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Case Presentation
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Airplane Vestibular Repositioning Maneuver (AVRM): A Pediatric Adaptation of the Foster Half-Somersault Maneuver - A Case Report

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Abstract

Background: Children with histories of extreme prematurity and congenital hypotonia often present with delayed motor development and gait instability. Positional vestibular dysfunction may be underrecognized in this population, and standard canalith repositioning maneuvers are frequently not feasible for toddlers.

Case Presentation: This case report describes a 3-year-old child born at 23 weeks gestation with congenital hypotonia and delayed motor milestones who demonstrated limited independent standing and ambulation. Prior to intervention, the child was unable to walk more than approximately 10 feet without assistance.

Intervention: A therapist-assisted pediatric modification of the Foster Half-Somersault maneuver, termed the Airplane Vestibular Repositioning Maneuver (AVRM), was performed. The child was supported in an airplane position while guided head and trunk movements analogous to the Foster maneuver were completed over a padded mat.

Outcomes: Immediately following the intervention and at one-week follow-up, the child demonstrated clinically meaningful improvements in postural control and mobility, including increased unsupported standing time and independent walking distance.

Conclusion: This case suggests that a therapist-supported pediatric adaptation of the Foster Half-Somersault maneuver may be a feasible and well-tolerated option for young children who are unable to perform traditional positional maneuvers. Further systematic investigation is warranted.

Keywords: Foster Half-Somersault Maneuver; Benign Paroxysmal Positional Vertigo (BPPV); Airplane Vestibular Repositioning Maneuver (AVRM); Canalith Repositioning; Epley Maneuver; Semont Maneuver; Vestibular Rehabilitation

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Introduction

Benign paroxysmal positional vertigo (BPPV) is well described in adults but is less commonly recognized and diagnosed in young children, particularly those with complex developmental histories. Children born extremely prematurely and those with congenital hypotonia frequently exhibit delayed postural control, balance deficits, and gait instability, which may obscure underlying vestibular contributions to functional limitations. Standard canalith repositioning maneuvers, such as the Epley or Foster Half-Somersault maneuver, typically require independent motor control, comprehension of verbal instructions, and tolerance of positional changes, making them difficult to implement in toddlers.

The purpose of this case report is to describe a therapist-assisted pediatric adaptation of the Foster Half-Somersault maneuver, referred to as the Airplane Vestibular Repositioning Maneuver (AVRM), and to report associated short-term functional outcomes in a young child with hypotonia and delayed motor development.

Case Presentation

The patient was a 3-year-old child with a medical history significant for extreme prematurity (born at 23 weeks gestation), congenital hypotonia, and delayed gross motor milestones. Prior to intervention, the child demonstrated limited postural stability, was able to stand independently for approximately 5–6 seconds, and ambulated no more than 10 feet without physical assistance.

Figure 1: Sequence of the Airplane Vestibular Repositioning Maneuver (AVRM). Illustrations created for this report based on the authors' original design.

Right side

Airplane hold:

- The clinician supported the child with one hand under the chest (ventral side) and one hand over the lower back.
- Child looked up towards the ceiling for 15 sec.

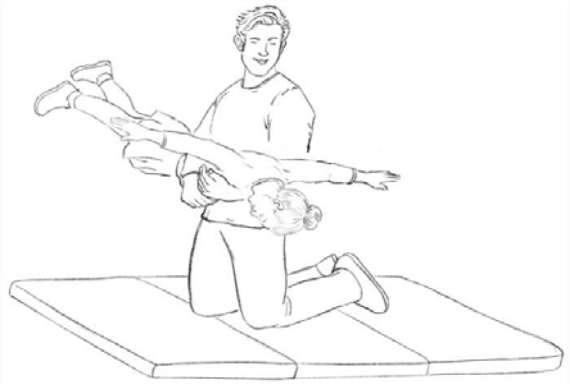

Figure 2: Sequence of the Airplane Vestibular Repositioning Maneuver (AVRM). Illustrations created for this report based on the authors' original design.

Downward tilt:

- The child's head and upper body were gently tilted downward to **~45°** below horizontal.
- Child's head pointing downwards, chin tucked in for 15 sec.
- Then explained to look to right side.

Figure 3: Sequence of the Airplane Vestibular Repositioning Maneuver (AVRM). Illustrations created for this report based on the authors' original design.

