The Peculiarities Of Hunter Syndrome Disorder

Abstract

There are genetic disorders that affect or disrupts the metabolism. These disorders are called inborn error of metabolisms. Most of the errors are due to difficulty or lack of enzyme that break down substrates. A substrate is the substance at which an enzyme act upon. The enzyme iduronate 2-sulfatse is what breaks down the sugar molecule called glycosaminoglycans or GAGs lacks in someone that has Hunter syndrome. Mucopolysaccharidosis Type 2, also known as Hunter syndrome is a rare progressive genetic disorder that affects mostly males. A child that has Hunter syndrome appears to be healthy at birth but throughout early life, symptoms will progress or develop in multiple organs systems. Symptoms such as re-occurring ear infection, enlarged liver and spleen can be seen early on. A severe form of this disorder may exhibit intellectual deterioration, and death occurs by the age 15 in most cases.

Hunter Syndrome

Hunter syndrome is a rare metabolic disorder that are seen mostly in males. This disorder is an X-linked disorder, hence affecting mostly males. Females can compensate due to having another X chromosome. On a cellular level, there is an accumulation of the glycosaminoglycans dermatan and heparin sulfate due to the deficiency in lysosomal enzyme called Iduronate-2-sulfatase or I2S. The buildup leads to permanent and progressive damage that can affect many body systems starting with appearance, organ functions, physical abilities and mental and cognitive development. Hunter syndrome has a variety of symptoms that exhibits in an assortment of severity. These symptoms can be managed and treated with various treatments such as enzyme replacement therapies and other ways to improve function. Also, there is no cure known cure for Hunter syndrome.

Hunter syndrome is a rare and inherited disorder. The risk of inheriting Hunter syndrome increases for each family member that has the disorder. According to Cleveland Clinic (2019), Hunter syndrome is passed down from the mother to the child in a gene mutation or abnormality. The body does not produce enough of Iduronate-2-sulfatase that is responsible for breaking down complex sugars the body produces. The person with Hunter syndrome does not produce enough if any at all the enzyme that leads to the molecules of sugar to buildup. The child with Hunter syndrome can exhibit normal growth up to 5 years of age and at which point the growth and development declines and slow down. Children that are born with this disorder does not exhibit signs early, but “between ages 2 and 4, they develop full lips, large rounded cheeks, a broad nose, and an enlarged tongue. The vocal cords also enlarge, which results in a deep, hoarse voice. Narrowing of the airway causes frequent upper respiratory infections and short pauses in breathing during sleep.” (Genetics Home Reference, 2008). Another sign that is evident with someone that has Hunter syndrome is that they are short in stature and significant impairment in mobility. Additionally, individuals with this disorder have distinguishing features such as a prominent forehead, a nose with flattened bridge and large abdomen.

Genetic testing concluded that the age of onset and severity can vary in the affected individuals. Progressive cognitive deterioration, airway impairments, and cardiac diseases can result in the

death within the first 20 years of life. The accumulation of GAGs on organ systems can be progressive parallel to the rate of the cognitive decline simultaneously. Clinical signs of Hunter syndrome include frequent ear and respiratory infections, inguinal hernia, short stature, behavioral problems, sleep apnea and facial dysmorphisms are common. These signs assist on early diagnosis of Hunter syndrome. According to Cleveland Clinic (2019), doctors uses several tests to diagnose this disorder. One way this is tested is using a urine test where the individual is checked for sugar levels in the urine. Unusually high levels of sugar molecules may indicate the possibility of Hunter syndrome. Blood tests can show low or absent levels of enzyme activity, which is also a sign of the disorder.

Additionally, evaluations follow the diagnosis of Hunter syndrome. There are many recommended tests and procedures to be done to assess the degree of the disorder. The test includes echocardiogram, to graphically assess the hearts movements as the ultrasound sends high frequency sound waves that evaluates the pumping of the heart. Another test is the pulmonary function testing, however “pulmonary function testing can be quite challenging in younger individuals and may be impossible for individuals with significant CNS involvement since it requires their full cooperation and is effort dependent.” (Scarpa, 2018). Sleep study is also conducted when sleep apnea is a major concern. Other tests include; audiologic evaluation, nerve conduction velocity and nerve ultrasound examination for carpal tunnel syndrome, MRI of the head and assessments for hydrocephalus and spinal cord compressions. Additional evaluations include ophthalmologic evaluation, and developmental assessments. These evaluations are due to the complications centered in the major organs including the lungs, heart, joints, central nervous systems and the connective tissues.

Respiratory issues start with the individual having an enlarged tongue, thickened gums and nasal passages that makes the process of breathing more difficult. This leads to having interrupted sleep due to ineffective breathing pattern. The presence of these abnormalities leads to developing sleep apnea. Individuals with Hunter syndrome also exhibit re-occurring ear infections and infections ranging from sinus, respiratory infections and pneumonia.

