Coupled analysis of the kinetic data of gait and functional MRI of the amputee. A case of brain plasticity and late acquisition of gait from a patient with congenital lower limbs atrophy

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Introduction.– In France, 7800 new cases of amputation have been identified in 2005, with a small proportion of congenital amputations. Most of the patients reach adulthood either having been taken care in rehabilitation or using prosthesis. Mapping in functional MRI (fMRI) of an adult who never walked has, to our knowledge, never been studied in the literature.

Objectives.– Describe the modifications of the cortical representation with fMRI during the gait learning with prostheses of a patient with congenital lower limb atrophy and correlate these modifications with kinetic and kinematic parameters of gait analysis.

Patient.– A 17-year-old girl, with congenital lower limbs atrophy, who underwent a double distal trans-femoral amputation, moving inside on her two stumps or with a manual wheelchair.

Materials and methods.– fMRI (active contraction, nociceptive stimulation and mental imagery) and gait analysis before prosthesis (M0) and 6 months after (M6).

Results.– All motor sequences of the initial fMRI present an activation of contralateral central regions and supplementary motor area (SMA). Mental imagery activates those same areas, with a more intense activation in the SMA and an additional activation of the parietal, left frontal and left temporal cortex. Somatosensory stimulation activates the post-central region. At 6 months, fMRI mapping is identical as at M0 with a slightly more intense and extensive activation of motor areas and an additional activation of frontal and prefrontal cortex. Kinetic and kinematic parameters of gait were improved between M0 and M6.

Discussion.– For traumatic amputees [1], the representation of the lost limb is still part of the body schema, with an incomplete reorganization and an expansion of the contiguous zone. For the agenesics as for our patient, the activation is still part of the body schema, with a incomplete reorganization and an expansion of the contiguous zone. For the agenesics as for our patient, the activation is substantially identical to the healthy subjects, without reorganization or telescoping areas.

At M6, the data of gait and fMRI show the acquisition of learning to walk by the improvement of the parameters of the analysis of walking and the concomitant activation of frontal and prefrontal areas.

Reference

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Prostheses and surgery in purpura fulminans sequelae

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Since the progress of medical resuscitation, the number of children having had a purpura fulminans with amputations of members has increased. We followed 15 children with a severe involvement of the limbs. This involvement is stereotyped enough, for lower limbs, amputations are almost done in middle of tibia both sides and present difficult problems for prosthesis.

We present you the case of Adrien, 18-year-old, followed in the department for 15 years for the after effects of purpura arisen at the age of 5 months. Because of this purpura, he presented an amputation of the left forearm and hand, of the middle of right tibia and septic arthritis of the left ankle.

The first equipment was made at the age of 11 months. The upper limb prosthesis is designed to meet the aesthetic and functional aspect of the amputated limb. Sometimes she has a specific function to allow the resumption of a professional activity or leisure.

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