CRANIOFACIAL SURGERY

What? Where? When? Who? And How?

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GSR Institute of Facial Plastic Surgery

- Non-profit hospital established in 1996
- Dedicated Cleft & Craniofacial Centre of Excellence
- Presently 1,500 cleft and cranio-facial surgeries are done every year
- 2 surgeons and 5 fellows with full support team
- More than 20,000 documented cleft & craniofacial surgeries have been performed since 1996
- 600 primary new born cleft children are registered every year

Craniofacial Surgery

What?

Where? When? Who? And How?

Craniofacial Anomalies

Abnormalities of the Head and Neck region

Congenital

With clefting

- Cleft lip and palate
- Craniofacial clefts

Without clefting

- Treacher Collins syndrome
- Cruzons syndrome
- Aperts syndrome

Acquired

Trauma

Neoplasms

- Benign
- Malignant

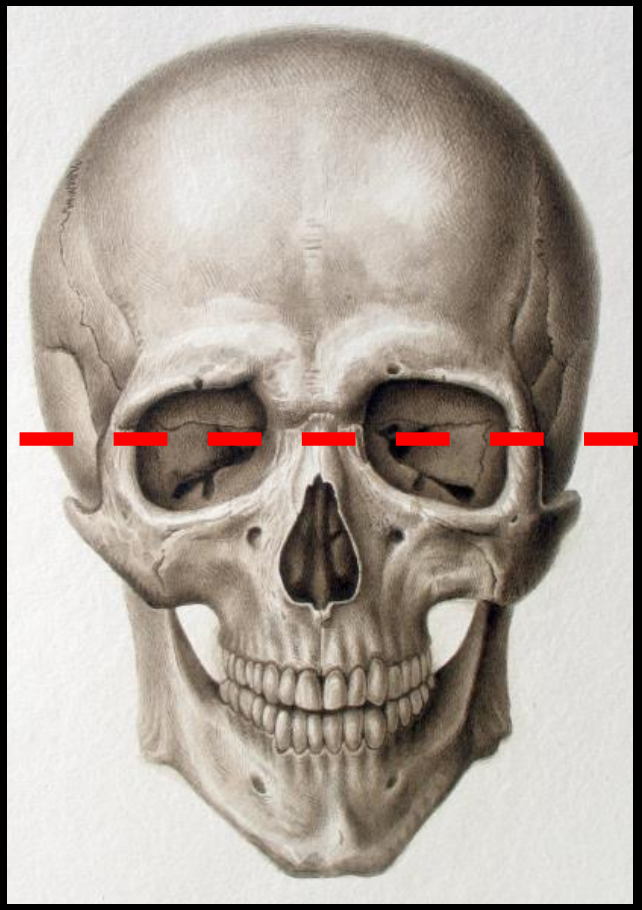
Craniofacial Surgery

Where?

What?.....When? Who? And How?

Facial Skeletal Surgery

CRANIOFACIAL SURGERY



MAXILLOFACIAL SURGERY

Facial Skeletal Surgery has two subdivisions, maxillofacial and craniofacial surgery separated by an imaginary line running between the optic foramina

Craniofacial Anomalies

- Craniosynostosis

Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

- Craniofacial Dysostosis

Crouzon Syndrome/Apert Syndrome/Pfeiffer Syndrome/Cloverleaf skull

- Craniofacial Syndromes and Anomalies

Treacher Collins Syndrome/Hemifacial Microsomia/Binder Syndrome/Pierre Robin Sequence/Craniofrontonasal Dysplasia/Craniofacial Clefts

- Cleft Lip and Palate
- Benign and Malignant Head and Neck Tumors

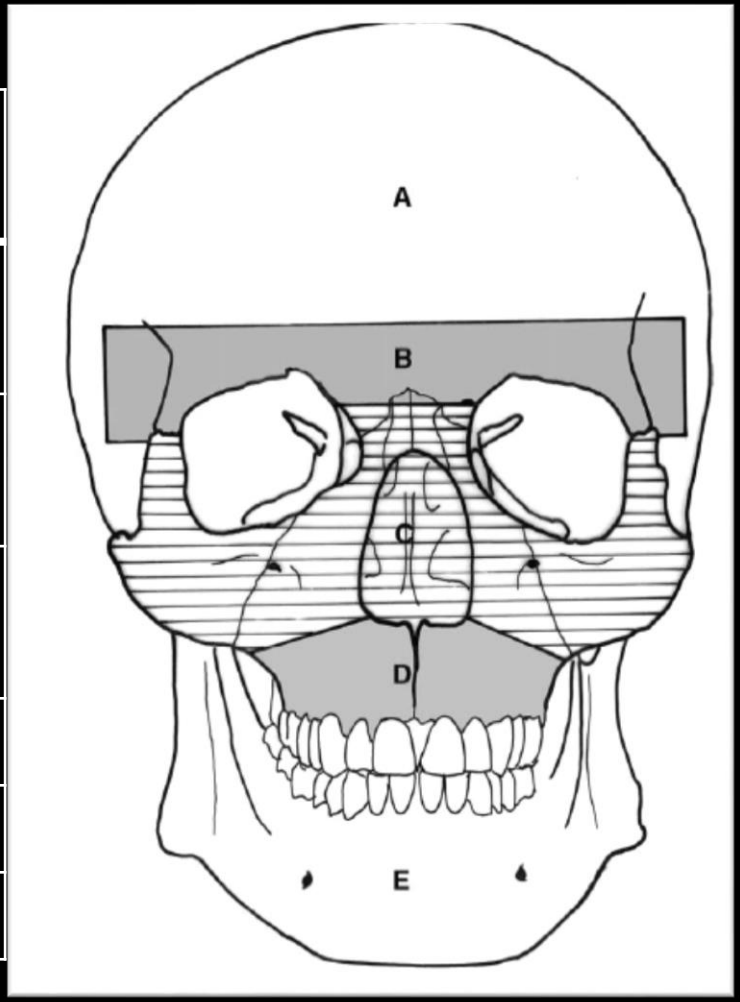
Encephaloceles/Dermoid cysts/Hemangiomas/Vascular Malformations/Fibrous Dysplasia/Sarcoma and other malignancies

- Craniomaxillofacial Trauma
- Non-syndromic Orthognathic Deformities

Classification Craniofacial Synostosis and Dysostosis

Tessier divided the craniofacial framework into five levels
Classified Synostosis and Dysostosis topographically and anatomically into six groups

Tessier's classification	**Levels of malformation**
Class 1: isolated cranial vault dysmorphism	Level A
Class 2: syndromic orbitocranial dysmorphism	Level B
Class 3: asymmetric orbitocranial dysmorphism	Level B and C
Class 4: Saethre-Chotzen group	Level A-C
Class 5: Crouzon group	Level A-D
Class 6: Apert group	Level A-E



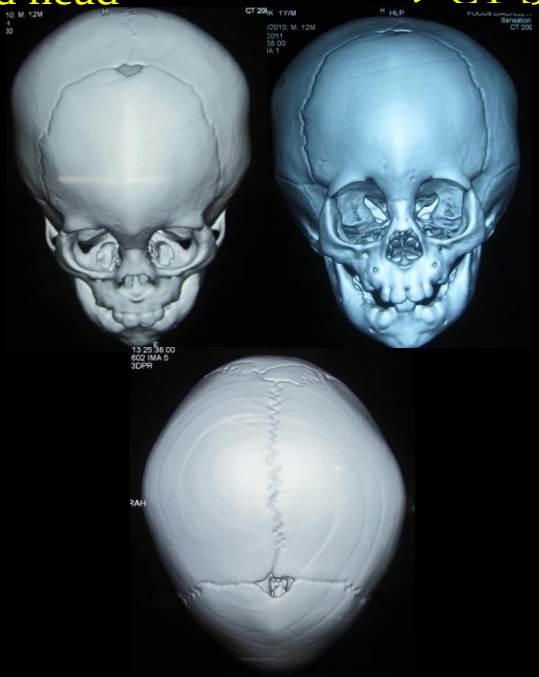
Craniosynostosis

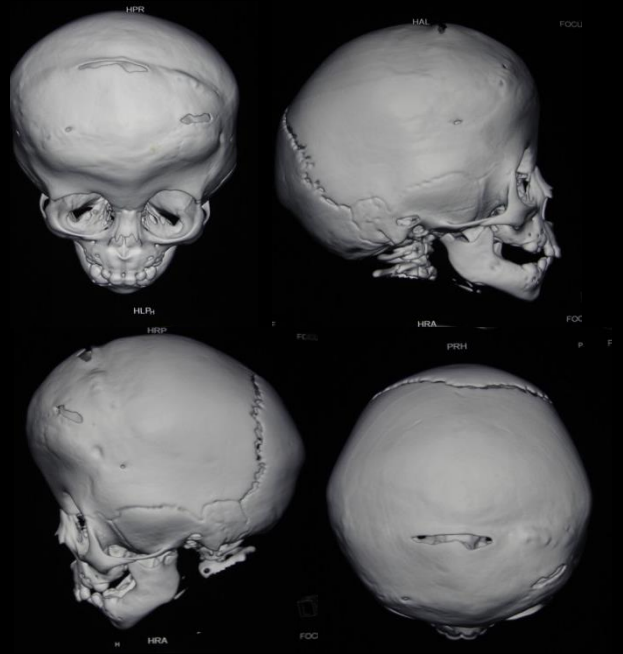
Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

Premature fusion of cranial sutures

Plagio~	=	Oblique shaped	=	Unilateral coronal or lambdoid suture synostosis
Trigon~	=	Triangular shaped	=	Metopic suture synostosis
Scapho~	=	Boat shaped	=	Sagittal suture synostosis
Brachy~	=	Flat shaped	=	Coronal suture synostosis

Irregular shaped head → CT Scan Skull → Suture synostosis

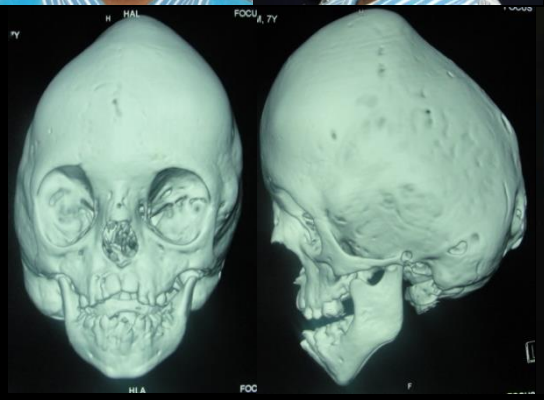




Craniofacial Dysostosis

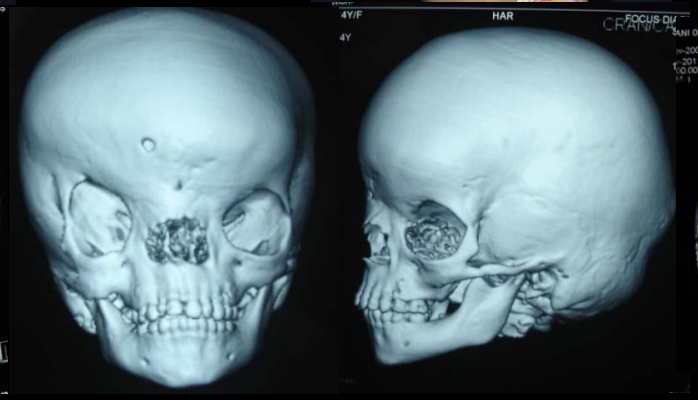
Crouzon Syndrome/Pfeiffer Syndrome/Cloverleaf skull

Crouzon Syndrome



- Craniosynostosis
- Exophthalmos
- Hypertelorism
- Stabismus
- Hypoplastic maxilla

Pfeiffer Syndrome



- Craniosynostosis
- Hypertelorism
- Retruded maxilla
- Stubby fingers and toes

Cloverleaf skull

- Severe craniosynostosis
- Cloverleaf shape of skull

Craniofacial Syndromes and Anomalies

Treacher Collins Syndrome/Binder Syndrome

Treacher Collins Syndrome

- Micrognathia,
- Underdeveloped zygoma,
- Drooping of lateral lower eyelids
- Malformed or absent ears with conductive hearing loss

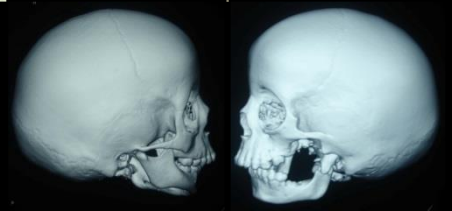
Binder Syndrome

- Midfacial hypoplasia with hypoplasia of cartilaginous nasal septum and premaxilla
- Complete absence of anterior nasal spine
- Class III skeletal and dental profile

Craniofacial Syndromes and Anomalies

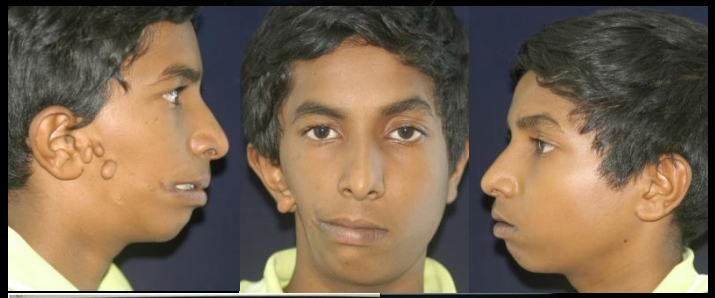
Hemifacial Microsomia

Type I



Type II a

Type II b



Type III

- Affects the development of the lower half of the face,
- Most commonly the ears, the mouth and the mandible

Craniofacial Syndromes and Anomalies

Pierre Robin Sequence

Pierre Robin Sequence

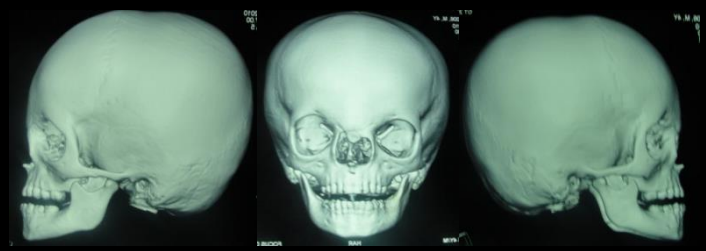
3 main features

- cleft palate,
- micrognathia
  (a small jaw)
- glossoptosis
  (airway obstruction caused by backwards displacement of the tongue base)

Craniofacial Syndromes and Anomalies

Craniofrontonasal Dysplasia

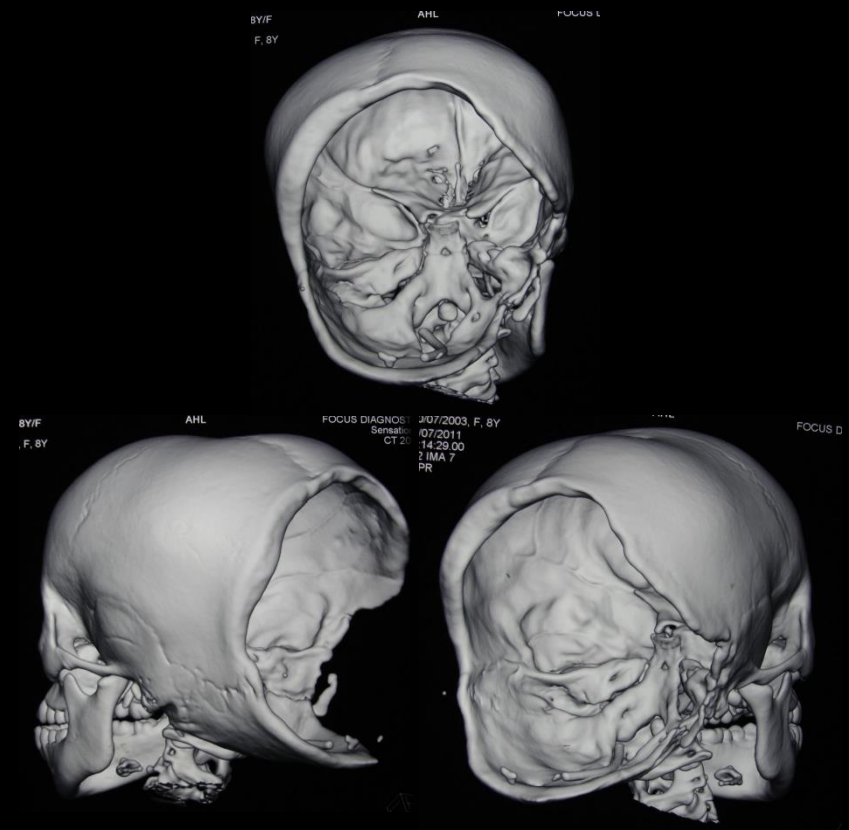
Hypertelorism



- Lateralization of the total orbital complex with increase in the interorbital distance and intercanthal width
- Increase in the distance between the lateral orbital walls and the interorbital distance to denote true hypertelorism
- May be symmetric, asymmetric or unilateral

Cranial Vault Defects

Dandy Walker Syndrome



Craniofacial Syndromes and Anomalies

Craniofacial Clefts

Tessier #0
facial cleft

Tessier #2
facial cleft

Tessier #3
facial cleft

Tessier #4
facial cleft

Tessier #5
facial cleft

Tessier #7
facial cleft

Bilateral Tessier
#3, #4, #30
Facial Cleft

Tessier 0-14
Facial Cleft
Orbital Hypertelorism

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Cleft Lip

Incomplete unilateral cleft lip

Complete Unilateral cleft lip

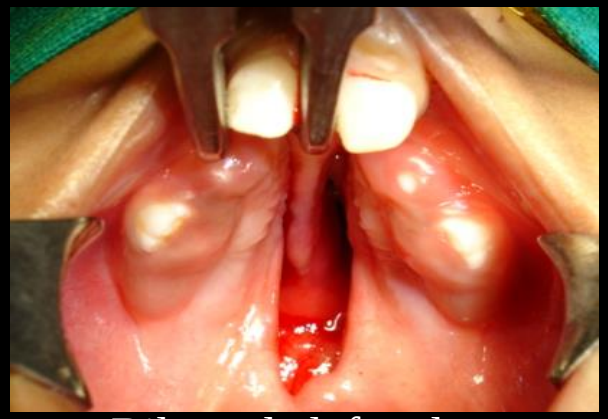
Incomplete bilateral cleft lip

Complete bilateral cleft lip

Cleft Palate

Cleft of hard and soft palate associated with cleft lip

Unilateral cleft palate



Bilateral cleft palate

Isolated cleft palate

Submucous cleft palate

Craniofacial Tumors

Encephaloceles

Meningocephalocele

Meningocele

neural tube defect

sac-like protrusions of the brain and the membranes that cover it through openings in the skull.

caused by failure of the neural tube to close completely during fetal development.

