THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI -600032.

INCIDENCE OF CRANIAL NERVE INJURY IN MILD HEAD INJURY

Dissertation submitted in partial fulfillment

of the requirements of

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CERTIFICATE

This is to certify that this dissertation entitled **"Incidence of cranial nerve injury in mild head injury"** submitted by **Dr.V.Dhandayuthapani**, appearing for **M.Ch (Neurosurgery)** degree examination in August 2013 is a original bonafide record of work done from August 2010 to February 2013 by him under my guidance and supervision in partial fulfillment of requirement of the Tamil Nadu Dr.M.G.R. Medical University, Chennai. I forward this to the Tamil Nadu Dr.M.G.R. Medical University, Chennai, Tamil Nadu, India.

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DECLARATION

I, Dr. V.Dhandayuthapani, solemnly declare that this dissertation **"Incidence of cranial nerve injury in mild head injury"** was done by me at the Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai under the guidance and supervision of the Professor of Neurosurgery, Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3, between 2010 and 2013.

This dissertation is submitted to the Tamil Nadu Dr.M.G.R. Medical University, Chennai-600032 in partial fulfilment of the University requirements for the award of the degree of M.Ch., Neurosurgery.

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(Dr.V.Dhandayuthapani)

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TABLE OF CONTENTS

ABBREVIATIONS USED

GCS - Glasgow Coma Scale

CSF - Cerebrospinal fluid

CT - Computerized tomography

VEP - Visual evoked potential

INTRODUCTION

Head injury affects up to 2% of the population per year and constitutes the major cause of death and severe disability among young people. Road traffic accidents play a significant role in world wide mortality rate, which is about 2.1%[14]. About 85% of the road traffic accidents occur in the developing countries being a major share of global burden. India accounts for about 10% of road accident fatalities worldwide[14]

An injury to head may cause various types of impact over the brain and calvarium like brain contusions, subarachnoid bleed, subdural haematomas, extradural haematomas, calvarial fractures, cranial nerve injury, scalp and facial injuries. Although cranial nerves injuries is not of prime concern in emergency department, cranial nerves injuries should be given adequate importance to avoid neurological morbidities that lead to compromise in quality of life, which requires long-term management, repeated surgical procedures or reconstructive measures.

The cranial nerves deficit has significant social and occupational impact over the patient. So, greater attention is to be paid for the earlier diagnosis and appropriate treatment at the right time.

The present study was undertaken to quantify magnitude of cranial nerve injury, distribution of various cranial nerve involvement, radiological correlation and outcome.

AIM OF THE STUDY

- Is to document the occurrence of cranial nerve injuries in patients with mild head injury.
- To correlate cranial nerve injury in mild head injury with radiological findings, to assess the outcome of patients with respect to initial clinical presentation.
- To study the value of meticulous clinical examination in head injury patients.

REVIEW OF LITERATURE

Cranial nerve injury was first noticed nearly two millennium ago, by Hippocrates, when he first noted[1,2], "…decreased vision occurs in injuries of forehead". Optic nerve injury was first demonstrated in an autopsy by Berlin in 1879[3]; the autopsy demonstrated optic canal fracture and optic sheath haemorrhage. Different types of optic nerve injury were first described by Hughes, in the year 1962. The classification[4] of the cranial nerves was first described by a medical student from Germany named Samuel Thomas Soemmemng two hundred years back.

Traumatic Cranial nerve weakness is an important part of head injury, which may not be readily apparent in emergency room, where the patient is brought in after having sustained head injury. The incidence of cranial nerve injury in neurotrauma varies between 5 and 23 %.

Purav et al, [2] conducted a study between a period of May 2002 to November 2004 out of 794 consecutive head injury patients, 100 cases had cranial nerves injuries and were included in this study.

He classified the patients' as[2]

1. Mild head injury
2. Moderate head injury and

3. Severe head injury based on the GCS at the time of admission.

He submitted all the cases for the cranial scanning at the time of admission. Detailed neurological examination of cranial nerves was done on daily basis. Investigations such as High-resolution temporal bone CT scan, audiogram, and Visual evoked potential were done when clinically indicated. Follow up was made at monthly intervals.

In his study he stated that the incidence of cranial nerve injuries was about2 12.6%. Among the 100 patients who developed cranial nerve palsies, 50 patients belonged to mild head injury, 26 patients belonged to moderate head injury and remaining 24 patients belonged to severe head injury sub group.

There was preponderance of male sex (87 males: 13 females). In his study he observed single cranial nerve palsy in about 67% of patients, and the remaining 32% being multiple cranial nerve palsies[2]. He also noted that among the single cranial nerve palsies, facial nerve palsy was the commonest followed by oculomotor and optic nerve respectively.

A.F Coello et al[11],.conducted a study in 49 consecutive patients who sustained minor head injury and cranial nerve palsies over a period of six years between January 2000 and January2006.

Meticulous clinical and neurological examination and appropriate investigations such as CT scan was performed in all patients. Based on the radiological findings the cranial nerve injuries were classified [1] into 3 types. They are as follows,

1. No obvious lesion
2. Skull base fracture and
3. Other scans abnormalities

All the patients were periodically evaluated in the first year after head trauma. He classified[1] clinical outcome of the cranial nerve palsy into 3 groups, they are as follows;

1. No clinical recovery
2. Incomplete recovery and
3. Complete recovery

Following head injury, single cranial nerve weakness was seen in 38 patients (77.6%) and multiple nerve injuries were seen in 11 (22.4%) patients. As per his study he stated that the olfactory nerve was the commonest nerve to be affected followed by the facial nerve and the oculomotor nerve, trochlear and abducens nerve respectively. Multiple

cranial nerve injuries was commonly involved facial and vestibulocochlear nerves.

When the patients were followed up after 1 year, 26 patients out of in the 32 skull base fracture group, 12 out of 20 patients with other CT abnormalities group. And 3 out of 10 patients without CT abnormalities group had no clinical recovery.

He had concluded minor head injury can also result in cranial nerve injuries similar to that of moderate or severe head injuries[1]. Olfactory nerve was the commonest[1] nerve to be affected followed by the facial nerve and the oculomotor nerve, trochlear and abducens nerve respectively. The trigeminal and lower cranial nerves were rarely affected in minor head injuries, traumatic third cranial nerve injury without any CT abnormality showed good clinical outcome.

Harjinder et al[4] said that Cranial nerves, along with major arteries and bridging veins, act as anchors to the brain in a sea of cerebrospinal fluid. Rapid shearing forces, acceleration/deceleration, injury to the skull base, penetrating craniocerebral injuries involving the skull base and various surgical procedures, lead to cranial nerve injuries. He had introduced rapid clinical assessment chart[4] for cranial nerve injury in head injury patient based on the following symptoms and signs,

1. Bleeding from nose
2. Watery nasal discharge
3. Decreased visual perception
4. Pupillary response to light
5. Posies, proposes
6. Complaints of double vision
7. Assessment of eye ball movements
8. Corneal reflex
9. Poor eye closure, facial weakness and asymmetry
10. Bleeding from ear
11. Hard of Hearing
12. Haemotympanum, rupture of tympanic membrane
13. Watery discharge from ear
14. Hoarseness of voice
15. Difficulty in coughing
16. Dysphagia and dysarthria

He also stated that olfactory dysfunction[4], due to disruption of the olfactory nerve prior to their decussation was commonly seen with head injuries. Post traumatic olfactory dysfunction accounts for about 40% and it recovers in three months but in some cases it may prolong upto 2 years.

Early recovery was noted in haematoma, contusion etc whereas regeneration and migration of neurons from olfactory mucosa to the olfactory bulb resulted in delayed recovery. Severe injury to lamina cribrosa and subsequent fibrosis lead to poor outcome with permanent anosmia.

Optic nerve injury[4] is rare he added. He found only a few Case series reported in literature. A large series reported an incidence of 2.78%. He stated that 51-57% had spontaneous visual recovery with conservative management. He used booster doses of dexamethasone with an a initial dose of 0.75 mg/kg, followed by 0.33 mg/kg 4 times a day for 3 days.

2.9% of head injury patients had an oculomotor palsy4 whereas head injuries contribute to only 8-16% of all oculomotor palsies 2.14% of patients with head injury developed trochlear nerve injury. Trochlear nerve injury is usually associated with other ocular nerve injuries. In unilateral trochlear nerve injury spontaneous recovery was noted in about

65% of cases. In case of incomplete recovery, prisms or a patch pasted on the spectacles is beneficial to achieve binocular single vision. If recovery is prolonged for more than a year, ocular muscle correction surgery is indicated.

Abducens nerve injury4 is seen in about 3-15% of head injuries, with an incidence of 3.02% in India. Most of the patients had multiple cranial nerve deficits. Lateral rectus palsy shows complete recovery. In cases of incomplete recovery, prisms can be used for correction of diplopia, or botulinum injected to the antagonist muscle. Ocular muscle surgery is reserved for lateral rectus weakness that persists for more than 6 months.

Trigeminal nerve is often injured[4] during base and maxillofacial injuries as this nerve exit through various foramina in the skull. Literature reveals few reports regarding trigeminal nerve injury. It usually present with hyperalgesia and can be treated with gabapentin or Carbamazepine. Nerve root section and radio frequency ablation is reserved for intractable root pain.

Temporal bone fractures are easily diagnosable in the post-CT era. The temporal bone fractures are classified[4] based on the orientation to the long axis of the petrouspyramid, into 3 types

1. Transverse or vertical

2. Longitudinal or horizontal

3. Oblique

Longitudinal fractures comprise about 70%[4] of all temporal bone fractures. Transverse fractures accounts for about 30%[4] and oblique temporal bone fractures are rare. This is due to the combined force of vectors that cause transverse and longitudinal fractures.

Entire petrous pyramid Fracture dislocation too has been reported and is usually associated with otorrhagia, basal dural tear, CSF leak and meningitis. The incidence of ninth, tenth and eleventh nerve injury are very low4. But when they are injured, they are injured together because of their anatomical location near jugular foramen.

Hypoglossal nerve is the nerve, least injured in head injury. As the nerve passes medial to the condyle it get injured in occipital condylar fractures. In minor condylar injuries, hypoglossal nerve palsy occurs as delayed complication.

Mechanism of cranial nerve injury

OLFACTORY NERVE INJURY

Injury to the olfactory nerve[4] filaments at the cribriform plate, or injury to the olfactory bulb or the olfactory tracts results in olfactory impairment. The first cranial nerve filaments can get injured by fractures at the cribriform plate of the ethmoid. Frontal or occipital impact can injure the olfactory nerve fibres by shearing or stretching of the nerve fibers. An occipital blow with or without fracture of the cribriform plate, results in a major injury as compared to that of frontal impacts.

These coup and contrecoup injuries produce severe acceleration/ deceleration forces which results in avulsion of olfactory roots. Fractures in this region can lead to olfactory filament laceration. Oedema, ischemia, hematoma of brain lead to impairment of olfaction.

A closed head injury with orbitofrontal and temporal lobe Contusions, olfaction is usually preserved. In surgical procedures involving the anterior skull base, iatrogenic damage to olfactory tract is common.

Olfactory nerve weakness can occur after surgery on anterior communicating artery aneurysms and following radiotherapy to the

anterior skull base. Olfactory damage can occur with that of missile injuries to the anterior base of skull.

OPTIC NERVE INJURY[4]

Optic nerve injury occurs with direct injury to the globe or orbit. The mechanism and pathogenesis remain unclear in case of closed head injury. Anderson et al stated that blow over the brow region transmit the stresses to the optic foramen .Following this, Gross et al stated that forcible blow to the brow region displaces orbit wall downwards which in turn releases the stress to the soft tissues which exhibit oscillation for a longer period than in the bony optic canal . Such oscillations results in stretching of the optic nerve, leading to injury to intraneural micro vasculature as well as to the nerve fibers, and finally, intracanalicular compression of the nerve. The chiasmal injury results from compressive, contusive, mechanical or ischemic damage due to frontal bone impaction in fractures of sella and clinoids.

Walsh and Lindenberg classified optic nerve injury into primary and secondary injury based on their study[4]

I. Primary:

a. Optic nerve concussion

b. Bruising of optic nerve

c. Intraneural hematoma and optic nerve sheath hematoma

d. Complete or incomplete avulsion of optic nerve

II. Secondary:

a. Optic nerve oedema

b. Ischemia

c. Micro -vascular occlusion

d. Infarction of the nerve

OCULOMOTOR NERVE INJURY[4]

Haematoma in the tectal region of mid brain leads to oculomotor weakness. Compression of the nerve at the tentorial hiatus by uncus in transtentorial herniation can often result in oculomotor palsy. Isolated oculomotor palsy occurs with avulsion injuries to the nerve at mesencephalicpontine junction. More often, base of skull fracture causes damage to the oculomotor nerve in combination with the other cranial nerves present in the cavernous sinus. Superior division of nerve is

injured in superior orbital fissure or orbit injury. Inferior division of the nerve is injured in maxillofacial injuries.

TROCHLEAR NERVE INJURY[4]

Isolated trochlear nerve injury occurs in its sub arachnoid course. A sudden blow to the head or deceleration injury to brain moves back the brain making the brainstem impacted into the tentorial region and consequent fourth nerve injury. The injury can occur in dorsal midbrain, or in the free edge of the tentorium. Even though trauma remains the prime cause for bilateral trochlear nerve injury, it is also reported in case of child abuse that involve violent shaking

TRIGEMINAL NERVE INJURY:

The trigeminal nerve is the most vulnerable when the skull base fracture extends to the middle cranial fossa and involving the foramen ovale and foramen rotundum where the nerve is fixed proximally at meckel's cave. Occasionally the post traumatic trigeminal nerve weakness presents as facial neuralgia and managed with carbamazepine.

If there is no recovery, surgical transection of the involved nerve root is considered.

