with ASA, there was evidence of a complete reopening of the M1 segment with a residual stenosis in M2 after 24-36 h, but the NIHSS score deteriorated and follow-up brain CT (which had been negative on admission) revealed extensive homolateral frontoparietal ischemia. Finally, 3 patients (2 treated with rtPA and one with ASA) revealed no signs of any recanalization and their NIHSS score remained the same or became worse. One patient treated with rtPA died of hemorrhage. In 10 patients, TCCD showed a distal MCA occlusion (M2): 6 of these were recanalized 3-6 h after treatment (rtPA) and this recanalization was complete in 4 cases and partial in 2 (and completed at 3-month follow-up). One patient treated with ASA was found recanalized after 3 months, while the vessels remained occluded in the remaining 3 cases (2 treated with rtPA and 1 with ASA). The NIHSS score improved in all recanalized cases with the exception of the one patient who still had extensive ischemia throughout the MCA region at follow-up CT scan, despite thrombolytic treatment.Of the 5 patients with T occlusions, 3 were treated with CEA (associated with locoregional urokinase in 2 cases) and experienced siphon and ACA recanalization, with residual MCA occlusion, at 3-6 h; then the MCA was fully recanalized within 24-36 h in one case, another had residual MCA stenosis at 3-month follow-up and the third patient died. In the latter cases (1 rtPA and 1 ASA) the occlusion did not change during the follow-up.The different segments of the MCA behaved differently in the intracranial stenosis subgroup: in the M1 segment, the flow had returned to normal in 2 cases (ASA) after 24-36 h, but the NIHSS score did not change with respect to the baseline. In the other cases (2 rtPA, 1 oral anticoagulant therapy and 3 ASA), the stenosis remained the same after 3 months. On the other hand in the M2 segment the flow rate had returned normal in all cases after 3 months, and already after 3-6 h in 3 cases (1 rtPA and 2 ASA), after 24-36 h in 1 (i.v. heparin) and after 5 days in 1 (ASA). In all these patients, the NIHSS score improved at 3-month follow-up. Atrial fibrillation was more frequent in the groups of MCA occlusion and stenosis and it is associated with a good outcome.

Conclusion: We may conclude that site of occlusion, speed of recanalization, residual stenosis and the presence of atrial fibrillation predict with high accuracy short-term stroke outcome indipedently from therapy used. TCCD and new ultrasound techniques with contrast agents may be considered useful, inexpensive and non-invasive methods to predict outcome in acute stroke patients.

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QontraXt®: application of a new Ultrasound Perfusion Imaging software in acute stroke

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Quantification of blood volume and flow is crucial for determining areas of different perfusion in whole organ/tissue due to impairment of blood supply or to characterize different lesions depending on the anatomical and functional aspects of vascular physiologyQONTRAXT is an user-friendly research software developed by AMID® (Rome, Italy) in cooperation with Bracco® Imaging R&D (Milan, Italy) , which has been designed for the evaluation of tissue perfusion obtained after Contrast-Enhanced Ultrasound (CE-US) examination. It has been specifically designed for radiological ultrasound applications and, at the present, it runs off-line on personal computer equipped with standard O.S. (Windows XP, Windows 2000, Windows Me, or Windows 98). The software analyzes the signal intensity changes induced by the i.v. injection (bolus and infusion) of microbubble-based ultrasound contrast agents over time providing pixel-by-pixel color-coded maps of the haemodynamic parameters of the organ/structure under investigation, and precisely:

regional blood volume (rBV)

regional blood flow (rBF)

mean-transit-time (MTT)

perfusion index (PIND)

QontraXt is able to process CE-US cine-loop performed using both the First-Pass technique (i.e. fast bolus injection of microbubbles, a.k.a. wash in-wash out curve) or the so called Disruption/Replenishment method (i.e. constant rate infusion of the contrast agent).

We try to apply this new Ultrasound Perfusion Imaging (UPI) parametric software in the off-line analysis in our acute MCA stroke patients. We performed UPI with the bolus track technique, with i.v. bolus injection of a second generation UCA, Sonovue® (Bracco International BV). The technical modality for UPI was a Power Modulation contrast imaging, using a low mechanical index (MI 1.0). The software converted the gray scale images in a parameter color-coded qualitative maps, then it allowed an off-line pixel-by-pixel analysis of time-intensity curves (TIC).

The resulting color-coded parametric maps allowed an immediate, visual assessment of the perfusion properties over the entire selected region of interest. Once the parametric maps had been generated, Qontrast allowed the pixel-by-pixel quantitative analysis of perfusion

through depiction of both curves and parametric numbers.

