Apert syndrome

- Identification of a Novel FGFR2 Gene Mutation (c.514_515delinsCT, p.Ala172Leu) in a Chinese Neonate With Apert Syndrome: A Case Report
- Cranial Bone Changes Associated With Intracranial Hypertension in Apert Syndrome: Insights for Early Surgical Intervention
- Syndromic Craniosynostosis: The Hidden Burden of Comorbidities on Surgical Outcomes
- Facial asymmetry in syndromic craniosynostosis patients undergoing midface surgery compared to a large general population
- The Revolutionary Role of Ultrasound in Anaesthetic Management of Apert Syndrome: A Report of Two Cases
- Ptosis and Craniosynostosis: Revisiting Syndromic and Surgical Associations
- Insight into Apert Syndrome: Reporting on Six Patients and Increasing Awareness
- FGFR2 residence in primary cilia is necessary for epithelial cell signaling

Apert syndrome is a form of acrocephalosyndactyly, a congenital disorder characterized by malformations of the skull, face, hands and feet. It is classified as a branchial arch syndrome, affecting the first branchial (or pharyngeal) arch, the precursor of the maxilla and mandible. Disturbances in the development of the branchial arches in fetal development create lasting and widespread effects.

In 1906, Eugène Apert, a French physician, described nine people sharing similar attributes and characteristics.

Linguistically, “acro” is Greek for “peak”, referring to the “peaked” head that is common in the syndrome. “Cephalo”, also from Greek, is a combining form meaning “head”. “Syndactyly” refers to webbing of fingers and toes.

In embryology, the hands and feet have selective cells that die, called selective cell death or apoptosis, causing separation of the digits. In the case of acrocephalosyndactyly, selective cell death does not occur and skin, and rarely bone, between the fingers and toes fuses.

The cranial bones are affected as well, similar to Crouzon syndrome and Pfeiffer syndrome. Craniosynostosis occurs when the fetal skull and facial bones fuse too soon in utero, disrupting normal bone growth. Fusion of different sutures leads to different patterns of growth on the skull. Examples include: trigonocephaly (fusion of the metopic suture), brachycephaly (fusion of the coronal suture and lambdoid suture bilaterally), dolichocephaly (fusion of the sagittal suture), plagiocephaly (fusion of coronal and lambdoidal sutures unilaterally), and oxycephaly or turricephaly (fusion of coronal and lambdoid sutures).

Findings for the incidence of the syndrome in the population have varied, with estimates as low as 1 birth in 200,000 provided[3] and 160,000 given as an average by older studies.

A study conducted in 1997, however, by the California Birth Defects Monitoring Program, found an incidence rate of 1 in 80,645 out of almost 2.5 million live births.

Another study conducted in 2002 by the Craniofacial Center, North Texas Hospital For Children, found a higher incidence of about 1 in 65,000 live births.

Clinical features

Craniosynostosis: Premature fusion of the skull bones, which leads to an abnormal head shape. This often results in a tower-shaped skull with a prominent forehead and flattened back of the head.

Facial abnormalities:

Midface hypoplasia: Underdeveloped midface, which can cause a flat nasal bridge and a protruding upper jaw.

Hypertelorism: Wide-set eyes due to the separation of the orbits (eye sockets).

Downward slanting of the eyes.

Narrowing of the eyelids (palpebral fissures).

Protruding lower jaw (mandibular prognathism).

Syndactyly: Fusion of fingers and/or toes, particularly involving the second, third, and fourth digits. This gives the hands and feet a characteristic “mitten-like” appearance.

Brachydactyly: Short fingers and toes.

Symmetrical or asymmetrical limb abnormalities:

Fusion of bones in the hands and feet. Additional fingers or toes (polydactyly). Dental anomalies:

Malocclusion (misalignment of the teeth). Crowding of teeth. High arched palate. Hearing loss: Conductive or sensorineural hearing loss can occur due to abnormalities in the middle ear or inner ear structures.

Respiratory problems: Breathing difficulties may arise due to the restricted space in the nasal passages and airways caused by craniofacial abnormalities.

Intellectual disability: Some individuals with Apert syndrome may have cognitive impairment, although intelligence can vary widely among affected individuals.

Other features:

Hydrocephalus (build-up of fluid in the brain). Vision problems such as optic nerve compression or strabismus (crossed eyes).

Complications

Intracranial hypertension.

lacrimal duct obstruction can occur as a secondary complication. The primary cause of lacrimal duct obstruction in Apert syndrome is typically related to the craniofacial abnormality present in individuals with this condition.

Due to the craniosynostosis and facial skeletal abnormalities seen in Apert syndrome, the anatomy of

the tear drainage system may be altered, leading to obstruction of the lacrimal ducts. Additionally, individuals with Apert syndrome may also have abnormalities in the development of the nasal passages and other structures of the face, which can contribute to tear drainage issues.