ABDUCENT NERVE INJURIES[4, 8]

Abducent nerve is vulnerable to tear or stretch due to its longest intracranial course or its location over the ridge of petrous part of temporal bone or due to its fixity to the petroclinoid ligament and to the cavernous sinus. Abducens nerve palsy along with lower cranial palsies occurs commonly with hyper extension injury to cervical spine.

FACIAL NERVE INJURY[7, 10]

Head injury is a deceleration injury, and facial nerve is injured at its site of tethering: at the geniculate ganglion, where it is tethered by the greater superficial petrosal nerve. The shearing force to the brain causes intraneural contusion, oedema and bleeding. In severe cases, transection occurs. The meatal foramen due to its narrow size in the labyrinthine segment is another site of compression. The facial nerve is injured, in fracture of otic capsule and 40to 50% of such cases present with complete Facial palsy. The extratemporal facial nerve, the styloid foramen and the

vertical segment are the sites most often injured. The nerve is generally completely transected. Immediate paralysis occurs due to transection or other form of severe head injury and results in poor prognosis.

Delayed paralysis can occur due to nerve oedema and swelling of the epineurium, and carries a better prognosis. Delayed paralysis can occur due to external compression by an expanding haematoma or swelling of loose fibrous tissue and periosteum between the nerve and the bony canal. Bilateral paralysis is also reported

VESTIBULO COCHLEAR NERVE INJURY [4,7,10]

Transverse petrous fractures may injure the anterior Part of the vestibule and the cochlea. These organs may have concussion also. Any injury to the central auditory pathways in the brainstem may lead to injury of the nerve. A blow to the head generates a pressure wave which in turn damages the cochlea that finally results in high frequency hearing impairment and tinnitus.

GLOSSOPHARYNGEAL, VAGUS ANDACCESSORY NERVES[4]

The lower cranial nerves are damaged together because of their close association in the jugular foramen. The lower cranial nerves, after

coming out from the brain stem enter the jugular foramen, and a fracture of this region may injure these nerves. Posterior skull base injury is relatively less common compared to that of the anterior or the middle skull base injury, hence intracranial injury is rare. However, gun shot injuries, stab injuries, stretch injuries due to fall from height damages the nerve in its extracranial course. Injury to ninth and tenth nerve is common with occipital condylar fractures.

HYPOGLOSSAL NERVE INJURY[4]

As the nerve passes medial to the condyle it gets frequently injured in the occipital condyle injuries. Minor head trauma and condylar injuries may result in hypoglossal nerve injuries. Surgeries on the neck, or submandibular gland or C2/C3 cervical disc may injure hypoglossal nerve. Bilateral injury is also described.

MATERIALS AND METHODS

It is a prospective analytical study; study period was from August 2010 to February 2013 in the Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai. Thousand consecutive patients admitted in our hospital trauma ward with mild head injury were studied for the incidence, type, mode and outcome of various cranial nerve injuries. Categorization of severity of head injury was based on Glasgow coma scale (GCS) score, GCS 13-15- mild, GCS 9-12-moderate, GCS 3-8-severe.

Inclusion criteria

- Regardless of age and sex, patients who were willing to participate in the study with GCS 13, 14 and 15 were included.

Exclusion criteria

- Patients with GCS 12 and less
- Patients with pre-existing cranial nerve injuries and other non traumatic causes of cranial nerve palsies like bell`s palsy
- Patient who did not come for regular follow up were excluded

All the patients were initially seen in our emergency services. Rapid clinical assessment was done using Harjinder et al's[4] rapid clinical assessment chart of head injured patient for cranial nerve injury. CT scan was done as soon as possible to rule out need of emergency neurosurgical intervention.

Patients with mild head injury were considered for this study, Inclusion in this study was determined using the above inclusion and exclusion criteria. Data was entered in the proforma as enclosed. After detail explanation about the study, the consent for study was obtained from patients and kin of the patients. Approval for the study was obtained from the college ethics committee.

After initial rapid cranial nerve injures assessment and ruling out the need for emergency neurosurgical intervention, all thousand patients were submitted for detailed clinical neurological examination. Methods adapted from DeJong's The Neurological examination[15] and Localization in Clinical Neurology by PAUL W. BRAZIS MD[16]

Patients who had olfactory nerve injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography obtained to analyze nature of fracture of anterior skull base and facial bones.

Patients who had optic nerve injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography taken to analyze nature of fracture of anterior skull base, orbit and facial bones. Visual evoked potential wave pattern was taken on admission and was repeated on monthly basis.

Patients who had Oculomotor, Trochlear and Abducens nerve injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography to taken analyze nature of fracture of anterior skull base, orbit and facial bones. Diplopia chart was made on admission and repeated on monthly basis.

Patients who had Trigeminal nerves injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography taken to analyze nature of fracture of anterior skull base, middle cranial fossa, orbit and facial bones.

Patients who had facial nerve injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography to analyze the nature of fracture of temporal bones.

Patients who had vestibulocochlear nerves injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography to analyze the nature of fracture of temporal bones. Audiogram was done to assess the type of hearing loss and level of hearing loss.

Patients who had Gloss pharyngeal, Vagus and accessory nerve injuries were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high resolution computerized tomography done to analyze the nature of fracture of skull base.

Patients who had Hypoglossal nerve injuries occipital condoyle close proximity with one another in the jugular foramen. Patients who had hypoglossal nerves injury were submitted for detailed clinical neurological examination on daily basis till discharge. Patients were kept under monthly follow up to find out neurological recovery and high

resolution computerized tomography done to analyze the nature of fracture of skull base and occipital Condoyle.

Observation

Primary outcome measures

1. Incidence of cranial nerve injury was observed among the study population.
2. Distribution of various cranial nerve injuries was observed in the study population.
3. Outcome of various cranial nerve injuries was observed in the study population

Secondary outcome of the study measures

1. The relationship between the nature of calvarial fractures and the incidence of cranial nerve injuries was analyzed.
2. The relation between the nature of the calvarial fractures and the recovery of cranial nerve injury was analyzed.
3. The relation between the fundoscopic changes and visual outcome of post traumatic optic neuropathy was analyzed.

4. The relation between the wave pattern of visual evoked potential and the visual outcome of post traumatic optic neuropathy was analyzed.

5. The relation between the nature of temporal bone fracture and the incidence of facial and vestibulocochlear nerve injuries was analyzed.

6. The relation between the temporal bone fractures and the type of hearing loss was analyzed.

7. The relation between the nature of the temporal bone fracture and the outcome of facial and vestibulocochlear nerve injuries was analysed.

Statistical analysis

Statistical analysis was performed by using chi-square test. Multivariate analysis of variance (chi-square test) is a statistical test procedure for comparing multivariate means of several groups. A statistically significant difference was indicated by a p-value of less than 0.05.

RESULTS

INCIDENCE OF CRANIAL NERVE INJURY

TOTAL SAMPLE	1000	%
PATIENTS WITH CRANIAL NERVE INJURIES	148	14.8%
PATIENTS WITH SINGLE CRANIAL NERVE INJURIES	122	12.2%
PATIENTS WITH MULTIPLE CRANIAL NERVE INJURIES	26	2.6%

Table-1: Incidence of Cranial Nerve Injury

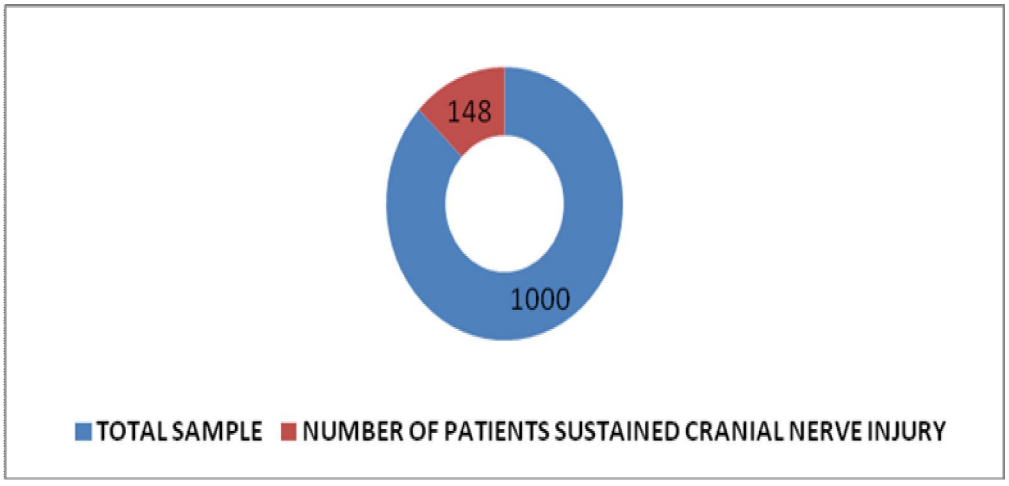

Chart 1: Incidence of Cranial Nerve Injury

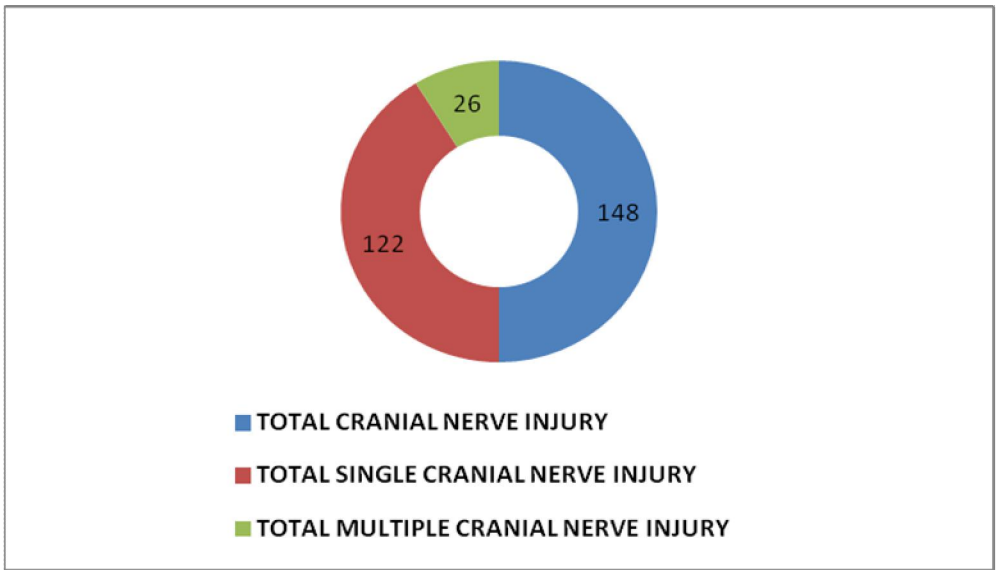

Chart 2: Proportion of Single and Multiple Cranial Injuries

The above table shows the incidence of cranial nerve injuries, proportion of single and multiple cranial injuries among the total cranial nerve injuries. It also reveals the proportion of cranial nerve injuries in the patients with various level of consciousness in mild head trauma.

CRANIAL NERVE INJURIES ON VARIOUS GCS

INCIDANCE OF CRANIAL NERVE BASED ON GCS	NO	%
PATIENTS CRANIAL NERVE INJURIES WITH GCS 13	28	18.91%
PATIENTS CRANIAL NERVE INJURIES WITH GCS 14	74	50%
PATIENTS CRANIAL NERVE INJURIES WITH GCS 15	46	31.09%

Table-2: Cranial Nerve Injuries on Various GCS

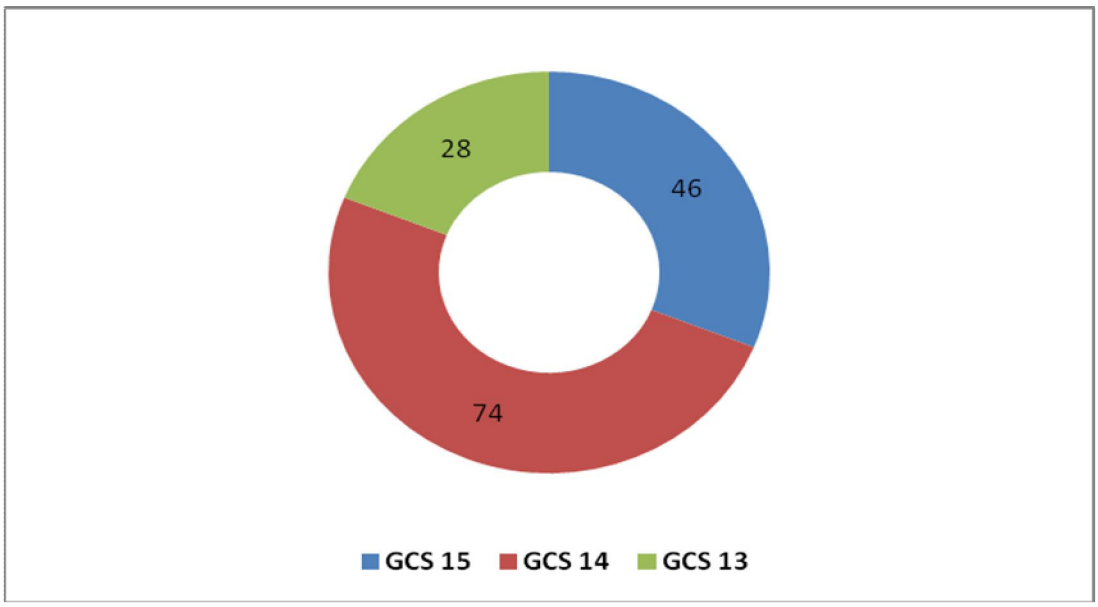

Chart 3: Cranial Nerve Injuries on Various GCS

ANALYSIS OF SEX DISTRIBUTION

SEX RATIO	MALE FEMALE RATIO	
	NUMBER	PERCENTAGE
TOTAL SAMPLE	853:147	85.3%:14.7%
CRANIAL NERVE INJURED	129:19	12.9%:1.9 %
SINGLE CRANIAL NERVE INJURED	103:19	84.4%:13.6%
MULTIPLE CRANIAL NERVE INJURED	26:0	26%:0%

Table-3: Analysis of sex distribution

The above table shows that about 90% of head trauma patients belong to male category and most of the cranial nerve injured patients were males. The females were less in number. As female patients were commonly injured with less force, they had single cranial nerve injury only with a relatively better outcome.