Seen between the

forehead and nose, or

on the back side of the skull

Craniofacial Tumors

Hemangiomas/Vascular Malformations

Vascular Malformations

Capillary

Venous

Lymphatic

Arterio-venous

Hemangioma

- Vascular Malformations
- Congenital vascular lesions
- Continue to grow throughout life

Growth caused by

- Progressive ectasia of existing vessels
- Usually caused by trauma, sepsis or hormonal changes

- Hemangiomas
- Acquired vascular lesions
- Period of growth followed by involution

Growth caused by

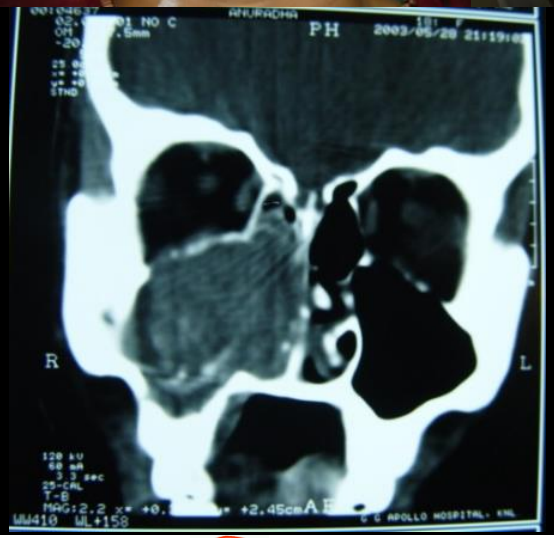
- Rapid proliferation by hyperplasia of endothelial cells
- Followed by spontaneous involution

Craniofacial Tumors

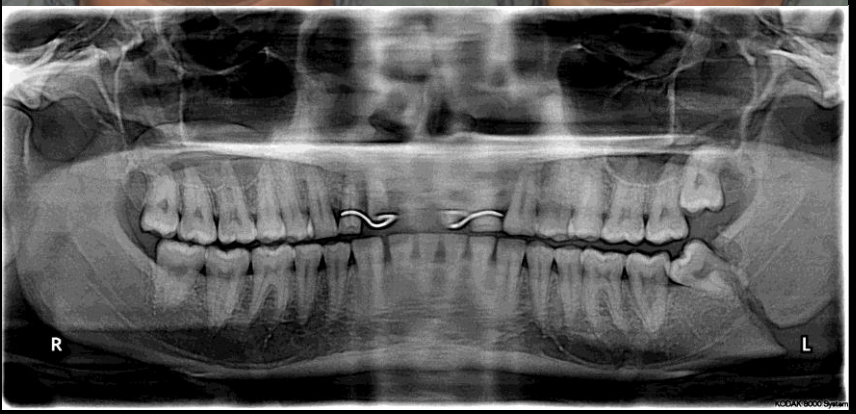
Plexiform Neurofibroma and benign tumors

Craniofacial Tumors

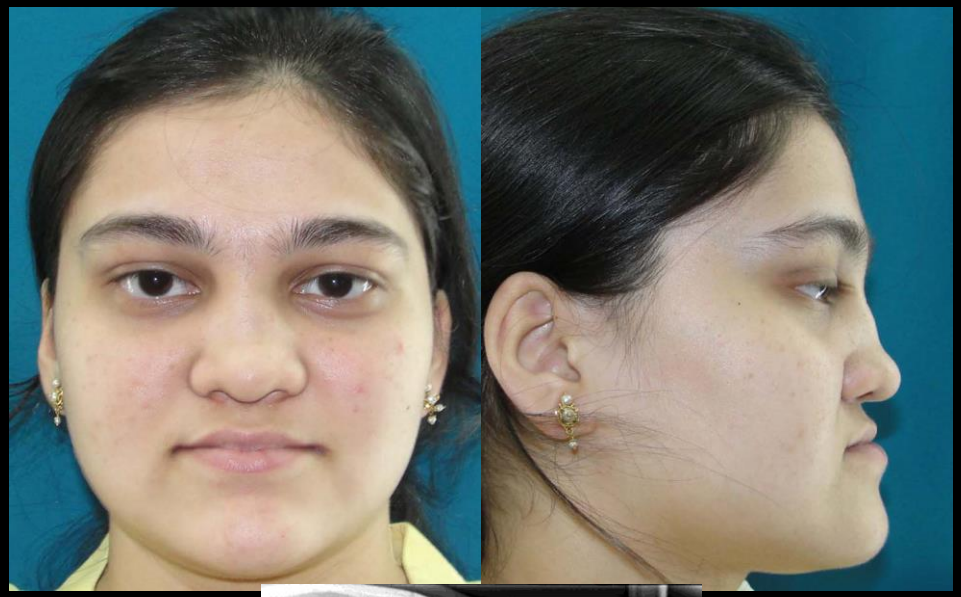
Sarcoma and other malignancies

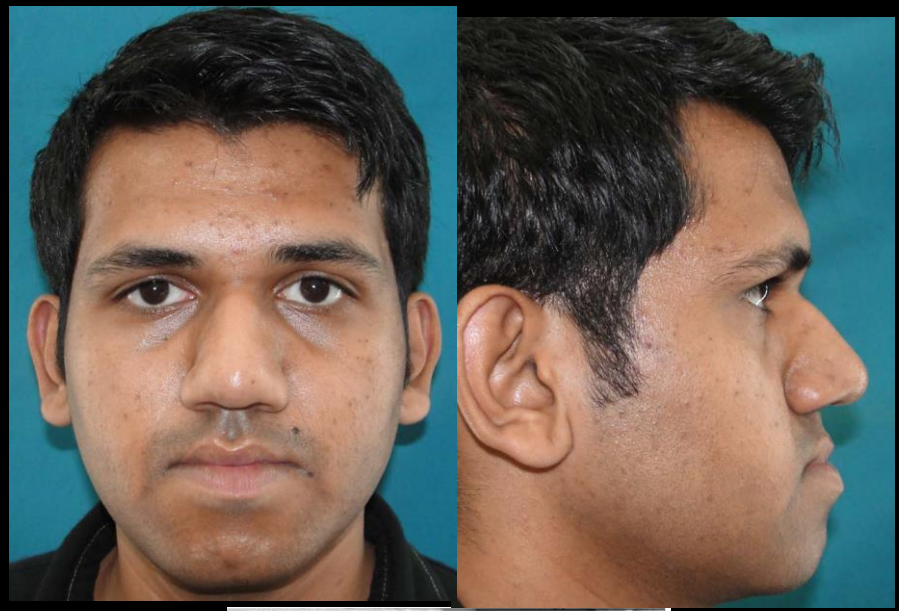


Craniomaxillofacial Trauma



Non-syndromic Orthognathic Deformities





Craniofacial Surgery

When?

What? Where?…. Who? And How?

Craniofacial Anomalies

Abnormalities of the Head and Neck region

Congenital

Soft Tissue:	3-12 months
Bone:	
Skull Reshaping:	Infancy
Orbital Rim Advancement:	6-24 months
Ant. Cranial Vault Recon.:	6-24 months
Post. Cranial Vault Recon.:	6-24months
Midface deformity:	5-7 years
Jaw Deformity:	13-18 years

Acquired

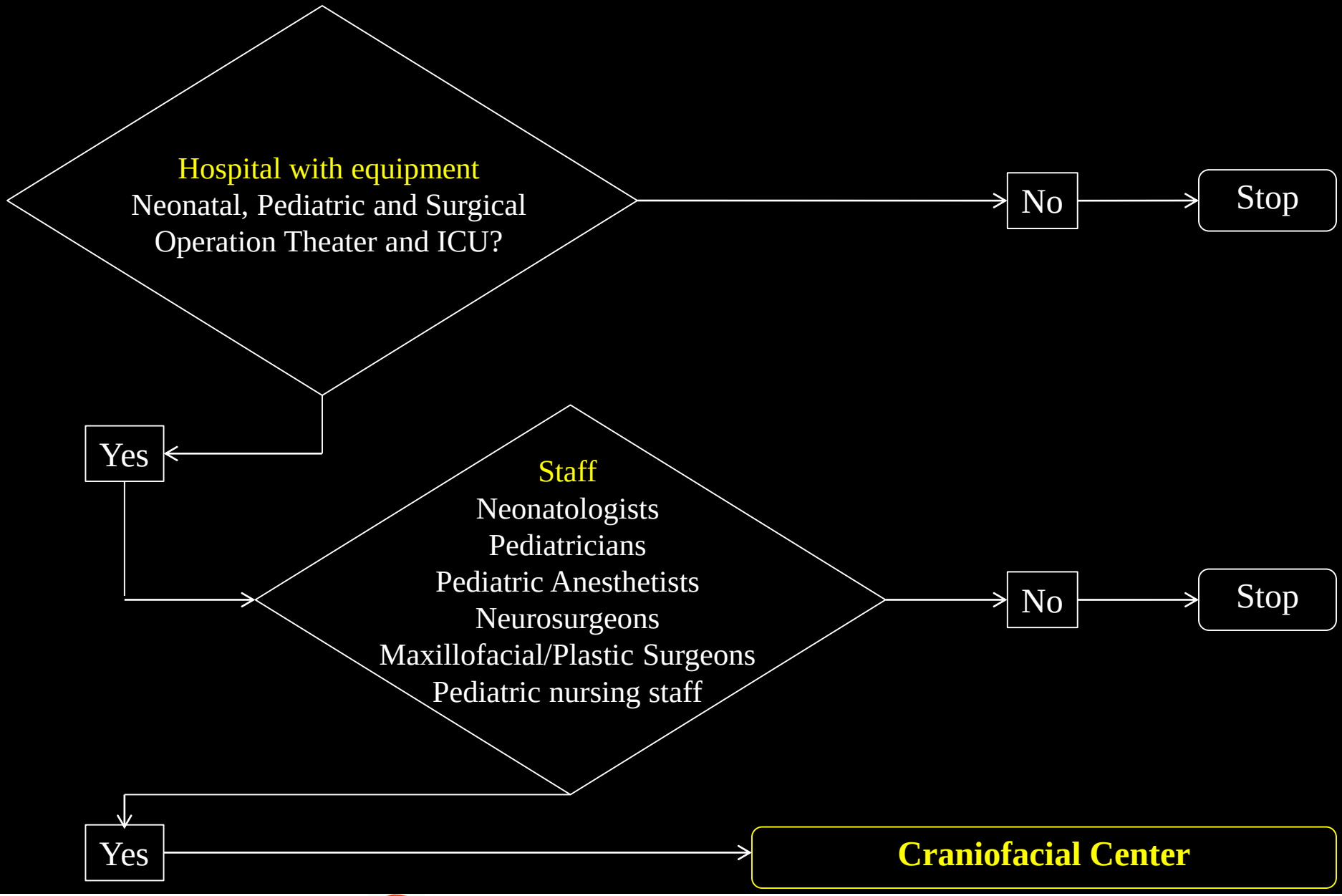
Immediate

Craniofacial Surgery

Who?

What? Where? When?.... And How?

Craniofacial Division or Center



Craniofacial Surgery

And How?

What? Where? When? Who?....

Craniofacial Treatment

Pediatric Anesthetists, Neurosurgeons,
Maxillofacial/Plastic Surgeons
Pediatric nursing staff
In
Pediatric and Surgical
Operation Theater and ICU

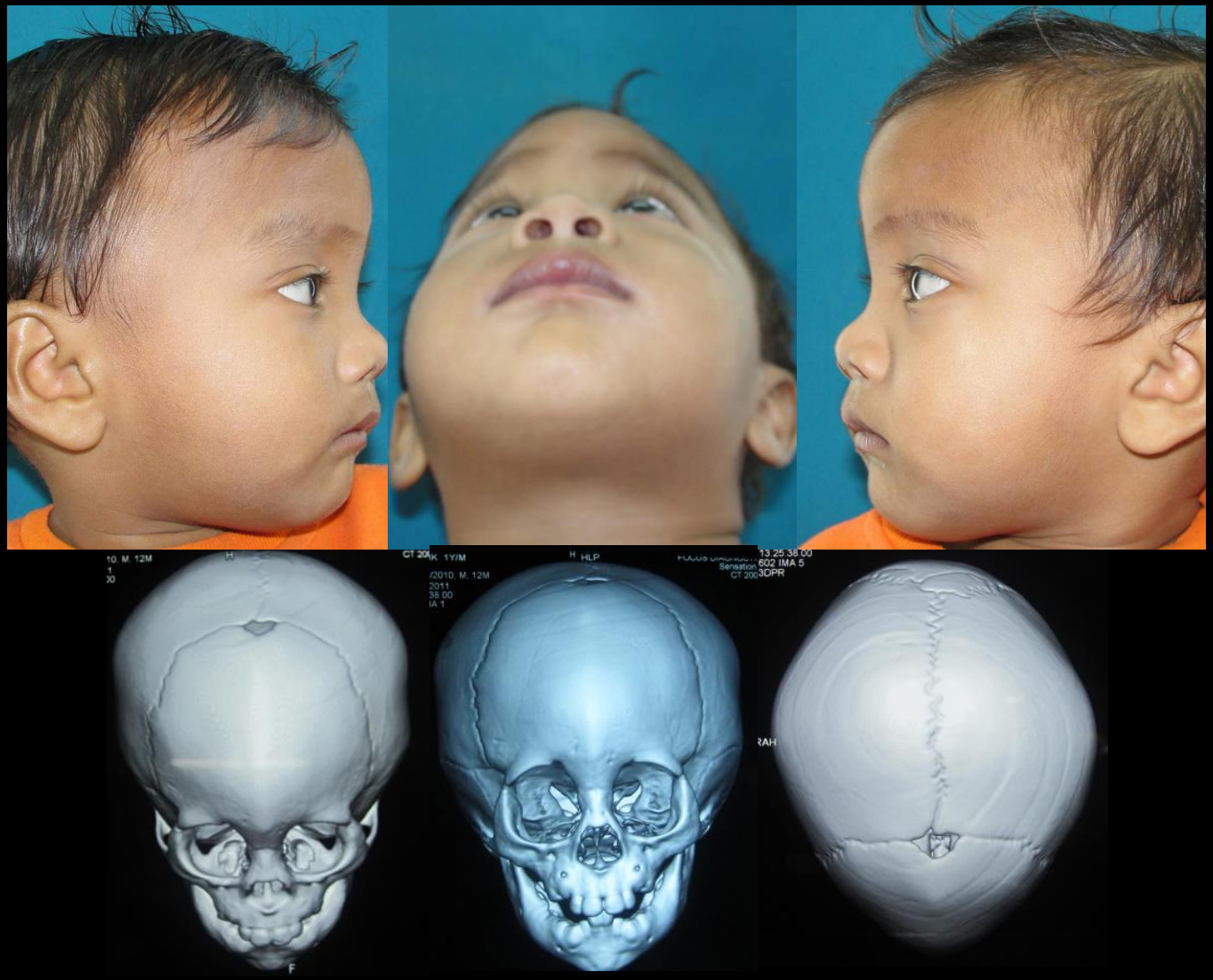
Bicoronal Incision



The skin incision for approaching the cranium, supraorbital area and the zygomatic area consists of bicoronal incision with the dissection as far forward and anterior as possible.

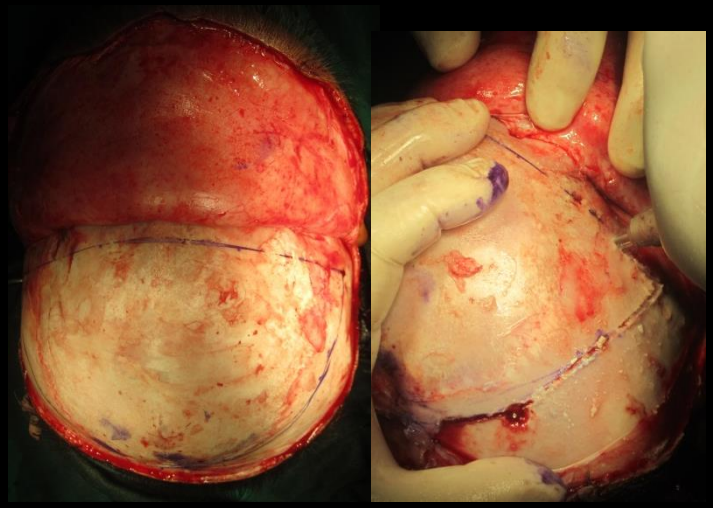
Craniosynostosis

Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

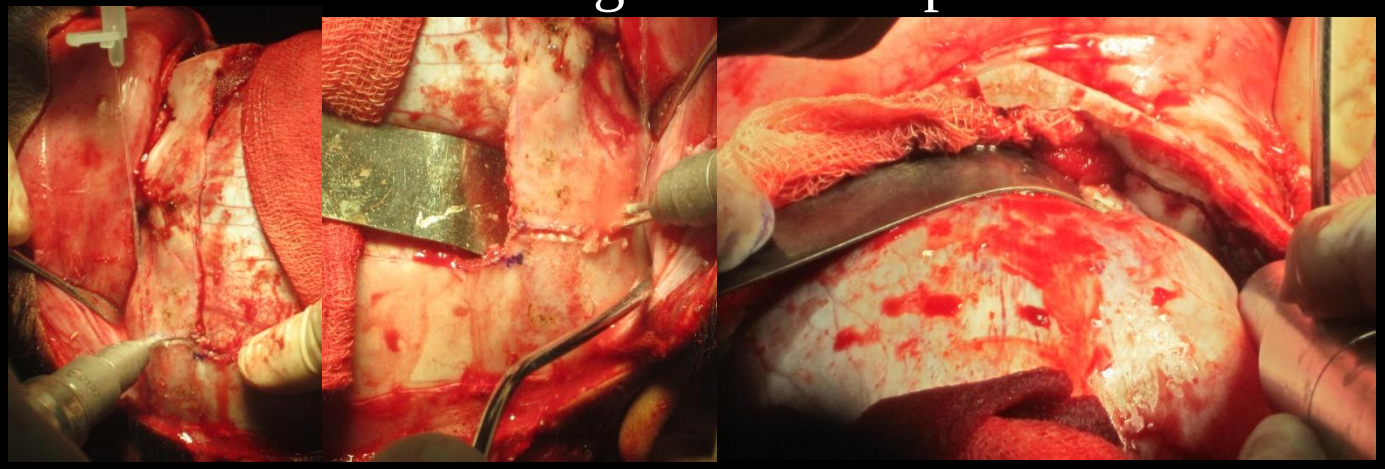


Craniosynostosis

Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly



Raising Frontal Flap

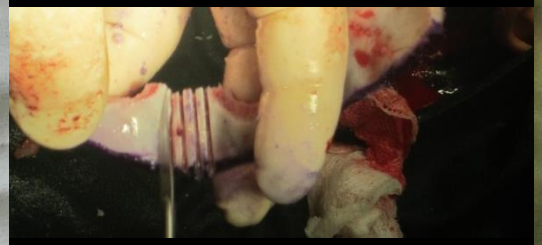


Harvesting supraorbital band

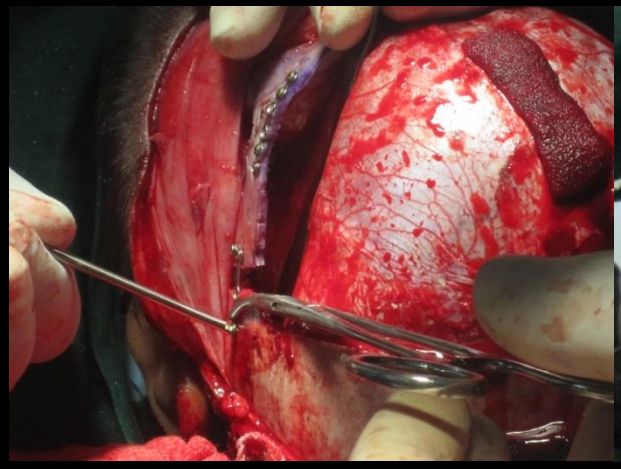
Craniosynostosis

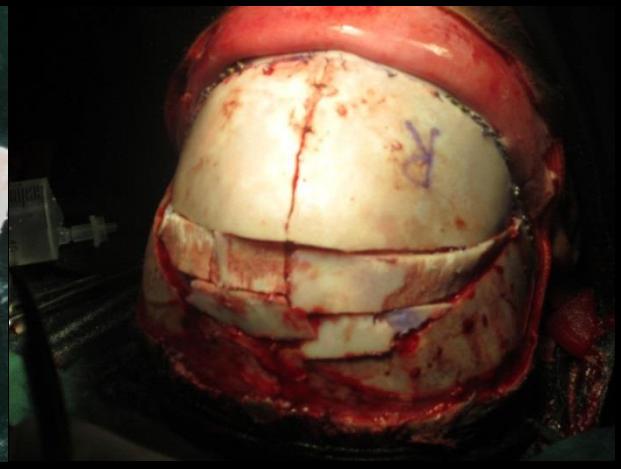
Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly






