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Review Article

A Comprehensive and Clinical Review of Partial Monosomy 13q Syndrome

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Abstract

Partial monosomy 13q syndrome is a rare chromosomal disorder in which part of the long (q) arm of chromosome 13 is missing (deleted or monosomic). The range and severity of symptoms may vary greatly, depending on the exact size and location of the deletion on 13q. Partial monosomy 13q syndrome is usually present at birth and may be associated with low birth weight, abnormalities of the head and face (skull and face), eye abnormalities, hand or foot defects, genital tract abnormalities in affected males, or Additional physical abnormalities should be identified. Many babies with partial monosomy 13q syndrome may have specific abnormalities in the head and face (cranium and face) such as small and unusual head size (microcephaly), wide and flat nasal bridge; lower jaw than normal (micrognathia) with a non-prominent upper jaw (maxilla); Prominent front teeth (incisors), large and low-set ears or a short neck with abnormal skin folds (skin adhesions). Partial monosomy 13q syndrome is a rare chromosomal disorder in which part of the long arm (q) of chromosome 13 is missing (deleted). Chromosomes are found in the nucleus of all cells in the body. They have the genetic characteristics of each person.

Keywords: Partial monosomy 13q syndrome, rare chromosomal disorder, deleted or monosomic, cranium and face

Overview of Partial Monosomy 13q Syndrome

Partial monosomy 13q syndrome is a rare chromosomal disorder in which part of the long (q) arm of chromosome 13 is missing (deleted or monosomic). The range and severity of symptoms may vary greatly, depending on the exact size and location of the deletion on 13q. Partial monosomy 13q syndrome is usually present at birth and may be associated with low birth weight, abnormalities of the head and face (skull and face), eye abnormalities, hand or foot defects, genital tract abnormalities in affected males, or Additional physical abnormalities should be identified. Affected infants and children may also be delayed in acquiring skills that require coordination of mental and muscular activity (psychomotor retardation) and may also experience varying degrees of intellectual disability. In most cases, partial monosomy 13q syndrome appears to occur for no apparent reason (scattered) [1].

Clinical Signs and Symptoms of Partial Monosomy 13q Syndrome

In many cases, babies with partial monosomy 13q syndrome have a low birth weight and may not grow as fast as expected (failure to thrive). Moderate to severe growth delays may persist into childhood, resulting in short stature. In addition, in most cases, affected people show a severe delay in acquiring skills that require coordination of mental and muscular activity (psychomotor retardation). Severe mental disorder is also present in most cases. However, in some affected individuals, the degree of intellectual disability may be mild or moderate [1].

Many babies with partial monosomy 13q syndrome may have specific abnormalities in the head and face (cranium and face) such as small and unusual head size (microcephaly), wide and flat nasal bridge; lower jaw than normal (micrognathia) with a non-prominent

upper jaw (maxilla); Prominent front teeth (incisors), large and low-set ears or a short neck with abnormal skin folds (skin adhesions). In some cases, in addition to showing microcephaly, some affected infants may experience premature closure (craniosynostosis) of the fibrous joints (metopic sutures) between the sides of the frontal bone. As a result, the head may have an unusual "triangular" appearance with a prominent (triangular) forehead. Children with trigonocephaly may have abnormal development of the forebrain (holoprosencephaly) [1] (Figure 1).