DISTRIBUTION OF CRANIAL NERVE INJURIES

NAME OF THE CRANIAL NERVE INJURED	NUMBER OF PATIENTS INJURED
OLFACTORY NERVE	22
OPTIC NERVE	32
OCULOMOTOR NERVE	22
TROCHLEAR NERVE	13
TRIGEMINAL NERVE	06
ABDUCENS NERVE	24
FACIAL NERVE	48
VESTIBULOCOCHLEAR NERVE	14
GLOSSOPHARYNGEAL NERVE	00
VAGUS NERVE	00
ACCESSORY NERVE	00
HYPOGLOSSAL NERVE	00

Table-4: Distribution of Cranial Nerve Injuries

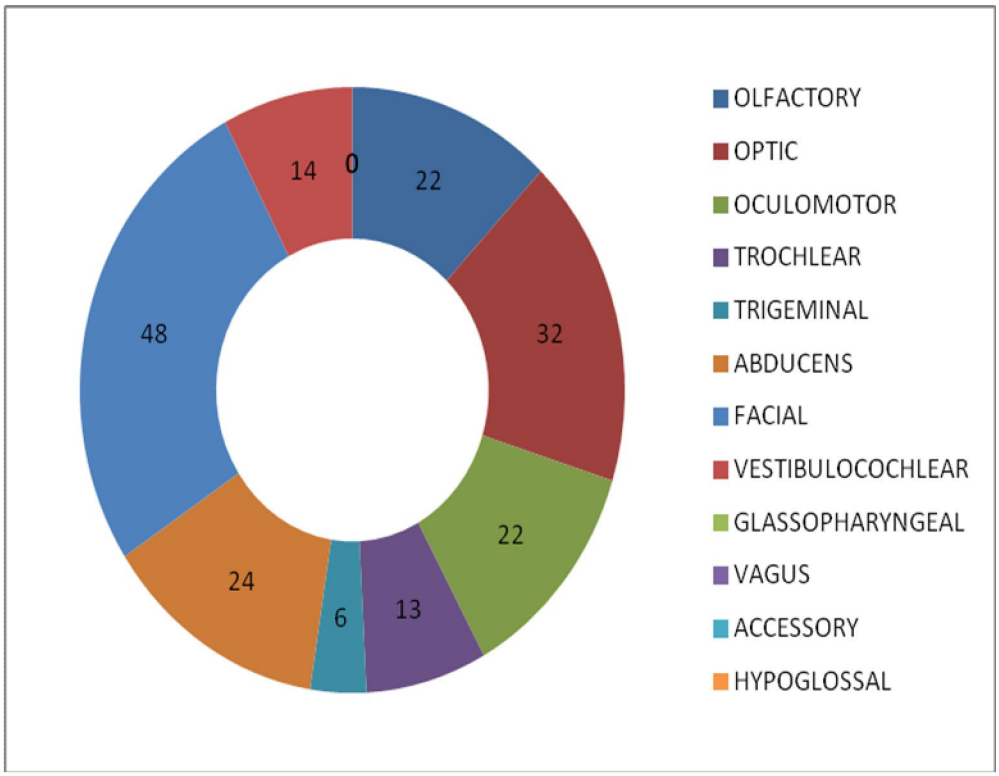

Chart 4: Distribution of Cranial Nerve Injuries

The above table states that the facial nerve was the commonest nerve to be involved in mild head injury in this study. This was followed by optic, abducens and olfactory nerves in descending order. In mild head injuries lower cranial nerve involvement was very rare.

DISTRIBUTION OF MULTIPLE CRANIAL NERVE INJURIES

CRANIAL NERVE INVOLVED	NUMBER OF PATIENTS
II,III,IV&VI	2
II&III	6
II&VI	4
III,IV&VI	3
VII&VIII	11

Table-5: Distribution of Multiple Cranial Nerve Injuries

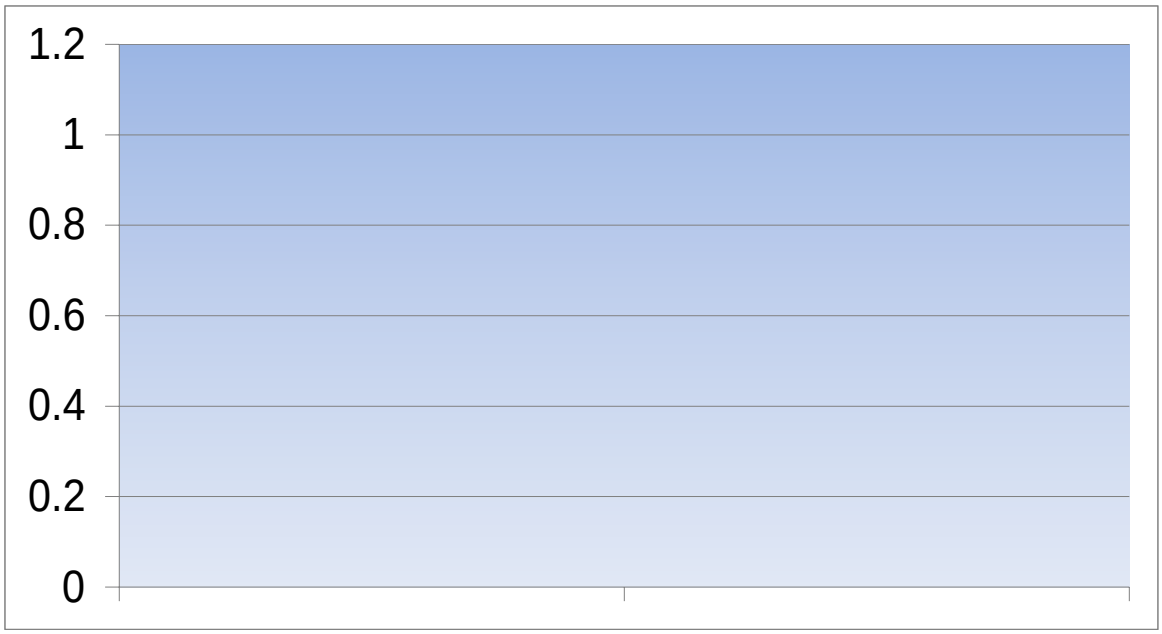

Chart-5: Distribution of Multiple Cranial Nerve Injuries

The above table states that there were 11 patients had facial and vestibulocochlear nerves injuries in this study. The optic and oculomotor nerves were injured in six patients. The optic and abducens nerves were injured in four patients. The oculomotor, trochlear and abducens nerves were injured in three patients and II,III,IV&V cranial nerves were injured in two patients.

ANALYSIS OF OLFACTORY NERVE

INCIDENCE OF OLFACTORY NERVE INJURY

TOTAL CRANIAL NERVE INJURY	**148**
OLFACTORY NERVE INJURY	**22**

Table-6: Incidence of Olfactory Nerve Injury

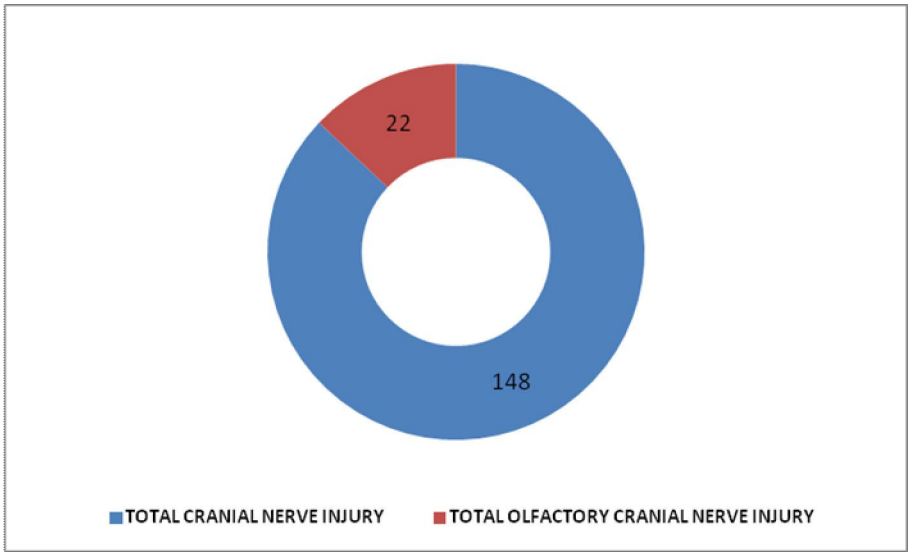

Chart-6: Incidence of Olfactory Nerve Injury

CT SCAN FINDING	NUMBER OF PATIENTS	RECOVERYSTATUS		p-VALUE	ODDS RATIO [CI]
		NUMBER	PERCENTAGE		
OCCIPITAL BONE FRACTURE	05	03	60%	0.611	1.698
NASOETHMOIDAL COMPLEX FRACTURE	13	05	38.5%	0.193	0.313
OTHER SCAN FINDING	04	03	75%	0.269	3.750
TOTAL NUMBER OF PATIENTS	22	11	50%	--	--

Table-7: Correlation between Scan Finding And Outcome

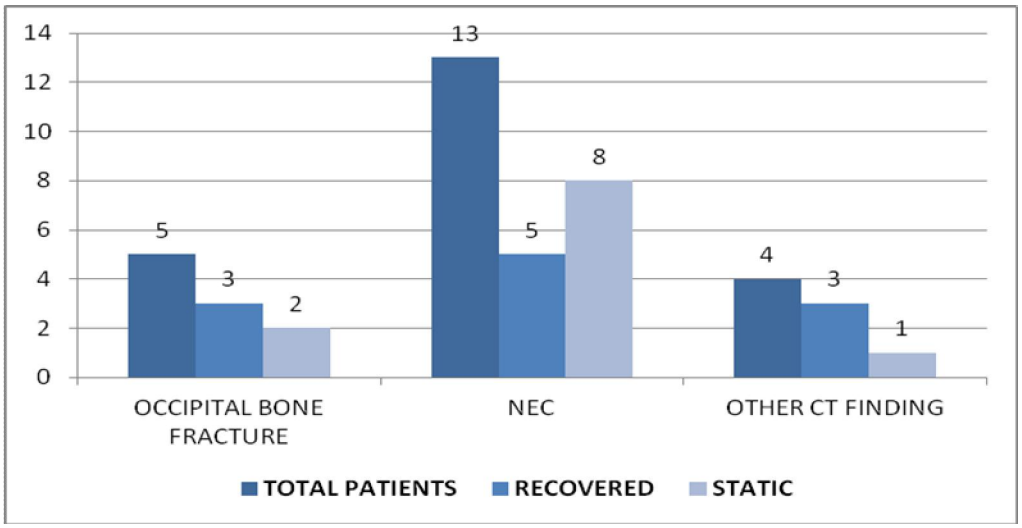

Figure 7: Correlation between Scan Finding and Outcome

The above table shows the relation between presence and nature of skull fracture and incidence of olfactory nerve injury and its outcome. Olfactory nerve injury occurred in five patients in occipital bone fracture, 13 patients had nesoethmoidal complex fracture, only four patients did not have fracture. The above factors were not statistically significant.

CORRELATION BETWEEN ASSOCIATED SCAN FINDING AND OUTCOME

ASSOCIATED FINDING	TOTAL NUMBERS	RECOVERY STATUS		P-VALUE	ODDS RATIO [C-I]
		NUMBERS	PERCENTAGE		
CSF RHINORRHOEA	09	00	0%	0.002	--
EXTRA DURAL HAEMOTOMA	03	00	0%	0.002	--
FRONTAL CONTUSION	09	04	44.4%	0.665	0.686[0.124-3.784]

Table-8: Correlation between Associated Scan Finding and Outcome

The above table shows the correlations between clinical and radiological findings and the incidence of olfactory nerve injury and its outcome. Among the above said factors CSF rhinorrhea, EDH are statistically significant.