Superior Orbital rim advancement and fixation





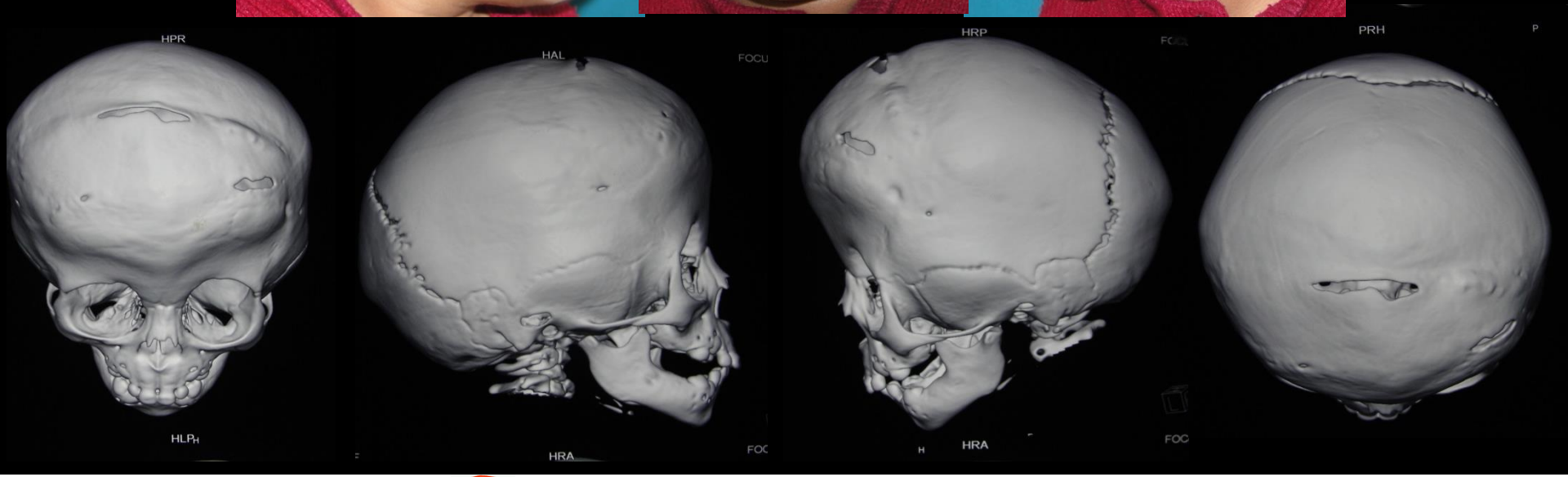
Fixation

Craniosynostosis

Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

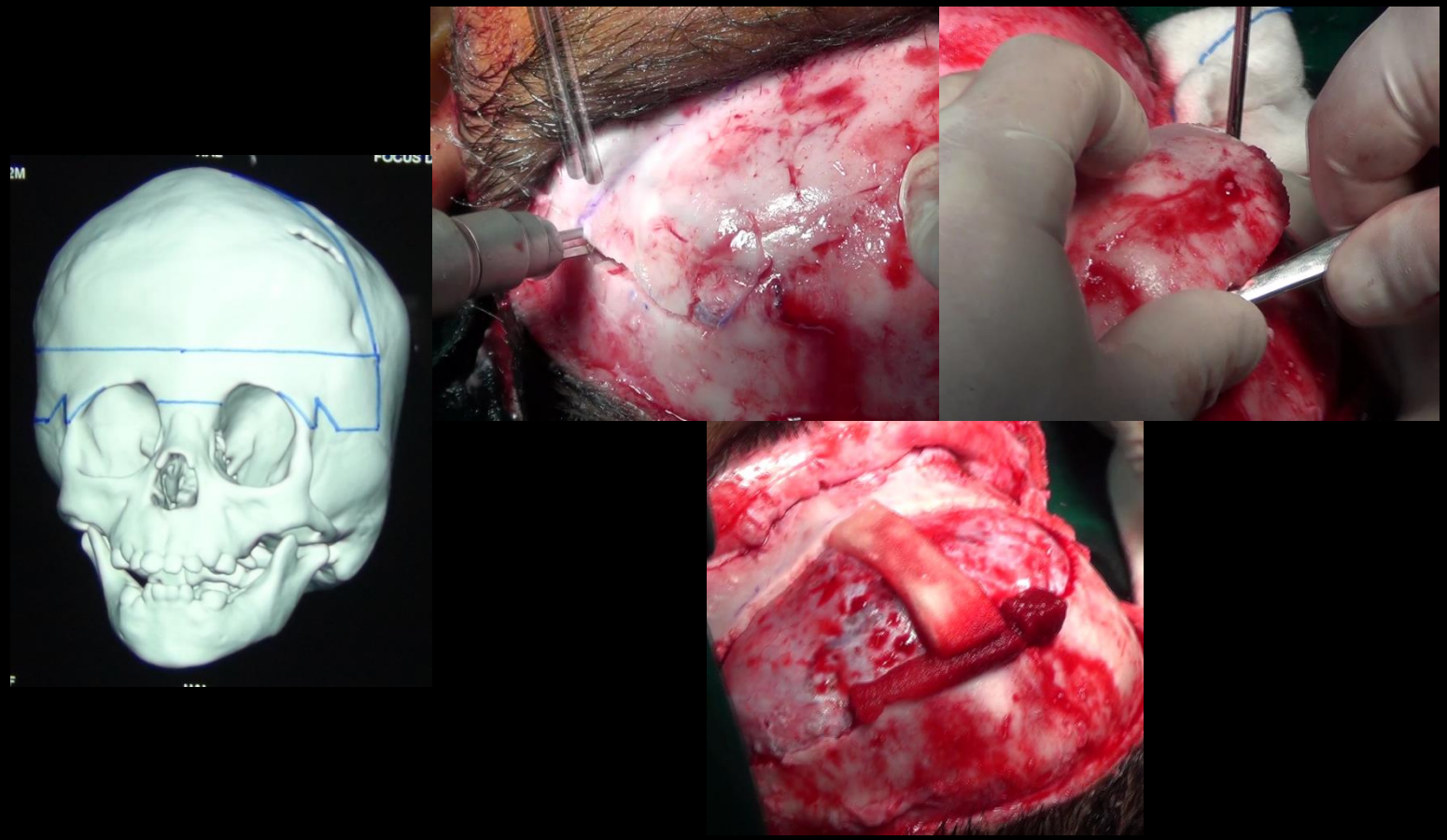
Craniosynostosis

Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

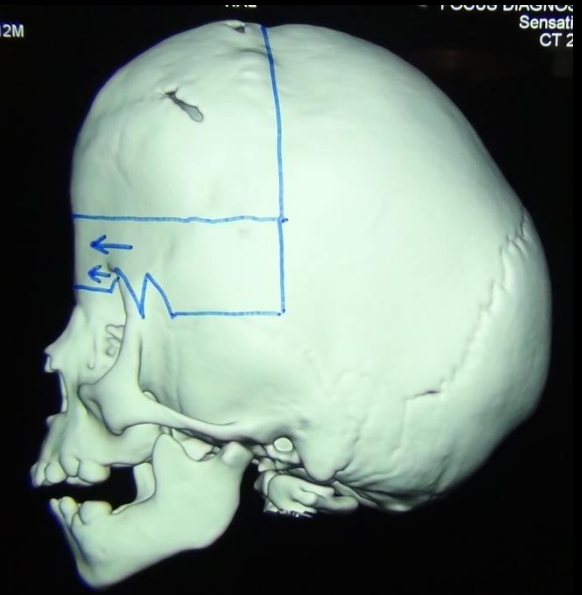


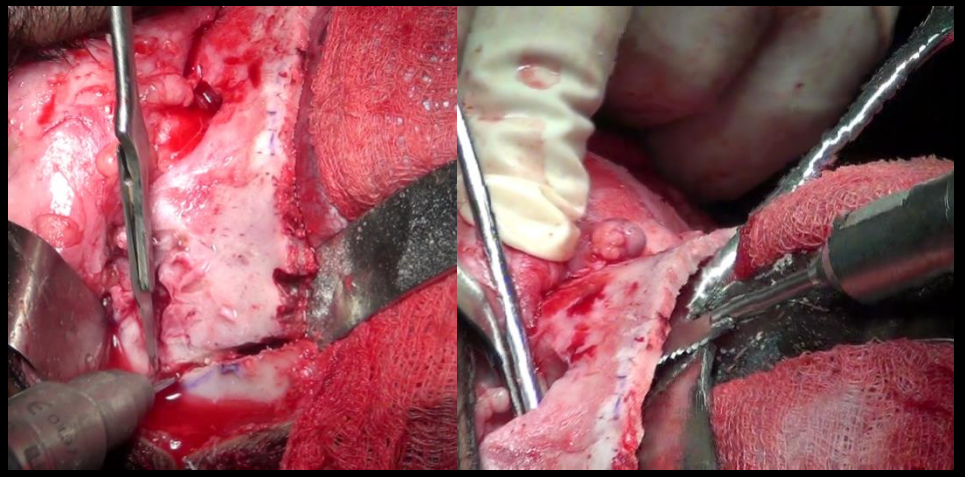
Craniosynostosis

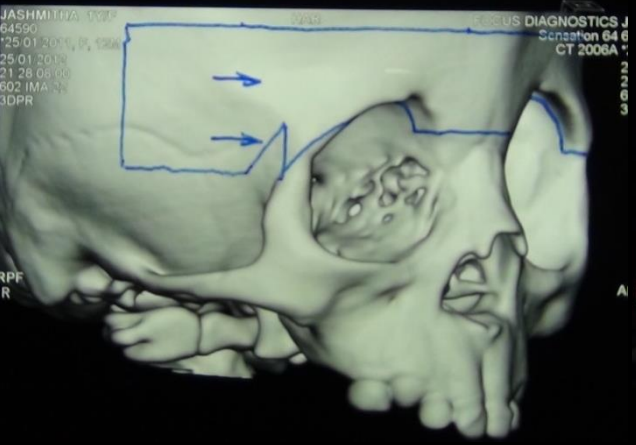
Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

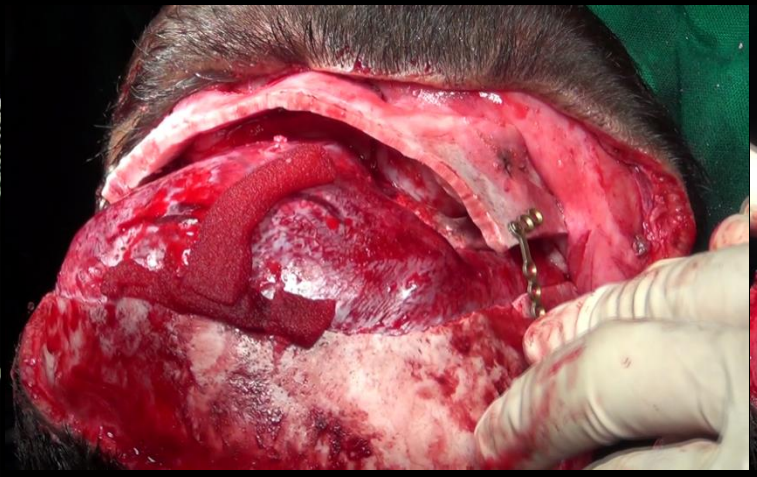


Raising Frontal Flap









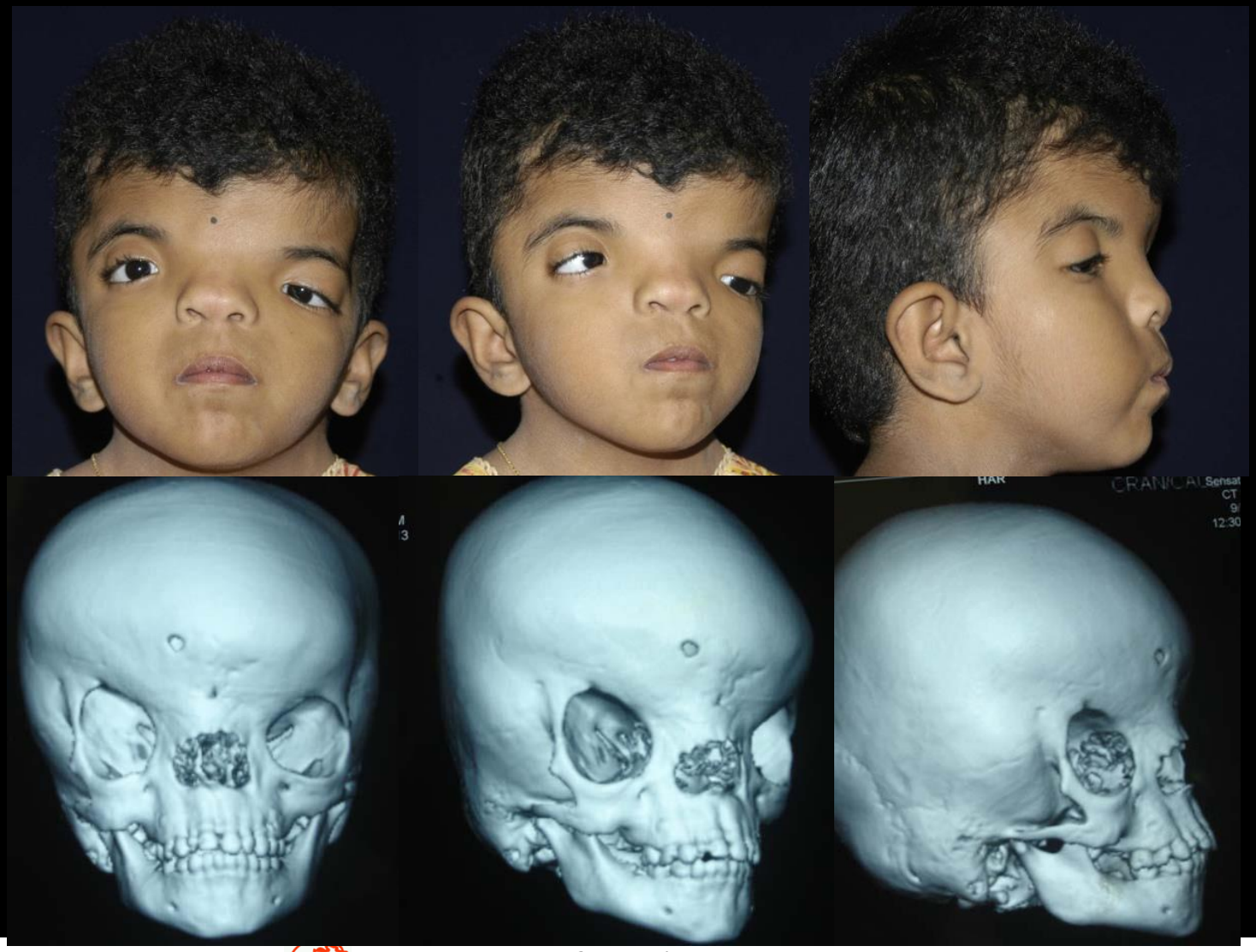
Superior Orbital rim advancement and fixation

Craniosynostosis

Plagiocephaly/Trigonocephaly/Scaphocephaly/Brachycephaly

Craniofacial Dysostosis

Pfeiffer Syndrome



Craniofacial Dysostosis

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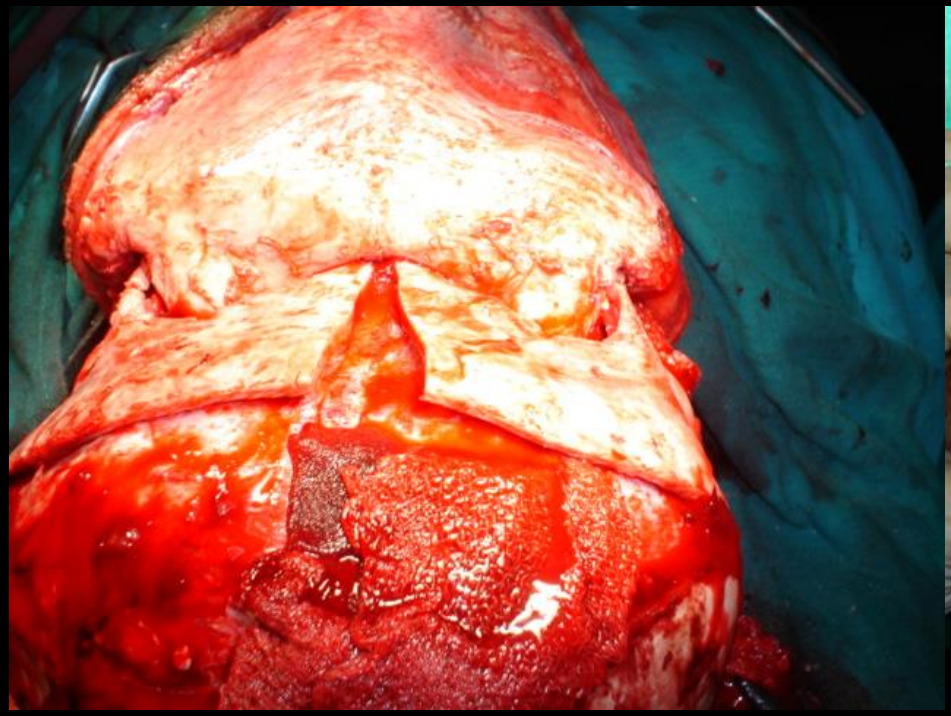
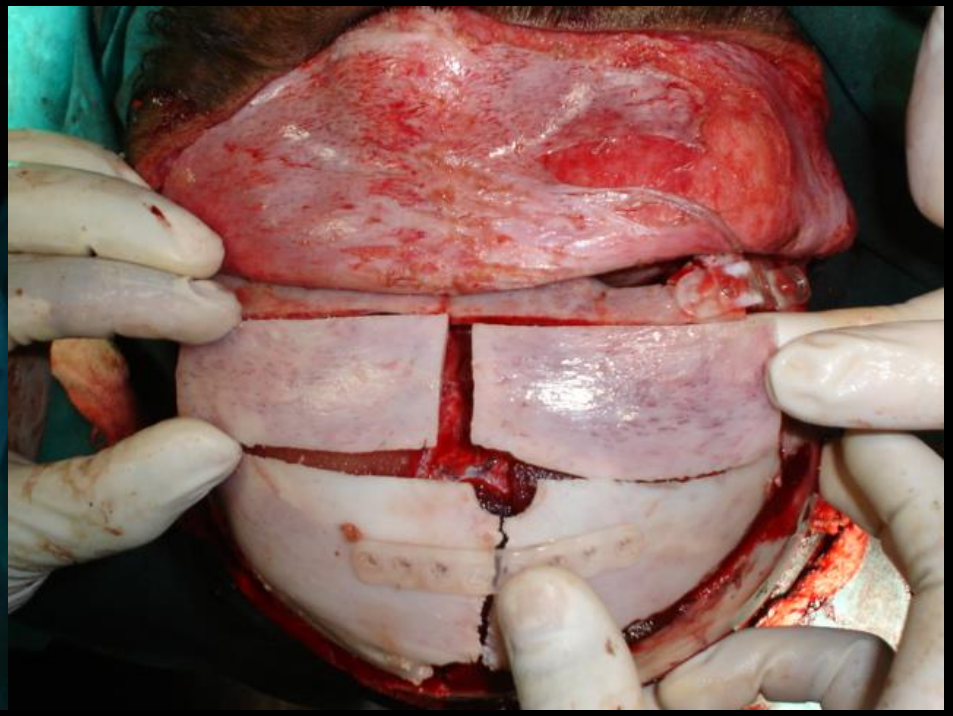


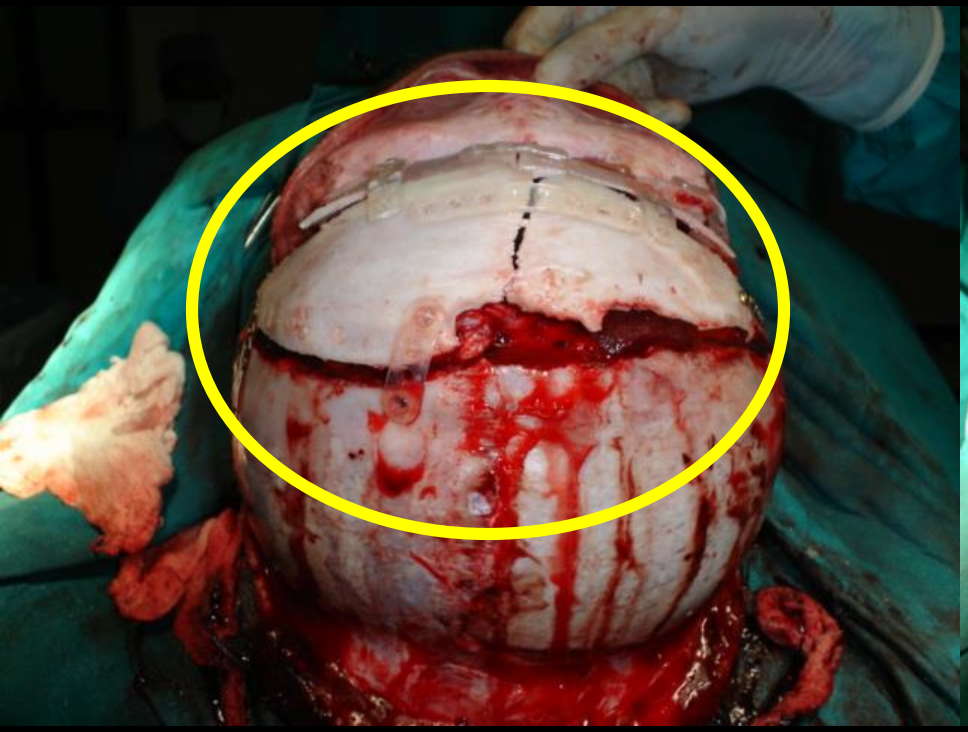


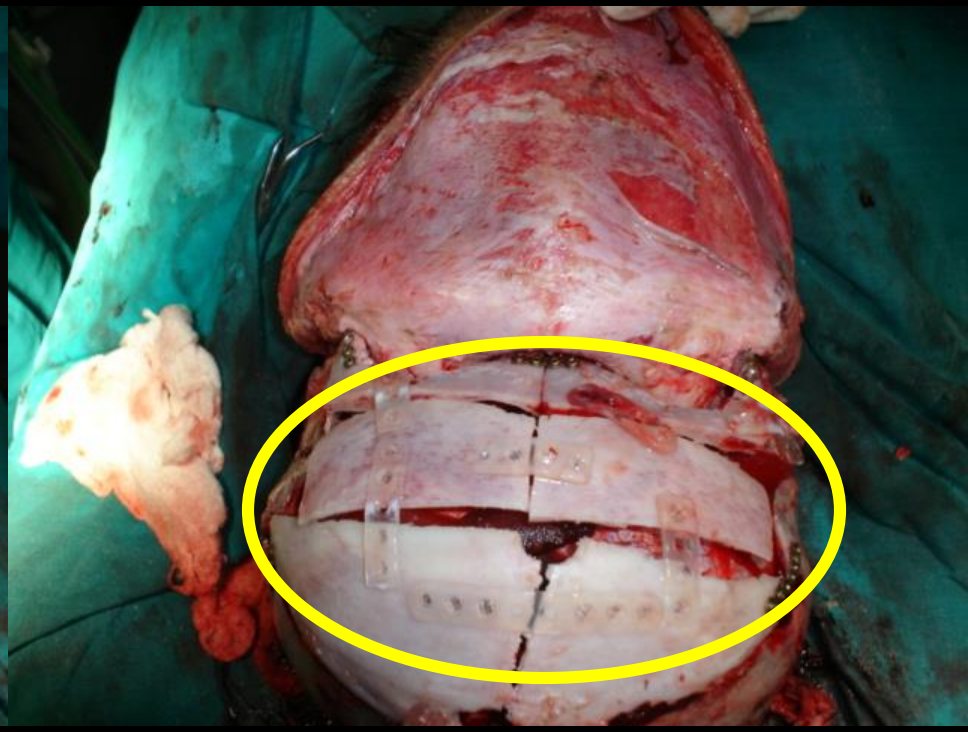
Facial Bipartition

A monobloc osteotomy with the orbits and midface in one unit is done. When the defects are amenable, the monobloc is partitioned at the midline

