與大師對談

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- 依照臨床時序，請大師模擬一線放射科醫師；於未知診斷，或者有限度臨床線索之情形下，進行閱片及解讀。
- 鑑別診斷為主要，確定診斷為次要。
- 目的在於學習大師之影像判讀邏輯思考。
- 請大師給予本院影像品質建議:
  Protocols, techniques, etc.

CASE 1
9 Y/O GIRL

Brief history

- **Past history**
  Respiratory distress after birth

- **Chief complain**
  Persistent weakness of lower limbs with bilateral ankle clonus

Imaging studies

Brain MRI (no C) (2020.11.11)

C-spine MRI (no C) (2020.11.11)

H&N CT (no C) (2020.11.11)

Imaging findings

- ✓ **Craniosynostosis**
  - ant. sagittal, coronal and lambdoid sutures
- ✓ **Orbital proptosis**
- ✓ **Midface hypoplasia**
- ✓ **Posterior fossa & foramen magnum stenosis**
  w/ syringohyromyelic obex & hydrocephalus s/p VP shunting
- ✓ **Bilateral maxillary ossifying fibroma**
  & narrowing of the nasal meatuses

Differential Diagnoses

- **Craniosynostosis syndromes**
  - Apert syndrome
  - **Crouzon syndrome**
  - Pfeiffer syndrome
  - Saethre-Chotzen syndrome
  - Muenke syndrome

