sup>37</sup>

The incidence of angle recession after blunt trauma in the patients presents with hyphema we found to be 71.4% at 1<sup>st</sup> month. The result is similar to the result of the study done by F.M Blanton, where he showed the incidence after traumatic hyphema to

be 71%.<sup>33</sup> It is also similar to the study by David mooney where 53 patients of traumatic hyphema were examined, 11 (21 per cent.) had normal angles, 42 had angle tears that is 77 per cent.<sup>40</sup> Danny et al determined the incidence of angle recession and glaucoma after traumatic microhyphema. Results show 62 had microhyphema and 35 had gross hyphema. Among them 47 (75.8 %) had angle recession<sup>36</sup> Other authors also showed a high incidence angle recession in traumatic hyphema patients like filipe et al showed 56% incidence.<sup>43</sup> Spaeth showed 60 % incidence,<sup>44</sup> kauffman and tolpin showed 94% incidence.<sup>42</sup>

In our study we have found that at 1<sup>st</sup> follow up intraocular pressure of blunt trauma eye is significantly increased than non-traumatic fellow eye. Proportion of patients with higher IOP (9.8%) of traumatic eye was significantly higher at in comparison to non-traumatic eye (0.0%) ( $Z=2.90;p=0.00374$ ) but it is not significantly related to angle recession as proportion of patients with higher IOP (10.0%) with angle recession was higher at 1 month in comparison to patients without angle recession (9.7%) but it was not significant ( $Z=0.04;p=0.96$ ). This finding is consistent with the study of M. Eagling that says Ocular hypertension developed towards the second week after injury, after the initial period of hypotony. Angle recession was not related to the development of ocular hypertension during this early post-traumatic period. He also concludes that it is the uveitis that is responsible for increased tension.<sup>45</sup>

In our study the proportion of patients with higher IOP decreased at subsequent visits for both the patients with angle recession and without angle recession. But at the last follow up there was no patients remained in non-angle recession group with increased intraocular pressure where as in angle recession group 5% patient remained to have high intraocular pressure and this group of patient has not responded to any medical treatment. This finding corresponds with the study of F.M. Blanton, where he shows among 130 patients of angle recession six patients (5%) developed transient raised intraocular pressure which is difficult to control and the pressure spontaneously returned to normal in one year. They hypothesised that due to trabecular damage there is decreased facility of outflow caused by angle recession and it is masked by 30 to 60 days by ciliary body hyposecretion. Then as the ciliary body becomes non functioning again frank glaucoma become manifest in 3 to 6 months. After that trabecular meshwork regains its normal function and intraocular pressure and outflow facility again become normal. Similar results found by Howard, Hutchinson, and Frederick (1965) performed tonography and applanation tonometry on their fifty hyphema cases

within 4 months of injury and found four patients with ocular tensions of 30 mm. Hg or more.<sup>33</sup>

In our study it is found that Proportion of patients with angle recession was significantly higher for degree of angle recession  $\leq 180^{\circ}$  (60.0%) than other degree of angle recession ( $Z=4.26;p<0.001$ ).we have 60% patients having less than  $180^{\circ}$ , 30% patients between  $180^{\circ}$  to  $360^{\circ}$ , and only 10% of  $360^{\circ}$  angle recession. This results corresponds with the study done by F.M.Blanton where he shows 58%, 29% and 13% patients respectively for less than  $180^{\circ}$ ,  $180^{\circ}$  to  $360^{\circ}$ ,  $360^{\circ}$  of angle recession.<sup>33</sup> But the result differs from the study done by Malik et al<sup>41</sup> where 10 Patients all having history of blunt trauma to the eye were included. Gonioscopic examination in three cases showed recession of angle all around the circumference, another three affecting 3/4th of the angle circumference and in one case only 2/3rd of the angle was involved. Out of the remaining three cases one had involvement of half of the angle while in other two, 1/3rd of angle was involved.

Recession of the anterior chamber angle is a common slit lamp and gonioscopic finding following concussive ocular trauma. A small percentage of these people go on to develop glaucomatous optic neuropathy and vision loss days, months or even years later. There are reports of glaucoma developing up to 50 years after the injury.

In our study we have taken cases of blunt ocular trauma to one eye from out patient department as well as from indoor. 82 of these cases are followed for 6 month. In each visit we have properly assessed the patient with best corrected visual acuity, slit lamp examination, gonioscopy, ophthalmoscopy and applanation tonometry. Data recorded in case record form and correlated.

We found that young males are three times more affected by blunt trauma. The incidence of angle recession to be 24.3% after 1 month. Incidence of angle recession among hyphema patients to be 71% after 1 month. In comparison to fellow control eye the affected eye has significantly increased intraocular pressure at one month. For subsequent visit the pressure becomes normal in affected eye. 5% of patients with angle recession the intraocular pressure continued to be increased till last visit despite treatment. We have also found that there is no relation to the degree of angle recession with increased intraocular pressure.

The limitation of our study is less duration of follow up. If we could follow the patient for a longer duration with greater number of study participants; the result would be much more conclusive.

## Conclusion

In our study we have found the incidence of angle recession in blunt ocular trauma patient to be 24.3% in 1<sup>st</sup> month of follow up. In patients with hyphema the incidence is more (71%). Intraocular

pressure is increased significantly in 1<sup>st</sup> follow up but latter decreased in subsequent visit. 5% of patient with traumatic angle recession have increased intraocular pressure till last follow up but it is not related to degree of angle-recession.

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