

Computer-Based Decision Support System for the Management of Acute Ischemic Stroke

Stroke is the third most common cause of death in the developed countries, accounting for more than 5 millions deaths every year. The term stroke spans two pathological conditions: steno-occlusive stroke and hemorrhagic stroke. Steno-occlusive stroke, which approximately counts for 85 % of all the strokes, is the sudden reduction or cessation of the blood supply to a tissue area secondary to an obstruction of the feeding vessel causing ischemia in the affected area.

Magnetic Resonance Imaging (MR) of the ischemic brain can identify stroke patients eligible for thrombolytic treatment; yet, an expert must analyze the images manually, which is time-consuming in an emergency situation. The treatment of stroke patients with thrombolytic is highly efficient; however, administering thrombolytic to patients with contraindications to treatment can ultimately result in death.

The aim of this project was to develop a fully automated decision support system to analyze acute MR images of the ischemic brain and assist the clinicians in identifying candidates for treatment. We developed a clinical software called COMBAT Stroke, using recent developments in image processing techniques. This software was tested retrospectively in 228 acute ischemic stroke patients. We found that COMBAT Stroke may help to not only identify patients that are potential candidates for thrombolysis, but also to exclude patients from this potentially harmful treatment. In addition to clinical assessment, COMBAT Stroke may provide an optimal framework for a rapid, efficient, and standardized clinical support tool to select patients with acute ischemic stroke for thrombolytic therapy.

Our findings reveal the conceivable advantages of using automated patient selection tools in clinical routine. Further development of COMBAT Stroke algorithm to predict tissue fate will provide clinicians with a more sophisticated support tool for clinical decision-making. We speculate that the described findings and future developments will lead to fast diagnosis and treatment decisions, resulting in better outcomes for acute stroke patients.