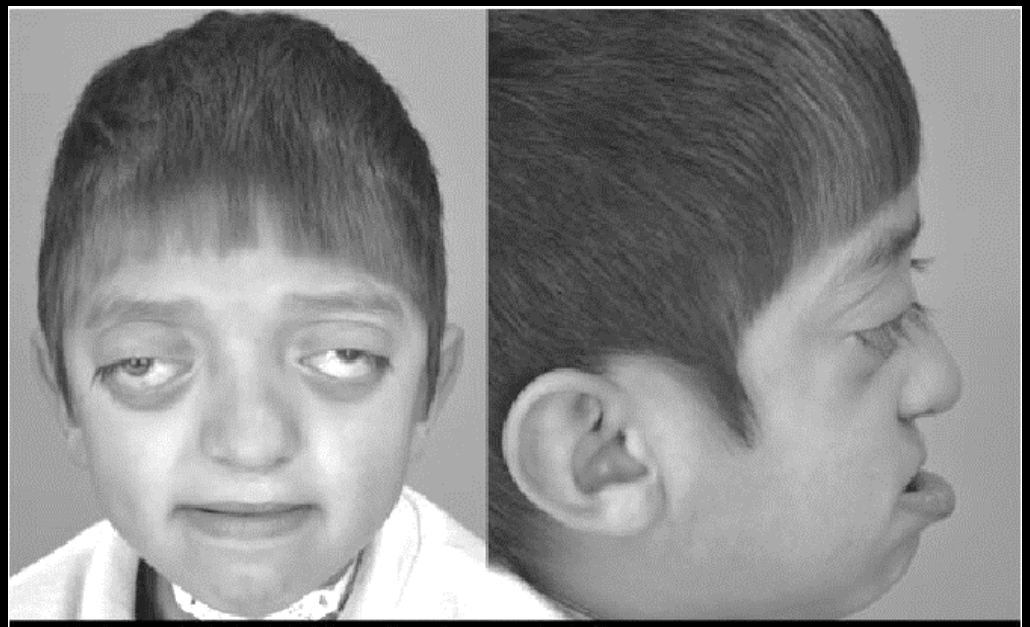
→ **Genetic report**

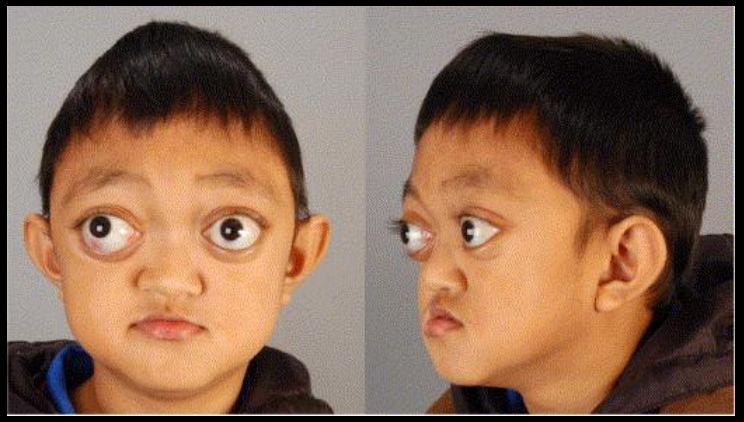
FGFR2 point mutation

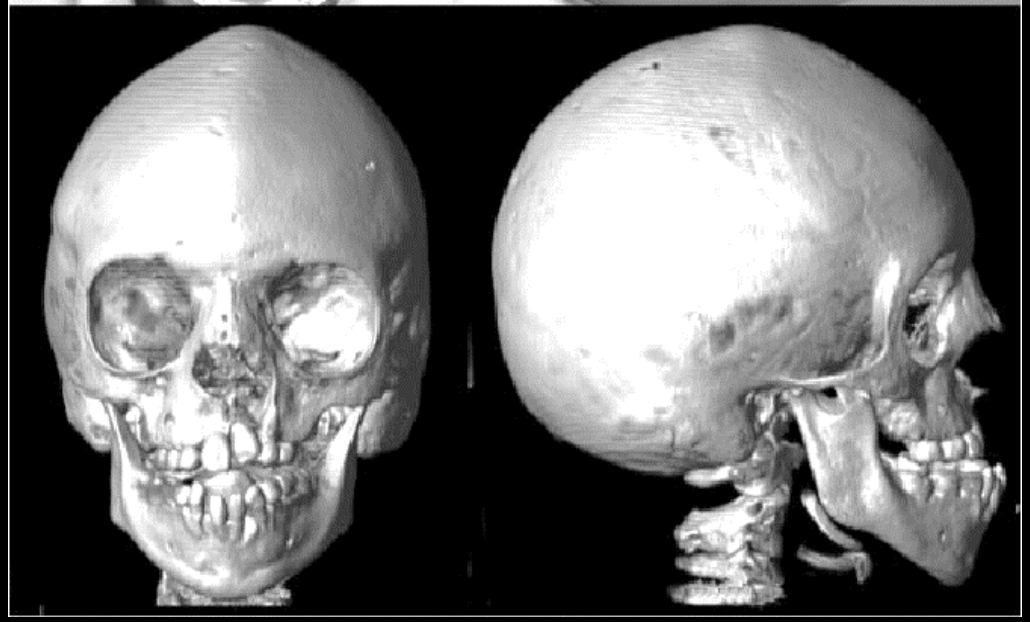
(1124 A>G)

Crouzon's syndrome

- **Craniofacial dysostosis**, branchial arch syndrome
- Autosomal dominant mutation in **fibroblast growth factor receptor (FGFR) 2 and 3** on chromosome 10
- Original triad by Octave Crouzon :
  Skull deformities / **facial anomalie**s / and **proptosis**
- Severe cases: "cloverleaf skull," maxillary hypoplasia, exophthalmos, mandibular prognathism or bifid uvula
- Chiari I malformations, hydrocephalus, cervical spine abnormalities