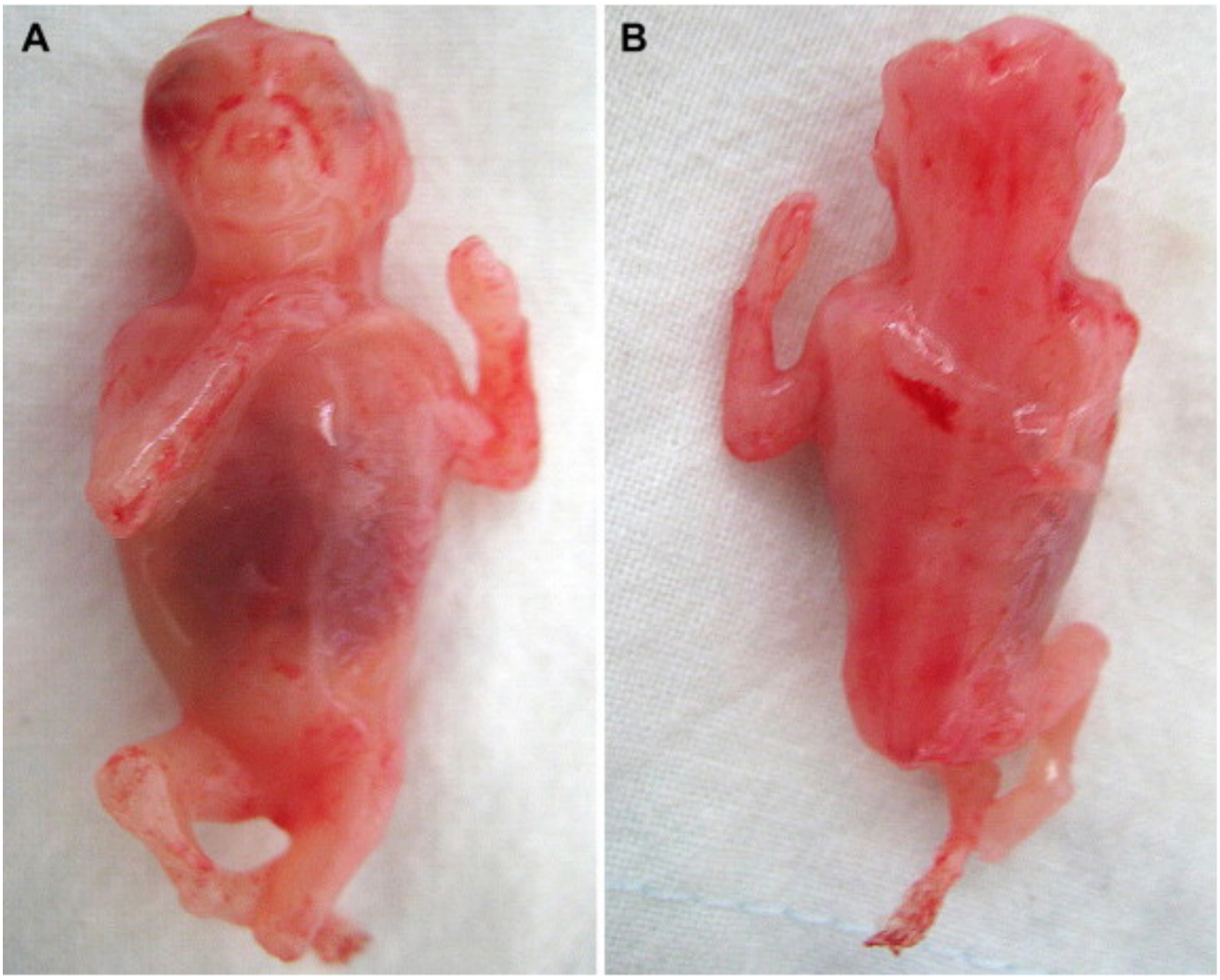

Figure 1: Images of an aborted fetus with partial monosomy 13q syndrome [1].

In rare and severe cases, additional craniofacial abnormalities may include incomplete closure of the roof of the mouth (cleft palate) or a vertical groove in the upper lip (cleft lip). Many infants and children with partial monosomy 13q syndrome also show various eye (eye) disorders. These often include unusually small eyes (microphthalmia), wide-set eyes (ocular hypertelorism), drooping of the upper eyelids (ptosis), or vertical skin folds on either side of the nose (epicanthal folds), which may be partially cover the eyes The inner corners of the affected eye may also show abnormal clouding of the lens (cataract) or the front (anterior), the clear part of the eye through which light passes (corneal opacification). Additionally, some tissue may be missing from the colored part of the eye (iris) (coloboma), giving the iris a "keyhole" appearance. Coloboma may also affect other tissues of the eye (for example, the choroid). Such eye abnormalities may lead to varying degrees of visual impairment or blindness in some cases. The degree of visual impairment depends on the severity or combination of eye abnormalities [1] (Figure 2).

