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Speech and Language Development in a Child with Agenesis of Corpus Callosum: A Case Study

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ABSTRACT

Agenesis of the corpus callosum (AgCC) is a rare congenital condition often linked to diverse neurodevelopmental impairments, particularly affecting communication abilities. This case study presents the detailed assessment and intervention approach for a 3-year-old girl with complete ACC, emphasizing the speech, language, and motor delays identified through standardized tools such as the Receptive-Expressive Emergent Language Scale (REELS) and Communication DEALL (COM-DEALL) checklist. The study underscores the role of early, multidisciplinary intervention in improving developmental outcomes in children with AgCC.

Keywords: *speech and language development, REELS, developmental milestones, agenesis of corpus callosum.*

INTRODUCTION

The corpus callosum is the largest white matter structure in the human brain, playing a crucial role in interhemispheric communication, facilitating integration of sensory, motor, cognitive, and language functions (Very well Mind, 2023). Agenesis of the corpus callosum (ACC), a rare congenital condition characterized by the partial or complete absence of this structure, often leads to neurodevelopmental impairments that vary widely in severity and presentation. Among these, speech and language delays are commonly observed, although their nature and extent can be inconsistent across cases. The exact incidence of the disorder in India is unknown, but corpus callosum agenesis has an incidence of 20/100,000 in south Asia and the extrapolated data normalized from the global prevalence rate for India indicate 1/240,000 live births.

In children with AgCC, speech and language development may be delayed or atypical, influenced by factors such as the presence of other structural or functional abnormalities, cognitive profile, and environmental stimulation. These children may present with a wide range of challenges, from poor expressive and receptive language skills to deficits in pragmatics, articulation, and motor coordination. However, despite the clinical significance of these communication delays, the speech and language profiles of children with ACC remain underexplored, particularly within the Indian context.

Studies in India, such as those by Chatterjee et al. (2023) and Singh & Arora (2017), have contributed to understanding the

broader developmental impact of ACC, yet there is limited documentation of speech-language characteristics using standardized tools. While neuroimaging helps identify AgCC early, the functional outcomes—especially in speech and language—often emerge during critical developmental windows and require detailed assessment.

There is thus a persistent need to document and analyze speech and motor development in children with AgCC through structured assessment tools like COM-DEALL (Communication DEALL Checklist) and REELS (Receptive-Expressive Emergent Language Scale), alongside motor and sensory profiling. Early identification and multidisciplinary intervention are critical to optimizing developmental outcomes in such children.

This case study aims to fill this gap by presenting the detailed assessment and intervention plan of a 3-year-old child with Agenesis of corpus callosum, who presented with delayed speech and language milestones. By integrating standardized assessments and highlighting the therapy approach, the study underscores the importance of early, multidisciplinary management in such neurodevelopmental conditions.

MATERIALS & METHODS

In the present study language skills of the child were assessed using Receptive expressive emergent language scale (REELS) and Communication DEALL developmental checklist (Com-DEALL).

The subject, a 3 -year-old female child, was diagnosed prenatally with complete AgCC. Developmental history revealed delays in motor milestones, difficulty in independent walking and balance issues. Initial concerns included speech and language developmental, limited vocabulary, and reduced social interaction. Birth history was uneventful, and there was no significant familial neurodevelopmental history.

PROCEDURE

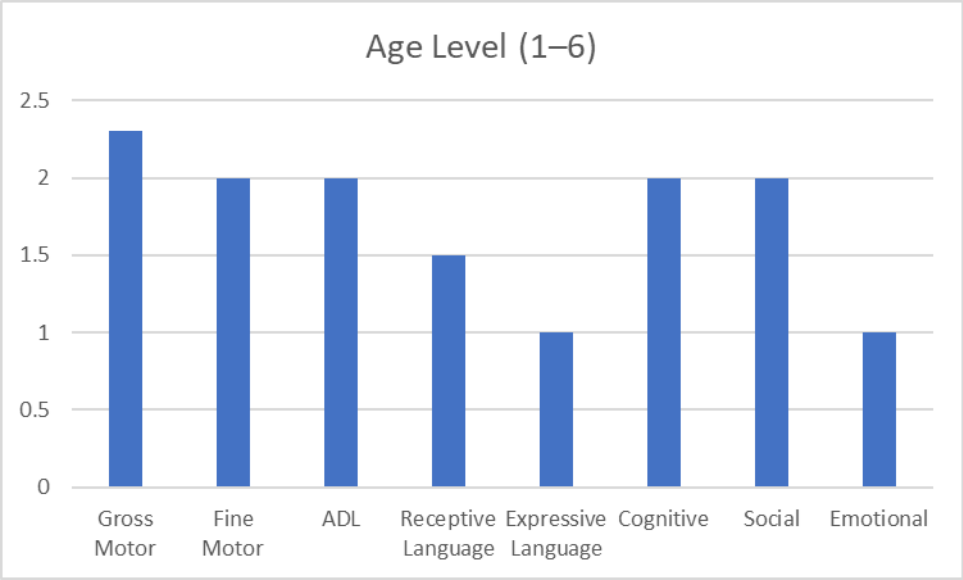
The case report concerns a 3-year-old girl of unrelated healthy Hindi speaking parents. The parents reported to the speech and hearing department with the chief complaint of unable to speak age appropriately. The case was born at 36 weeks of gestation, with delayed birth cry and low birth weight of 2 kgs. Paediatric impression based on MRI led to diagnosis of agenesis of corpus callosum.MRI study of brain reveals absence of corpus callosum with parallel placed bilateral ventricles, colpocephaly and high riding third ventricle, representing corpus callosum agenesis. Parental perception indicated delayed motor milestones at 5 months, and delayed walking by 16 months. The language developmental milestones were reported to be delayed in all areas of reception and expression of speech.