Craniofacial Dysostosis

Pfeiffer Syndrome





Fixation

In children fixation is done with bioresorbable bone plates

Craniofacial Dysostosis

Pfeiffer Syndrome

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Craniofacial Dysostosis

Crouzon Syndrome

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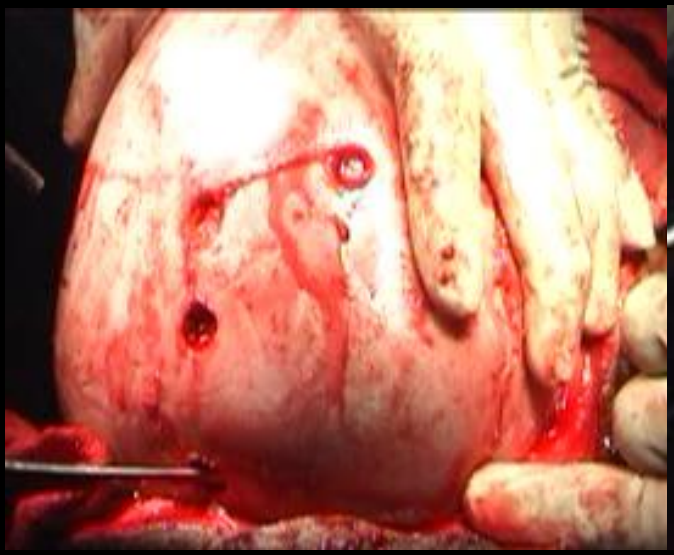
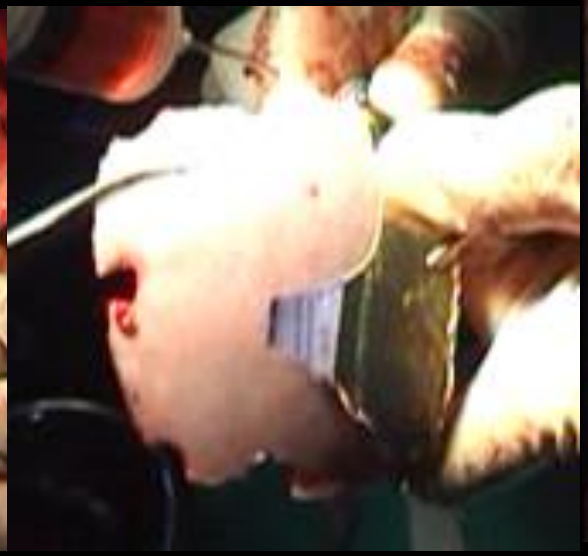
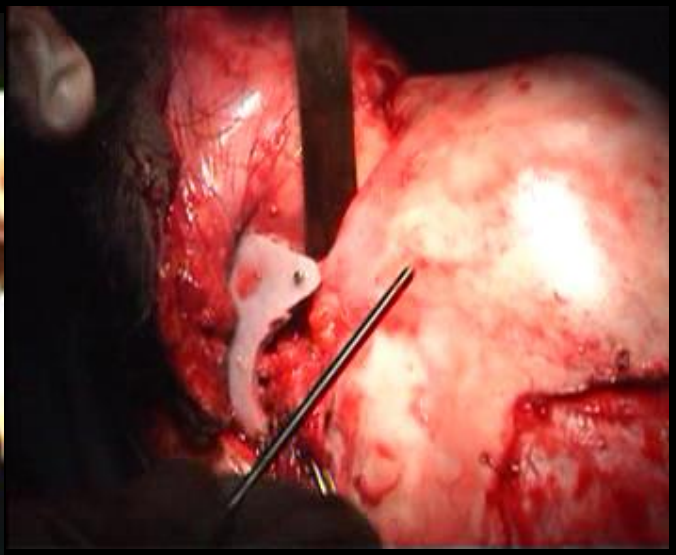
Craniofacial Syndromes and Anomalies

Treacher Collins Syndrome

Treacher Collins Syndrome

Craniofacial Syndromes and Anomalies

Treacher Collins Syndrome

Full thickness calvarial bone grafts
Bilateral lateral canthopexy

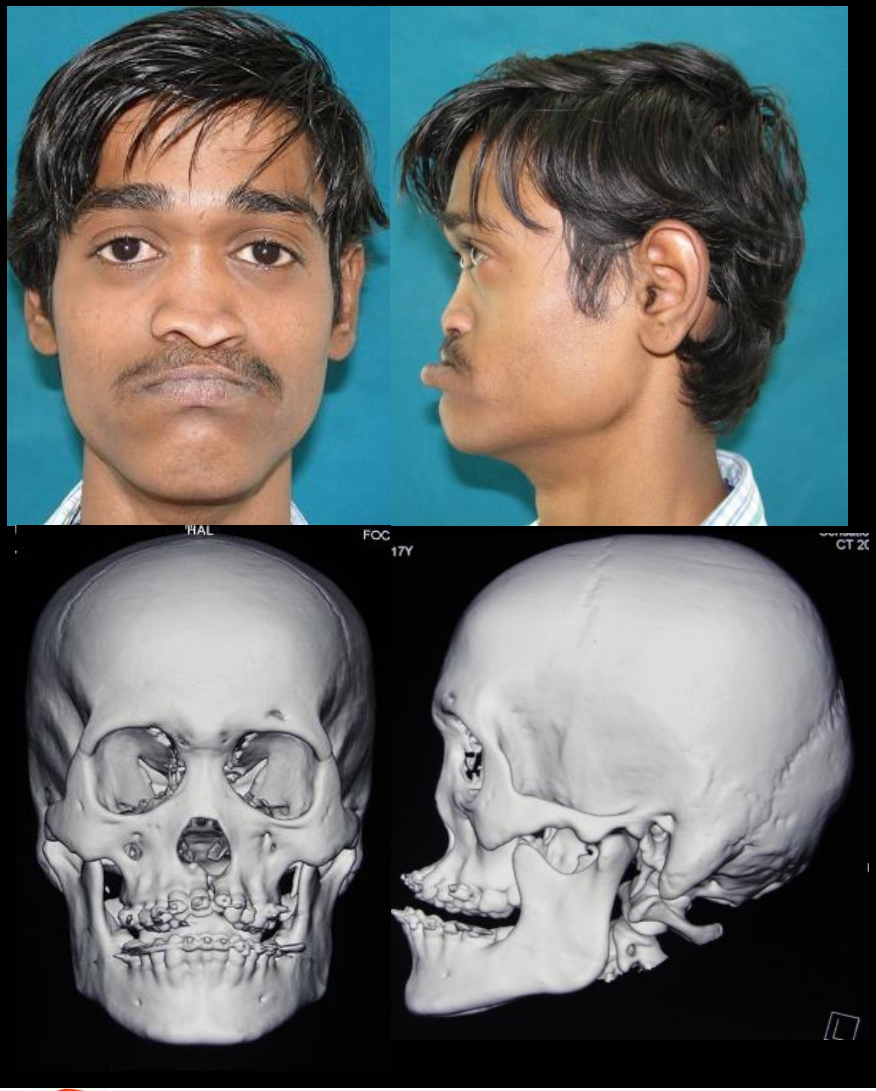
Craniofacial Syndromes and Anomalies

Treacher Collins Syndrome

Craniofacial Syndromes and Anomalies

Binder Syndrome

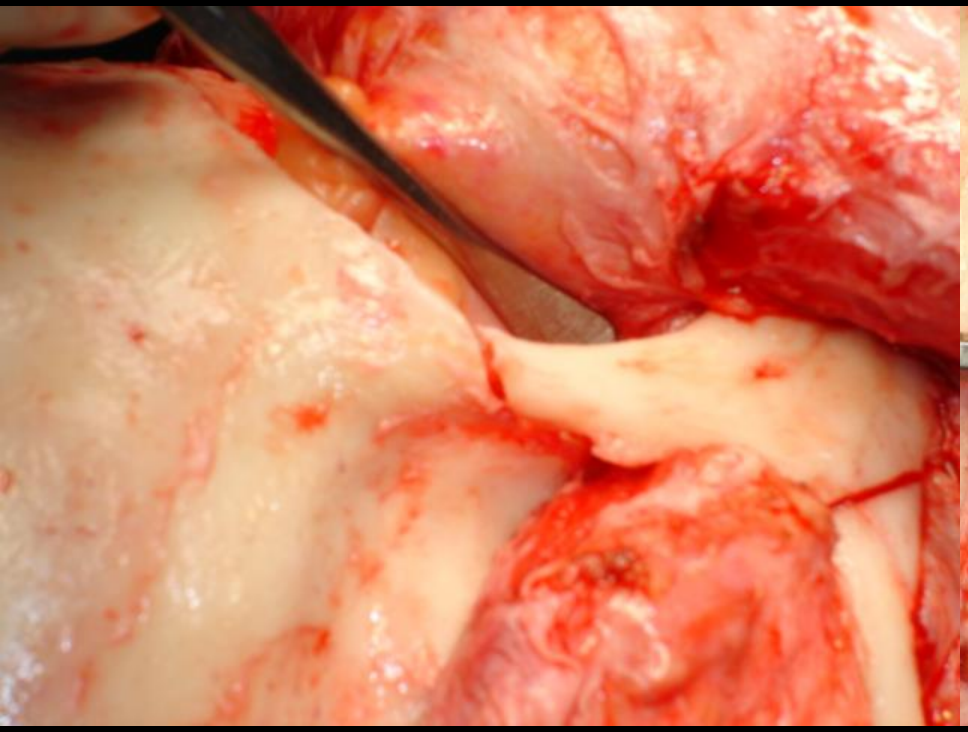
Binder Syndrome

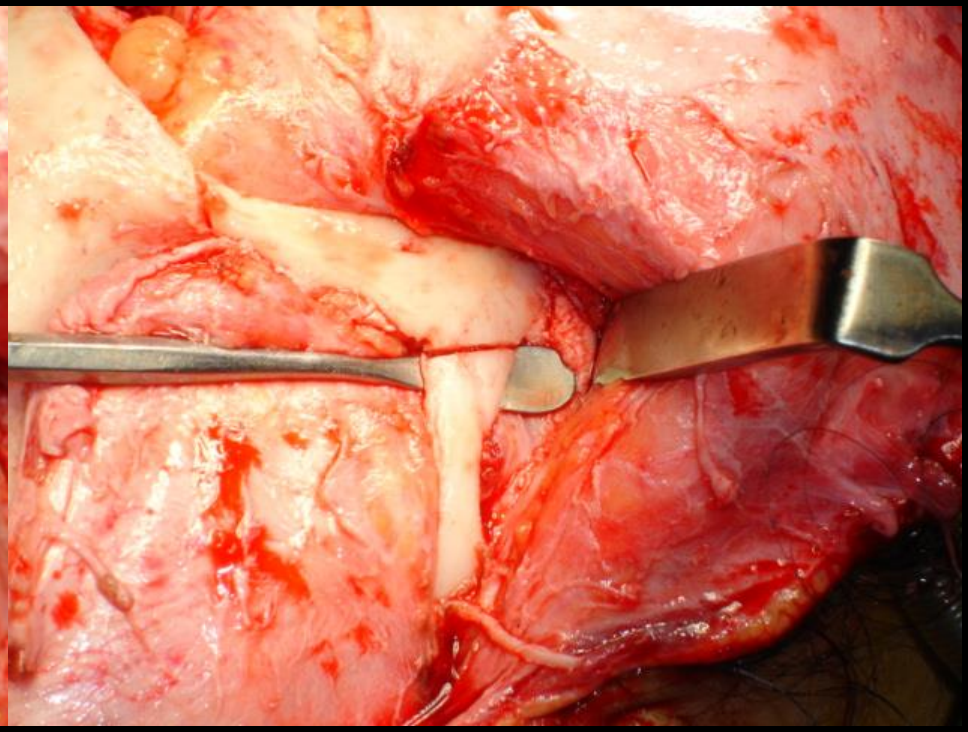


Performing a LeFort III Osteotomy

Frontozygomatic suture osteotomy and dysjunction of zygomatic arch is done

Orbital osteotomy along the lateral aspect of the internal orbit is done

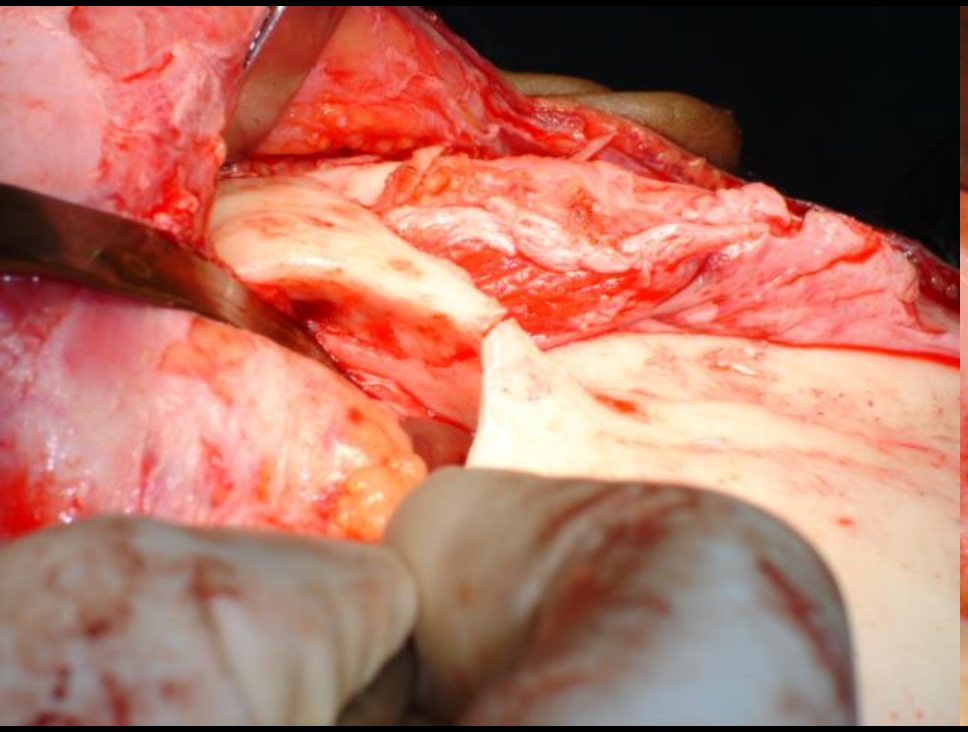


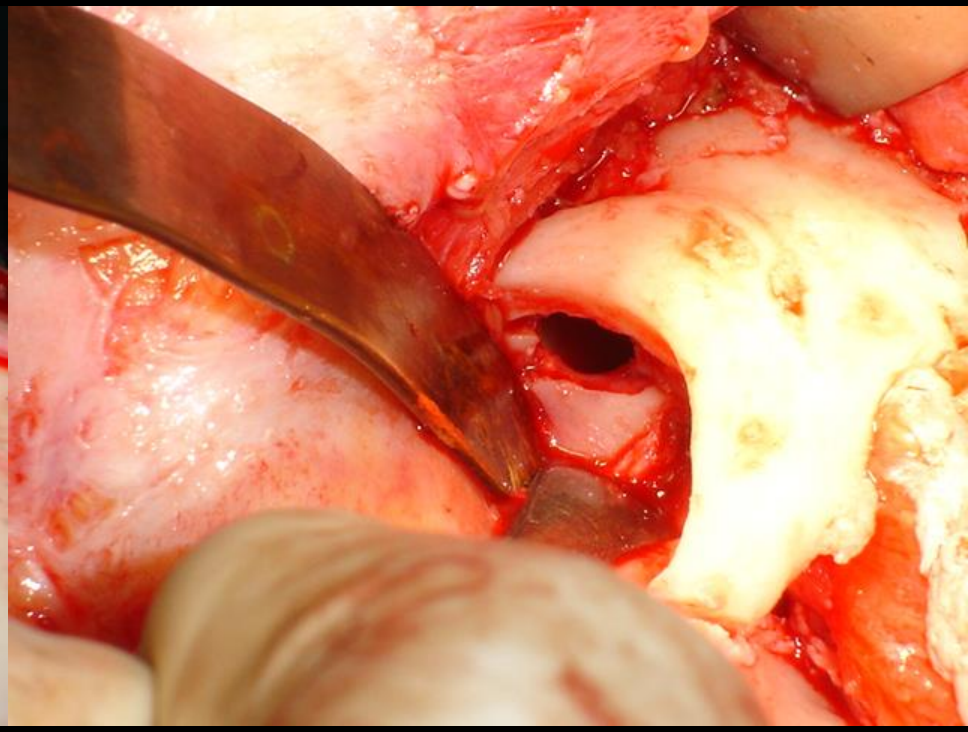


Performing a LeFort III Osteotomy

The osteotomy is continued along the sphenozygomatic suture line to the inferior orbital fissure.

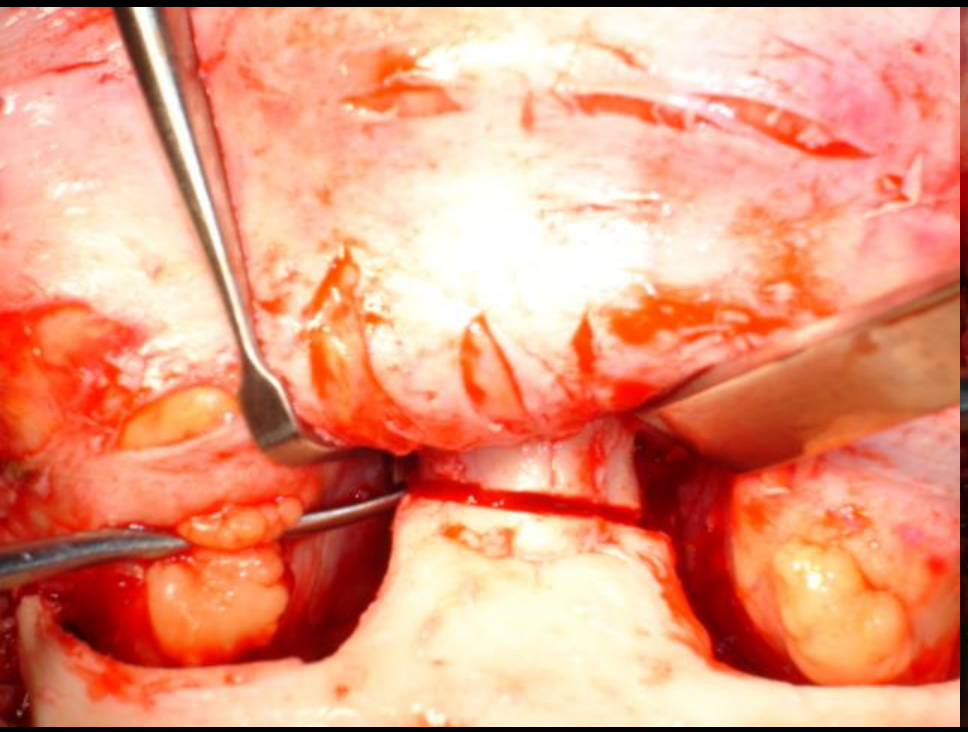
The osteotomy then extends medially across the floor of the orbit up the medial wall of the orbit