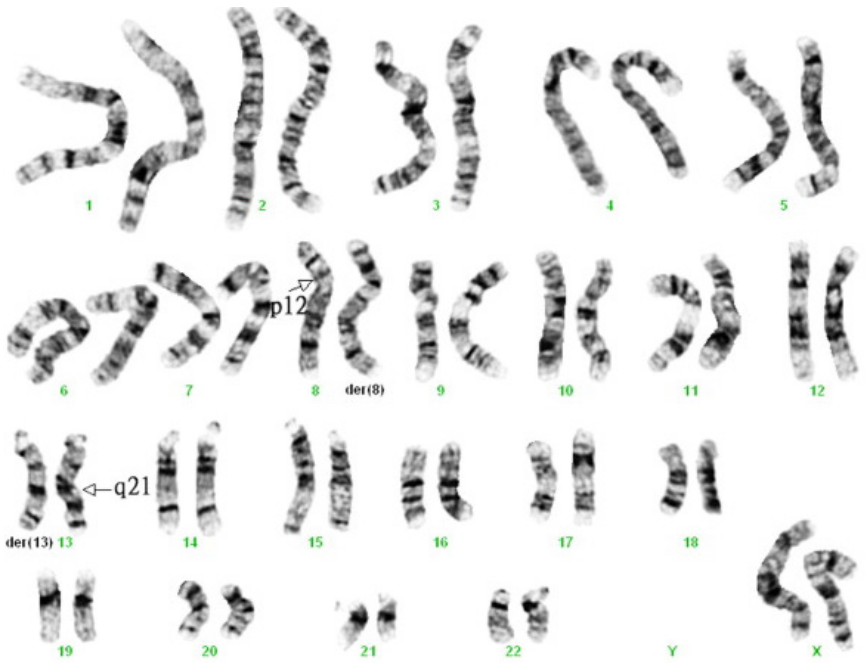

Figure 2: Schematic of the partial monosomy 13q syndrome karyotype [1].

In some cases, infants and children with partial monosomy 13q syndrome may also develop a malignant tumor of the retina (retinoblastoma), the nerve-rich membrane of the eye. In such cases, both eyes are usually affected (bilateral retinoblastoma). Symptoms associated with retinoblastoma may include a whitish mass in the pupil behind the lens of the eye (leukocoria or "cat's eye reflex"), crossed eyes (strabismus), decreased vision or blindness, pain and redness, or abnormal swelling. Eye fluid pressure (secondary glaucoma) [1,2].

Some people with partial monosomy 13q syndrome may also have abnormalities in the hands or feet. These may include an underdeveloped (hypoplastic) thumb or an absent thumb. In addition, fifth fingers that are abnormally bent (clinodactyly), adhesions or fusion of certain fingers (syndactyly), unusually short, big toes; Or legs that are twisted in an abnormal position (cleft foot) occur in patients with this syndrome. In some cases, affected individuals may exhibit additional skeletal abnormalities. These may include rib abnormalities, bone abnormalities in the spine (vertebrae), or lateral curvature of the spine (scoliosis) [1,2].

In some cases, men with partial monosomy 13q syndrome may have genital abnormalities. For example, the opening of the urethra (mitos) may appear on the underside of the penis (hypospadias), or the testicles may fail to descend into the scrotum. In some cases, the scrotum may be unusually small or abnormally divided into two parts (bifid testicle). The penis may be unusually small (micropenis), or there may be an abnormal passage between the scrotum and the anus (perineal fistula). In rare cases, the opening of the anus may be absent or covered by a thin membrane, causing obstruction (anal atresia) [1,2].

In some severe cases, people with partial monosomy 13q syndrome may also show certain abnormalities of internal organs, including the heart, brain, intestines, or kidneys. In some cases, heart abnormalities may be associated with partial monosomy 13q syndrome, including atrial and ventricular septal defects, which are rare heart defects that are present from birth (congenital). The normal heart has four chambers, the upper two chambers are known as the atria. They are separated from each other by a stringy partition known as the atrioventricular septum. The two lower chambers of the heart are known as the ventricles and are separated from each other by the ventricular septum. The valves connect the atria (left and right) to the respective ventricles. There is a small opening between the two atria (foramen ovale) at birth. Shortly after birth, the atrial septum gradually closes and covers this opening. In babies with atrial valve defects, the atrial septum may not close properly or may be incomplete during fetal development. As a result, the atria must continue to open long after they close, increasing the workload on the right side of the heart and causing excessive blood flow to the lungs [1,2].

