

The role of preoperative speech assessment in predicting postoperative speech impairment in children with posterior fossa tumours (PFTs)

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Children with brain tumors in the posterior fossa (PF) often experience *postoperative speech impairment* (POSI), characterised by either mutism, severely reduced speech (Grønbaek et al., 2021), and/or persistent speech production deficits (De Smet et al., 2012). In the current study, we asked whether it would be possible to distinguish the POSI and non-POSI groups based on speech features *before* surgery.

We report data from 135 children: 16 who later developed POSI (3;9–14;4 years), 62 non-POSI (3;2–17;11 years), and 57 healthy controls (3;0–18;1 years). Speech-language pathologists rated their recorded narrative speech samples based on a range of motor-speech features. Our analysis revealed significant preoperative differences between the POSI and the non-POSI patients in the domains of resonance (e.g., hypernasality) and voice quality (e.g., leaky, hoarse, strained voice). The POSI group also showed more impairment compared to healthy controls in most speech aspects, while the non-POSI group differed from the controls in some aspects. Moreover, younger patients showed more articulatory and prosodic impairment than older patients.

Our results indicate that patients show speech impairments relative to controls, and within the patient group, the POSI group has more severe speech impairments. Future studies should clarify whether speech impairments and POSI are causally linked to damage in cerebellar speech-related lobules, crossed cerebello-cerebral connections (via tumor or hydrocephalus), or brainstem regions housing cranial nerves for articulation and velopharyngeal control. According to the maturation hypothesis, the ongoing development of cerebello-cerebral networks makes younger children more vulnerable to postoperative speech impairment, explaining the age effect observed in our study. Since this study included only children aged 3 years and older, our follow-up will investigate infants from 6 months onward using long-format audio recordings to examine the progression of impairment before and after surgery.