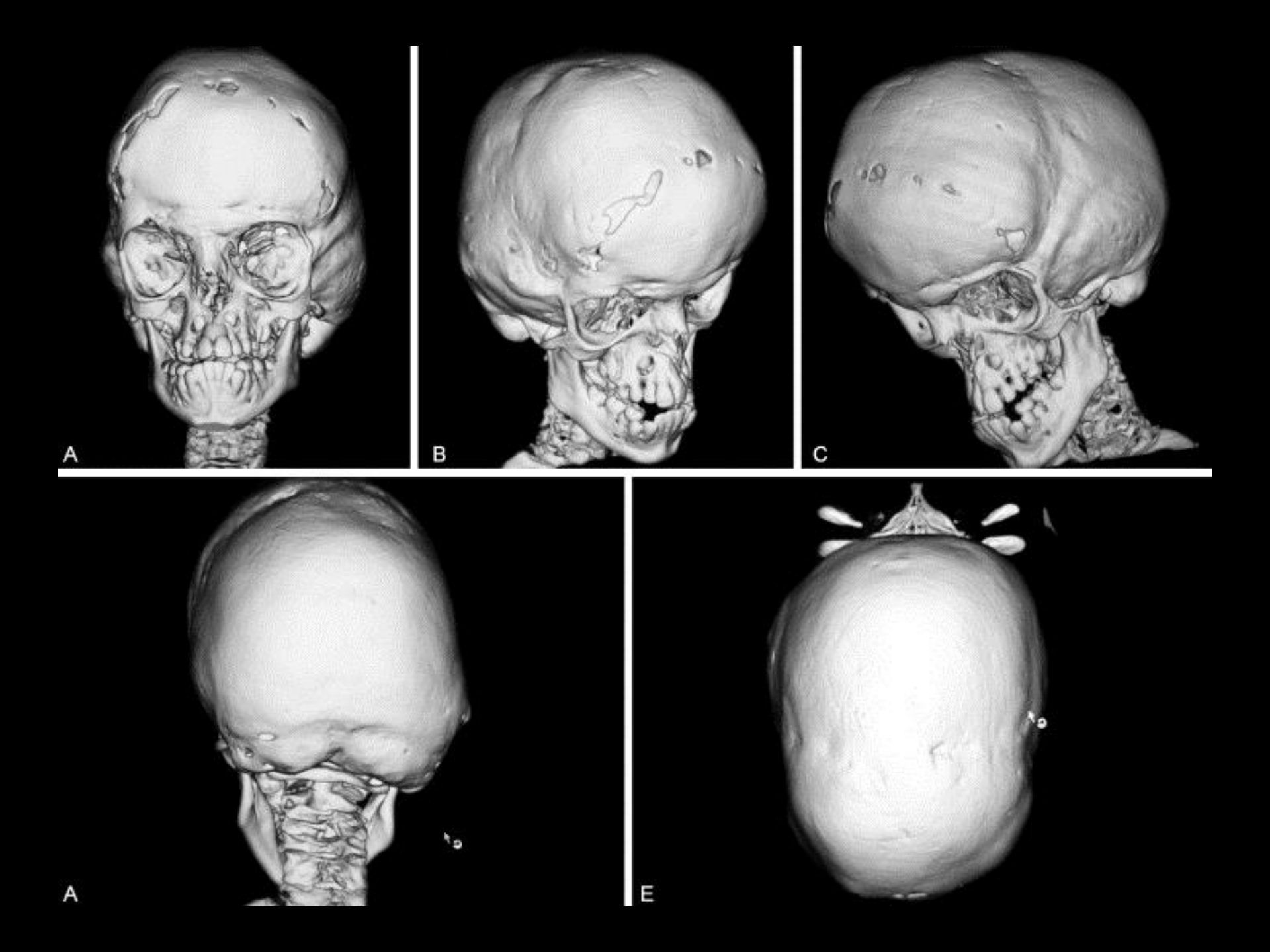

A
B
C
A
E

Table 1. Genetic mutations and their craniofacial phenotype.
Adapted from Senarath-Yapa et al., 2012 and Flaherty et al., 2016. The phenotypic features described may not be present in all individuals diagnosed with the condition. According to Wilkie et al., 2010, Muenke syndrome is clinically not diagnostic as phenotypic appearances vary from no characteristics to overlapping with other craniosynostosis syndromes.

Gene Chromosome	**Syndrome** Characteristic phenotype	**Hydrocephalus?**
FGFR1 8p	**Pfeiffer syndrome** Premature suture closure, brachycephaly, cutaneous syndactyly, hypertelorism, high forehead, midfacial retrusion, beaked nose, hearing loss, dental problems, brachydactyly, digit webbing, syndactyly, cloverleaf skull deformity, developmental delay, cognitive deficits	Yes (>90%)
	Jackson Weiss syndrome	
FGFR2 10q	**Crouzon syndrome** Premature suture closure, brachycephaly, flat forehead, midfacial retrusion, eye proptosis, hypertelorism, mandibular prognathism, beaked nose, mild limb abnormalities, variable cognitive function	Yes (>90%) Chiari I
	Jackson Weiss syndrome	
	Apert syndrome Premature suture closure, brachycephaly, eye proptosis, midfacial retrusion, exorbitism, hypertelorism, heterotropia, high arched palate, cleft palate, structural brain anomalies, cognitive impairment, complex syndactyly	Yes (~70%)
	Pfeiffer syndrome	Yes
	Beare Stevenson syndrome	
FGFR3 4p	**Crouzon syndrome** with Acanthosis Premature suture closure, brachycephaly, midfacial retrusion, acanthosis nigricans	
	Muenke syndrome Premature suture closure brachycephaly, orbital hypertelorism, midfacial retrusion, high arched palate, hearing loss, mild anomalies of the hands and feet, developmental delay	Yes (Seldom)
	Thantophoric Dysplasia	
EFNB1 Xq	**Craniofrontonasal syndrome**	Seldom
TWIST1 7p	**Saethre-Chotzen syndrome** Premature suture fusion, brachycephaly, high forehead, low frontal hairline, ptosis, hypertelorism, broad nasal bridge	Yes (30-50%)

Disorder	Thumbs	Hands	Great Toes	Feet	Targets for genetic testing
Crouzon syndrome	Normal	Normal	Normal	Normal	***FGFR2***
Crouzon syndrome with acanthosis nigricans	Normal	Normal	Normal	Normal	***FGFR3***
Apert syndrome	Fusion of thumb to fingers is occasionally seen	Soft tissue with or without bone syndactyly	Fusion of great toe to other toes is occasionally seen	Soft tissue with or without bone syndactyly	***FGFR2***
Pfeiffer syndrome	Broad, medially deviated	Variable brachydactyly	Broad, medially deviated	Variable brachydactyly	***FGFR1, FGFR2***
Muenke syndrome	Normal	With or without carpal fusion	May or may not be broad	Tarsal fusion may or may not be present	***FGFR3***
Jackson-Weiss syndrome	Normal	Variable	Broad, medially deviated	Abnormal tarsals	***FGFR2***
Beare-Stevenson gyrate syndrome	Normal	Normal	Normal	Normal	***FGFR2***