Etiology of Partial Monosomy 13q Syndrome

Partial monosomy 13q syndrome is a rare chromosomal disorder in which part of the long arm (q) of chromosome 13 is missing (deleted). Chromosomes are found in the nucleus of all cells in the body. They have the genetic characteristics of each person [3]. In cases of Partial Monosomy 13q syndrome, deletion

of part of the long arm of chromosome number 13 is responsible for the symptoms and findings characteristic of this chromosomal disorder. The extent and severity of associated abnormalities may depend on the length and exact location of the deleted portion of the long arm of chromosome 13 [3].

Researchers have attempted to determine specific symptoms and physical characteristics (phenotypes) that may be associated with the deletion of specific band locations on the long arm of chromosome 13. The medical literature indicates that proximal deletions that do not extend to band q32 appear to be associated with growth retardation, mild to moderate intellectual disability, and various physical abnormalities. ("Proximal" refers to the closest point of attachment, the closest center or proximity to the point of origin.) Those involved in the q14 band have an increased risk of retinoblastoma. In addition, evidence suggests that deletion of a portion of the q32 band may be associated with developmental delay, severe intellectual disability, hand and foot abnormalities, brain abnormalities, eye abnormalities, and other significant abnormalities. Individuals with deletions limited to distal 13q beyond band q32 (eg, distal deletions involving bands q33-q34) may have severe mental retardation and, in some cases, craniofacial abnormalities. Many researchers have stated that such distal deletions do not usually appear to be associated with major malformations. However, according to one report, there was distal deletion in a boy with myelomeningocele, abnormally small head size (microcephaly), minor facial abnormalities, and other findings. Myelomeningocele is a developmental defect in which a sac containing part of the spinal cord, its protective membranes (meninges), and cerebrospinal fluid protrudes abnormally through a defect in the spine (vertebral column). Research continues on specific band regions that may be critical in producing some of the potential traits associated with the 13q deletion [3].

As mentioned above, for people with retinoblastoma, researchers have identified that the chromosomal region that is consistently lost is part of the q14 band (13q 14). Based on this finding, it is believed that a gene or genes in this chromosomal location may play a role in fetal retinal development. However, it is important to note that not all individuals with a 13q 14 deletion develop retinoblastoma. According to the medical literature, approximately 20% of individuals with band 13q 14 have malignancy [3].

The exact cause of partial monosomy 13q syndrome is not fully understood. In most documented cases, partial monosomy 13q syndrome appears to be due to spontaneous (de novo) errors early in embryonic development. In such cases, the parents of the affected child usually have normal chromosomes and may have another child with a mild chromosomal abnormality. However, in other cases, partial monosomy 13q syndrome may be due to a parental chromosomal rearrangement. In some cases, the parental chromosomal rearrangement may be a "balanced translocation." Translocations occur when certain regions of chromosomes are lost and rearranged, resulting in a change in the genetic material and a change in the set of chromosomes [4].

In other cases, the parental chromosomal rearrangement may be an inversion or an insertion. An inversion occurs when a chromosome is broken in two places and then these parts are rejoined in reverse order. An inversion has occurred when part of one chromosome is inserted into a gap that exists in another chromosome in a different chromosomal (non-homologous) pair. If such a chromosomal rearrangement is balanced, it is usually harmless to the carrier. However, they are sometimes associated with a higher risk of abnormal chromosomal development in the offspring of carriers [4].

Frequency of Partial Monosomy 13q Syndrome

Partial monosomy 13q syndrome appears to affect women slightly more than men. Although rare, deletion of the long arm of chromosome 13 occurs as a monosomy. Since the diagnosis of the disorder in 1963, more than 125 cases have been recorded in the medical literature [5,6].