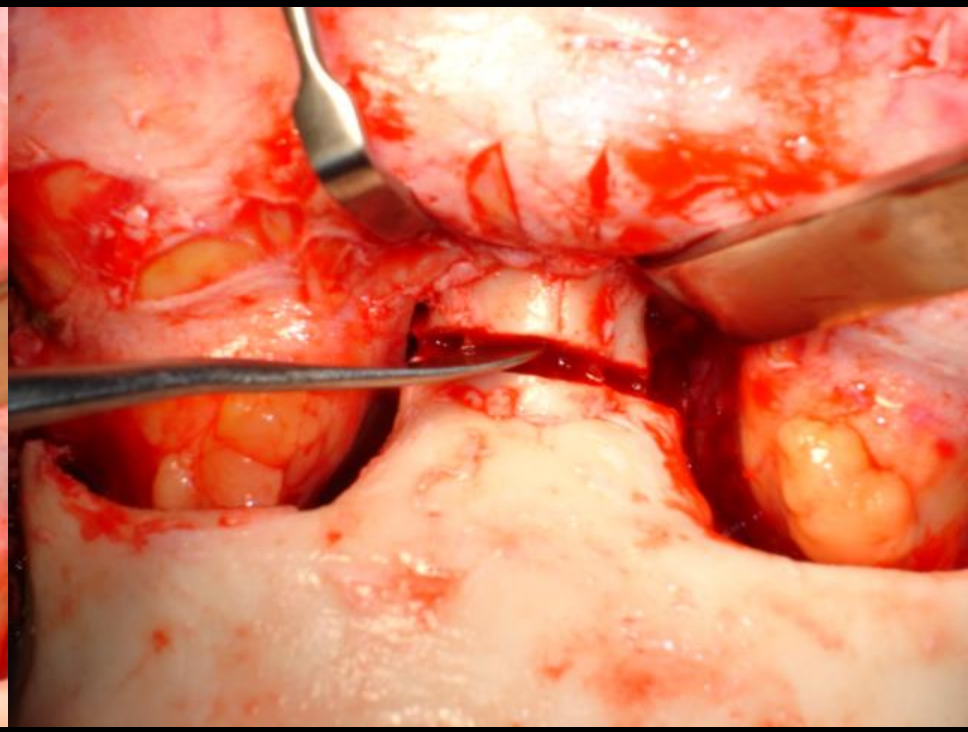




Performing a LeFort III Osteotomy

The osteotomy ends on the dorsum of the nose



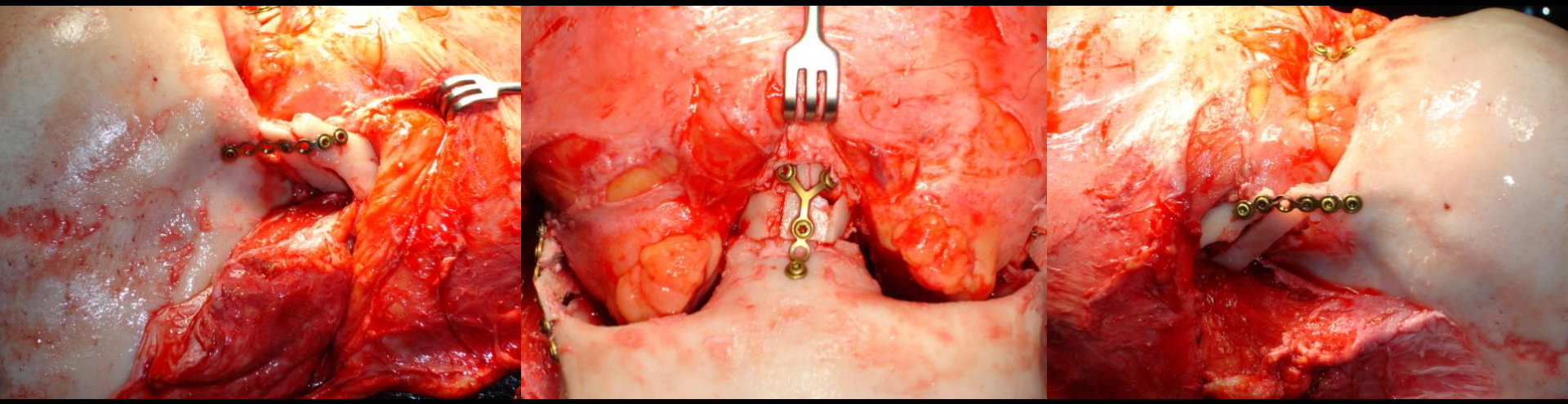


Performing a LeFort III Osteotomy

Calvarial bone graft is harveted

Fixation after performing a LeFort III Osteotomy

Fixation is done with 1.5 mm low profile plates at the nasal and frontozygomatic areas with interposition of bone grafts



Craniofacial Syndromes and Anomalies

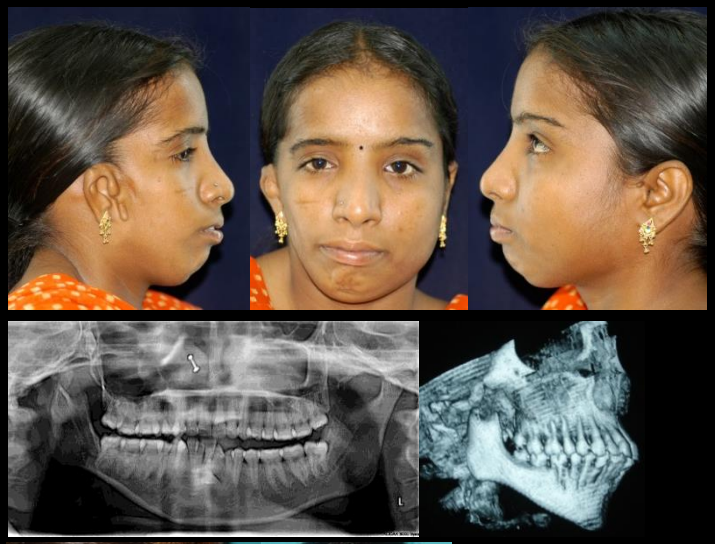
Binder Syndrome

Craniofacial Syndromes and Anomalies

Hemifacial Microsomia

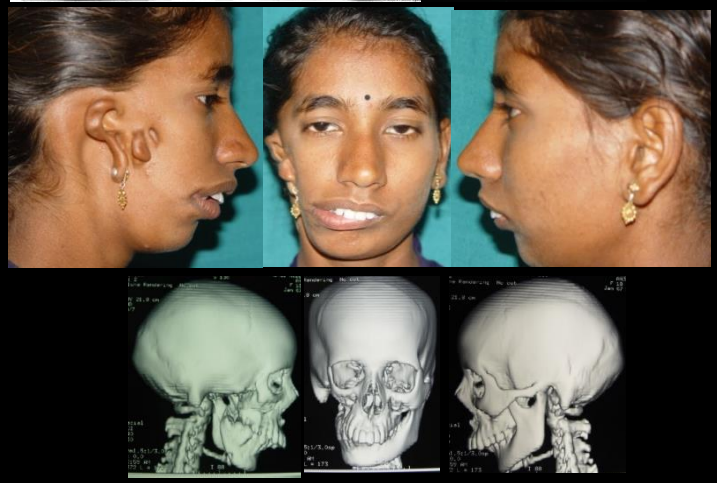
Type I

Type II a



Type II b

Type III



Type I HFM

Genioplasty

Type I HFM

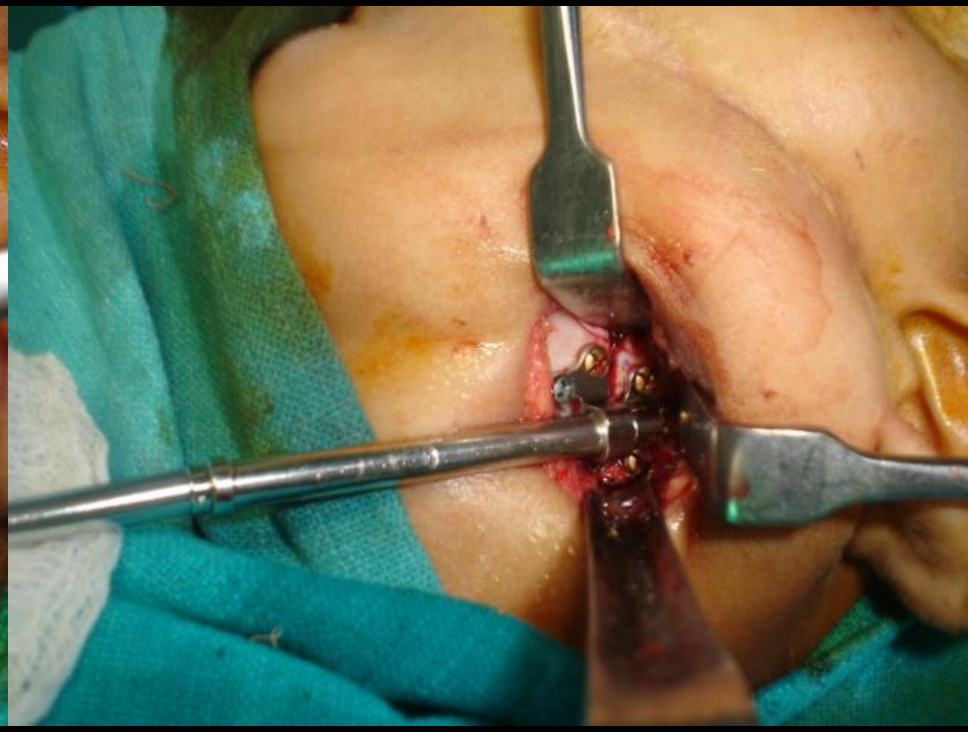
Type I HFM

Surgery Stage I

Soft tissue closure

Type I HFM

Surgery Stage II

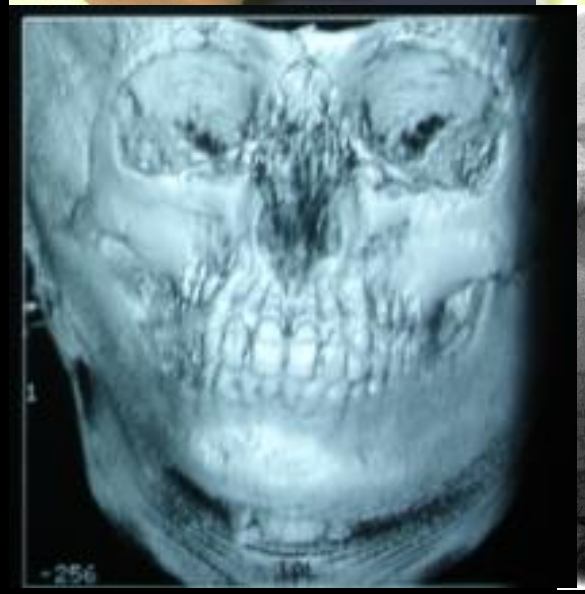


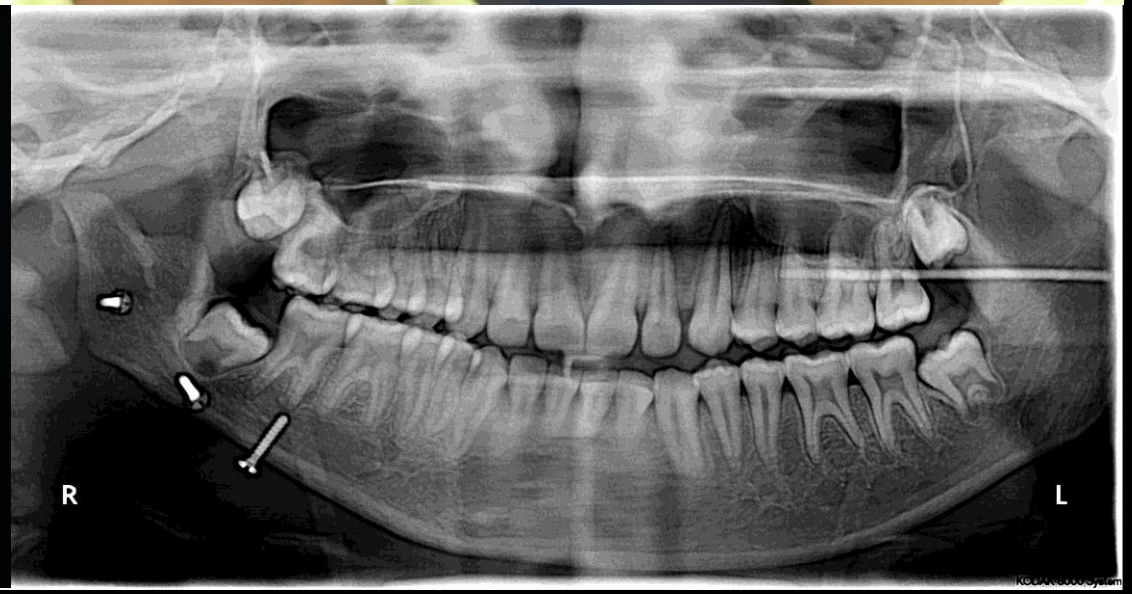
Distraction

Type I HFM

Surgery Stage II

Type II b HFM





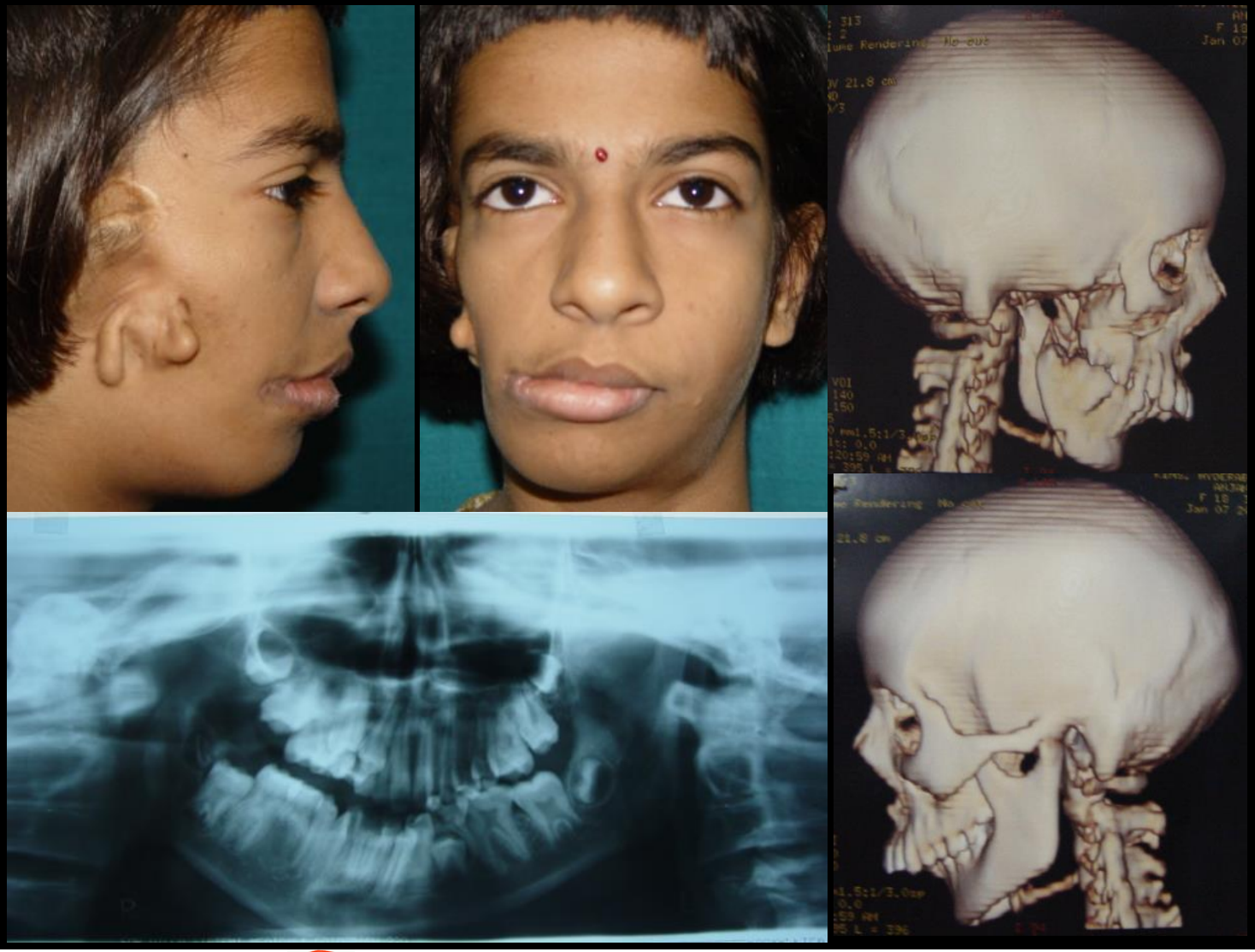
Type II b HFM

Surgery

Type II b HFM

Surgery

Type III HFM

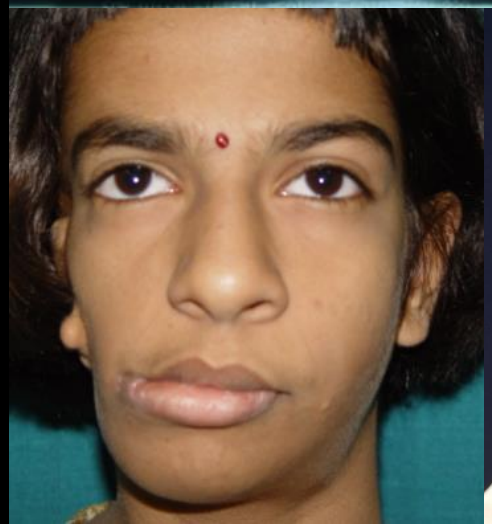


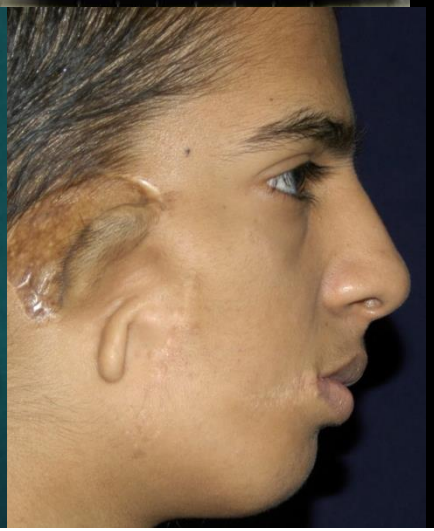
Type II b HFM

Surgery

Type II b HFM

Surgery





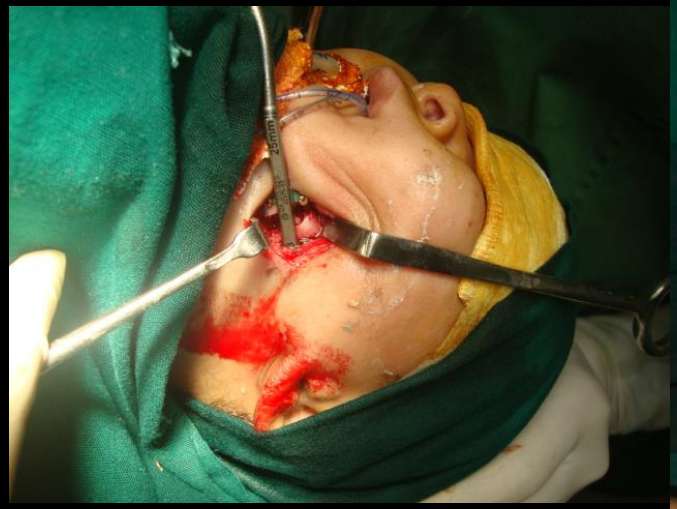
Craniofacial Syndromes and Anomalies

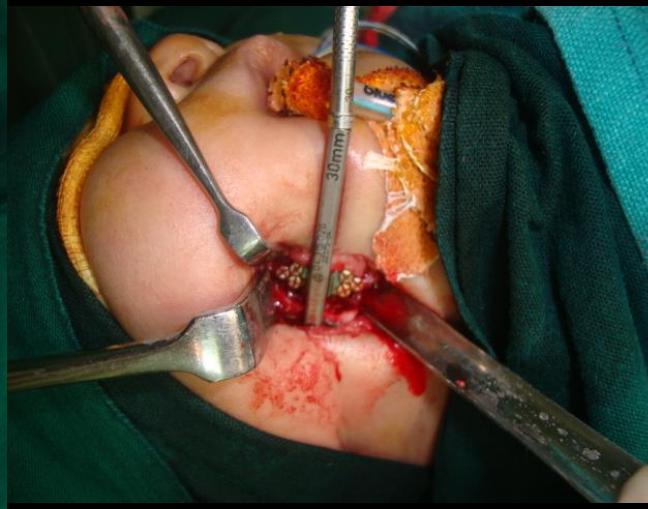
Pierre Robin Sequence/Craniofrontonasal Dysplasia