Management of lacrimal duct obstruction in individuals with Apert syndrome may involve a multidisciplinary approach, including evaluation by ophthalmologists, otolaryngologists (ENT specialists), and craniofacial surgeons. Treatment may include conservative measures such as regular eye care, lubricating eye drops, and management of eye infections. In cases of severe obstruction or recurrent issues, surgical interventions such as dacryocystorhinostomy (DCR) or tear duct probing may be considered to improve tear drainage and alleviate symptoms.

Treatment

- Syndromic Craniosynostosis: The Hidden Burden of Comorbidities on Surgical Outcomes
- The Revolutionary Role of Ultrasound in Anaesthetic Management of Apert Syndrome: A Report of Two Cases
- Ptosis and Craniosynostosis: Revisiting Syndromic and Surgical Associations
- Targeting of C-ROS-1 Activity Using a Controlled Release Carrier to Treat Craniosynostosis in a Preclinical Model of Saethre-Chotzen Syndrome
- Perioperative Airway Management for Midface Surgery in Children With Syndromic Craniosynostosis; a Single Center Experience With Immediate Extubation
- Prevalence and treatment outcomes of hydrocephalus among children with craniofacial syndromes
- Intraoperative Skull Fracture During Halo Application in Subcranial Le Fort III: Strategies for Managing a Rare Complication
- Apert Syndrome

Treatment for Apert syndrome typically involves a multidisciplinary approach to address the various medical, surgical, and developmental needs of affected individuals. Since Apert syndrome affects multiple systems, treatment plans are tailored to each individual's specific needs and may include the following components:

Craniofacial Surgery: Craniofacial surgery is often necessary to address craniosynostosis (premature fusion of skull bones) and facial abnormalities characteristic of Apert syndrome. Surgical interventions aim to correct skull shape, relieve pressure on the brain, and improve facial symmetry and function.

Syndactyly Release Surgery: Individuals with Apert syndrome often have syndactyly, where fingers and toes are fused together. Syndactyly release surgery is performed to separate the fused digits, improving hand and foot function and appearance.

Orthodontic Treatment: Orthodontic interventions may be needed to address dental and jaw abnormalities associated with Apert syndrome, such as malocclusion and crowding of teeth. Braces, orthodontic appliances, and jaw surgery may be utilized to achieve optimal dental alignment and occlusion.

Speech Therapy: Speech therapy may be recommended to address speech difficulties that can arise due to craniofacial abnormalities, cleft palate, or other related factors. Speech therapists work with individuals to improve articulation, language skills, and overall communication abilities.

Ophthalmologic Care: Regular eye examinations and ophthalmologic care are essential to monitor

and manage ocular manifestations of Apert syndrome, such as proptosis (bulging eyes), strabismus (misalignment of the eyes), and vision problems. Surgical interventions may be needed to address certain eye conditions.

Psychological Support: Psychological and emotional support is important for individuals with Apert syndrome and their families. Counseling, support groups, and resources for coping with the challenges associated with the condition can be beneficial.

Educational Support: Children with Apert syndrome may benefit from educational interventions tailored to their specific learning needs. Special education services, individualized education plans (IEPs), and accommodations in school settings can help optimize academic success and development.

Comprehensive Medical Care: Regular medical evaluations are important to monitor growth, development, and overall health in individuals with Apert syndrome. Coordination of care among various specialists is essential to address any medical issues that may arise.

Treatment for Apert syndrome is typically ongoing and may involve multiple surgeries and interventions over the course of a person's lifetime. The goal of treatment is to improve function, appearance, and quality of life for individuals affected by this rare genetic disorder.

Craniofacial Surgery

The application of 3D-printed positioning and shaping templates in tandem with anterior and posterior cranial distraction osteogenesis demonstrates efficacy in addressing Apert syndrome. Notably, significant enhancements in head shape and orbit were observed, and the incidence of postoperative complications such as cerebrospinal fluid leakage and infection remained minimal. Moreover, long-term follow-up affirmed stability [1].

The preference for occipital expansion as the initial craniofacial procedure in Apert and Crouzon-Pfeiffer syndromes is supported by the greater increase it produces in intracranial volume (as evidenced by the OFC), which reduces the incidences of tonsillar herniation and papilledema [2].

1)
Shen W, Cui J, Ji Y, Liang Liang K, Chen J. Impact of Anterior and Posterior Vault Distraction Osteogenesis (A-PVDO) and 3D-Printed Positioning/Shaping Templates in Apert Syndrome: A Case Series Study. J Craniofac Surg. 2024 Feb 26. doi: 10.1097/SCS.0000000000010070. Epub ahead of print. PMID: 38408331.
2)
Spruijt B, Rijken BF, den Ottelander BK, Joosten KF, Lequin MH, Loudon SE, van Veelen MC, Mathijssen IM. First vault expansion in Apert and Crouzon-Pfeiffer syndromes: front or back? Plast Reconstr Surg. 2015 Sep 10. [Epub ahead of print] PubMed PMID: 26368328.