Diagnosis of Partial Monosomy 13q Syndrome

In some cases, partial monosomy 13q syndrome may be diagnosed before birth (fetal) with specialized tests such as ultrasound, amniocentesis, or placental villus sampling (CVS). Ultrasound studies may show specific findings that indicate a chromosomal disorder or other developmental abnormalities in the fetus. During amniocentesis, a sample of the fluid that surrounds the developing fetus is removed and studied. During placental villi sampling, a tissue sample is removed from part of the placenta. Chromosomal studies performed on this fluid or tissue sample may indicate a partial monosomy of the long arm of chromosome 13 [7].

A diagnosis of partial monosomy 13q syndrome may be confirmed after birth (postnatally) based on a thorough clinical evaluation, specific physical findings, chromosomal studies, and in some cases, a specialized enzyme test (assay). According to the medical literature, if people with mental disorders, developmental delay or retinoblastoma show associated skull and face or finger abnormalities, the diagnosis of partial monosomy 13q syndrome should be considered. In some cases, people with retinoblastoma may have reduced activity of a specific enzyme (esterase D) due to a deletion at band q14 on chromosome 13, and researchers have found that the retinoblastoma and esterase D genes are very close together (proximal) in Chromosome band 13q 14 (eg, the retinoblastoma gene is located at 13q 14.1-13q 14.2, while the D-esterase gene is located at 13q 14.11). Therefore, both genes may be deleted in some individuals with partial monosomy

13q syndrome. Consequently, an enzyme study (assay) that measures D-esterase levels may be performed as a screening test in individuals diagnosed with partial monosomy 13q syndrome to help predict the possible development of retinoblastoma. If such a test shows an abnormal level of D-esterase enzyme, the patient should be carefully and regularly monitored for the possibility of tumor growth [7].

Retinoblastoma may be diagnosed based on specific clinical findings and specialized imaging tests. The most common symptoms of retinoblastoma are the appearance of a whitish mass in the pupil area behind the lens of the eye (leukocoria or "cat's eye reflex") and abnormal deviation of the eye (strabismus). Specialized imaging tests used to confirm retinoblastoma or to characterize the tumor may include regular X-ray studies, using a special tool to examine the interior of the eye, computed tomography (CT), magnetic resonance imaging (MRI), or ultrasound. During an MRI, a magnetic field and radio waves are used to create cross-sectional images of the eye. During a CT scan, a computer and X-rays are used to create a film that shows cross-sectional images of the eye's tissue structure. In ultrasound, reflected sound waves are used to create images. Additional specialized tests may also be performed to further characterize the nature of the malignancy and help determine appropriate and potential treatments [7].

The diagnosis of some congenital heart defects (for example, atrial or ventricular septal defects) that occur in association with partial monosomy 13q syndrome may be confirmed by a careful clinical examination and specialized tests that allow doctors to determine the structure and function of the heart. Assess the heart. These tests may include X-ray studies, electrocardiogram (EKG), echocardiogram, and cardiac catheterization. X-ray studies may show abnormal enlargement of the heart (cardiomegaly) or malformations of other heart structures. An EKG, which records the heart's electrical impulses, may show abnormal electrical patterns. During an echocardiogram, ultrasound waves are directed at the heart, enabling doctors to study the heart's function and movement. During cardiac catheterization, a small hollow tube (catheter) is inserted into a large vessel and passed through the blood vessels leading to the heart. This method allows doctors to determine the amount of blood flow through the heart, to measure the pressure inside the heart or to detect anatomical abnormalities [8].

Hirschsprung's disease may be diagnosed with a barium enema, a procedure in which a special contrast material is injected into the rectum, and then X-rays are taken of the area. Microscopic examination of a small sample of tissue removed from the mucous membranes of the rectum (biopsy) may confirm the absence of nerve fibers (ganglions) [8]. Specialized imaging studies or additional tests may be used to detect other eye abnormalities. Some abnormalities of the reproductive system, skeleton, kidney (renal) or brain; or additional physical abnormalities potentially associated with partial monosomy 13q syndrome [9].