Pierre Robin Sequence

Craniofacial Syndromes and Anomalies

Pierre Robin Sequence/Craniofrontonasal Dysplasia





Craniofacial Syndromes and Anomalies

Pierre Robin Sequence/Craniofrontonasal Dysplasia

Pierre Robin Sequence

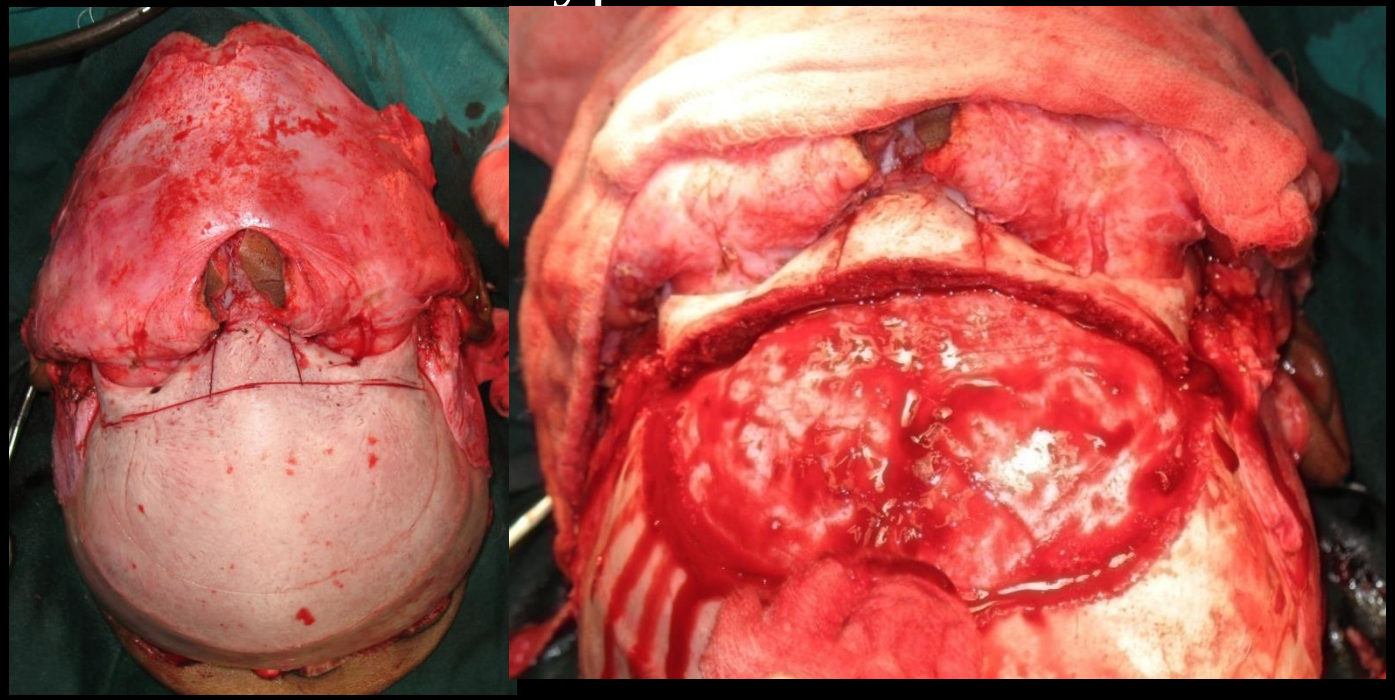
Craniofacial Syndromes and Anomalies

Pierre Robin Sequence/Craniofrontonasal Dysplasia

Hypertelorism

Naso-orbital Complex

Hypertelorism



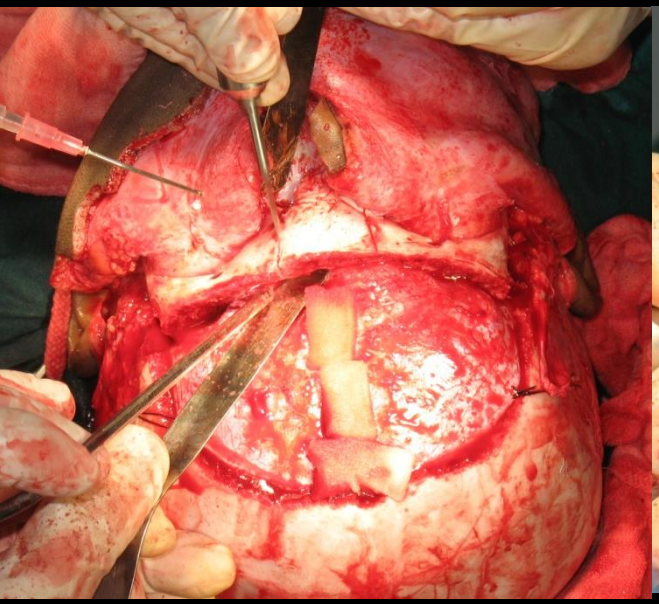
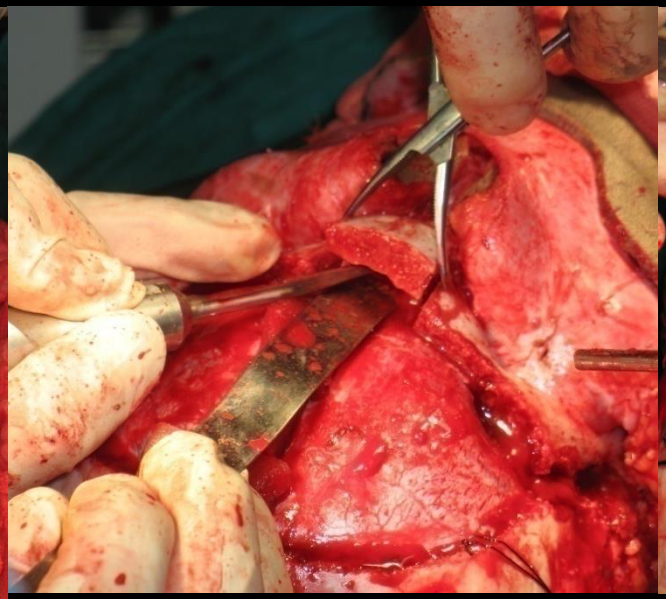
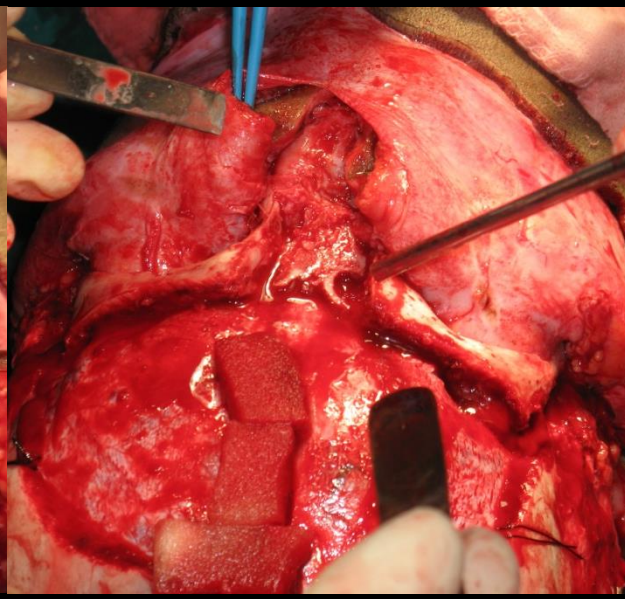
Transfrontal Craniotomy

This includes a transfrontal craniotomy with an intervening frontal bar, which is left intact.

The frontal bar results from parallel osteotomies that are atleast 1 cm from the supraorbital rims and permits orientation of the orbits once they have been mobilized

Naso-orbital Complex

Hypertelorism

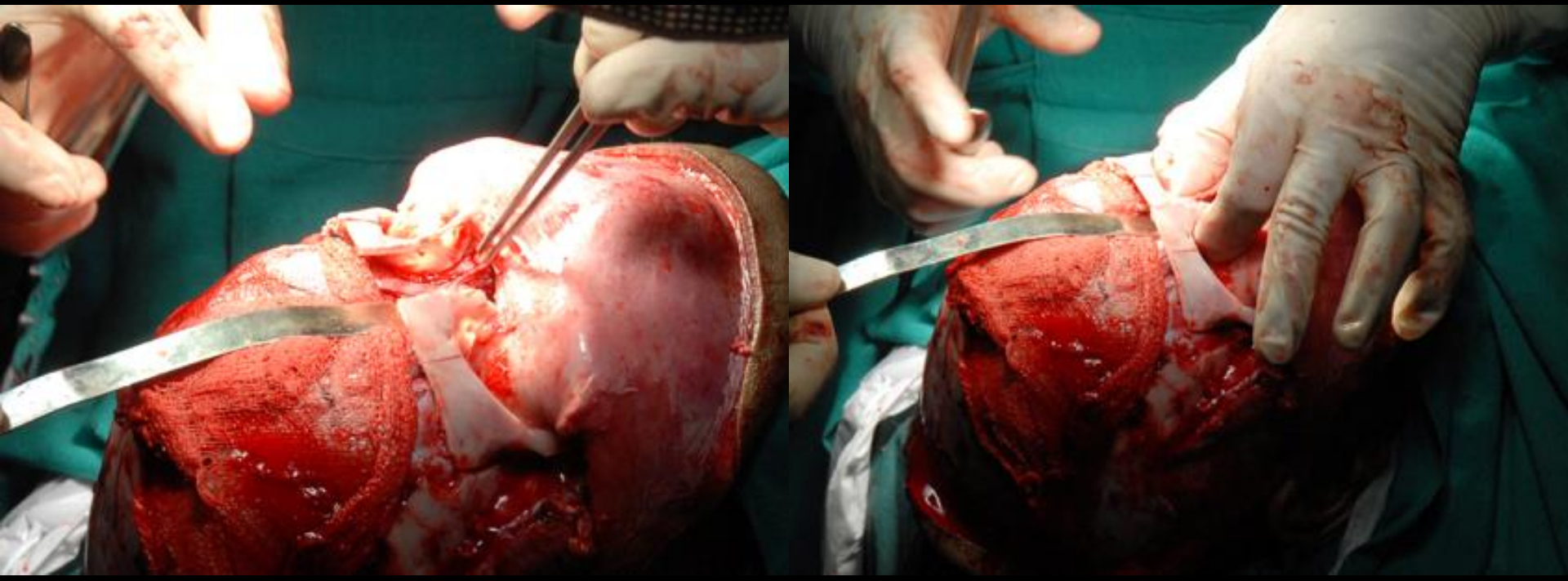
Orbital roof osteotomy

The bony cuts of the orbital roofs are performed with intracranial visualization

Orbital approximation

A central block of bone is removed between the orbits to allow their approximation in a medical direction.

Naso-orbital Complex
Hypertelorism



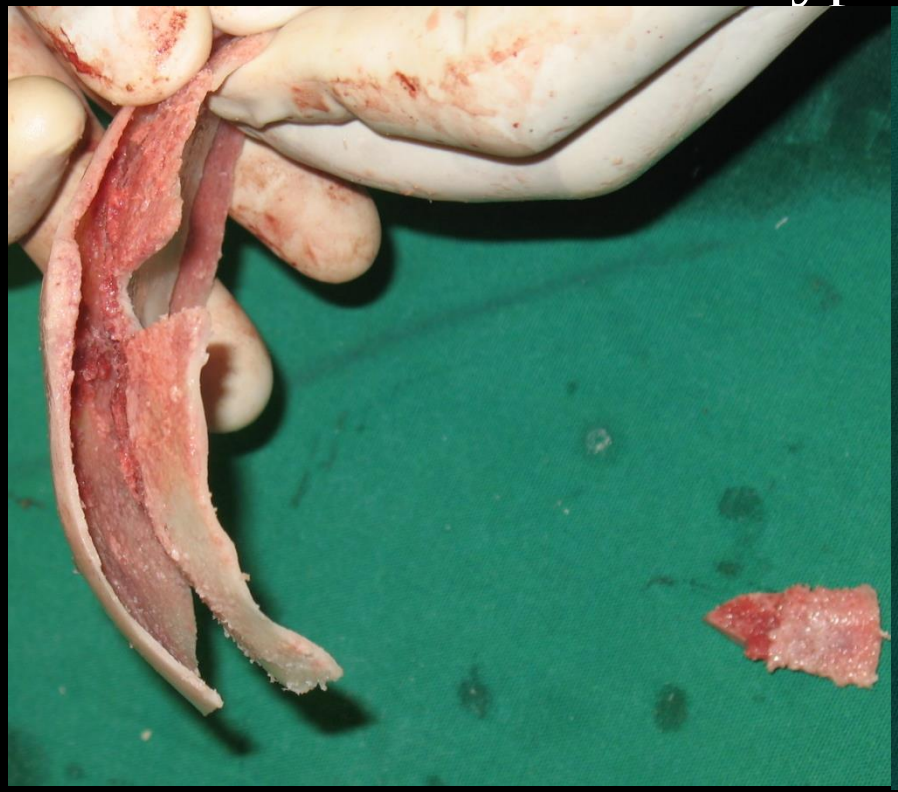
Finishing osteotomy

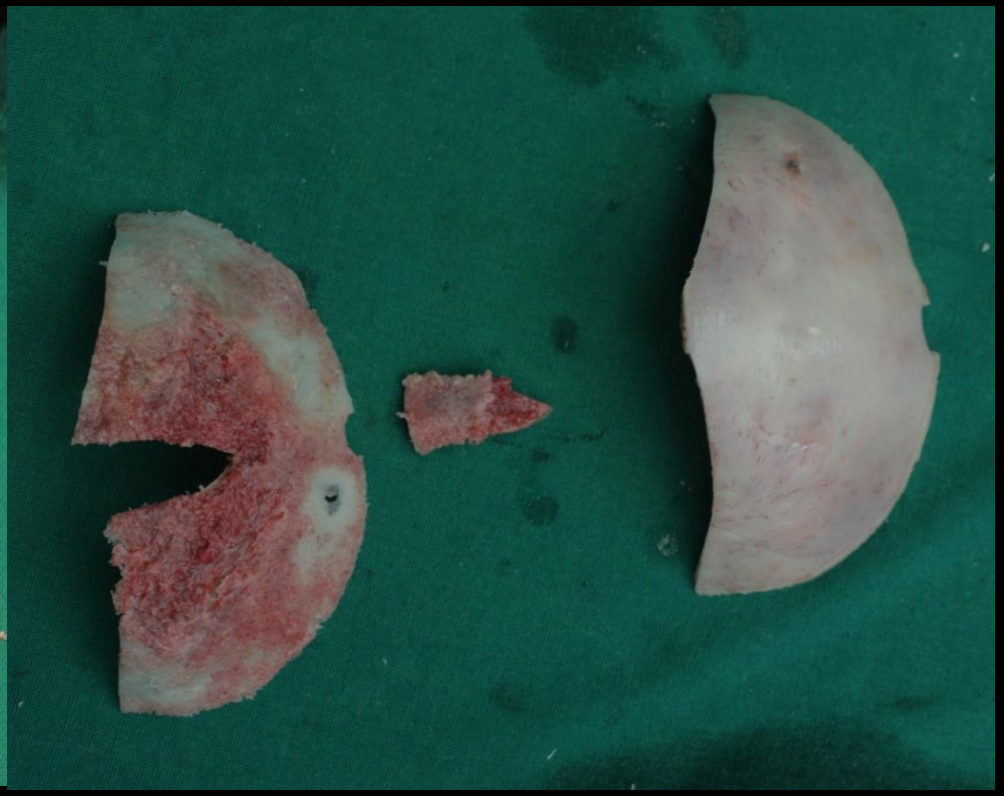
Finally, a wedge of bone is removed from either side of piriform fossa so that the nasal airways are not constricted when the orbits are moved medially.

If the osteotomies have been performed to their full depth, the orbits can be approximated by finger pressure alone

Naso-orbital Complex

Hypertelorism



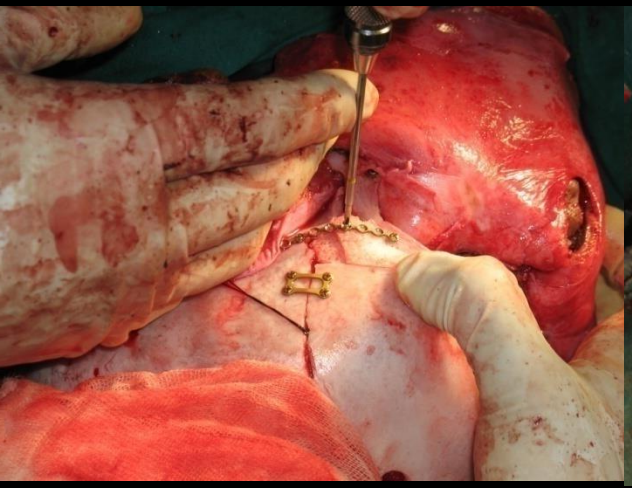
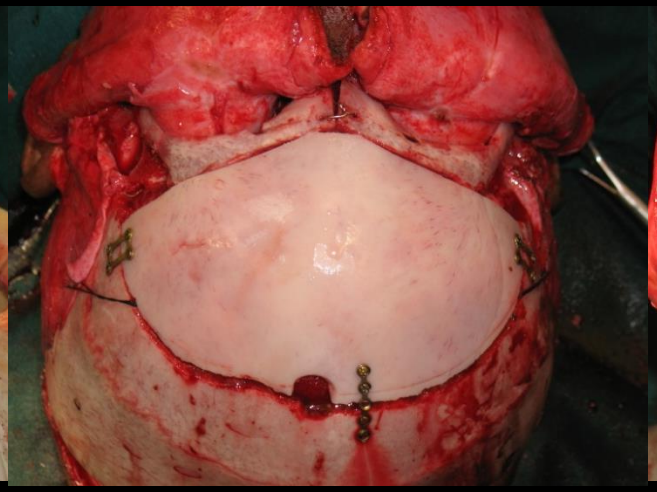
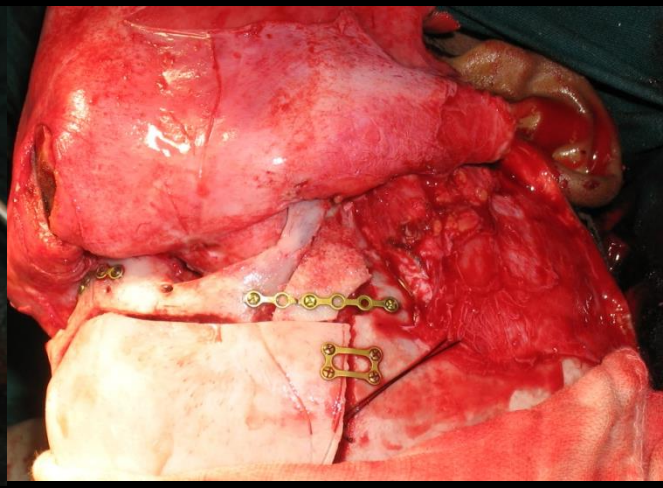


Fixation and bone grafting

Bone graft material harvested from the calvarium can be split into into the two cortices and one cortex can be used to graft bone in the defects and the other can be used to close the original defect

Naso-orbital Complex

Hypertelorism

Fixation and bone grafting

The orbits are positioned and held in place with wires or micro-or miniplates.

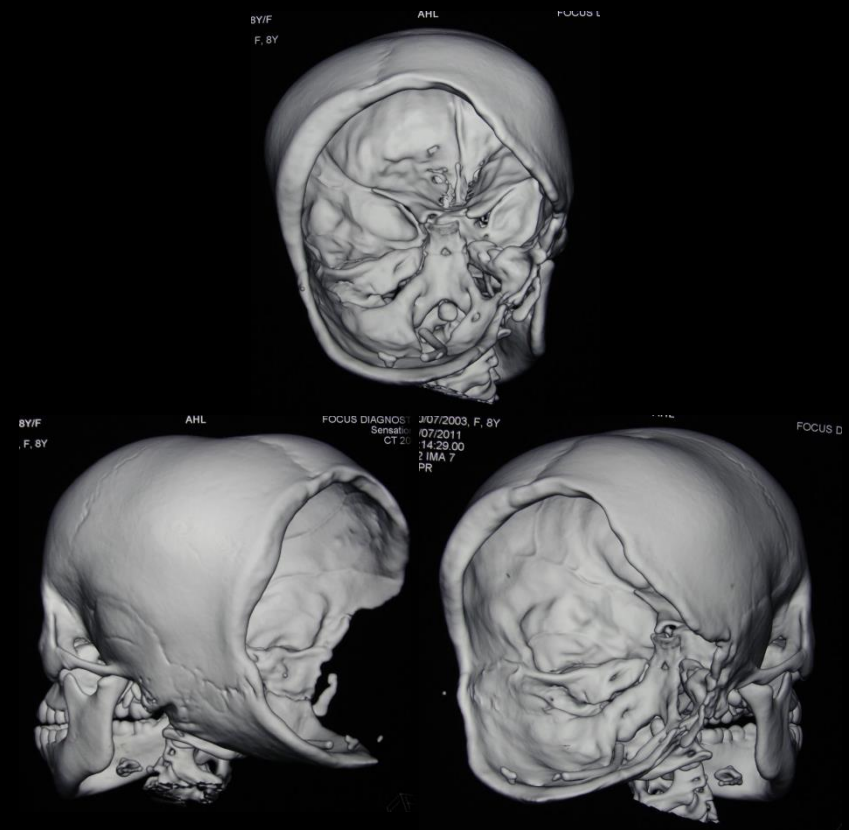
Bone graft material harvested from the clavarium, iliac crest, or rib is then used to fill in the resulting gap defects at the lateral orbital walls and zygomatic areas