ANALYSIS OF OPTIC NERVE

INCIDENCE OF OPTIC NERVE INJURES

TOTAL CRANIAL NERVE INJURY	148
TOTAL OPTIC NERVE INJURY	32
ISOLATED OPTIC NERVE INJURY	20
ASSOCIATED WITH OTHER NERVES	12

Table-9: Incidence of Nerve Optic Injures

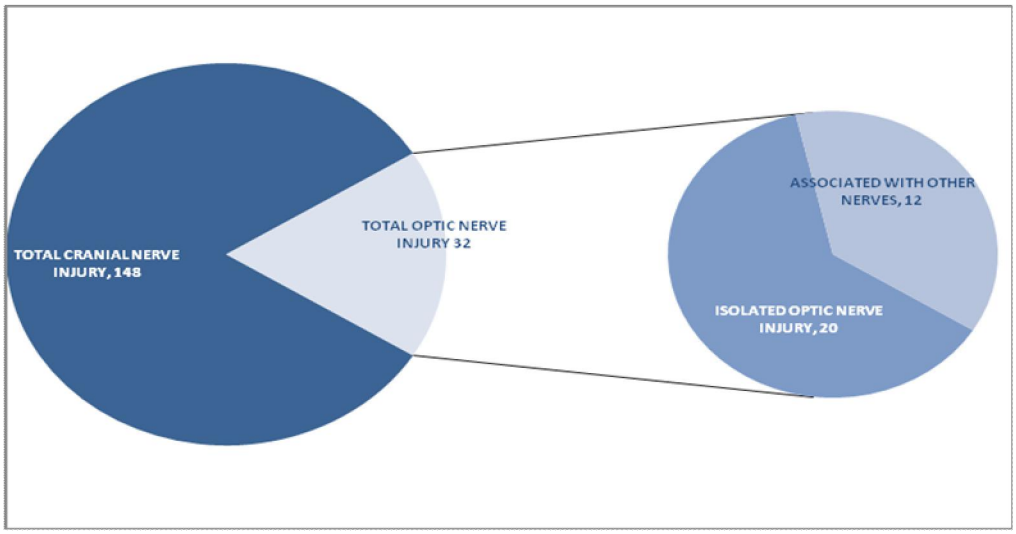

Table-9: Incidence of Optic Nerve Injures

LEVEL OF VISION	NUMBER OF PATIENTS	LEVEL OF RECOVERY STATES						P-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
PERCEPTION OF LIGHT ABSENT	05	01	20%	00	0%	04	80%	< 0.05
PERCEPTION OF LIGHT PRESENT	08	01	12.5%	02	25%	05	62.5%	
HAND MOVEMENT	11	04	36.4%	01	19.1%	06	54.5%	
FINGER COUNT	08	06	75%	01	12.5%	01	12.5%	

Table-10: Correlation between Visual Perception on Admission and Outcome

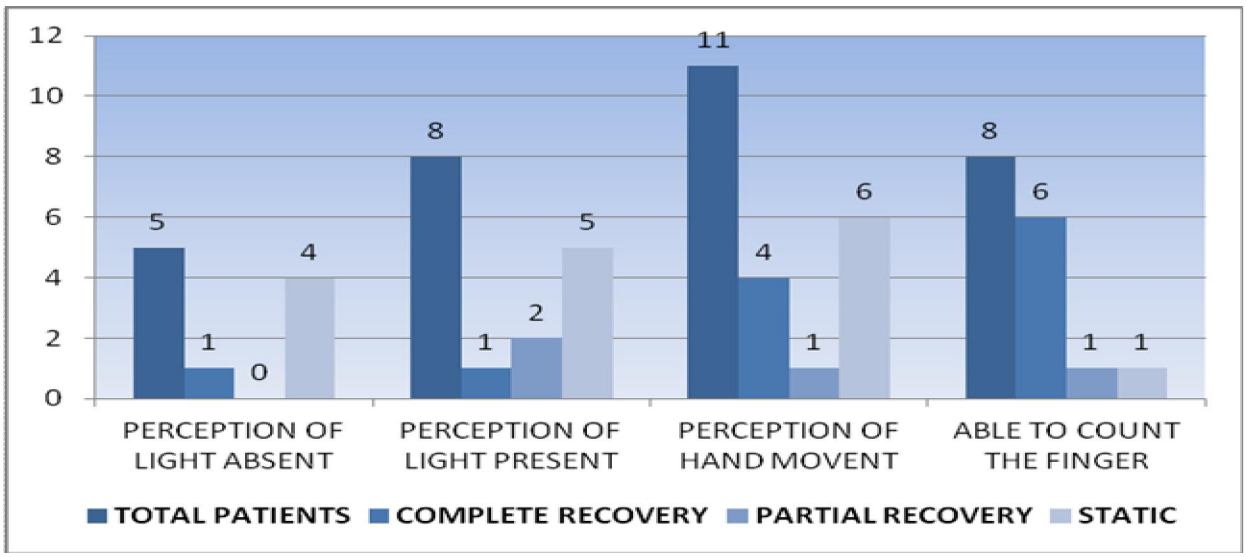

Figure 9: Correlation between Visual Perception on Admission and Outcome

The above table shows the correlation between initial visual status of the patients and final visual outcome in traumatic optic nerve injury. The above said factors are statistically significant.

CORRELATION BETWEEN NATURE OF ORBIT FRACTURE AND OUTCOME

NATURE OF FRACTURE	TOTAL NUMBER	RECOVERY STATUS						p-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
NORMAL CT	02	01	50%	0	0%	01	50%	< 0.05
MULTIPLE COMPLEX FRACTURE	10	01	10%	01	10%	08	80%	
MEDIAL WALL ORBIT FRACTURE	08	04	50%	02	25%	02	25%	
LATERAL WALL ORBIT FRACTURE	12	08	66.7%	01	8.3%	03	25%	

Table-11: Correlation between Nature of Orbit Fracture and Outcome

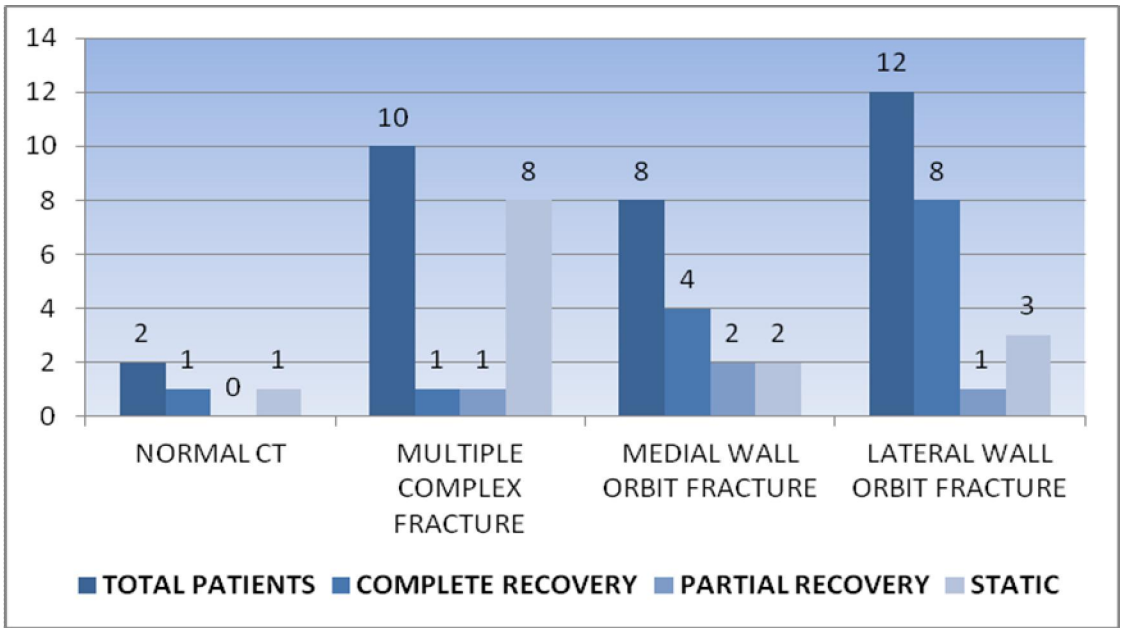

Chart-11: Correlation between Nature of Orbit Fracture and Outcome

The above table shows the correlation between type of orbital bone fracture and final visual outcome in traumatic optic nerve injury. The above said factors are statistically significant

ANALYSIS OF OCULOMOTOR NERVE INJURIES

INCIDENCE OF OCULOMOTOR INJURY:

TOTAL CRANIAL NERVE INJURY	**148**
TOTAL OCULOMOTOR CRANIAL NERVE INJURY	**22**
ISOLATED OCULOMOTPR NERVE INJURY	**11**
ASSOCIATED WITH OTHER NERVES	**11**

Table-12: Incidence of Oculomotor Injury

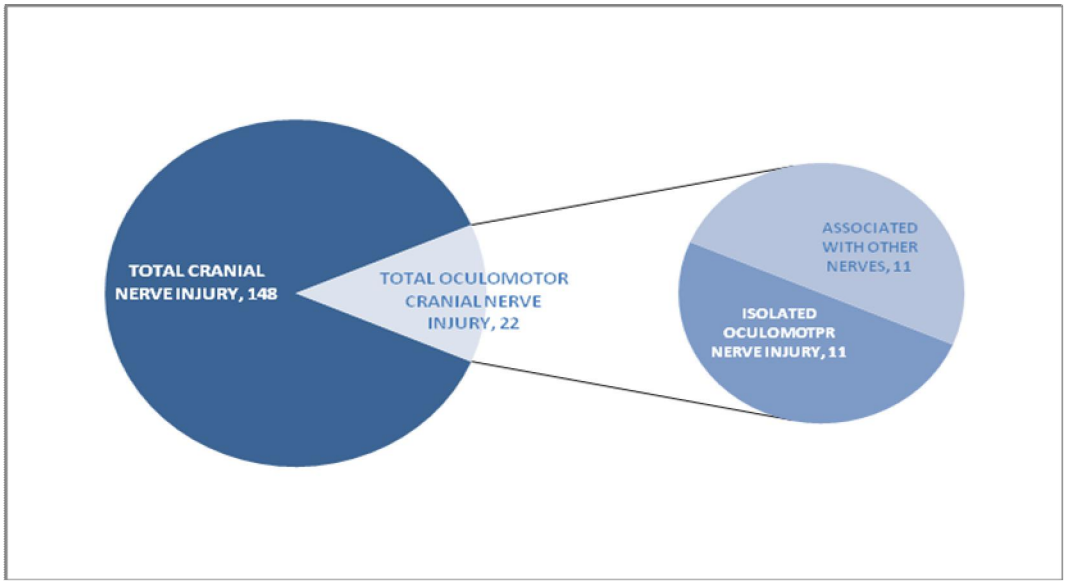

Chart 12: Incidence of Oculomotor Injury

NATURE OF FRACTURE	TOTAL NUMBER	RECOVERY STATUS						P-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
NORMAL CT SCAN	03/22	03	100%	00	0%	00	0%	< 0.05
ORBITAL FRACTURE	14/22	04	28.6%	03	21.4%	07	50%	
OTHERS	05/22	03	60%	01	20%	01	20%	

Table-13: Correlation between Scan Finding and Out Come

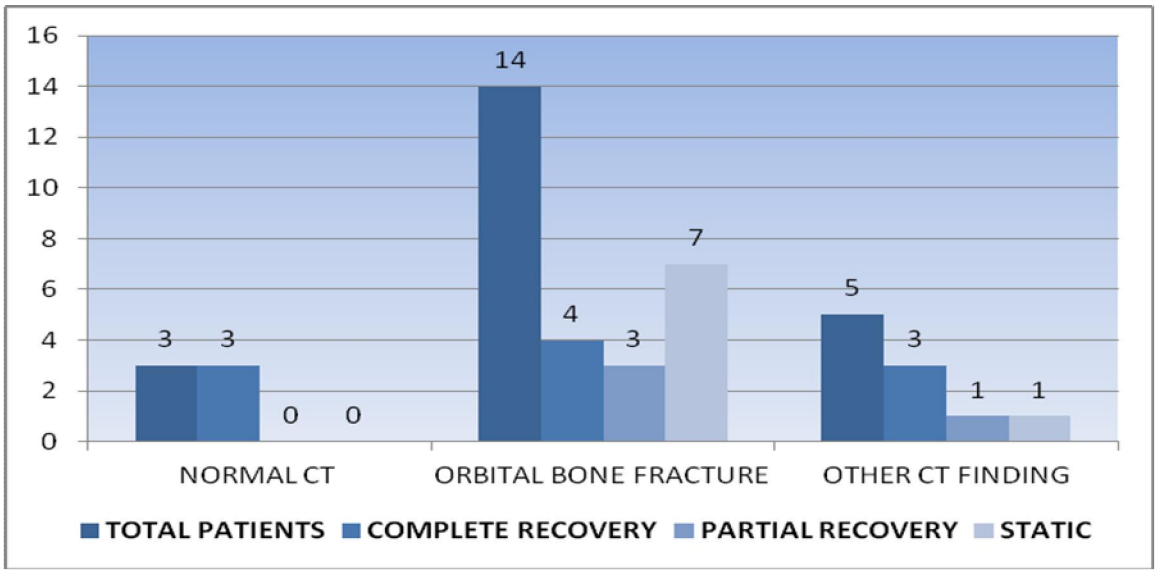

Chart-13: Correlation between Scan Finding and Out Come

The above table shows the correlation between the orbital bone fracture and recovery oculomotor nerve injury in traumatic oculomotor nerve injury. The above said factors were statistically significant

ANALYSIS OF TROCHLEAR NERVE INJURIES

INCIDENCE OF TROCHLEAR NERVE INJURY

TOTAL CRANIAL NERVE INJURY	148
TOTAL TROCHLEAR NERVE INJURY	13
ISOLATED TROCHLEAR NERVE INJURY	08
ASSOCIATED WITH OTHER NERVES	05

Table-14: Incidence of Trochlear Nerve Injury

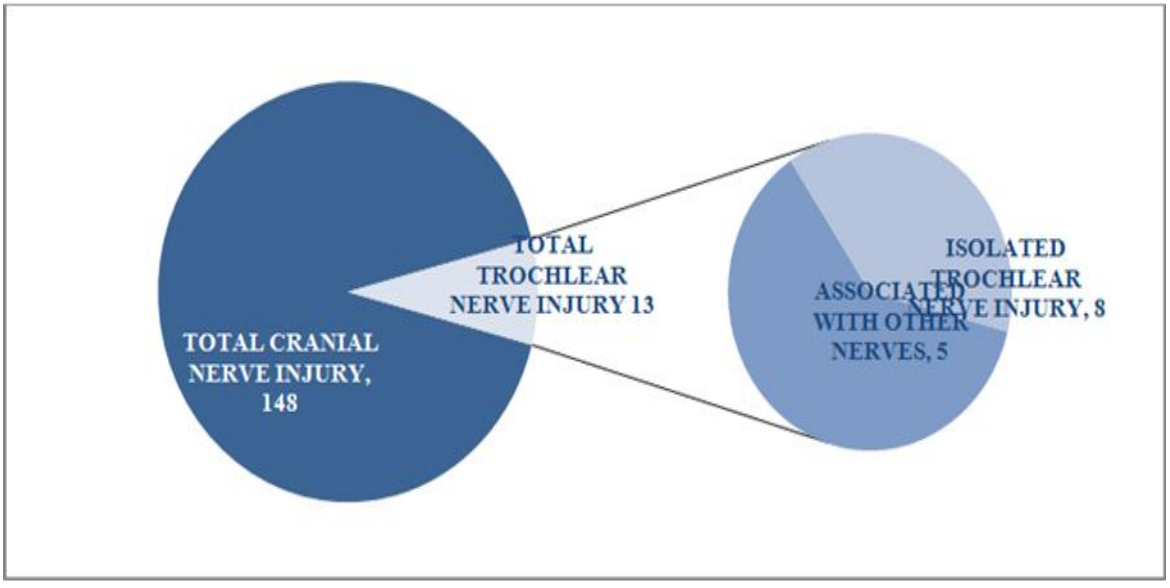

Chart 14: Incidence of Trochlear Nerve Injury

NATURE OF FRACTURE	NUMBER OF PATIENTS	RECOVERY STATUS						P-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
NORMAL CT SCAN	02/13	02	100%	00	0%	00	0%	< 0.05
ORBITAL BONE FRACTURE	08/13	01	12.5%	02	25%	05	62.5%	
OTHERS	03/13	03	100%	00	0%	00	0%	

