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MEETING ABSTRACT

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Pre-hospital diagnosis for stroke and trauma patients using microwave technology

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Background

For stroke and traumatic brain injury (TBI) patients minimizing the time from stroke onset/accident to treatment is fundamental to increase the chances of achieving good clinical outcome. For patients with ischemic stroke thrombolytic treatment may be effective, but only 1–8% receive this treatment due to delays in seeking medical attention and late diagnosis. TBI patients with severe injury require immediate transportation to a trauma center. Microwave technology (MWT) has potential to be used for prehospital diagnosis of stroke and TBI patients by detecting intracranial bleedings and thereby make pre-hospital thrombolysis for stroke patients possible and increase triage accuracy for TBI patients.

Methods

Two clinical trials enrolling 20 + 25 stroke patients performed with research prototype systems (Brain Alfa and Stroke finderR10, Medfield Diagnostics AB, Göteborg, Sweden) have been completed. Two further studies are ongoing.

Regarding TBI laboratory experiments using a human cranium phantom and numerical simulations of subdural hematoma (SDH) have been performed. The first clinical study assessing the potential for MWT to detect SDH has recently started.

The microwave-based systems use 8–12 transmitting and receiving antennas. The classification algorithm is trained on measurements on patients with confirmed diagnosis, using a leave-one-out procedure.

Results

For the clinical studies on stroke patients all cases of hemorrhagic stroke could be detected while correctly

classifying most cases of ischemic stroke [1]. For the SDH models the total classification accuracy was 98–100%, and SDH of different sizes and at different positions could be distinguished.

Conclusions

MWT has potential to improve the acute care for stroke and trauma patients by making a prehospital diagnosis. This would lead to decreased human suffering and large societal economic savings.

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1. Persson M, et al: Microwave-based stroke diagnosis making global pre-hospital thrombolytic treatment possible. *IEEE Trans Biomed Eng* 2014, **61**:2806-2817.

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