Treatment

Hypertelorism

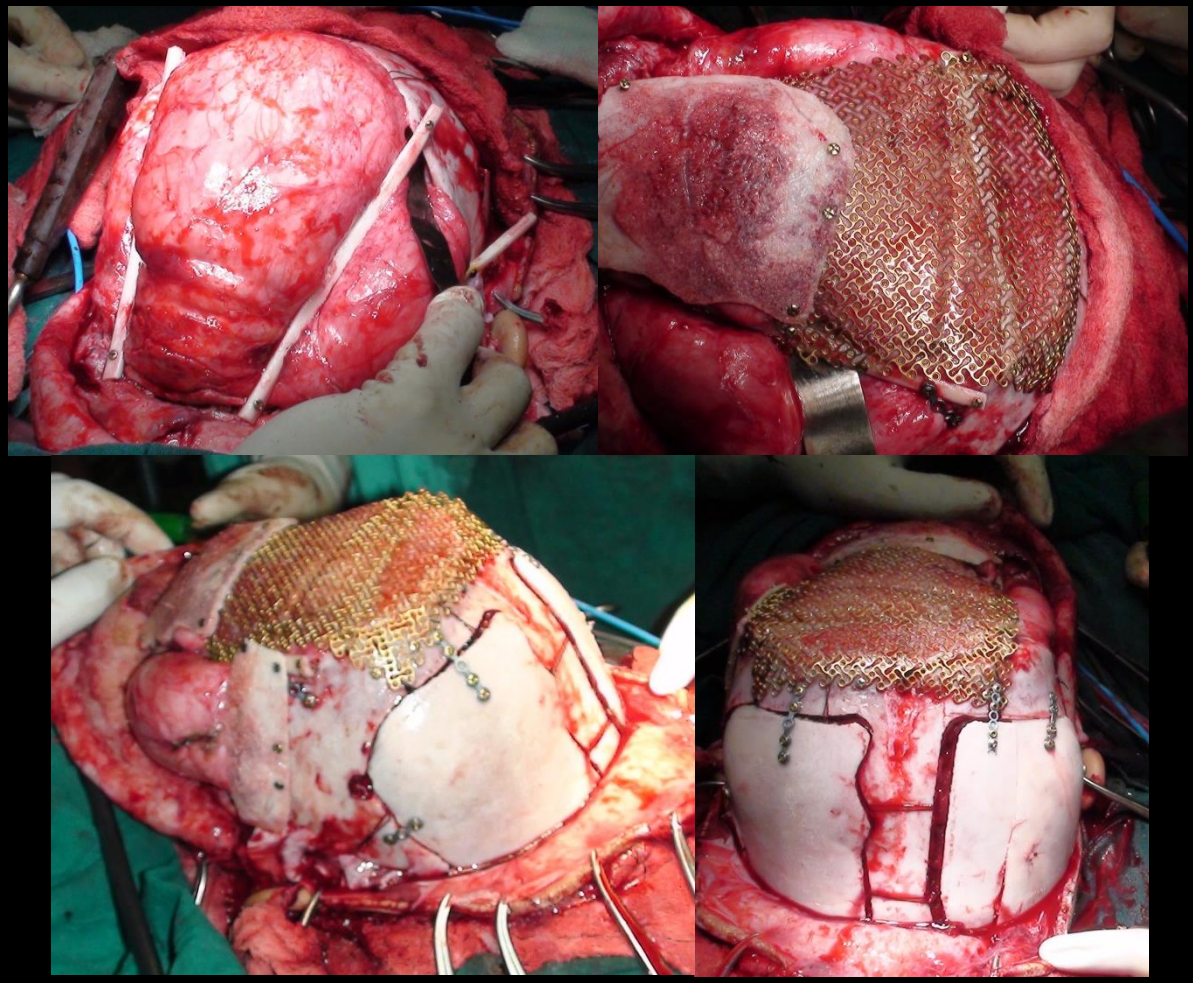
Cranial Vault Defects

Dandy Walker Syndrome



Cranial Vault Defects

Dandy Walker Syndrome



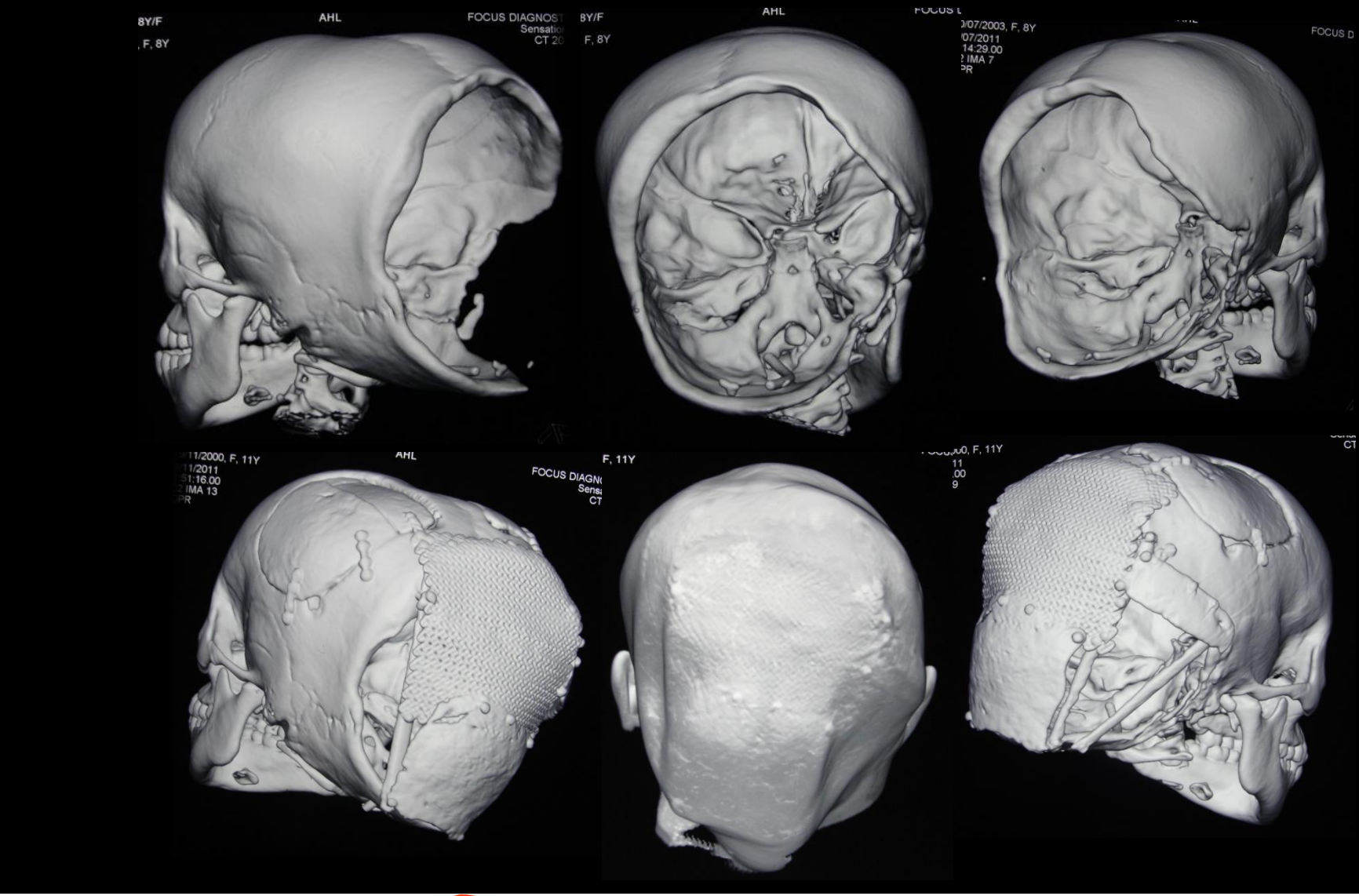
Reconstruction of posterior cranial vault with bilateral tibial bone, split calvarium and titanium mesh

Cranial Vault Defects

Dandy Walker Syndrome

Cranial Vault Defects

Dandy Walker Syndrome



Craniofacial Syndromes and Anomalies

Craniofacial Clefts

Tessier #0 facial cleft

Craniofacial Syndromes and Anomalies

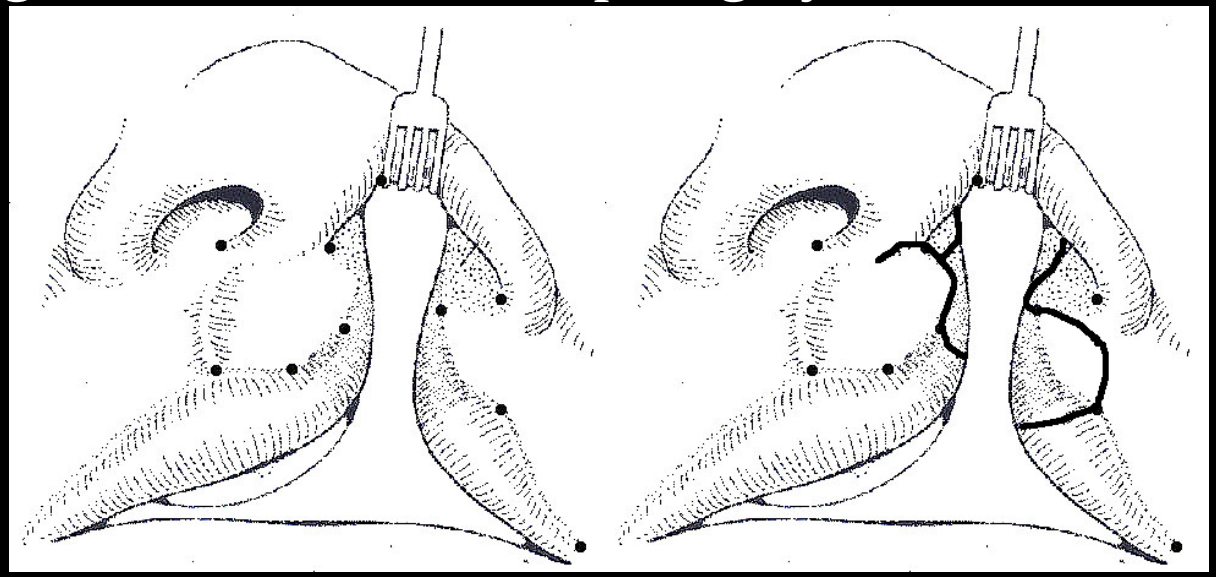
Craniofacial Clefts

Craniofacial Syndromes and Anomalies

Craniofacial Clefts

Unilateral Cleft Lip Repair

Incision design for unilateral cleft lip surgery



Source:

Afroze Incision for Functional Cheiloplasty, Technical Note

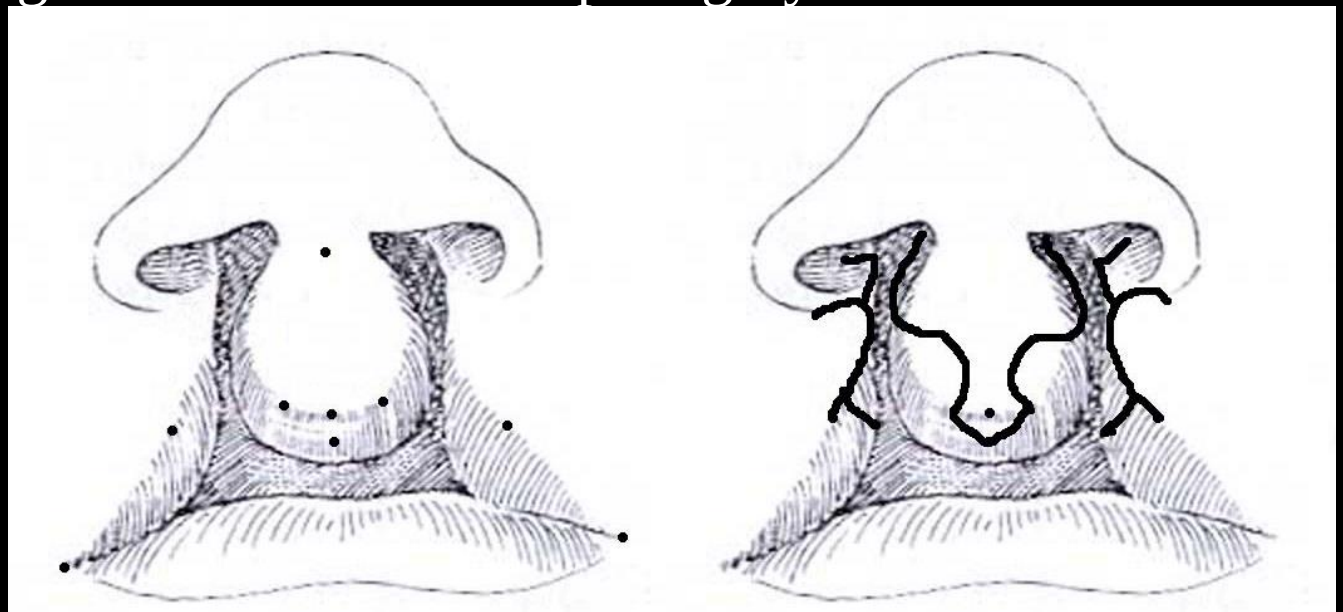
Gosla Srinivas Reddy et. al.; J. Craniofac. Surg. 20(8):1733-1736, September 2009.

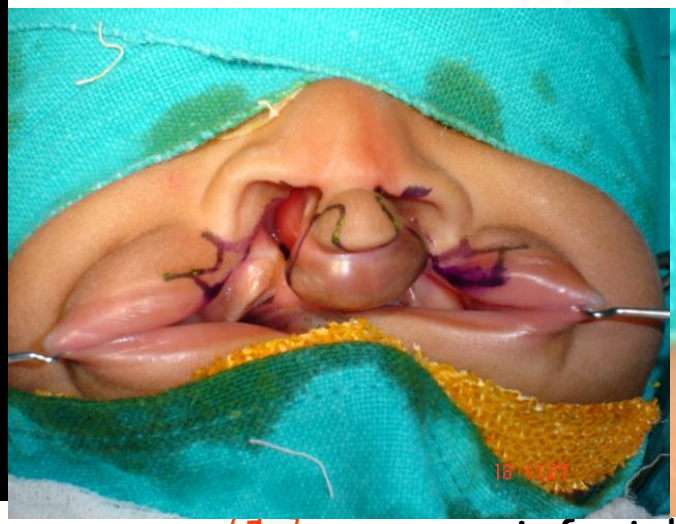
Unilateral Cleft Lip Repair

4 years post operatively

Bilateral Cleft Lip Repair

Incision design for bilateral cleft lip surgery

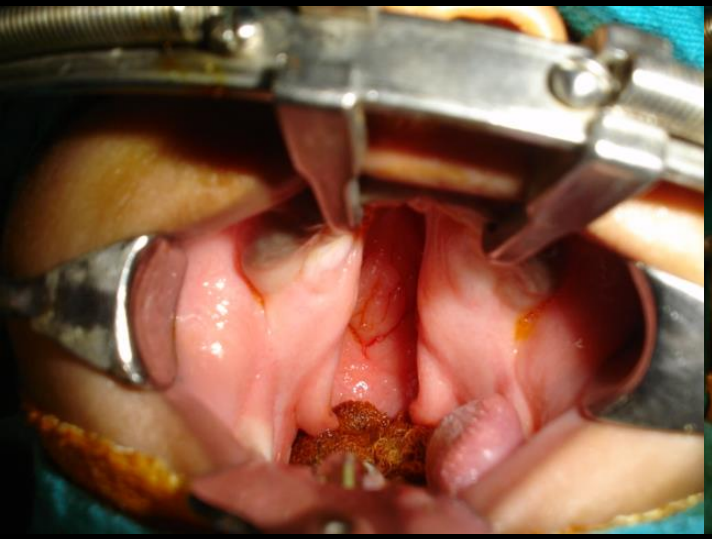


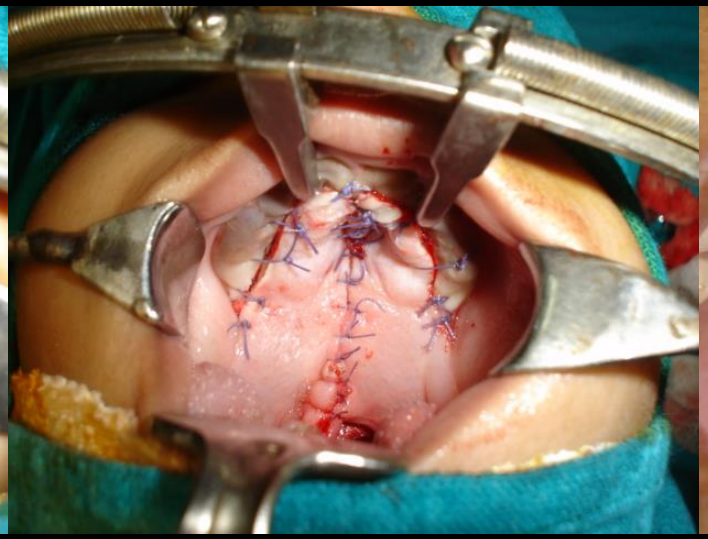


Bilateral Cleft Lip Repair

Preoperative | 5 days postoperatively | 18 months postoperatively | 3 years postoperatively

Cleft Palate Repair



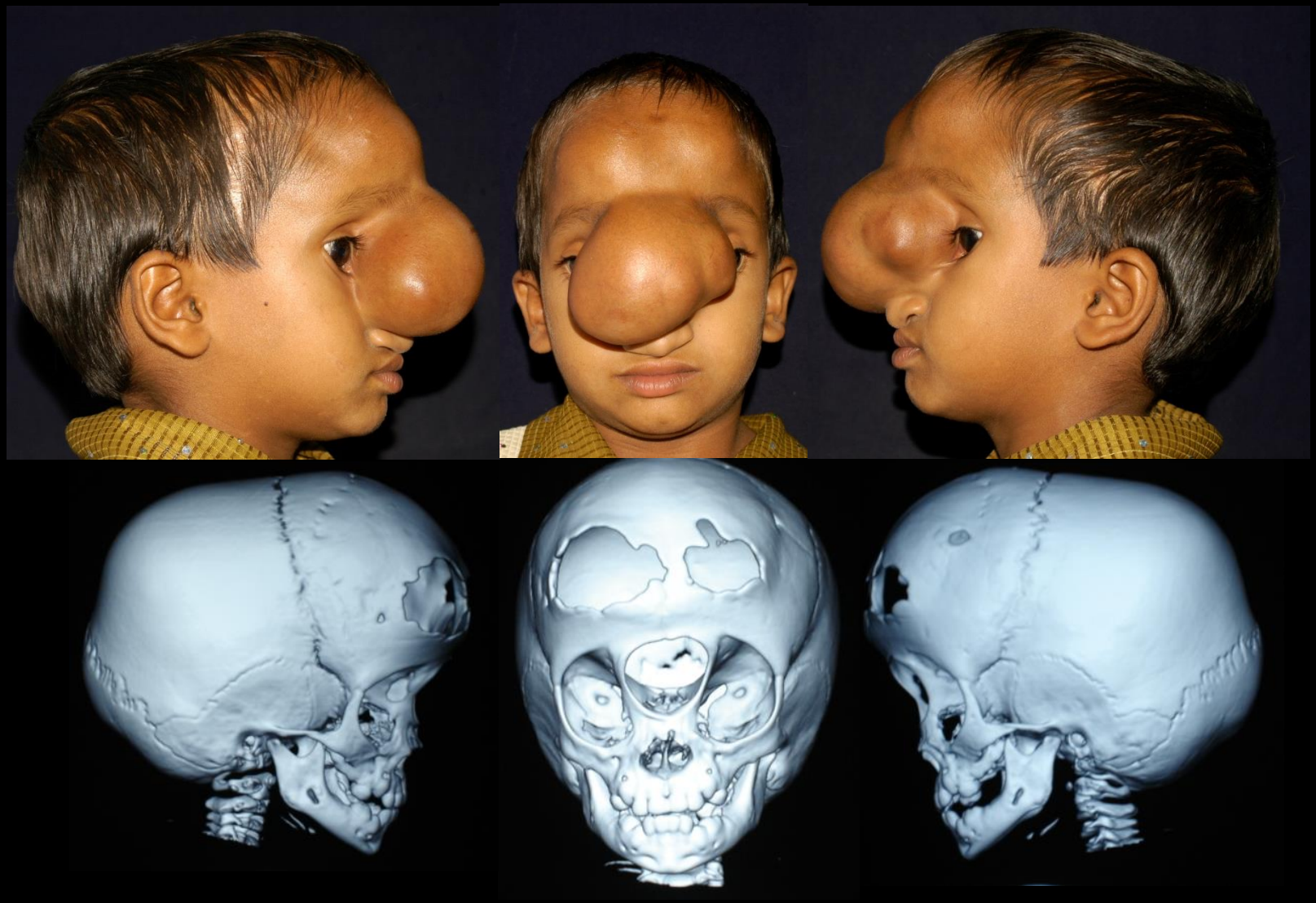


Complete Palate Repair

Follow up at age 8 years

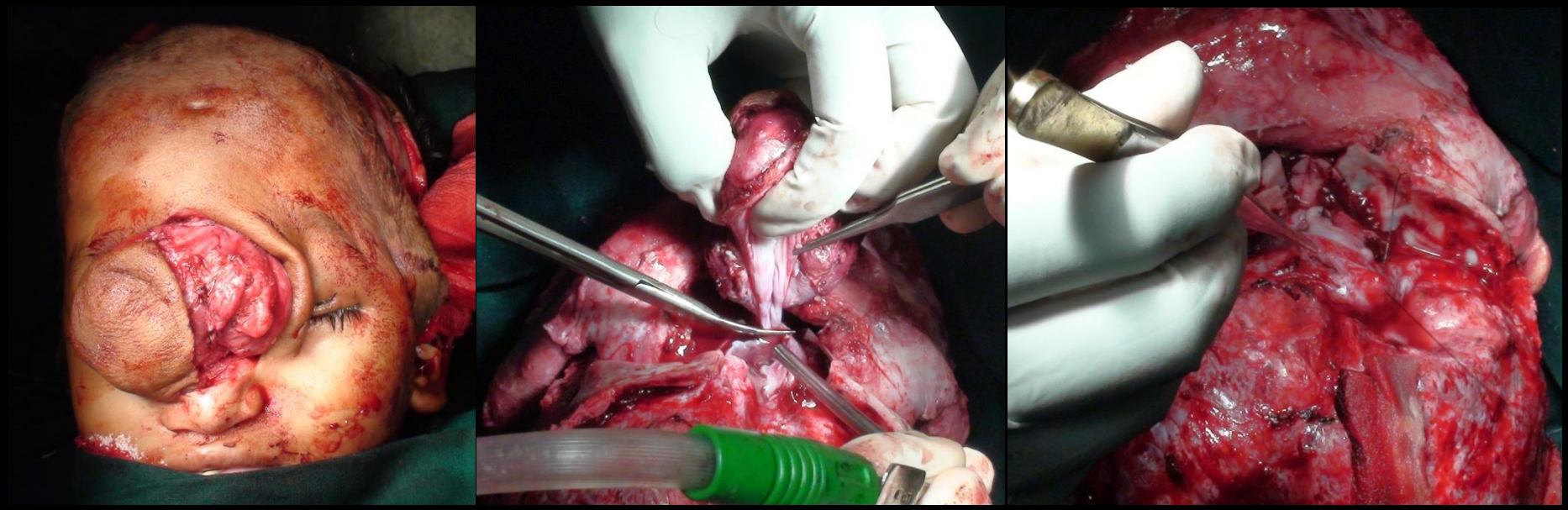
Benign and Malignant Head and Neck Tumors

