A Treatment for the Number One Genetic Cause of Infant Mortality

By Meghan Goddard

After years of research, Boston Children’s Hospital has been FDA approved for a medication to help improve and extend the lives of children with Spinal Muscular Atrophy (SMA). SMA is the number 1 cause of infant mortality from a genetic disorder. Boston Children’s Hospital is known for their incredible care and research. For the past three years it has been ranked as number one for best children’s hospital in the nation by *U.S. News & World*. The hospital has the largest research program for a pediatric institution and has spent the last thirteen years researching SMA. Dr. Basil Darras, is the SMA Program Director and a pediatric neurologist at Boston Children’s Hospital. The improvements are phenomenal, where children who would never have been able to lift their arms or hold up their heads can finally do so.

Spinal muscular atrophy is a very rare genetic condition. There are three types of SMA, all of which result in weakened muscles. Type 1 is the most severe form with almost no independent movement, including breathing and feeding difficulties. This disorder is often referred to as Werding-Hoffmann disease and symptoms occur just months after birth. Type 1 SMA patients typically do not live past age two. Children with Type 2 cannot walk, but can sit independently and symptoms occur between 6 to 18 months old. They can have a typical life expectancy. Type 3 is often known as Kugelberg-Welander disease and is a much milder form. Symptoms appear around 18 months and have a typical life span. Walking for children with type 3 is a possibility, but may be difficult or in need of assistance. This type often resembles muscular dystrophy (Boston Children’s Hospital).

The newly approved medication is called Nusinersen. It has shown an increase in survival of the motor neurons that die off in SMA, located in spinal cord and brainstem. The result is a lack of muscle control in children, controlled by a mutation in the SMN1 gene. We have another gene, SMN2, which is essentially a backup for SMN1 and can also produce the SMN protein. However, the SMN2 gene is normally spliced out as an exon, generating a nonfunctional protein. Nusinersen works to make this SMN2 gene functional. It does this by targeting SMN2’s mRNA. This prevents the exon from being spliced out. Therefore, patients can generate functional and full-length SMN protein via SMN2 gene (Boston Children’s Hospital).

Clinical trials began in 2011. They worked with infants with SMA type 1, phase 3 through a control and experimental group, who were given Nusinersen. The drug was injected into the spinal canal via a lumbar puncture. Forty percent of the experimental babies had improved motor skills. This included showing head control, sitting and standing, and some even walking with help, a huge advance for SMA babies. A second trial was done in which children, age two to twelve with type 2 SMA, received the drug. The patients had to already be able to sit alone, but unable to walk independently. These patients, too, had improved motor function. These studies were named ENDEAR and CHERISH, respectively. They have an SMA Natural History Study, where for 12 years they have followed SMA types 1 through 3 children regularly. This also serves as a control to compare children with SM A(Boston Children’s Hospital).

Before this approval, the treatment for spinal muscular atrophy consisted of just maintaining symptoms, preventing and dealing with complications. The drug will be marketed under the name SpinrazaTM by Biogen, approved by FDA in December of 2016. It is approved for all forms of spinal muscular atrophy (Boston Children’s Hospital). This is a huge advancement in the medical world, especially neurology and something that is exciting and should be discussed. I have had the honor of being in a study with Dr. Darras. His passion and the work he is doing is incredible. Some issues with this new drug is its cost. With different insurance companies approving it or not, this could lead to many ethical issues. The question comes down to who gets the drug? The baby who is just starting their life and could prevent the effects of SMA, or a ten year old who will soon be in a wheel chair and has been struggling all their life? Will it come down to denying patients whose insurance can’t cover it? Although these are things to think about and issues the medical world has to face, this is still an amazing feat that should be celebrated.

2013, Boston Childrens Hospital. "Spinal Muscular Atrophy (SMA) Program | Research and Innovation." Boston Childrens Hospital. N.p., 2016. Web. 07 Mar. 2017.

2013, Boston Childrens Hospital. "Spinal Muscular Atrophy (SMA) in Children." Boston Childrens Hospital. N.p., 2016. Web. 07 Mar. 2017.