Table-15: Correlation between Scan Finding and Out Come

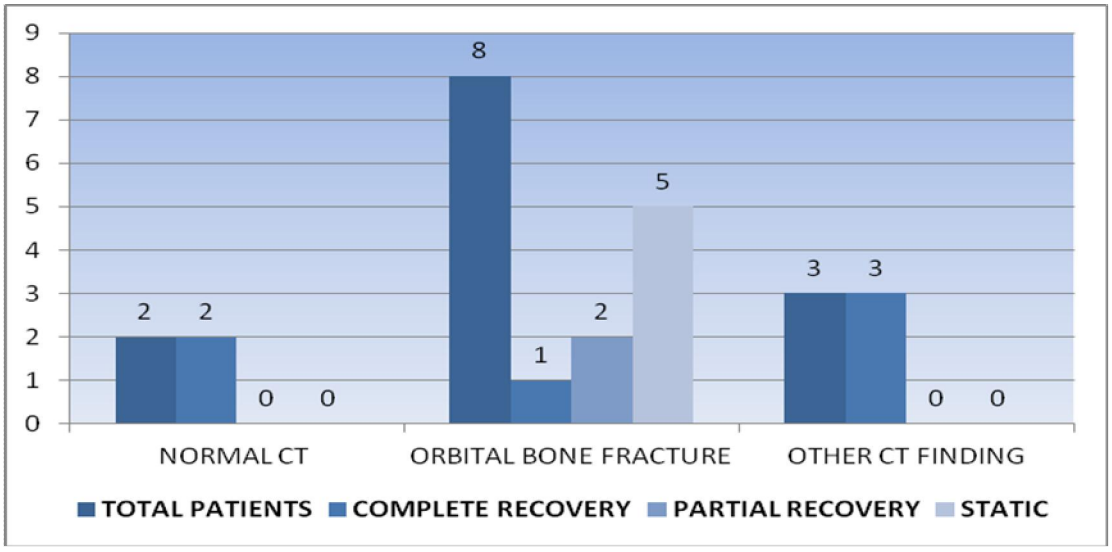

Chart 15: Correlation between Scan Finding and Out Come

The above table shows the correlation between orbital bone fracture and final trochlear nerve recovery in traumatic trochlear nerve injury. The above said factors were statistically significant

ANALYSIS OF TRIGEMINAL NERVE INJURIES:

CORRELATION BETWEEN SCAN FINDING AND OUT COME

NERVE INJURED	CAUSE OF INJURY	NUMBER OF PATIENTS
SUPRAORBITAL	FRONTAL BONE FRACTURE	2
INFRAORBITAL	MAXILLA FRACTURE	2
MANDIBULAR	MANDIBULAR FRACTURE	2

Table-16: Correlation between Scan Finding and Out Come

ANALYSIS OF ABDUCENS NERVE INJURIES:

INCIDENCE OF ABDUCENS NERVE INJURY

TOTAL CRANIAL NERVE INJURY	148
TOTAL ABDUCENS NERVE INJURY	24
ISOLATED ABDUCENS NERVE INJURY	15
ASSOCIATED WITH OTHER NERVES	09

Table-17: Incidence of abducens nerve injury:

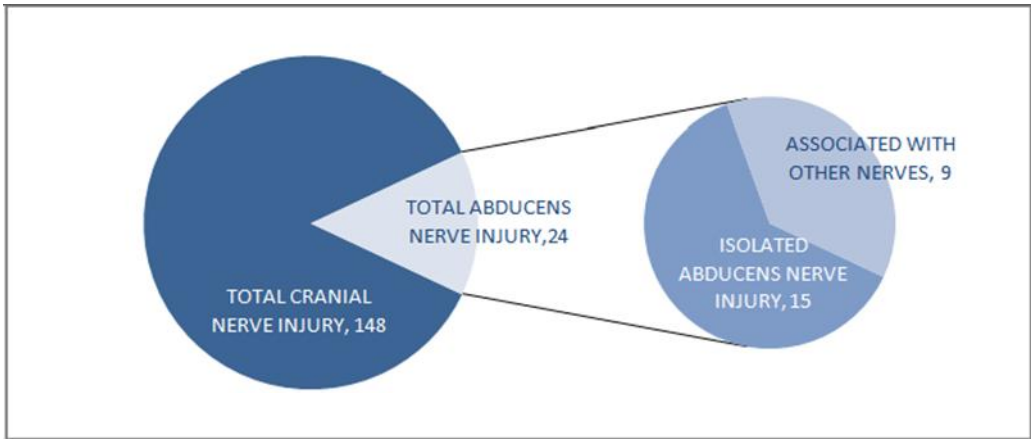

Chart-16: Incidence of Abducens Nerve Injury

NATURE OF FRACTURE	NUMBER OF PATIENTS	RECOVERY STATUS						p-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
NORMAL CT SCAN	06/24	04	66.7%	01	16.7%	01	16.7%	>0.05
ORBITAL BONE FRACTURE	07/24	04	57.1%	01	14.3%	02	28.6%	
OTHERS	11/24	05	45.5%	02	18.3%	04	36.4%	

Table-18: Correlation between Scan Finding and Out Come

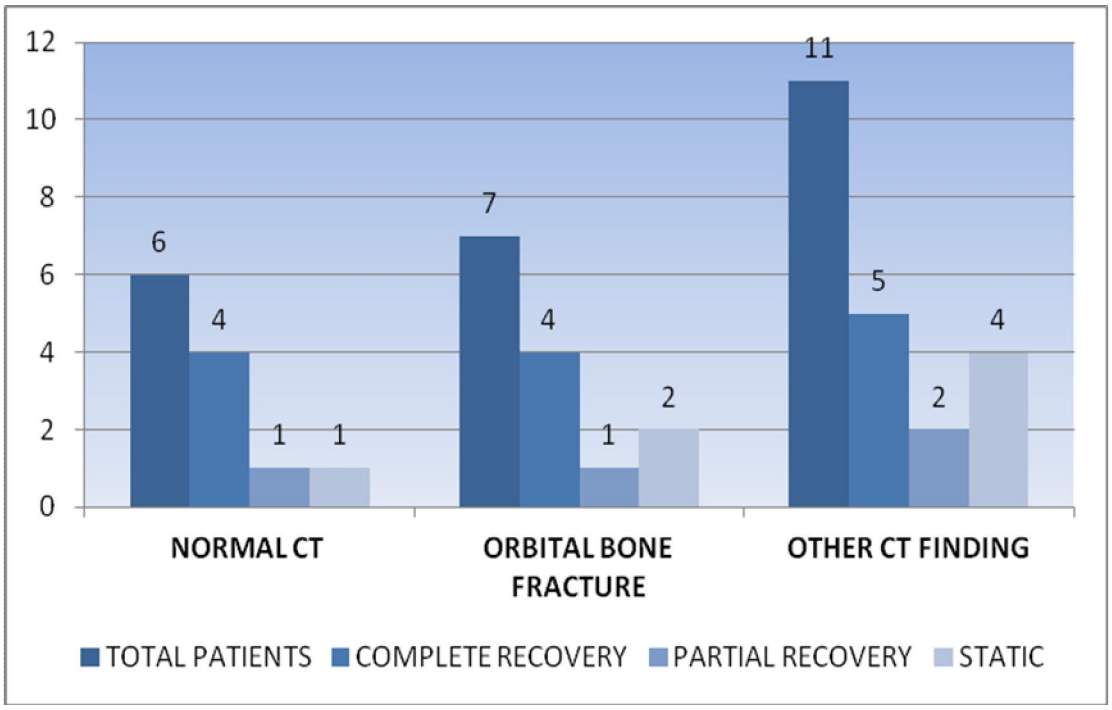

Chart-17: Correlation between Scan Finding and Out Come

The above table shows the correlation between orbital bone fracture and abducens nerve recovery in traumatic abducens nerve injury. Statistical analysis showed that the factors were statistically significant

ANALYSIS OF FACIAL NERVE INJURIES

INCIDENCE OF FACIAL NERVE INJURY

TOTAL CRANIAL NERVE INJURY	148
TOTAL FACIAL NERVE INJURY	48
ISOLATED FACIAL NERVE INJURY	37
ASSOCIATED WITH OTHER NERVES	11

Table-19: Incidence of facial nerve injury:

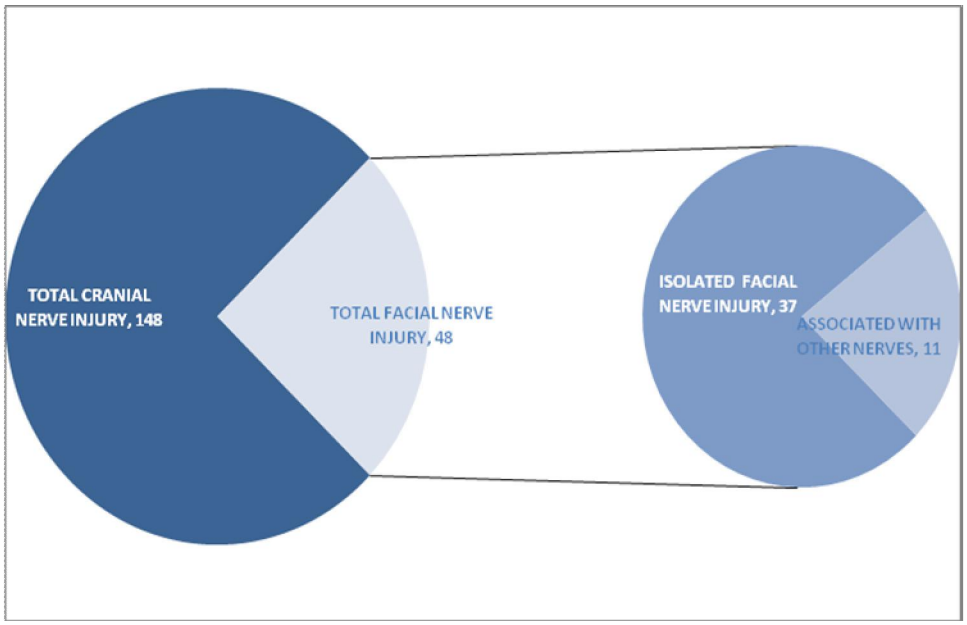

Chart-18: Incidence of facial nerve injury:

NATURE OF TEMPORAL BONE FRACTURE	TOTAL NUMBER	INITIAL GRADING												P-VALUE
		GRADING I		GRADING II		GRADING III		GRADING IV		GRADING V		GRADING VI		
		NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	
TRANSVERSE	17	00	0%	03	17.6%	11	64.7%	03	17.6%	00	0%	00	0%	0.002
HORIZONTAL	18	00	0%	00	0%	01	5.6%	13	72.2%	04	22.2 %	00	0%	0.003
OBLIQUE	09	00	0%	00	0%	00	0%	00	0%	05	55%	04	44.4 %	0.001
NORMAL CT SCAN	04	00	00	03	75%	01	25%	00	0%	00	0%	00	0%	0.002

Table-20: Correlation between Temporal Bone Fracture and Initial Presentation

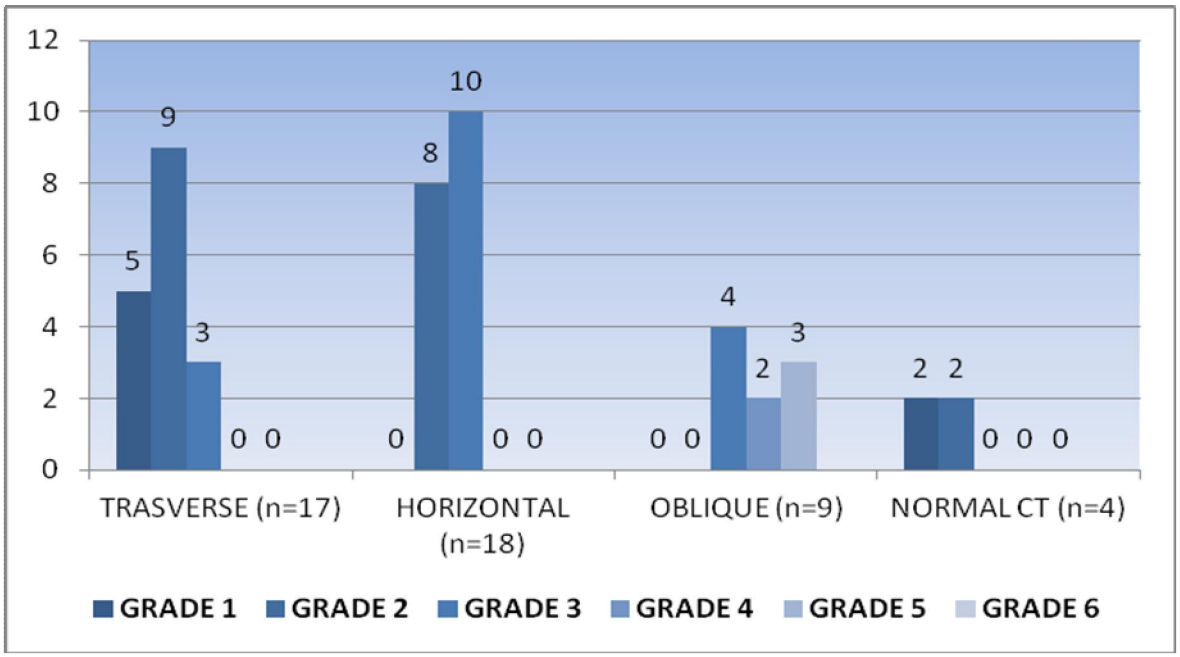

Chart-19: Correlation between Temporal Bone Fracture and Initial Presentation

The above table shows the correlation between the various temporal bone fractures and the grading of facial nerve weakness in traumatic facial nerve injury. The above said factors were statistically significant.

