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Diagnostic Instrument for Mild Aphasia (DIMA): Sensitive and Valuable Addition to Standard Language Assessment in Glioma Patients

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Diagnostic Instrument for Mild Aphasia (DIMA): sensitive and valuable addition to standard language assessment in glioma patients

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Introduction

Low-grade glioma (LGG) patients typically suffer from milder aphasia than high-grade glioma (HGG) or stroke patients. Therefore, their linguistic impairments often cannot be detected with standard aphasia tests (e.g., Satoer et al., 2013). The Diagnostic Instrument for Mild Aphasia (DIMA) is the first standardized test-battery to assess mild language disorders on different linguistic levels. We investigate pre- and postoperative linguistic abilities of LGG and HGG patients with the DIMA.

Methods

The DIMA consists of subtests that tap *phonology* (word, compound, non-word, sentence repetition), *semantics* (odd-picture-out), and *syntax* (sentence completion). Additionally, we administered the Boston Naming Test, Category and Letter Fluency, and the Token Test. Patients were assessed before awake surgery (*T1*, N=98), three-months (*T2*, N=69), and one-year (*T3*, N=30) postoperatively. DIMA performance was compared to healthy controls (N=214). Group differences were examined with parametric (t-test) and nonparametric (Mann-Whitney-U, Wilcoxon) tests.

Results

DIMA: Preoperatively, patients deviated on sentence repetition and sentence completion ($p<0.05$). HGG patients performed worse than LGG on word, non-word, and sentence repetition ($p<0.05$). There was no effect of hemispheric tumor localization. At T2, compound repetition and odd-picture-out also became impaired ($p<0.05$) and there was a decline compared to T1 on all repetition tasks ($p<0.05$). At T3, only sentence completion remained impaired ($p<0.01$) with a deterioration compared to T1 ($p<0.01$).

Standard tests: At T1, patients were impaired on BNT, Category- and Letter Fluency ($p<0.01$). HGG patients performed worse than LGG patients on BNT and TT ($p<0.01$). Patients with left-hemispheric tumors performed worse on BNT and Letter Fluency compared to patients with right-hemispheric tumors ($p<0.05$). At T2, TT also became impaired ($p<0.05$) and patients declined compared to T1 on Verbal Fluency tests ($p<0.01$). At T3, only BNT and Category Fluency remained impaired ($p<0.05$), with no significant declines compared to T1.

Conclusions

The DIMA is the first test-battery to detect peri-operative impairments in patients with left- or right-hemispheric gliomas at different linguistic levels. Pre- and postoperative impairments were found on phonological (repetition) and syntactic subtests (sentence completion) of the DIMA. The semantic level (odd-picture-out) was only impaired short-term postoperatively. Regarding the standard tests, BNT and Verbal Fluency detected impairments at all test moments, while Token Test scores only deviated three-months postoperatively.

Awake surgery seemed to have protected most linguistic functions at long-term. However, the DIMA appeared sensitive to detect postoperative decline compared to baseline level. All phonological DIMA subtests captured short-term decline, in line with earlier evidence for the value of (non-)word repetition (Sierpowska et al., 2017). As expected, Verbal Fluency was also sensitive to short-term deterioration. DIMA sentence completion was the only sensitive test to detect further long-term decline, reflecting earlier spontaneous speech analyses (Satoer et al., 2018). Left-hemispheric tumor localization only affected standard test performance. HGG patients had more severe impairments than LGG on DIMA repetition and standard tests (BNT and TT). We advise adding the DIMA to standard language evaluation of glioma patients, as it allows for more detailed counseling about language outcome at the different linguistic levels with indications for rehabilitation.

References

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