RESULT

The results of REELS used to assess language skills demonstrated a receptive language age ranging from 11-12 months whereas lower expressive language age range 9-10months. The standardised developmental checklist of con -DEALL assessed the child in eight domains. The result showed that the language scores, social& emotional scores lagged way behind as compared to the motor and cognitive scores. Childs attention concurs to level 1 on Reynell's Attention Scale which indicates child can pay attention but any new events are likely to distract. The results of developmental profiles suggested an error play pattern and the child preferred unoccupied and solitary play. The mode of communication used by the child as reported by parents was predominantly nonverbal – vocalisations and crying to get the desired object. Detailed oral peripheral examination revealed inadequate lip seal which led to drooling. However, the parents reported of hypersensitivity to food items and also reported of poor chewing abilities. Expressive vocabulary consisted of differentiated crying and vocal gestures

primarily for hunger and other necessities. Pre linguistic skills of nonverbal imitation were present however eye contact and turn taking were inadequate. Sensory profile also indicated difficulty in sensory integration and also difficulty in her walking and balance coordination.

Graph 1. Age wise values of communication DEALL developmental checklist



Audiological Evaluation: Comprehensive audiological test battery approach was conducted to determine hearing loss and other associated auditory disorder of the child. Different attentive and reflexive behaviours were observed during informal assessment which was done using different frequencies of stimuli at higher intensities (like Gadva, clap, wood rattle, damru and palm rattle). In addition, BERA was administered to determine hearing sensitivity with a transient stimulus using rarefaction polarity presented at the rate of 19.1/s which revealed bilateral normal hearing sensitivity.

DISCUSSION

The assessments reveal substantial delays in both receptive and expressive language domains. The absence of the corpus callosum likely disrupts interhemispheric communication, affecting language processing and production. Children with ACC often present with multisystem developmental delays. In this case, the child exhibited significant delays in expressive and receptive language skills along with motor incoordination and poor oral-motor skills. The child's reliance on non-verbal communication and challenges in understanding verbal instructions underscore the need for targeted interventions focusing on both language comprehension and expression. In the Indian context, Singh and Arora (2017) reported similar findings in a child with ACC, emphasizing the importance of early diagnosis and intervention. Chatterjee et al. (2023) also highlighted the variability in clinical presentations among children with ACC, suggesting that individualized assessment and intervention strategies are crucial. Also, the study by Mounisha et al. (2020) supports the current case report by highlighting the significant role of the corpus callosum in overall brain connectivity and its impact on developmental domains, particularly speech and language. Their findings emphasize how anomalies in the corpus callosum structure contribute to delays in motor, cognitive, and communication milestones, reinforcing the necessity for early and targeted interventions in affected children.

Multidisciplinary intervention involving speech-language therapy, occupational

therapy, and physiotherapy was essentially planned for developmental support. Early intervention can significantly improve adaptive functioning and quality of life.

Therapeutic Intervention A multimodal intervention plan was developed, incorporating:

- **Oral-Motor Therapy:** Targeting oral musculature to improve articulation and feeding behaviours, informed by findings from Ng et al. (2004).
- **Speech and Language Therapy:** Emphasis on building vocabulary, enhancing sentence structure, and improving comprehension.
- **Sensory Integration Therapy:** Utilizing vestibulo-proprioceptive inputs to enhance attention, motor planning, and language, consistent with Dalvand et al. (2009).
- **Neurofunctional Training:** Emphasizing postural control and motor sequencing to support expressive communication (Pacheco et al., 2021).

CONCLUSION

The present case study highlights the critical role of the speech-language therapist in the early identification, assessment, and management of speech and motor delays in a child with agenesis of the corpus callosum (AgCC). Early intervention began at the age of two, a developmental period known for rapid language acquisition, thereby offering an optimal window for therapeutic engagement. The study by Moser et al. (2024) provides empirical evidence that agenesis of the corpus callosum (AgCC) significantly affects language and communication functioning in children and adolescents. It emphasizes the variability in language outcomes based on cognitive profiles and associated anomalies, underscoring the importance of early and individualized speech-language assessments. The findings align with the current case report by highlighting how disrupted interhemispheric connectivity contributes to language impairments and supports the need for comprehensive, multidisciplinary interventions. In such cases, Speech-Language Pathologists (SLPs) play a vital role in facilitating communication development by implementing strategies that support, enhance, or compensate for delays in speech and language skills. The therapist's ability to tailor therapy goals to the child's specific needs was instrumental in initiating functional communication, including eye contact, gesture use, and single word utterances.

A multidisciplinary approach, involving close coordination with occupational and physiotherapists, ensured that therapy was holistic, addressing both communicative and motor challenges. Parent involvement was a key component of the intervention process

This case underlines the value of early, structured, and multidisciplinary intervention in maximizing developmental outcomes in children with neurodevelopmental anomalies like AgCC.Their intervention is crucial in promoting functional communication and overall developmental outcomes in children with this condition.

Declaration by Authors

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