NATURE OF TEMPORAL BONE FRACTURE	TOTAL NUMPER	FINAL GRADING												P-VALUE
		GRADING I		GRADING II		GRADING III		GRADING IV		GRADING V		GRADING VI		
		NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	
TRANSVERSE	17	05	29.4%	09	52.9%	03	17.6%	00	0%	00	0%	00	0%	0.002
HORIZONTAL	18	00	0%	08	44.4%	10	55.6%	00	0%	00	0%	00	0%	0.003
OBLIQUE	09	00	0%	00	0%	04	44.4%	02	22.2%	03	33.3%	00	0%	0.001
NORMAL SEAN	04	02	50%	02	50%	00	00%	00	0%	00	0%	00	0%	0.002

Table-21: Correlation between Temporal Bone Fracture and Final Presentation

The above table shows the correlation between theVarious temporal bone fractures and the final grade (outcome) of facial nerve weakness in traumatic facial nerve injury are showed in above table. The above said factors are statistically significant.

ANALYSIS OFVESTIBULOCOCHLEAR NERVE

INCIDENCE OF VESTIBULOCOCHLEAR NERVE:

TOTAL CRANIAL NERVE INJURY	148
TOTAL VESTIBULOCOCHLEAR NERVE INJURY	14
ISOLATED VESTIBULOCOCHLEAR NERVE INJURY	03
ASSOCIATED WITH OTHER NERVES	11

Table-22: Incidence of Vestibulocochlear Nerve

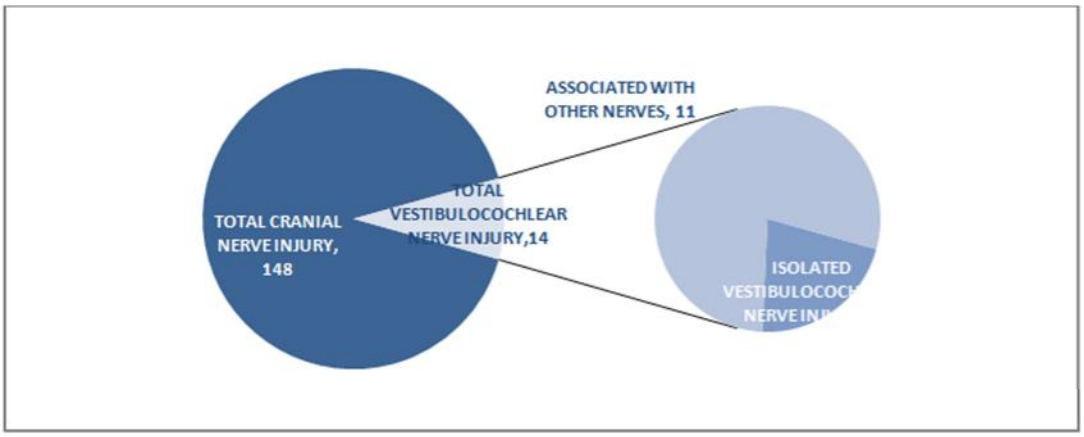

Chart-20: Incidence of Vestibulocochlear Nerve

NATURE OF FRACTURE	TOTAL	RECOVERY STATUS						P-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
TRANSVERSE	03	03	100%	00	00%	00	0%	0.032
HORIZONTAL	03	02	66.7%	01	33.3%	00	0%	0.023
OBLIQUE	08	00	0%	02	25%	06	75%	0.004

Table-23: Analysis of Temporal Bone Fracture and Outcome

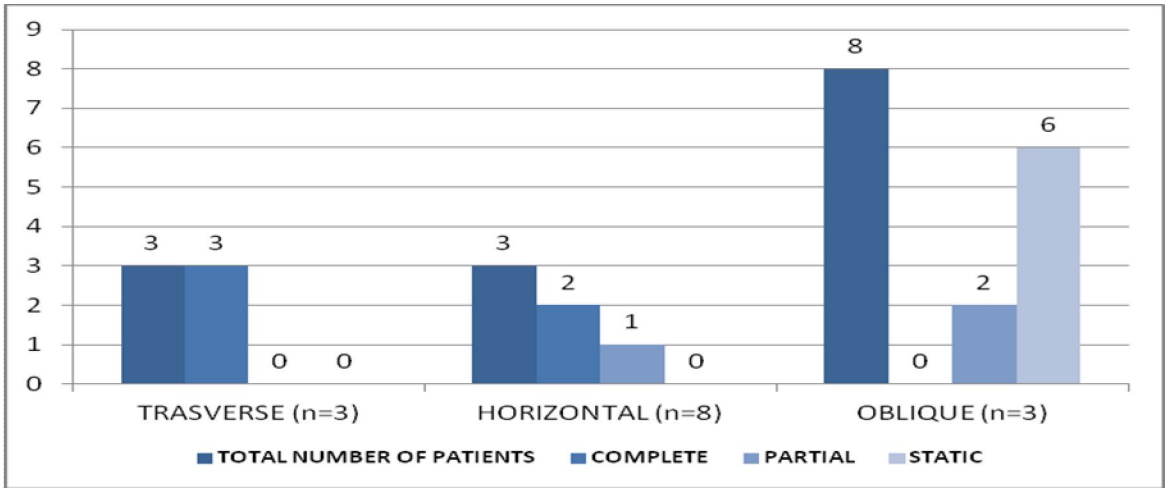

Chart-21: Analysis of Temporal Bone Fracture and Outcome

The above table shows the correlation between thevarious temporal bone fractures and recovery of hearing in traumatic vestibulocochlear nerve injury. The above said factors were statistically significant.

TYPE OF HEARING LOSS	TOTAL	RECOVERY STATUS						P-VALUE
		COMPLETE		PARTIAL		STATIC		
		NO	%	NO	%	NO	%	
CONDUCTIVE	04	03	75%	01	25%	00	00%	0.088
SENSORI NEURAL	06	03	37.5%	02	25%	03	37.5%	0.881
MIXED	04	00	0%	01	25%	03	75%	0.184

Table-24: Analysis of Type of Hearing Loss and Outcome

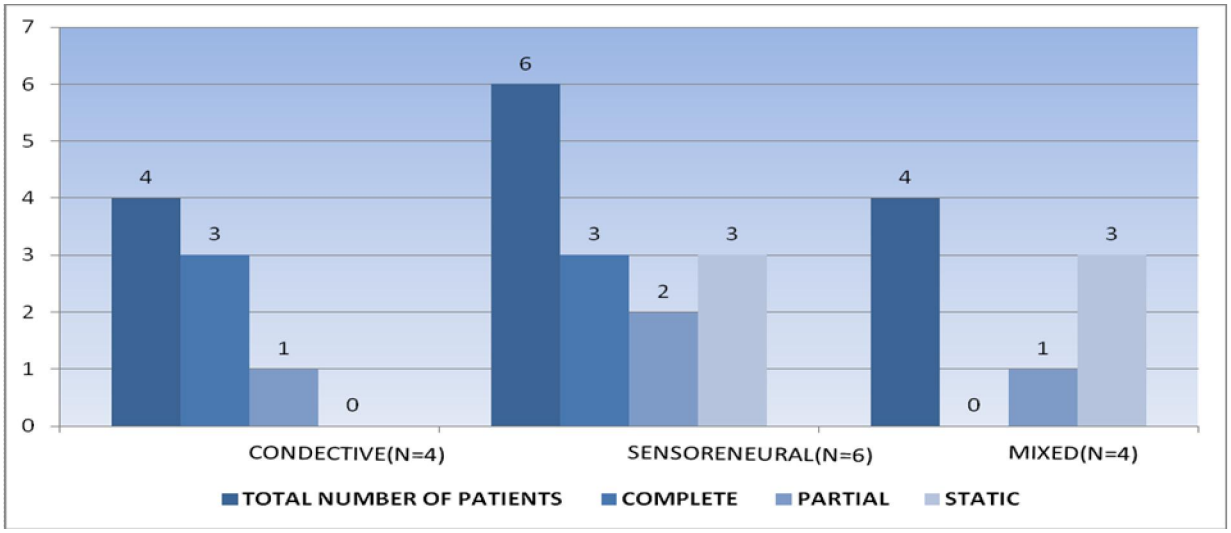

Chart-22: Analysis of Type of Hearing Loss and Outcome

The above table shows the correlation between the Various temporal bone fractures and type of hearing loss and recovery of hearing in traumatic vestibulocochlear nerve injury. The above said factors were statistically not significant.

None of the study population showed lower cranial nerve injury [9th,10th 11th and 12th] in this study.

DISCUSSION

Cranial nerve injuries are commonly associated with head injuries. In this study the incidence of cranial nerve injuries in mild head injury is about 14.8%. The literature also states that the incidence of cranial nerve injury was about 5 to 23%[1, 2, 3, 4]. Road traffic accidents being the single leading cause for the head injuries which in turn causes cranial nerve injuries. The middle age male population have the highest predilection for head injury.

This study also illustrates that the road traffic accidents account for about 90% of head injury. The male female ratio in our study population was about [853: 147] 85.3%:14.7 %. Among mild head injuries 31.9% had GCS 15, 50 % had GCS 14 and 18.9% had GCS 13.In this study about 148 patients out of 1000 patients had cranial nerve injuries and about 26 patients had multiple cranial nerve injuries which is about 2.6 % of the total sample and 17.5% of patients who had cranial nerve injuries. The above statistics compares well with existing literature.

Contrary to the existing literature olfactory is not the commonest nerve injured in our study[1, 12]. This is already highlighted by Purav patel et al[1], who stated that tertiary care population show less incidence of traumatic olfactory nerve injury. The olfactory nerve injury in this study was about 2.2% of the total sample and among who sustained to have

cranial nerve injury it was about 14.8%. This is the second most common isolated cranial nerve injury in this study.

The commonest cause for olfactory nerve injury is direct impact over the cribriform plate where the nerve finally exits which was about 59% the patients who had first cranial nerve injury. This is also injured during the contrecoup impact over the occipital region due to acceleration and deceleration effect over the olfactory bulb or olfactory nerve, and some time olfaction is impaired due to local haematomas like anterior inter hemispherical bleed, basofrontal contusions and extra dural haematomas. In this study 18% of patient had impaired olfaction due to local compressions.

olfactory nerve injury occurring due to cribriform plate fracture has a poor prognosis in compared to better out come if it is due to occipital bone fracture and frontal contusion and best outcome seen when it is due to local haematomas. CSF rhinorrhea (dural tear) is the single most negative prognostic factor in our study.

Optic nerve is the second most commonly involved cranial nerve in mild head injury as per our study. This is about 3.2% of total study population and 21.6% of the persons who had cranial nerve injuries. Optic nerve has the strongest association with multiple cranial nerve injuries. Optic nerve is most commonly injured due to the complex orbital

bone fracture extending from orbital roof to optic canal, seen in about 31.25% seen in our study. In patients who had medial and lateral wall of the orbital bone fracture, the optic nerve was injured about 35.5% and 25% respectively. Poor outcome was observed in patients who had poor vision at the time of injury. Patients who had lost the vision due to multiple complex fractures showed no recovery[11].

Patients who did not show any wave pattern in visual evoked Potential on admission had poor optic nerve recovery[11]. Optic nerve recovery was relatively good in patients with abnormal wave pattern and better with patients with normal wave pattern. Patients who showed pallor of the optic disc during follow-up period had poor recovery.

In this study among two patients who had bilateral total loss of vision and normal CT brain, one patient showed complete recovery, and another patient did not show any improvement.

The incidence[1, 2, 4, 9] of oculomotor nerve injury was about 2.2% in total study population and 14.8% of patient who sustained cranial nerve injury in this study. Out of 22 patients 11 patients had isolated oculomotor nerve injury, which is about 50% and in remaining 50% that is 11 patients had multiple cranial nerve injuries. In the latter sub group, two patients with oculomotor nerve injury also had optic, trochlear, and

abducens nerve injury. Three patients had associated trochlear and abducens nerve injury. Remaining six patients had optic nerve injury.

Out of 22 patients, three patients with a normal CT brain recovered well. Majority of patients who presented with skull orbital bone fracture showed very poor prognosis. Among the five patients who had no fracture, two patients who had brain stem contusion presented with bilateral III rd nerve weakness. Three patients had tentorial haematomas, all five patients showed good recovery. Patients who had multiple cranial nerve injuries had a poor outcome. The skull fracture and other CT scan findings were directly related to the outcome of the patient and the p-value of < 0.05 was statistically significant. This clearly shows the correlation between orbital fractures and a poor outcome in third nerve injury. The above results of this study compared with other studies[1, 4] (A. F. Coello et al and Purav patel et al).

