Functional Polymorphism of MMP9 and BDNF as a potential biomarker of neuroplasticity in prelingual deafness treatment with cochlear implantation

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Introduction:
Genetic biomarkers of neuroplasticity in prelingually deaf children treated with cochlear implantation could facilitate their clinical management, giving higher chances for development of robust proficiency of spoken language.

We investigated whether carrying of a certain variants of genes encoding matrix metaloproteinase MMP9 and neurotrophin BDNF is a prognostic marker of auditory skills acquisition outcome.

Material and Method:
We performed a retrospective analysis of functional MMP9 variant (rs3918242, c.1562 C>T) known to affect MMP9 gene expression level and BDNF variant (rs6265, c.196G>A, p.Val66Met) known to affect the protein function in a group of 124 hearing loss children, aged below 2, treated with unilateral cochlear implantation. We studied associations between the presence of relevant MMP9 and BDNF genotypes and auditory development of the implanted children. Language acquisition was assessed with Little Ears Questionnaire over 14 months post intervention.

Results:
Prevalence of MMP9 variants in the studied group was C/C - 66%, C/T- 34%, BDNF - G/G - 75.5%, G/A- 24.5% and this data are consistent with Caucasian population dispersion. In the subgroup of subjects implanted below 1 year, showing no response in pre-implnat ABR median rate of auditory development for carriers of rs3918242 C/T genotype (median 5.0, IQR 4.0-.9.0) 1 month after CI activation is statistically significantly higher than for carriers of rs3918242 C/C (median 2.0, IQR 1.5-5.0) p=0.0102).This predominance remains in 5th month of auditory development (p=0.0424), but not in further follow up. (U Mann Whitney test).

Conclusions:
rs6265 G/G genotype and rs3918242 C/T genotype predisposes their deaf carriers to better response to a sensory stimulation delivery to cochlea in first months after CI activation than carriers of the rs6265 G/A and rs3918242 C/C genotypes. Further studies should address potential biomarker value of those genetic variants as well as possible functional role of MMP9 and BDNF in neuroplasticity evoked by cochlear implantation in the prelingually deaf children.

Can language acquisition be considered a phenotypic trait?