TIC parameters calculated for each investigation were: max video intensity value (SI peak), Time-To-Peak (TTP), bolus sharpness, and Area Under the Curve (AUC).

The mathematical model implemented in QontraXt, in order to mimic the time propagation of the video signal intensity due to the passage of the UCA, is a Gamma-Variate Function:

SI(t)= SIpeak? [(t/TTP) b x TTP e – b x (t -TTP)].

The perfusion images can be visualized in full screen also in a 3D representation.

In our experience the 3D visualization is the best way to represent the perfusion deficit in acute stroke patients with a complete MCA infarct.

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The Importance of Middle Cerebral Artery Stenosis Morphology in Patients with Recurrent Ischemic Stroke

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Background: Intracranial stenosis are a manifestation of atherosclerosis and a cause of cerebral ischemia. They are associated with high rate of recurrent cerebrovascular ischemic events and death. The morphology of intracranial stenosed intracranial vessels might be important in predicting cerebral ischemic events. Middle cerebral artery (MCA) stenosis has been demonstrated to the most frequent among intracranial stenosis. We investigated the relationship between the middle cerebral artery stenosis morphology and clinical recurrence by Transcranial Color Doppler ultrasonography (TCCD) and angiopower-TCD.

Patients and Methods: 98 patients (58 male, 40 female; mean age 68.53+/-12.8) with first ischemic stroke admitted to our Neurological Department between January 2002 and December 2004 presented intracranial stenosis. The MCA stenosis was detected in 45 patients. The MCA stenosis were classified into severe (>50%) and mild (<50%) following the Baumgartner criteria (1999). MCA stenosis morphology was studied by TCCD and Angiopower transcranial doppler using contrast agent (SonoVue, Bracco SA) and 3 types of stenosis were identified: monofocal with and without post-stenotic dilatation, plurifocal stenosis and tubular. Clinical and TCCD recordings were performed at 3th, 6 th 12 th and 24th month from discharge.

Results: A new ischemic event during the follow up in the territory supplied by the stenosed MCA occurred in 20 (44,4%) out of 45 patients. All 20 patients presented a severe MCA stenosis 9 with a tubular stenosis and 6 with monofocal stenosis without post-stenostic dilatation and 5 plurifocal stenosis. Out of the other 25 patients 10 presented a severe monofocal stenosis with post-stenotic dilatation and the other 15 patients had a mild stenosis with tubular or monofocal morphology.

Conclusion: These preliminary data suggest a possible correlation between severe MCA stenosis with tubular or monofocal without post-stenotic dilation or plurifocal morphology and ischemic stroke recurrence. MCA stenosis morphology might be considered   a predictive factor of cerebral ischemic recurrence. Further studies are needed to confirm our preliminary findings.

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Ultrasound Perfusion Imaging within three hours in acute MCA stroke

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Background: Several studies have demonstrated the value of Ultrasound Perfusion Imaging (UPI) to detect perfusion deficits in patients with acute stroke, predicting size and localization of the ischemic lesion. Recently, some Authors showed different patterns of brain perfusion and differentiated "tissue at risk" and "core of infarction" in acute stroke, trying to individualize the "ultrasonic mismatch" corresponding to the ischemic penumbra. Nevertheless none of these studies were conducted within a therapeutic window.

Methods and Patients: We conducted a open, observational study using Transcranial Color-Coded Duplex Sonography (TCCD) within three hours from the stroke onset. TCCD was performed using a SONOS 5500 ultrasound system (Philips Medical Systems) and a 2.5 MHz sector transducer (S3 probe, Philips). Inclusion criteria were: age >18 years, stroke onset within three hours, good visualization of standard landmarks (third ventricle, thalamus, pineal gland, anterior horn of the ipsilateral ventricle), a baseline brain CT scan achieved no more than 1 hour before UPI. Standard TCCD was performed bilaterally after UPI. The investigation was conducted in the axial midthalamic plane and only a controlateral examination was achieved. The maximum depth was fixed in 14 cm, whereas the gain was optimized for each patient at the beginning of the investigation. UPI consisted in a bolus track technique, with i.v. injection of 2.5 mL of a second generation UCA, Sonovue® (Bracco International BV) plus 2.5 mL of saline solution (NaCl 0.9%), followed immediately by 3.0 mL of a saline bolus to flush the injection line. The technical modality for UPI was a Power Modulation contrast imaging, using a low mechanical index (MI 1.0). The gray scale images were recorded on an optical disk; then an off-line analysis of time-intensity curves (TIC) was done with a new UPI software (QontraXt®, AMID, Rome & Bracco, Milan). A