Trochlear nerve injury was seen in 1.3 % of the total study population and 8.78% of the sub group with cranial nerve injuries. Isolated trochlear nerve injury seen in 61.5% (08 patients) and 38.5 % (5patients) of patients had multiple cranial nerve injuries. In the latter sub group, two patients had associated optic, oculomotor and abducens nerve injury and three patients had associated oculomotor and abducens nerve injury.

Orbital bone fracture is the single most common cause for trochlear nerve injury, which is about 61.5% (8/13 patients), followed by other CT findings in about 23.07% (3 patients) and normal CT findings in about 15.30% (2patients).

Binocular diplopia is the commonest symptom associated with trochlear nerve injury, and middle aged male patients were common victims. Skull bone fracture associated with trochlear injury had a poor outcome, which was about 12.5% (1/8 patient). Patients who had no fractures regardless of other findings in the CT had a better outcome. The above factors were statistically significant. This study results compares well with A. F. Coello et al and Purav patel et al[1], [4] .

In the available literature Trigeminal[1, 2, 4] nerve is one of the least common nerves to be injured, as seen in this study. In this study the peripheral branches of trigeminal nerve were only injured in all six patients. In this group, two patients had frontal bone fracture and associated supra orbital nerve injury, two patients had maxillary fracture and associated infra orbital nerve injury, one patient had mandibular fracture with mandibular nerve injury and the last one had mandibular bone fracture with associated inferior dental nerve injury. None of the above patients showed any improvement.

Connel et al, suggested that the trigeminal nerve is the most vulnerable when the skull base fracture extends to the middle cranial fossa and involving the foramen ovale and foramen rotundum where the nerve is fixed proximally at meckel's cave. Occasionally the post traumatic trigeminal nerve weakness presents as facial neuralgia and managed with carbamazepine. If there is no recovery, surgical transection of the involved nerve root is considered.

Traumatic abducens nerve injury[1, 4, 9] was one of the common nerves to be involved seen in 2.4% (24 patients) of the total sample population and in about 16.21% (24 of 148 patients) of those who had cranial nerve injury. 15 patients (62.5 %) had isolated sixth nerve weakness and 9 patients (37.5 %) had multiple cranial nerve injury. Of the nine patients, two were associated with optic, oculomotor, and trochlear nerve injuries. Three of the nine multiple cranial nerve injured patients were associated oculomotor and trochlear nerve injuries. Four of the nine multiple cranial nerve injured patients had associated optic nerve injury. Orbital bone fracture is the most common reason for abducens nerve injury seen in about (45.8%) eleven out of twenty four patients. Other scan findings like contusion and other haematomas constitute about (29.16%) seven out of twenty four patients. And (25%) six out of twenty four patients had normal a CT scan. Patients who had

abducens nerve weakness due to skull fracture had poor outcome. 45.5% of patients had complete recovery, 18.2% of patients had partial recovery and 36.4% did not show any improvement. Patients who had abducens nerve weakness due to reasons other than skull fracture had a relatively good outcome, that is 57.1% had complete recovery, 14.3 % patients partial recovery and 28.6% did not show any improvement. The patients who had abducens nerve weakness with normal CT scan had relatively better outcome, about 66.7% showed complete recovery, 16.7 % patients showed partial recovery and 16.7% did not show any improvement. Two of the patients with normal scan had bilateral sixth nerve weakness, one of whom recovered completely. The above factors were associated with outcome of abducens nerve injury and were statistically significant. This study results correlated well with other studies made by A. F. Coello et al and Purav patel et al [1, 4, 8] .

Facial nerve injury was the commonest nerve to be involved, seen in 4.8% (48 patients) of the total sample population and about 32.4% (48 of 148 patients) of those who sustained cranial nerve injury. 37 patients (77.08 %) had isolated seventh nerve weakness and 11patients (22.92 %) had multiple cranial nerve injury. All the patients who had multiple cranial nerve weakness had associated eighth nerve injury.

Petrous part of the temporal bone fracture is the single most reason for traumatic seventh nerve injury, seen in 34 patients (91.7%). Rest four patients had normal scan constituting 8.3% of the patients. Based on the nature of fracture, temporal bone fracture is classified as 1.Transverse, 2.Horizontal and 3.oblique. 17 (31.45%) patients with transverse fracture presented with facial nerve weakness, 18 (37.5%) of patient with horizontal fracture showed facial nerve weakness. 9(18.75%) of patients with oblique fracture presented with facial nerve weakness.

Based on the House Brackmann's grading system grade III and IV weakness was the common presentation. The patients who had oblique fracture have higher grade weakness than the transverse or horizontal type of fracture. Four patients had Facial nerve injury without temporal bone fracture. Two out of four patients who had delayed onset facial nerve weakness. All the four recovered completely.

Facial nerve injury associated with transverse temporal bone fracture had relatively good recovery than horizontal or oblique type fracture. Ten of seventeen patients had delayed onset of facial weakness and had a good outcome. Facial nerve injury patients with horizontal temporal bone fracture had comparatively good recovery than oblique type of fracture. The overall outcome was poor in oblique type, good in horizontal and better in transverse. The overall outcomes of the delayed

onset of facial nerve injury patients were better than immediate onset. The above factors in associated with outcome of facial nerve were statistically significant. This study results compares well with others studies by A. F. Coello et al and Purav patel et al [1, 4, 10].

The traumatic Vestibulocochlear nerve injury accounts for 1.4% (14) of the total study population and 9.45% of the patients who had sustained cranial nerve. Facial nerve was the only other cranial nerve weakness associated with eighth nerve injury (78.5 %) the rest (21.5%) three patients had isolated eighth nerve injury.

In the patients with eighth nerve injury, eight patients had oblique temporal bone fracture, most did not recover, 25% patients had partial recovery. Three patients with horizontal fracture had a good outcome with two of them recovering completely and the other recovering, albeit with residual deafness. The last subgroup of three patients with transverse temporal bone fracture had a complete recovery. These results relate well with A. F. Coello et al and Purav patel et al [1, 4, 7.]

In our study, the ninth, tenth, eleventh and twelveth cranial nerve injuries were not reported and the available literature also shows very minimal representation.

Conclusion

1. The incidence of cranial nerve injury in mild head injury is around 15%.

2. In olfactory nerve injury CSF rhinorrhea (dural tear) is the single most negative prognostic factor in this study.

3. In optic nerve injury visual evoked potential is the most important indicator for optic nerve recovery.

4. Cranial nerve injury (III, IV&VI) associated with skull bone fracture had a relatively poor outcome and was found to be statistically significant.

5. Trigeminal nerve injury is relatively uncommon.

6. The commonest cranial nerve involved is seventh cranial nerve (facial nerve) which was about 32.4 percent of cranial nerve injured.

7. Oblique type of temporal bone fracture is commonly associated Vestibulocochlear nerve injury with poor prognosis.

8. Lower cranial nerve (Nine, ten, eleven and twelve) injuries were very rarely mild head injury.

9. Road traffic accidents are the prime mode of injury and middle age male population were commonly injured.

10. This study also emphasizes the value of meticulous clinical examination in head injury patients.

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PROFORMA

INCIDENCE OF POST TRAUMATIC CRANIAL NERVE PALSY

NAME: **AGE:** **SEX**

IP NO: **MIN NO** **DOA** **DOD** **ADDRESS:**

MODE OF INJURY:

History suggestive of cranial nerve injury:

Periorbital odema/ subconjuctival haemorrhage /CSF rhinorrhea/ CSF otorrhoea

CLINICAL EXAMINATION:

ADMISSION GCS:

CRANIAL NERVE EXAMINATION

Cranial nerve	Clinical examination	Clinical examination RIGHT	Clinical examination LEFT	Lab test and electrophysiological study RIGHT	Lab test and electrophysiological study LEFT
	Able to Perceive smell YES/NO				
2nd	**Visual acuity- normal** **Field of vision -normal** **Colour vision- normal** **Findus -normal**			**VEP**	**VEP**
3rd	**Ptosis present /absent** **Pupils** **Adduction**			**Diplopia chart**	**Diplopia chart**
4th	Deppression Intortion			**Diplopia chart**	**Diplopia chart**
5th	**Bulk** **Tone** **Power** **Sensory** **V1** **V2** V3				
6th	**Abduction**				
7th	**Blink rate** **Deviation of mouth** **Forehead wrinkling**				
8th	**Rinnie** **Webers** **ABC**				

9th	**Sagging of soft plate Deviation of uvula Gag reflex Pharyngeal sensation**				
10th	**Sagging of soft plate Deviation of uvula Gag reflex Pharyngeal sensation**				
11th	**Shrugging of shoulder Weakness of SCM & trapezius**				
12th	**Atrophy of tongue Fasciculation Deviation of tongue**				

CT FINDINGS :

MRI FINDINGS:

FOLLOW UP:

FOLLOW UP:	Clinical examination	**Lab test and electrophysiological study**

ABBREVIATIONS USED IN MASTER CHART	
Multiple complex orbital #	Multiple complex orbital bone fracture
Medial wall #	Medial wall of orbit fracture
Lateral wall #	Lateral wall of orbit fracture
Other ct finding	C t scan other than calvarial fracture
Normal ct	Ct brain with bone window is normal
Nec	Nasoethmoidal complex
TTB#	Transverse temporal bone fracture
LBT#	Longitudinal temporal bone fracture
OTB#	Oblique temporal bone fracture
Frontal bone #	Frontal bone fracture
OB #	orbital bone fracture
Mandible #	Mandible fracture
Maxilla #	maxilla fracture
Complete	Complete recovery
Partial	Partial recovery
Static	No recovery
Yes	Present
No	Absent
0	Blank space

	SEX	OLFACTORY	OPTIC	OCULOMOTOR	TROCHLEAR	TRIGEMINAL	ABDUCENS	FACIAL	VESTIBULOCOCHLEAR	GLOSSOPHARYNGEAL	VAGUS	ACCESSORY	HYPOGLOSSAL	MULTIPLE CRANIAL NERVE	SINGLE CRANIAL NERVE	SCAN FINDING	1ST NERVE RECOVERY	RECOVERY 1ST NERVE	3RD NERVE RECOVERY	4TH NERVE RECOVERY	RECOVERY 5TH NERVE	6TH NERVE RECOVERY	RECOVERY WITH NERVE	RECOVERY WITH NERVE
1	MALE	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	0	0	0	STATIC	0	0
2	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	COMPLETE	0	0	0	0	0	0
3	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OCCIPITAL BONE FRACTURE FRANTAL CONTUSION	RECOVERED	0	0	0	0	0	0	0
4	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	0	0	COMPLETE	0	0
5	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	COMPLETE	0	0	0	0	0
6	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
7	MALE	NO	YES	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	STATIC	STATIC	0	STATIC	0	0
8	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES		RECOVERED	0	0	0	0	0	0	0
9	FEMALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
10	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
11	MALE	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	STATIC	0	0	0	0	0
12	FAMALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTB #	0	0	0	0	0	0	YES	0
13	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
14	FEMALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	0	0	COMPLETE	0	0
15	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRANTAL CONTUTION U/L	RECOVERED	0	0	0	0	0	0	0
16	MALE	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	FRONTAL BONE#	0	0	0	0	STATIC	0	0	0
17	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	LTB#	0	0	0	0	0	0	YES	COMPLETE
18	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	COMPLETE	0	0	0	0
19	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	OTB #	0	0	0	0	0	0	YES	0
20	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	STATIC
21	MALE	NO	NO	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	OB #	0	0	COMPLETE	PARTIAL	0	PARTIAL	0	0
22	MALE	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	STATIC	0	0	0	0	0
23	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	COMPLETE	0	0	0	0	0
24	MALE	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	0	0	0	STATIC	0	0
25	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
26	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	COMPLETE	0	0	0	0	0	0
27	FEMALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRANTAL EDH CSF LEAK	STATIC	0	0	0	0	0	0	0
28	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	COMPLETE	0	0	0	0
29	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
30	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OB#	0	0	0	0	0	COMPLETE	0	0
31	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	PARTIAL
32	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
33	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OCCIPITAL BONE FRACTURE FRANTAL CONTUSION	RECOVERED	0	0	0	0	0	0	0
34	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	STATIC
35	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0

36	MALE	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	0	0	0	STATIC	0	0
37	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
38	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	STATIC	0	0
39	MALE	NO	NO	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	OB #	0	0	COMPLETE	COMPLETE	0	COMPLETE	0	0
40	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	STATIC
41	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	COMPLETE	0	0	0	0	0	0
42	FEMALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OB#	0	0	0	0	0	COMPLETE	0	0
43	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
44	FEMALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE CSF LEAK	STATIC	0	0	0	0	0	0	0
45	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	COMPLETE	0	0	0	0	0
46	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	COMPLETE	0	0	0	0
47	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRONTAL EDH	RECOVERED	0	0	0	0	0	0	0
48	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
49	MALE	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	FRONTAL BONE#	0	0	0	0	STATIC	0	0	0
50	MALE	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	LATRAL WALL #	0	STATIC	PARTIAL	0	0	0	0	0
51	MALE	NO	YES	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	MEDIAL WALL #	0	PARTIAL	STATIC	STATIC	0	PARTIAL	0	0
52	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRANTAL CONTUTION U/L C	STATIC	0	0	0	0	0	0	0
53	MALE	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	0	COMPLETE
54	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	STATIC	0	0	0	0	0	0
55	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
56	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	PARTIAL	0	0	0	0	0
57	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	COMPLETE	0	0	0	0	0	0
58	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
59	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OCCIPITAL BONE FRACTURE FRANTAL CONTUSION	STATIC	0	0	0	0	0	0	0
60	MALE	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	STATIC	0	0	0	0	0
61	MALE	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	OTB #	0	0	0	0	0	0	0	PARTIAL
62	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
63	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	PARTIAL	0	0	0	0	0	0
64	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	PARTIAL	0	0
65	FEMALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE	RECOVERED	0	0	0	0	0	0	0
66	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB#	0	0	0	PARTIAL	0	0	0	0
67	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
68	MALE	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	MAXILLA #	0	0	0	0	STATIC	0	0	0
69	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB #	0	0	COMPLETE	0	0	0	0	0
70	MALE	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	0	0	0	COMPLETE	0	0
71	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE	RECOVERED	0	0	0	0	0	0	0
72	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	STATIC
73	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	PARTIAL	0	0	0	0	0	0
74	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	LTB#	0	0	0	0	0	0	YES	COMPLETE
75	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
76	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	STATIC	0	0	0	0	0
77	FEMALE	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	STATIC	STATIC	0	0	0	0	0
78	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	ANTERIOR INTER HEMIPHERICAL BLEED	RECOVERED	0	0	0	0	0	0	0
79	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
80	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
81	MALE	NO	NO	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	OTHER CT FINDING	0	0	COMPLETE	COMPLETE	0	COMPLETE	0	0
82	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRANTAL CONTUTION B/L C	STATIC	0	0	0	0	0	0	0
83	MALE	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	0	PARTIAL
84	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	PARTIAL	0	0	0	0	0	0
85	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
86	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	COMPLETE	0	0	0	0
87	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
88	FEMALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OB#	0	0	0	0	0	COMPLETE	0	0
89	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	ANTERIOR INTER HEMIPHERICAL BLEED	RECOVERED	0	0	0	0	0	0	0
90	MALE	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	MAXILLA #	0	0	0	0	STATIC	0	0	0
91	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
92	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	TTB#	0	0	0	0	0	0	YES	COMPLETE
93	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
94	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
95	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	STATIC
96	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	STATIC	0	0	0	0	0	0