Head rotation and Leveling:

- The child's body was brought to a stable horizontal position while maintaining head control and rotated to the right side for 15 secs.
- The clinician maintained full support of the child, while the caregiver remained positioned adjacent to the child to provide reassurance and assist with maintaining the child's side view orientation.

Figure 4: Sequence of the Airplane Vestibular Repositioning Maneuver (AVRM). Illustrations created for this report based on the authors' original design.

Return to upright:

- The child was slowly raised to an upright position with controlled head extension, mirroring the final step of the Foster Somersault maneuver.

The maneuver was completed on both sides sequentially to address potential canalith involvement bilaterally. The child remained **calm, cooperative, and without distress** throughout the procedure.

Caregiver reports noted frequent loss of balance and hesitation during transitions. No formal vestibular diagnosis had been established.

Intervention: Airplane Vestibular Repositioning Maneuver (AVRM)

The Airplane Vestibular Repositioning Maneuver is a therapist-assisted pediatric modification of the Foster Half-Somersault maneuver originally described by Carol Foster, MD. This adaptation was designed for young children who are unable to independently perform the maneuver due to fear, limited motor control, or developmental delay.

During the intervention, the therapist supported the child in an airplane position, using one hand under the chest and the other over the lower back to maintain trunk stability and controlled movement. The child was verbally and visually guided to lift the head and look upward, after which the therapist gently tilted the torso into a tucked, somersault-like head-down position. While inverted, the child's head was guided approximately 45 degrees to the right and then gradually lifted to a level, back-parallel position. The maneuver concluded with the child being returned to upright standing with continued therapist support. Each position was held for approximately 15 seconds, and the sequence was then repeated on the opposite side. A caregiver assisted by providing verbal cues to help maintain the child's side-view orientation during each position. A padded mat was positioned beneath the child throughout the intervention to enhance safety.

Safety Screening and Precautions

Prior to intervention, the child was screened for cervical spine precautions and cardiopulmonary stability and was deemed medically appropriate for therapist-assisted positional vestibular treatment. The patient was monitored continuously during the maneuver, with predefined stop criteria including distress, vomiting, or oxygen desaturation; no adverse events occurred.

Diagnostic Limitations

Formal positional nystagmus testing was not performed due to the patient's age and limited tolerance for standard diagnostic procedures. Accordingly, clinical reasoning was based on observational findings and functional response to intervention rather than instrumented assessment. As a result, benign paroxysmal positional vertigo cannot be definitively confirmed in this age group.

Outcomes

Immediately following the intervention, the child demonstrated improved postural stability, increasing unsupported standing duration to approximately 30 seconds and independent ambulation to approximately 30 feet. At one-week follow-up, further functional gains were observed, including unsupported standing for up to one minute and independent ambulation of approximately 50 feet without assistance.

Discussion

This case describes the application of a therapist-assisted pediatric adaptation of the Foster Half-Somersault maneuver in a young child with extreme prematurity, congenital hypotonia, and delayed motor development. The Airplane Vestibular Repositioning Maneuver was well tolerated and temporally associated with immediate and short-term functional improvements in standing balance and gait.

The AVRM was developed to preserve the biomechanical head positioning intent of the original Foster maneuver while accommodating developmental, emotional, and safety considerations unique to young children. Therapist-supported positioning allowed controlled head and trunk movements while reducing fear and ensuring safety. Immediate improvements may have been influenced by nonspecific factors such as increased arousal, attention, or postural facilitation in addition to vestibular effects.

This case also highlights the possibility that positional vestibular dysfunction may be underrecognized in children with complex developmental histories and may contribute to gait instability and delayed mobility.

Conclusion

A therapist-assisted pediatric adaptation of the Foster Half-Somersault maneuver was applied safely in a 3-year-old child with extreme prematurity, hypotonia, and delayed motor milestones. The Airplane Vestibular Repositioning Maneuver was well tolerated and associated with clinically meaningful improvements in standing balance and independent ambulation. This technique may represent a feasible therapeutic option for young children who are unable to participate in standard canalith repositioning maneuvers. Further systematic study is needed to evaluate its broader applicability.

Ethics and Consent

All identifying patient information has been removed. Written informed consent for publication was obtained from the patient's parent/guardian. This report describes a single clinical case and did not require institutional review board approval per institutional policy.