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Review Article

Crouzon's Syndrome- A Review

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ABSTRACT:

Crouzon syndrome is a rare inherited autosomal dominant genetic disorder affecting first branchial arch that causes craniofacial dysmorphy by affecting growth and development of cranium and facial skeletons. Disease process starts from in utero and continues to develop to 2 to 3 years of age. Crouzons child usually presents with various clinical manifestations. On severe course, Crouzon's Syndrome may cause difficulties in breathing, feeding, vision and brain development. Management of Crouzons child should be undertaken with multi-disciplinary coordinated clinical team care that involves surgical treatment based on cosmetics and severity of child needs. This review article highlights the importance of clinical manifestations, disease frequency, diagnosis, treatment protocal of multidisciplinary approach required for the management of this craniofacial dysostosis that favours early detection and prognosis of syndrome child.

Key words: Crouzons syndrome, craniosynostosis.

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INTRODUCTION:

Crouzon syndrome is an autosomal dominant genetic disorder casing craniosynostosis. Craniosynostosis occurs due to premature closure of one or more cranial sutures that affects the physical and mental well-being of the child.[1] This syndrome affects mainly the first branchial/pharyngeal arch through which maxillary and mandibular development occurs. It is also known as Branchial Arch Syndrome.

DESCRIPTION:

Crouzon's Syndrome is a rare genetic disorder with complete penetrance and variable expressivity characterized by pre-mature closure of certain skull bones.[3] This syndrome affects the shape of the head and face by preventing the skull from growing normally through its early fusion of cranial sutures (Craniosynostosis), which usually manifests during first year of life. [4]

HISTORY:

Octave Crouzon, a French Physician described the Crouzon Syndrome in 1912. [2] He also discovered that the syndrome implied a genetic basis.

EPIDEMIOLOGY:

It is termed as most common craniosynostosis syndrome.[5]Its incidence is approximately 1 in 25000 births worldwide.[6],[28] Currently, estimated as 1.6 out of every 1lakh people[7].It accounts approximately 4.8% among all Craniosynostosis Syndrome[8] with no race or sex predilection.[9]

ETIOLOGY:

Crouzons Syndrome is caused due to mutation in the gene FGFR2 and FGFR3 (Fibroblast Growth Factor Receptor). During embryonic development, these two fibroblast

growth factor receptors are involved in osteoblastic differentiation.[12] Crouzons Syndrome is mostly associated with FGFR2 gene mutation[12],[10] with 80% involving Iglll domain of extra cellular region and 20% of mutation located in Ig l-Ig ll domains of transmembrane and tyrosine kinase regions. Mutation of FGFR 3 gene causes a distinct form of Crouzons Syndrome associated with Acanthosis nigricans[11],[28] (dark thick patched skin).

SIGNS AND SYMPTOMS:

I. CRANIAL FEATURES:

Most distinguishing feature is Oxycephaly/ Turricephaly (fusion of coronal & lambdoid suture), Trigonocephaly (fusion of metopic suture), Dolicocephaly (fusion of sagittal suture), Plagiocephaly (unilateral premature closure of lambdoid & coronal suture), Brachycephaly (fusion of coronal suture), Sometimes increased intracranial pressure due to premature closure of suture bones results in mental retardation[13],[16], optic nerve atrophy leading to blindness. often, Sensorineural hearing loss and breathing problems [15] might occur.

II. FACIAL FEATURES:

Abnormal growth of facial bones leads to Hyperteloric bulging eyes, Strabismus, Parrot beak nose, Psittichorhinia, Exopthalmos[21],[22] due to early fusion of surrounding bones leading to shallow eye sockets and ocular proptosis. [31] Small pointed nose ,upper airway obstruction often results in Acute respiratory distress[14]. Midface deficiency with skeletal Class lll malocclusion (due to maxillary retrognathism), Dolicofacial growth pattern, Concave facial profile[17], Lip incompetence, Asymmetrical Leptoprosopic face with non consonant smile.

III. DENTAL FEATURES:

Upper teeth crowding due to restricted maxillary growth. presence of posterior bilateral crossbite, permanent underbite. [18] Occasionally oligodontia[20], macrodontia, peg shaped tooth, widely spaced teeth noted [19] with hypodontia.

IV. PALATAL FEATURES:

In maxillary arch, the palate is narrow with maxillary hypoplasia, V shaped dental arch[4], High arched & Cleft palate with bifid uvula.