Therapeutic Pathways for Partial Monosomy 13q Syndrome

Treatment of partial monosomy 13q syndrome is directed toward specific symptoms that are specific to each individual. Treatment may require the coordinated effort of a team of specialists. including pediatricians, surgeons, ophthalmologists, doctors who treat malignancy (oncologists), radiologists, cardiologists, neurologists, doctors specializing in the diagnosis and treatment of skeletal abnormalities (orthopedics) or other health care professionals Health workers may need regular and comprehensive planning for the treatment of patients [1,2,9]. In some cases, treatment may include surgical repair of certain abnormalities. For example, surgery may be performed to correct certain abnormalities of the skull, face, eyes, genitals, skeleton, heart, or other abnormalities that may be associated with the disorder. The surgical procedures performed depend on the severity of the physical abnormalities and the symptoms associated with them [9].

In children with retinoblastoma, the treatments used may depend on the effect of one or both eyes and the possibility of preserving or restoring vision. If one eye is affected (unilateral retinoblastoma), the eye may be surgically removed along with part of the optic nerve. Radiation therapy or chemotherapy may be performed. If the tumor is very small, radiation alone may be used in some cases. If both eyes are involved (bilateral retinoblastoma), the affected eye may be surgically removed while the other eye is treated with antibiotics, radiation therapy, chemotherapy, and a procedure that uses extreme cold to destroy the tissue (cryotherapy) or another method that uses intense, focused light (eg, laser therapy) to heat and destroy tissue (photocoagulation). Corrective lenses or other measures may be used to help improve vision after retinoblastoma treatment [10].

In some cases, children with partial monosomy 13q syndrome may have vision problems caused by additional eye abnormalities (eg, coloboma, microphthalmia, cataracts). Corrective glasses, contact lenses, surgery, or other procedures may also be used in such cases to help improve vision abnormalities [10]. In children with craniosynostosis and trigonocephaly, surgery may be performed to correct premature closure of the skull bones. In people with hydrocephalus, shunts may be implanted to drain excess cerebrospinal fluid from the brain and reduce pressure [10].

In many cases, atrial or ventricular septal defects may be corrected with surgery. Before surgery, medical management may include treating symptoms related to congestive heart failure. Medicines such as digoxin may help prevent irregular heartbeats and heart beats that are too fast (tachycardia). Dietary salt restriction, medications that help eliminate excess body fluids (diuretics), or bed rest may also be effective treatments for congestive heart

failure. In some cases, surgery may not be indicated for infants with small ventricular septal defects that may close on their own or become less functional as the child matures and grows. Conservative treatment may include close monitoring of symptoms and cardiac function [10]. Additionally, nutritional considerations may be important in infants with atrial or ventricular defects. Respiratory infections should be treated aggressively and promptly. Because of the risk of bacterial infection of the lining of the heart (endocarditis) and heart valves, people with atrial or ventricular septal defects may be prescribed antibiotics before any surgery, including dental procedures such as tooth extractions [10].

In people with partial monosomy 13q syndrome who also manifest Hirschsprung disease, the condition may often be surgically corrected in early childhood. Other treatments for partial monosomy 13q syndrome are symptomatic and supportive. A team approach may be helpful to ensure affected individuals reach their maximum potential. Such a team approach may include specific therapeutic training, physical therapy, and other medical, social, or occupational services. Genetic counselling will also be helpful for families of children with partial monosomy 13q syndrome. Chromosomal studies are needed to determine whether a chromosomal rearrangement is present in one parent [10].

Discussion and Conclusion

Most children with atrial valve disease do not have any symptoms. However, in some cases, accompanying symptoms may include abnormal weight loss, mild growth retardation, and increased susceptibility to frequent respiratory infections. In rare cases, severely affected children may experience shortness of breath, extreme fatigue with exercise, or irregular heartbeats (arrhythmias) [1-10].

Ventricular septal defect is characterized by an abnormal opening in the fibrous partition separating the two ventricles (ventricular septum). The size and location of the defect determines the severity of the symptoms. A small ventricular septal defect may close on its own (spontaneous) or become less functional as the child matures and grows. A moderate-sized defect may affect the heart's ability to pump blood effectively to the lungs and the rest of the body (congestive heart failure). Symptoms associated with heart failure may include abnormal breathing rate (tachypnea), chest tightness, abnormally fast heart rate (tachycardia), abnormally enlarged liver (hepatomegaly), or failure to thrive. A large ventricular septal defect can cause life-threatening complications in infancy. A persistent increase in pressure within the artery that carries blood from the heart to the lungs (pulmonary artery) can cause permanent damage to the lungs [1-10].