Cardiac complications for someone that has Hunter syndrome is due to the thickening of heart tissues that leads to the impairment of heart valve functions. These functions are due to the irregular closing of heart valves that leads to certain body organs not receiving blood properly. Individuals with this disorder also exhibits high blood pressure due to the narrowing of the aorta and other blood vessels. This can also lead to the narrowing of arteries in the lungs making it difficult for oxygen to be distributed. The irregularity in the cardiac region can result to heart failure as the condition worsens.

The skeletal system has abnormalities that causes the individual to be short in stature and other cases that may reach close to normal height. Individuals that are affected with this disorder have other abnormalities that can progress to having an unusually shaped vertebrae, spines pelvises. These irregularities can also manifest in irregularly shaped legs, arms and fingers. Other disorder like carpal tunnel syndrome can result from bone deformities and buildup of sugar molecules in the tissues. Carpal tunnel syndrome can result in nerve compression that causes pain, numbness, and tingling in the hand and arm.

The central nervous system complications progress and continue to develop in individuals with Hunter syndrome. Due to the buildup of fluids in the individuals’ brain, pressure can lead to headaches, cognitive impairment, and can even hinder vision. The individual with this disorder

may develop a condition in the spinal cord that leaves the membrane surrounding it thickened and scarred. This may lead to excess pressure on the upper spinal cord. This can lead to the individual to be fatigued and may become less active. A child with Hunter syndrome “also experiences a decline in intellectual function and a more rapid disease progression. Individuals with the severe form begin to lose basic functional skills between the ages of 6 and 8.” (Genetics Home Reference, 2008).

Connective tissue problems manifests due to sugar molecules accumulating in the tissues that affect the joins and ligaments. Swelling of the joints and abnormalities in cartilage and bones causes the joint to stiffen. This can lead to pain and difficulty in mobility. Another complication are hernias. Hernias occurs when soft tissue usually part of the intestine, pokes through a weak spot or tear in the lower abdominal wall. In cases with Hunters syndrome, the individual can develop hernias that are large. This may also be caused by internal pressure caused by the enlargement of the liver and spleen.

Management of Hunter syndrome ranges from therapy to medical procedures and surgery. Treatment can include “developmental, occupational, and physical therapy; shunting for hydrocephalus; tonsillectomy and adenoidectomy; positive pressure ventilation; carpal tunnel release; cardiac valve replacement; inguinal hernia repair; hip replacement.” (Scarpa, 2018). To manage symptoms of respiratory complications, removal of tonsils and adenoids can assist in the opening of the airway and possibly alleviate sleep apnea. Another way to assist with sleep apnea, is the use of breathing devices such as the CPAP machine. It is also important to keep a strict bedtime schedule in a safe environment with soft pillows and padding on the walls to promote rest and safety.

Treatments for individuals with Hunter syndrome can include therapy that allows the improvement of mobility by alleviating stiffness and promoting joint function. Adaptive equipment such as wheelchairs are also used for individuals experiencing pain and limited join motion and mobility. Hernias can be repaired through surgery but is often repeated due to the impairments in connective tissues. Another way hernia is managed is by having supportive truss. A supportive truss is an undergarment that prevents the protrusion of tissue and promotes comfort. Most of the therapies are dependent on the individual’s symptoms. According to Cleveland Clinic (2019), the treatment shown to do tis best is enzyme replacement therapy. Doctors replace the missing enzyme with a human made version of the enzyme. This enzyme replacement is given intravenously once a week since, “an enzyme replacement therapy, Idursulfase (Elaprase), was approved in 2006 by the U.S. Food and Drug Administration as a treatment for MPS II.” (National Organization for Rare Disorder, 2019).

Early treatment of Hunter syndrome can prevent permanent organ and tissue damage. Individuals with the disorder may have to adapt and adjust their daily activities according to the progression of the symptoms. Provide the child with a safe home environment to assist in managing the individual’s behaviors. There are other emerging treatments such as stem cell transplant that infuses the healthy blood stem cells into the persons body to promote new cell development with the potential to create the lacking enzyme. Another emerging treatment is gene therapy where the individual will have the chromosome replaced to cure Hunter syndrome, but much research is to be done for this therapy to be available.

The prevalence of this disorder is rare, and groups are available for those that are affected by this disorder. Regular supervision may be required for the child in day to day activities and many

of the body systems affected may require the individual and the family to visit primary doctors, specialists and other therapists at a regular basis. The early recognition of the signs and symptoms of Hunter syndrome can benefit the individual by getting treatment early on to manage symptoms and promote comfort.

References

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