In mandibular arch, mandibular prognathism present with reverse overjet. [19]

DIFFERENTIAL DIAGNOSIS:

The syndromes with similar clinical manifestations are Apert Syndrome, Pfeiffer Syndrome, Carpenter Syndrome, Seatre chotzen syndrome, Jackson Weiss Syndrome.[23],[29],[30] Distinguishing feature of Crouzon syndrome from other craniosynostosis syndromes is through the lack of hand, foot and digital abnormalities.[19],[26]

INVESTIGATIONS:

Diagnosing crouzon syndrome requires roentgencephalometric evaluation of cranium and facial skeleton[33], proper radiographic analysis of MRI (magnetic resonance imaging) scan, CT(computed tomography) scan, and X rays of involved bones.

Genetic counseling is advised as crouzon syndrome is an autosomal dominant disorder, there is 50% chance of transferring pathogenic variants' to foetus. This can be identified by prenatal testing in pregnant mothers.

Genetic testing is done to determine the chances of developing gene disorders. It is a medical test done to identify malformations of chromosomes, genes and proteins through molecular genetic tests, chromosomal genetic tests, biochemical genetic tests.

During 11th week of gestation, DNA of foetus is isolated from the Chorionic villus biopsy obtained from the suspected pregnant mother to identify the presence of FGFR2 gene mutation[32].

TREATMENT:

Management of crouzon syndrome involves- non surgical and surgical methods.

Basic modalities of treatment involves: -providing easy breathing, providing space for brain development[27], checking for fluid buildup and intracranial pressure, midface surgery to improve breathing and protecting eyesight.

Non surgical management- early diagnosis of the syndrome through referring Geneticist, Physiotherapist at early stage of disease process helps in treating the developmental delay at earlier state. Midface distraction can be done using transfacial pins and through external devices[24]. Orthodontic therapy involving orthopedic appliance like Rapid maxillary expansion with facemask therapy favours maxillary forward displacement.[34]

Surgical management- any surgical intervention needs craniofacial team consisting of Craniofacial surgeon, Neurosurgeon, ENT and Ophthalmic surgeons, Orthodontist, Geneticist, Psychologist, Respiratory care specialist, Speech and language therapist to correct cranio-facial dysmorphy. Aim of Surgical interventions is to prevent respiratory, cerebral and ophthalmic complications. Surgery is indicated for cosmetic reasons and in fatal conditions. surgical aspects involves:

In infants- Cranioplasty done for skull expansion and remodeling.

In childhood- Shunt surgery done to reduce intracranial pressure. Choanal dilation, Grommet insertion, Bone anchored hearing aid done to improve airway and hearing. Squint surgery done to correct vision and ocular squint , Tarsorrhaphy done to protect surface of eye.

In Adolescence- Facial advancement (Lefort III midface advancement, fronto-orbital advancement) done to improve breathing difficulty, esthetic appearance[25]

Other surgeries like Posterior cranial vault distraction, monobloc frontofacial advancement done in severe cases.

Dental management- maxillary teeth removed to relieve crowding due to small sized jaw. To expand the palate and for proper alignment of teeth- orthodontic braces to be placed. Orthodontic braces will hold the teeth in proper position before and after jaw surgery. In case of maxillary retrusion, Lefort I maxillary advancement planned after cessation of facial bones growth.

REFERENCES:

1. Marsh JL, Vannier MW. Cranial Deformities Comprehensive Care for Craniofacial Deformities. St. Louis: Mosby; 1985. p. 154.
2. Rodriguez, Eduardo (2018). Plastic Surgery: Volume 3: Craniofacial, Head and Neck Surgery and Pediatric Plastic Surgery (4 ed.). Elsevier.
3. Fogh-Andersen P. Craniofacial dysostosis (Crouzon's disease) as a dominant hereditary affection. Nord Med 1943;18:993-6
4. Crouzon LE. Dysostose cranio-faciale héréditaire. Bulletin de la Société des Médecins des Hôpitaux de Paris. 1912;33:545–555.
5. Reference, Genetics Home. "Crouzon syndrome". Genetics Home Reference. Retrieved 21 November 2018
6. Singer SL, Walpole I, Brogan WF, Goldblatt J. Dentofacial features of a family with Crouzon syndrome. Case reports. Aust Dent J. 1997;42:11–7
7. Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LH, Stephens K, Amemiya A, Robin NH, Falk MJ, Haldeman-Englert CR (October 20, 1998). "FGFR-Related Craniosynostosis Syndromes". GeneReviews.
8. Gray TL, Casey T, Selva D, Anderson PJ, David DJ. Ophthalmic sequelae of Crouzon syndrome. Ophthalmology. 2005 Jun;112(6):1129–1134.
9. Hlongwa P. Early orthodontic management of Crouzon syndrome: a case report. J Maxillofac Oral Surg. 2009 Mar;8(1):74–76
10. Fries PD, Katowitz JA. Congenital craniofacial anomalies of ophthalmic importance. Surv Ophthalmol 1990;35:87-119
11. Gorlin RJ, Cohen MM, Levin LS. 3rd ed. Oxford: Oxford University Press; 1990. Syndromes of the head and neck; pp. 516–26
12. Snyder-Warwick AK, Perlyn CA, Pan J, Yu K, Zhang L, Ornitz DM (February 2010). "Analysis of a gain-of-function FGFR2 Crouzon mutation provides evidence of loss of function activity in the etiology of cleft palate"
13. Glaser RL, Jiang W, Boyadjiev SA, Tran AK, Zachary AA, Van Maldergem L, et al. Paternal origin of FGFR2 mutations in sporadic cases of Crouzon syndrome and Pfeiffer syndrome. Am J Hum Genet 2000;66:768-77
14. Jarund M, Lauritzen C. Craniofacial dysostosis: airway obstruction and craniofacial surgery. Scand J Plast Reconstr Surg Hand Surg. 1996;30:275–279.
15. "Crouzon Syndrome - NORD (National Organization for Rare Disorders)". NORD (National Organization for Rare Disorders). Retrieved 21 November 2018.
16. Cohen MM Jr., editor. Craniosynostosis: Diagnosis, evaluation, and management Crouzon syndrome. In: Craniosynostosis: Diagnosis, Evaluation, and Management. 2nd ed. New York: Oxford University Press; 2000. p. 361
17. "Crouzon syndrome | Genetic and Rare Diseases Information Center (GARD) – an NCATS Program". rarediseases.info.nih.gov. Retrieved 21 November 2018.
18. Flint, Paul (2015). Cummings Otolaryngology (6 ed.). Elsevier. pp. 2891–2914
19. Padmanabhan V, Hegde AM, Rai K. Crouzon's syndrome: A review of literature and case report. Contemp Clin Dent 2011;2:211-4
20. Kaur H, Singh Waraich H, Sharma CM. Crouzon syndrome: A case report and review of literature. Indian J Otolaryngol Head Neck Surg 2006;58:381-2.
21. Haroop K,Waraich HS, Sharma CM. Crouzon syndrome.A case report and review of literature. Indian J Otolaryngol Head Neck Surg.2006;58:381-2
22. Babic GS, Babic RR. Opthalmological and radiological picture of crouzon syndrome: A case report. Acta Medica Medianae. 2009;48:37–40.
23. Maloth S, Padamashree S, Rema J, Yalsangi S, Ramadoss T, Kalladka M. Diagnosis of Crouzon's syndrome. Hong Kong Dent J. 2010;7:95–100
24. Coeugniet E, Dhellemmes P, Vinchon M, Wolber A, Pellerin P.Midfacial distraction without osteotomy using a transfacial pin and external devices.J Craniofac Surg. 2012 Jan;23(1):184-9.
25. 25.Taglialatela Scafati C, Aliberti F, Taglialatela Scafati S, Mangone GM, Taglialatela Scafati M. The value of the maxillo-malar osteotomy in the treatment of Crouzon syndrome with exorbitism. Ann Plast Surg. 2008;61:285–9
26. Rani PJ, Shailaja S, Srilatha S, Sridevi K, Payal, Vinod VC. Crouzon syndrome: Acase report. Int J Dent Case Rep. 2012;2:117–22.
27. Bowling EL, Burstein FD. Crouzon syndrome. Optometry 2006;77:217-22
28. Cohen MM., Jr Craniosynostosis update 1987. Am J Med Genet Suppl. 1988;4:99–148.
29. Panigrahi I. Craniosynostosis genetics: The mystery unfolds. Indian J Hum Genet. 2011;17:48–53 -dd
30. Regezi JA, Sciubba JJ. Oral pathology - clinical pathologic correlations. 4th ed. Philadelphia: W.B. Saunders; 1999. pp. 477–478
31. Vivek P, Hegde AM, Rai K. Crouzon's syndrome: a review of literature and case report. Contemp Clin Dent 2011;2:211-4.
32. Schwartz M, Kreiborg S, Skovby F.First-trimester prenatal diagnosis of Crouzon syndrome. Prenat Diagn. 1996 Feb;16(2):155-8.
33. Crouzon Syndrome. A clinical and roentgencephalometric study. Kreiborg S et al. Scand J Plast Reconstr Surg Suppl. (1981)
34. Ingersoll RG, Paznekas WA, Tran AK, Scott AF, Jiang G, Jabs EW. Fibroblast growth factor receptor 2 (FGFR2): Genomic sequence and variations. Cytogenet Cell Genet 2001;94:121-6