97	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB #	0	0	COMPLETE	0	0	0	0	0
98	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
99	MALE	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	MULTIPLE COMPLEX ORBITAL#	0	COMPLETE	STATIC	0	0	0	0	0
100	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OCCIPITAL BONE FRACTURE FRANTAL CONTUSION	RECOVERED	0	0	0	0	0	0	0
101	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE CSF LEAK	STATIC	0	0	0	0	0	0	0
102	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
103	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB#	0	0	0	STATIC	0	0	0	0
104	FEMALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	ANTERIOR INTER HEMIPHERICAL BLEED	STATIC	0	0	0	0	0	0	0
105	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
106	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	STATIC	0	0	0	0	0	0
107	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	COMPLETE	0	0	0	0	0
108	FEMALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	COMPLETE	0	0
109	MALE	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	MANDIBLE #	0	0	0	0	STATIC	0	0	0
110	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
111	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	YES	NO	TTB#	0	0	0	0	0	0	0	YES	COMPLETE
112	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRONTAL EDH CSF LEAK	STATIC	0	0	0	0	0	0	0
113	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
114	MALE	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB#	0	0	0	STATIC	0	0	0	0
115	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
116	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB #	0	0	PARTIAL	0	0	0	0	0
117	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	STATIC	0	0	0	0	0	0
118	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	0	0	COMPLETE	0	0
119	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE CSF LEAK	STATIC	0	0	0	0	0	0	0
120	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
121	MALE	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	NO	YES	NO	OTB #	0	0	0	0	0	0	YES	0	0
122	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	COMPLETE	0	0
123	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OB #	0	0	PARTIAL	0	0	0	0	0
124	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
125	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
126	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	LTB#	0	0	0	0	0	0	YES	0
127	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	OCCIPITAL BONE FRACTURE FRANTAL CONTUSION	STATIC	0	0	0	0	0	0	0
128	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	0	0	STATIC	0	0
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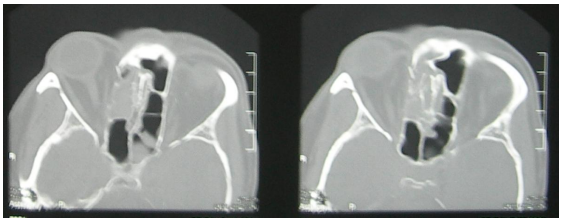
132	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	COMPLETE	0	0
133	FEMALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	0	YES	0
134	MALE	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	COMPLETE	0	0	0	0	0
135	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
136	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	MEDIAL WALL #	0	COMPLETE	0	0	0	0	0	0
137	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	0	YES	0
138	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	0	0	STATIC	0	0
139	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE FRANTAL CONTUTION U/L	RECOVERED	0	0	0	0	0	0	0
140	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
141	MALE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	LATRAL WALL #	0	COMPLETE	0	0	0	0	0	0
142	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	0	YES	0
143	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	COMPLETE	0	0
144	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
145	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	NORMAL CT	0	0	0	0	0	0	YES	0
146	MALE	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	YES	TTB#	0	0	0	0	0	0	YES	0
147	MALE	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	YES	OTHER CT FINDING	0	0	0	0	0	PARTIAL	0	0
148	MALE	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NEC WITH FRONTAL BONE FRACTURE CSF LEAK	STATIC	0	0	0	0	0	0	0



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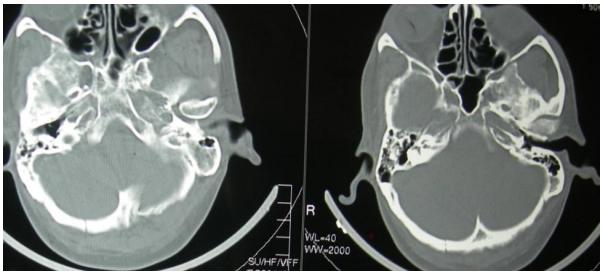

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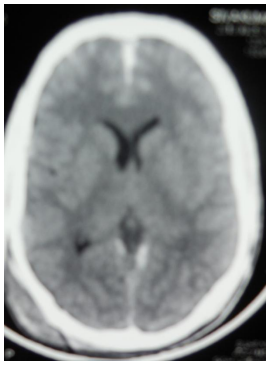
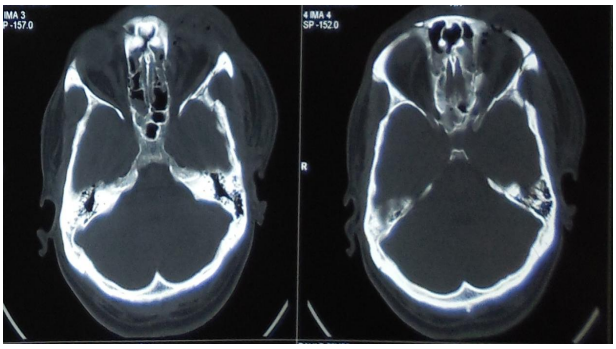
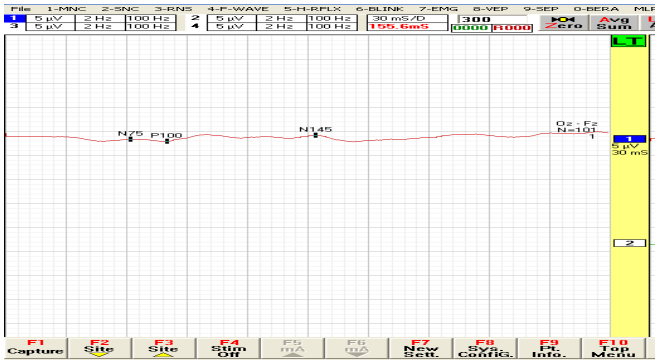
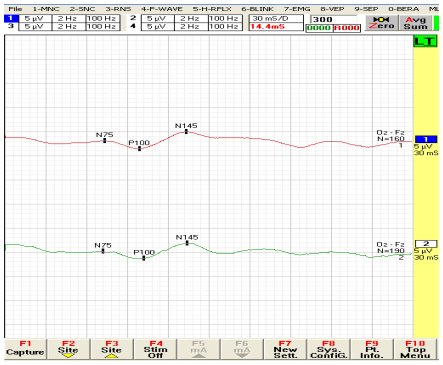


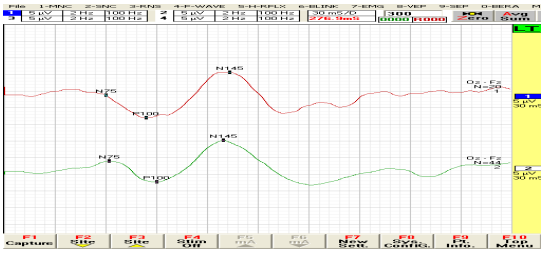
1c

Various type of C T finding causing olfactory nerve injury a. NEC fracture, b. occipital bone fracture and c. occipital impact with anteriorinterhemispherical bleed

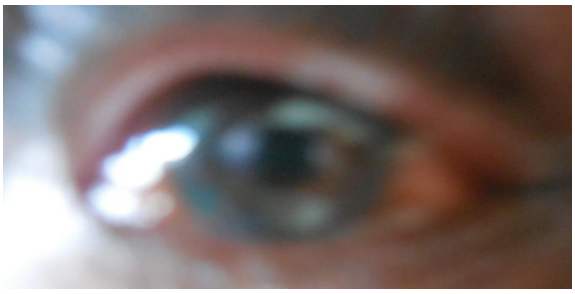


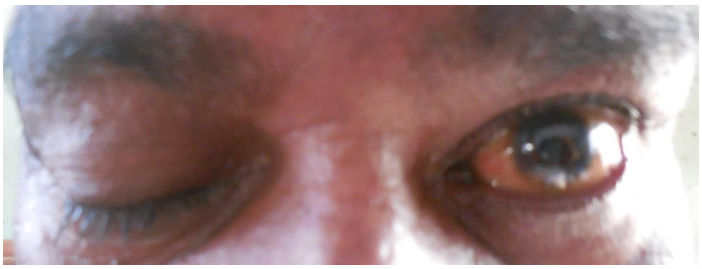






Orbital bone fracture causing optic nerve injury CT scan with serial VEP





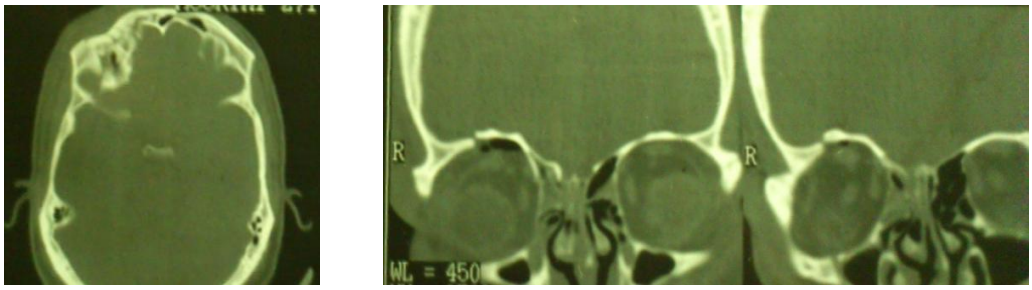


Image 1: Clinical photo & CT scan showing Orbital bone fracture which caused third nerve weakness

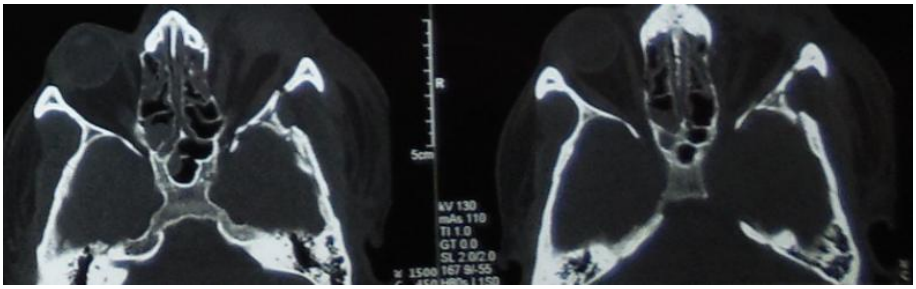
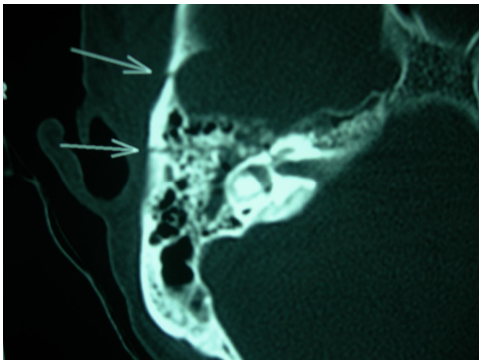
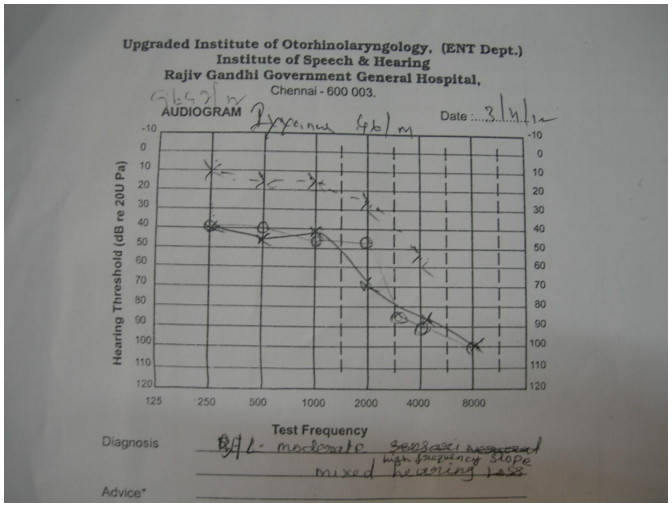


Image 1: Clinical photo & CT scan showing Orbital bone fracture which caused fourth nerve weakness

Trauma causing Normal CT scan bilateral abducens nerve injury

Image 1: Clinical photo & CT scan showing Temporal bone fracture which caused facial nerve weakness





Right temporal bone fracture causing vestibulocochlear nerve injury CT scan with audiogram

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