Advancements in the treatment of pediatric spinal muscular atrophy.

Thomas Turner*

Department of Cellular and Molecular Medicine, University of Ottawa, Canada

Introduction

Spinal muscular atrophy (SMA) is a genetic disorder characterized by the progressive loss of motor neurons, leading to muscle weakness and atrophy. It primarily affects children and is one of the leading genetic causes of infant mortality. Recent advancements in the treatment of SMA have significantly improved the prognosis for affected children. These advancements include novel drug therapies, gene therapy, and supportive care strategies. This article explores the latest breakthroughs in SMA treatment and their impact on pediatric care [1].

SMA is caused by mutations in the SMN1 (survival motor neuron 1) gene, which encodes the SMN protein essential for the survival of motor neurons. The severity of SMA varies depending on the amount of functional SMN protein, which is influenced by the presence of the SMN2 gene. Although SMN2 also produces the SMN protein, it does so inefficiently due to a splicing error. The number of SMN2 copies can partially compensate for the lack of SMN1, influencing disease severity [2].

SMA is classified into four main types based on the age of onset and severity: SMA Type 1 (Werdnig-Hoffmann disease): The most severe form, with onset before six months of age. Without treatment, children with SMA Type 1 typically do not survive beyond early childhood. SMA Type 2: Onset between six and 18 months. Children can sit but not walk unaided and have a reduced lifespan. SMA Type 3 (Kugelberg-Welander disease): Onset after 18 months, with children able to walk initially but often losing this ability over time. SMA Type 4: Adult-onset form, generally less severe [3].

Risdiplam (Evrysdi): Risdiplam is an oral small molecule that also promotes the production of functional SMN protein by modifying SMN2 splicing. Approved for patients of all ages with SMA, Risdiplam offers a convenient administration route and has demonstrated significant improvements in motor function and survival in clinical trials [4].

Gene Replacement Therapy: Onasemnogene Abeparvovec is the most prominent example of gene replacement therapy for SMA. Its success has paved the way for further research into gene therapies that can provide long-lasting benefits from a single treatment. Ongoing studies are exploring the optimal timing, dosage, and long-term effects of gene therapy in SMA patients [5].

SMN2 Splicing Modulators: Besides Nusinersen and Risdiplam, other splicing modulators are being developed to increase SMN protein production. These include oral compounds and other antisense oligonucleotides designed to enhance the efficiency of SMN2 splicing correction. Stem Cell Therapy: Research into stem cell therapy aims to replace lost motor neurons and restore muscle function. While still in experimental stages, stem cell therapy holds promise for treating SMA by regenerating damaged tissue and improving motor function [6].

Nutritional Support: Nutritional management is critical to ensure adequate growth and prevent malnutrition. Children with SMA may have difficulty swallowing and require specialized feeding strategies or gastrostomy tubes. Physical and Occupational Therapy: Regular physical and occupational therapy help maintain muscle strength, flexibility, and function. Assistive devices, orthotics, and mobility aids can enhance independence and quality of life [7].

Surgical Interventions: Orthopedic surgery may be necessary to address complications such as scoliosis and joint contractures. Early intervention and regular monitoring can prevent or mitigate these issues. Despite these significant advancements, ongoing research is essential to further improve outcomes for children with SMA. Areas of focus include: Optimization of Current Therapies: Research aims to determine the best timing, dosage, and combination of existing therapies to maximize benefits and minimize side effects [8].

Development of New Treatments: New drug candidates and gene therapies are being explored to target different aspects of SMA pathology, including muscle regeneration and neuroprotection. Long-Term Outcomes: Long-term follow-up studies are needed to understand the durability of treatment effects and the natural history of SMA in the context of these new therapies [9].

Access and Equity: Efforts are ongoing to ensure that all patients, regardless of geographic location or socioeconomic status, have access to these life-changing treatments. This includes addressing the high costs of therapies and improving healthcare infrastructure globally [10].

Conclusion

Advancements in the treatment of pediatric spinal muscular atrophy have transformed what was once a devastating diagnosis into a manageable condition with significantly improved outcomes. The development of disease-modifying therapies such as Nusinersen, Zolgensma, and Risdiplam

***Correspondence to:** Thomas Turner, Department of Cellular and Molecular Medicine, University of Ottawa, Canada. E-mail: turner@ou.CN.com

***Received:** 27-Apr-2024, Manuscript No. JNNR-24-137851; **Editor assigned:** 27-Apr-2024, Pre QC No. JNNR-24-137851(PQ); **Reviewed:** 13-May-2024, QC No. JNNR-24-137851; **Revised:** 17-May-2024, Manuscript No. JNNR-24-137851(R); **Published:** 24-May-2024, DOI: 10.35841/aajnnr-9.3.208*

***Citation:** Turner T. Advancements in the Treatment of Pediatric Spinal Muscular Atrophy. J Neurol Neurorehab Res.2024;9(3):208*

has revolutionized the standard of care, offering hope and a better quality of life for affected children and their families. As research continues to advance, further innovations are expected to enhance our understanding and treatment of SMA, ultimately striving for a cure and the best possible outcomes for all patients.

References

1. Deguise MO, Chehade L, Kothary R. Metabolic dysfunction in spinal muscular atrophy. Int J Mol Sci. 2021;22(11):5913.
2. Mercuri E, Pera MC, Scoto M, et al. Spinal muscular atrophy—insights and challenges in the treatment era. Nat Rev Neurol. 2020;16(12):706-15.
3. Coratti G, Ricci M, Capasso A, et al. Prevalence of spinal muscular atrophy in the era of disease-modifying therapies: an Italian Nationwide Survey. Neurology. 2023;100(11):522-8.
4. Davidson JE, Farrar MA. The changing therapeutic landscape of spinal muscular atrophy. Aust J Gen Pract. 2022;51(1/2):38-42.
5. Farrar MA, Kiernan MC. The genetics of spinal muscular atrophy: progress and challenges. Neurotherapeutics. 2015;12(2):290-302.
6. Herman I, Lopez MA, Marafi D, et al. Clinical exome sequencing in the diagnosis of pediatric neuromuscular disease. Muscle Nerve. 2021;63(3):304-10.
7. Tizzano EF, Zafeiriou D. Prenatal aspects in spinal muscular atrophy: From early detection to early presymptomatic intervention. Eur J Paediatr Neurol. 2018;22(6):944-50.
8. Singh NN, Lee BM, DiDonato CJ, et al. Mechanistic principles of antisense targets for the treatment of spinal muscular atrophy. Future Med Chem. 2015;7(13):1793-808.
9. Singh P, Liew WK, Darras BT. Current advances in drug development in spinal muscular atrophy. Curr Opin Pediatr. 2013;25(6):682-8.
10. Ebert AD, Svendsen CN. Stem cell model of spinal muscular atrophy. Arch Neurol. 2010;67(6):665-9.

Citation: *Turner T. Advancements in the Treatment of Pediatric Spinal Muscular Atrophy. J Neurol Neurorehab Res.2024;9(3):208*