Encephaloceles



Treatment

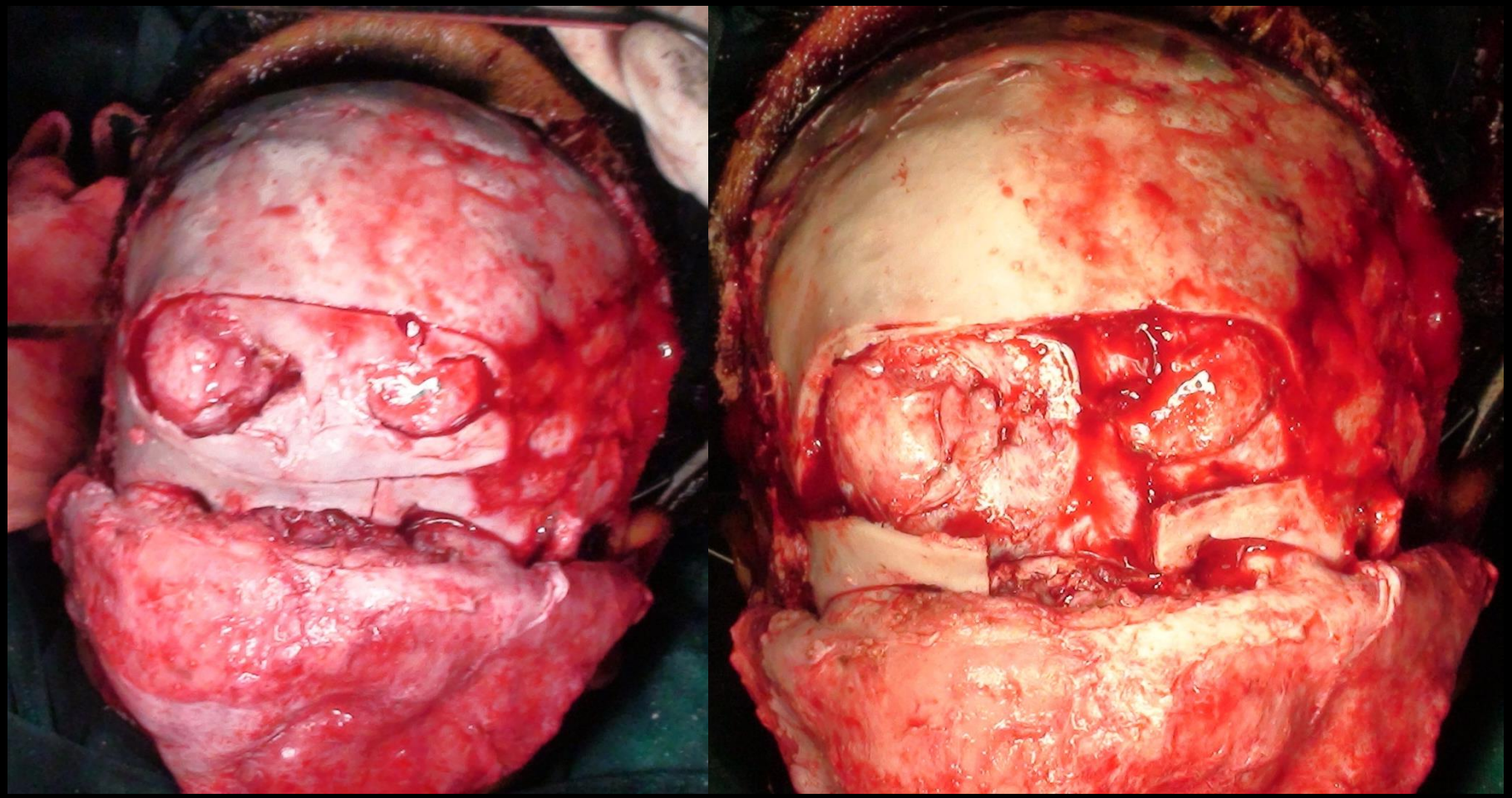
Nasal encephalocele



Encephalocele Resection

Treatment

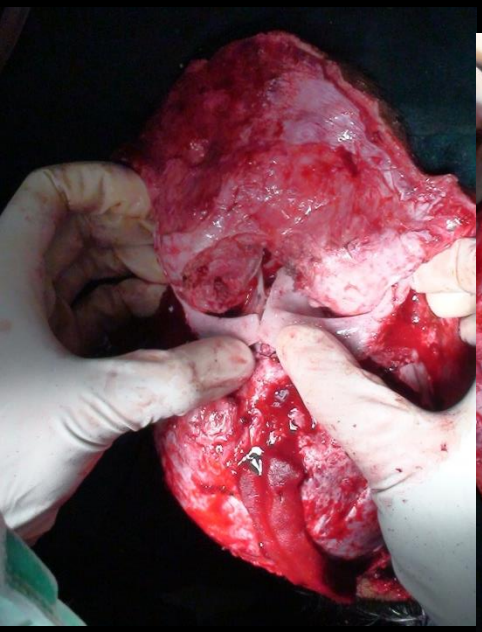
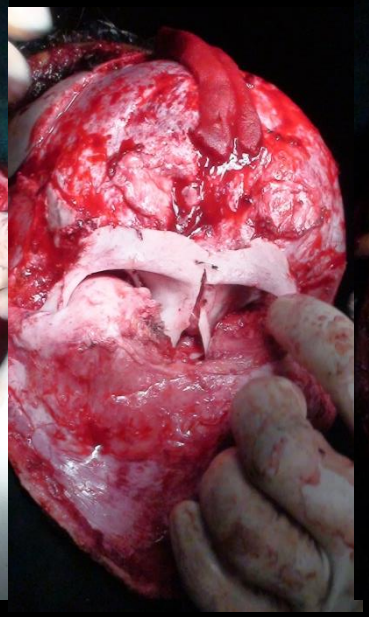
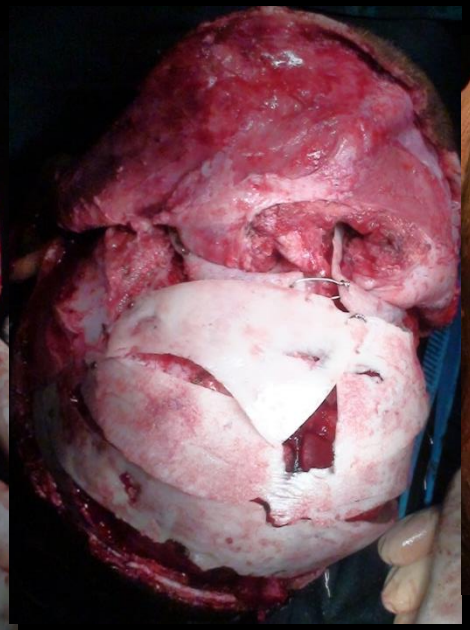
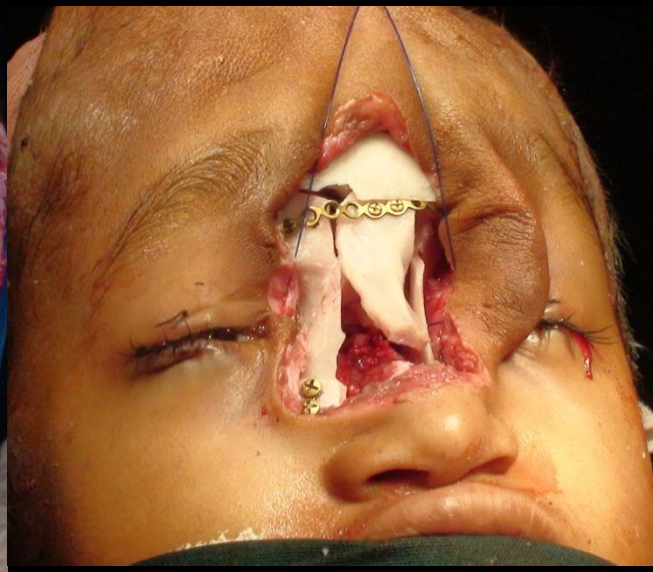
Nasal encephalocele



Transfrontal Craniotomy

Treatment

Nasal encephalocele

Finishing osteotomy, fixation and closure

Treatment

Nasal encephalocele

Benign and Malignant Head and Neck Tumors

Hemangiomas/Vascular Malformations

Vascular Malformations

Hemangioma

Capillary

Venous

Lymphatic

Arterio-venous

Sclerotherapy

- Syrup or Tablet Propranolol: 0.5 -1 mg/kg of body weight in two divided doses for 6 months under strict pediatric supervision

  (***Propranolol***, β-blocker, vascoconstrictor, regulating angiogenic pathways inducing apoptosis of vascularized endothelial cells)

- Injection Triamcinolone (Kenocort): One 20 mg /ml vial diluted in 2 ml saline and 1ml lignocaine injected intralesionally, once a month for six months.

  (***Triamcinolone***, corticosteroid suppresses vasculogenic capability of multipotent stem cells)

- Contractubex (10% aqueous onion extract, 50 U heparin per gram of gel,1% allantoin) gel and olive oil: massage on the lesion twice daily till the regression of the lesion.

Surgical Protocol

- Key is Accessibility

  Accessible = Surgery

  Inaccessible = Embolisation and surgery

- Ligation of all possible blood vessels in the vicinity of the lesion
- Aim of surgery
  - HARMONIC SCALPEL is used to radically excise all affected tissue as remnants of necrotic tissue can form a focus of a granuloma or further infection.
  - Reconstruct what ever possible
  - Post operative maintenance with steroidal injections intra-lesionally

Treatment…

High Flow A-V Malformation

Treatment…

Hemangioma

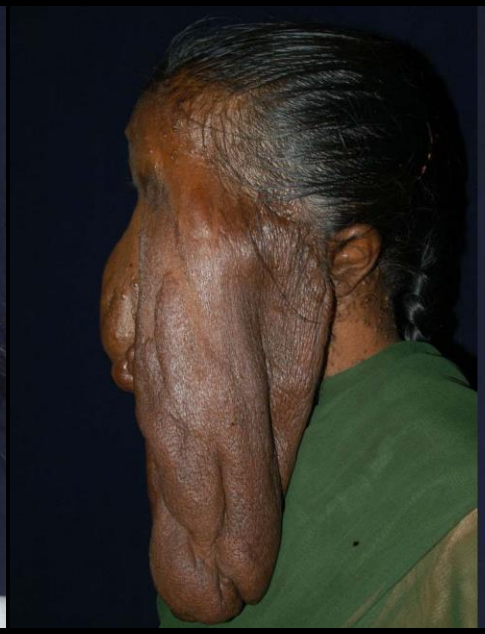
Treatment with full thickness skin graft harvested from right groin

Craniofacial Tumors

Plexiform Neurofibroma and benign tumors

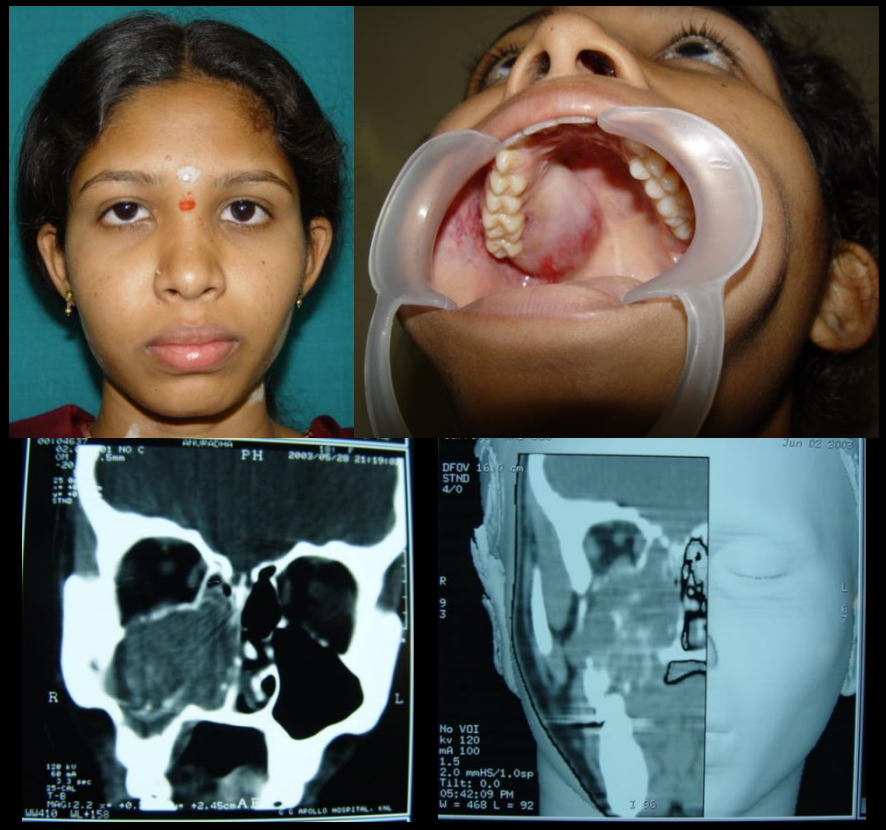
Craniofacial Tumors

Plexiform Neurofibroma and benign tumors




Craniofacial Tumors

Sarcoma and other malignancies



Craniofacial Tumors

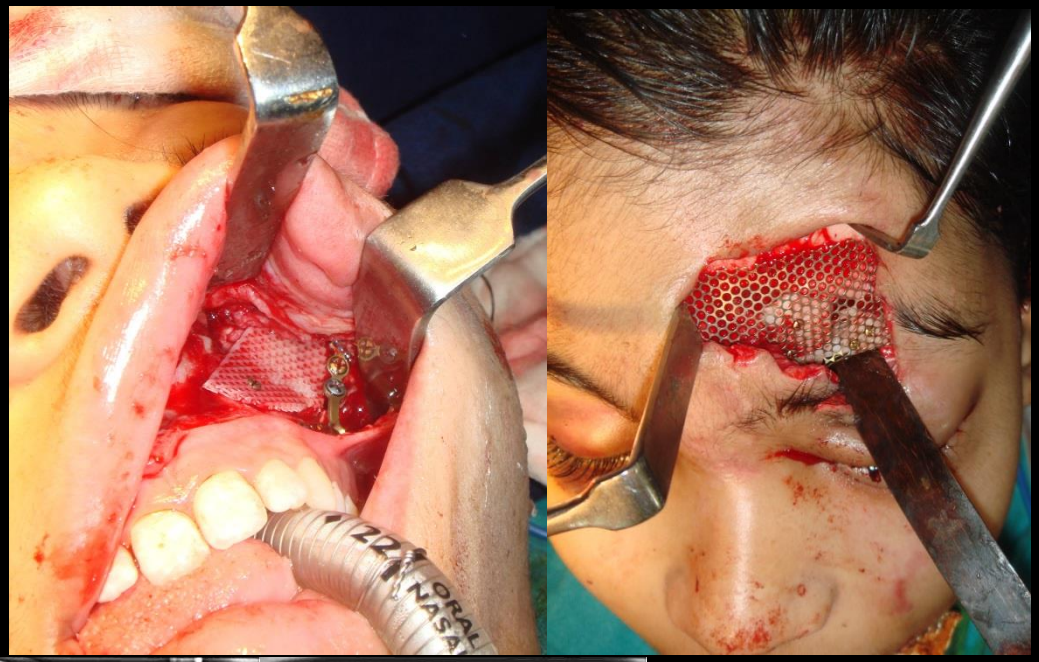
Sarcoma and other malignancies

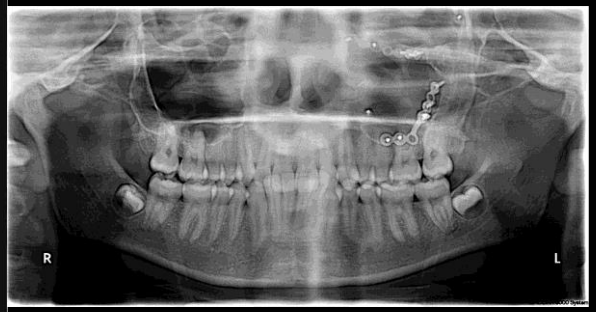
Benign and Malignant Head and Neck Tumors

Sarcoma and other malignancies

Craniomaxillofacial Trauma

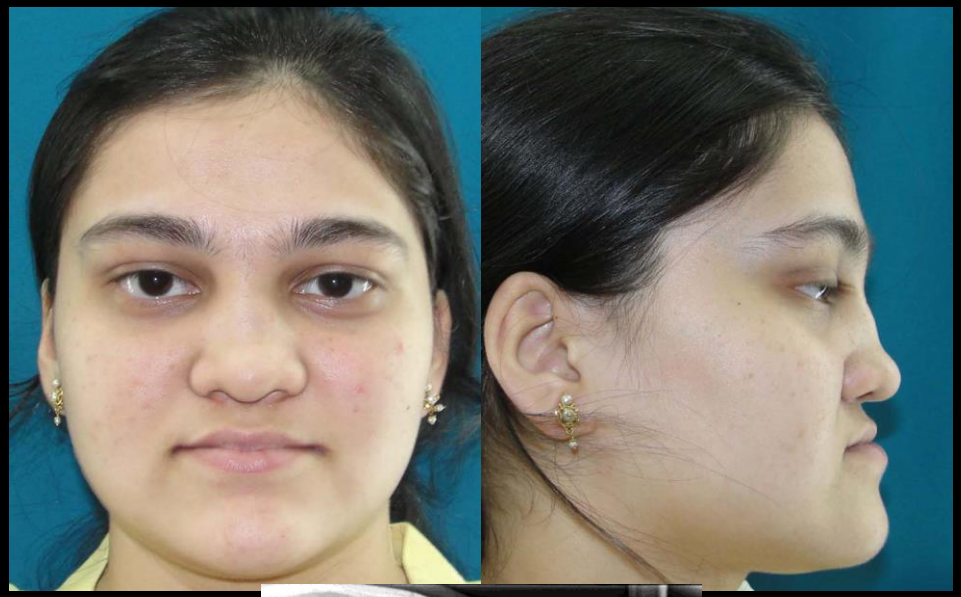
Craniomaxillofacial Trauma

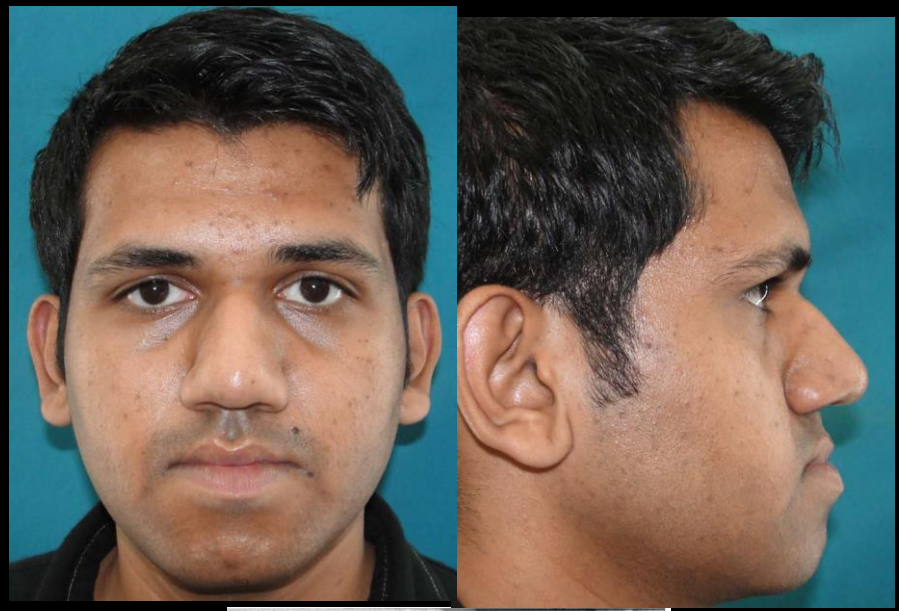




Craniomaxillofacial Trauma

Non-syndromic Orthognathic Deformities





High LeFort I Osteotomy with Rhinoplasty

LeFort I + Bilateral Saggital Split Osteotomy

Bring the Smile Back

Thank You