As mentioned above, babies with trigonocephaly may have abnormal forebrain development (holoprosencephaly). In some cases of partial monosomy 13q syndrome, additional brain abnormalities may occur, such as the absence (agenesis) of certain parts of the brain (for example, the rhinencephalon or the corpus callosum), protrusion of the membranes surrounding the brain (meninges) through an abnormal opening. Skull (meningocele) or abnormal accumulation of cerebrospinal fluid in the skull, causing increased pressure on the brain (hydrocephalus) [1-10].

In addition, some people with partial monosomy 13q syndrome may also have Hirschsprung's disease, a disorder in which the absence of nerve fibers (ganglions) in the muscle wall of the colon prevents the muscles from working to push out waste (feces). It prevents through the lower digestive tract. (Peristalsis). As a result, stool accumulates abnormally in the large intestine, causing enlargement (dilation) of the large intestine (megacolon), diarrhea, constipation, abdominal distension, nausea, vomiting, or loss of appetite (anorexia). will be in rare cases, some people with partial monosomy 13q syndrome may also show kidney (kidney) abnormalities. These may include insufficient growth (hypoplasia) or absence (agenesis) of the kidney [1-10].

Symptoms of the following disorders can resemble those of partial monosomy 13q syndrome. Comparison may be useful for differential diagnosis of this syndrome:

Cytochromosome 13 is a rare chromosomal disorder in which chromosome 13 is broken at both ends (ie, the ends of the long arm [13q] and the short arm [13p]). The chromosomal ends then join together to form a ring. Affected babies often have low birth weight, lack of growth, psychomotor retardation, or intellectual disability. In addition, they may have certain abnormalities in the head and face (craniofacial) area, such as an abnormally small head size (microcephaly), a flattened nasal bridge, a prominent upper jaw (maxilla), prominent front teeth (incisors), big ears, low adjustment or other abnormalities of the skull and face. In some cases, affected individuals may also show abnormalities in the eyes, which may include retinoblastoma in some cases, male genital tract abnormalities, Triangular head or brain malformations, skeletal malformations, congenital heart defects or additional physical malformations. Most cases of circular chromosome 13 appear to be due to a spontaneous genetic change (mutation) early in fetal development that occurs for unknown reasons (sporadic) [1-10].

C syndrome is a very rare disorder characterized by premature closure of the fibrous joints between certain bones of the skull (craniosynostosis) with a "triangular" head with an abnormally prominent forehead (trigonocephaly). Additional abnormalities in the head and face (skull and face) may be present, such as a short nose with a wide nasal bridge, vertical folds on the inner corners of the eyes (epicanthus); a deep groove in the roof of the mouth (cleft palate); Or messy and poorly adjusted ears. Additional physical abnormalities may include squinting (strabismus), joints that are dislocated or fixed in a permanently bent position (joint

contractures), or additional skeletal abnormalities. In some cases, affected individuals may exhibit genital abnormalities, congenital heart defects, or other physical abnormalities. There is also mental retardation. C syndrome is thought to be inherited as an autosomal recessive genetic trait [1-10].

Many other chromosomal disorders have similar features to partial monosomy 13q syndrome. The only way to determine which chromosomal disorder a person has is through chromosomal testing [1-10].

Treatment of partial monosomy 13q syndrome is directed toward specific symptoms that are specific to each individual. In some cases, children with partial monosomy 13q syndrome may have vision problems caused by additional eye abnormalities (eg, coloboma, microphthalmia, cataracts). Corrective glasses, contact lenses, surgery, or other procedures may also be used in such cases to help improve vision abnormalities. In people with partial monosomy 13q syndrome who also manifest Hirschsprung disease, the condition may often be surgically corrected in early childhood. Other treatments for partial monosomy 13q syndrome are symptomatic and supportive [1-10].

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