# Prognostic value of ultrasonographic study and monitorization of intracranial hemorrhage in acute stroke unit.

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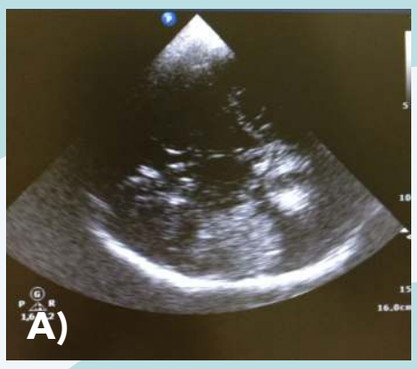
**Background and Aims:**

Several studies have proved a good correlation between measurements performed by transcranial duplex sonography (TDS) and standard techniques (brain CT or ICP monitorization) in the scope of intracerebral haemorrhage (ICH). However, prognostic value of this parameters has been scarcely investigated. The aim of this study was to evaluate the prognostic value of measurements performed by TDS in ICH patients, as well as the variations of these parameters over time.



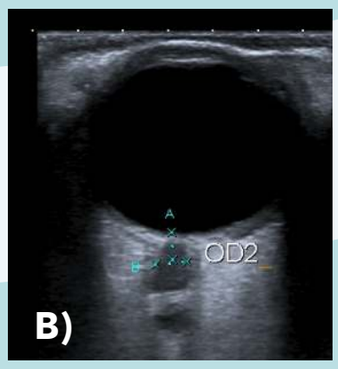




**Figure 1.** A) Deep ICH visualized by TDS. Axial cut. B) Enlarged optic nerve sheath measured by orbit TDS

**Methods:**

Consecutive patients with spontaneous ICH admitted to a stroke unit were recruited. TDS was performed within 12 hours of baseline CT and up to 3 control studies were scheduled every 24 hours. Included neurosonological markers were: hematoma volume (HV), midline shift (MLS), III ventricle diameter, pulsatility index (PI) and mean velocity (MV) in both MCAs and mean thickness of both optic nerve sheaths (MTONS) (Figure 1). Correlation of HV and MLS between CT and TDS was analyzed, using an intraclass correlation coefficient (ICC), if the time between both was less than 2 hours. Crude logistic regression analysis was performed to evaluate the prognostic value of measurement in the first TDS in ICH. As prognostic variables we evaluated early neurologic deterioration (END) and death during hospitalization (DDH). ROC analysis was used to evaluate the discriminative value of MTONS.

**Table 2:** variables associated with END and DDH

| | END (n=8) | No END (n=25) | p | DDH (n=8) | No DDH (n=25) | p |
|---|---|---|---|---|---|---|
| Age (mean) (DS) (yr) | 70 (11) | 81 (8) | 0.027 | 70.1 (11) | 83.3 (7.7) | 0.015 |
| Baseline NIHSS (mean) (DS) | 8 (5) | 11(5) | 0.286 | 9 (5) | 13 (7) | 0.120 |
| HV (mean) (DS) (mL) | 67 (34) | 31 (28) | 0.03 | 72.3 (34) | 31.8 (27.2) | 0.024 |
| IIIV diameter (mean) (DS) (mm) | 0.57 (0.2) | 0.53 (0.2) | 0.667 | 0.58 (0.2) | 0.53 (0.2) | 0.544 |
| MLS (mean) (DS) (cm) | 0.34 (0.3) | 0.11 (0.1) | 0.022 | 0.33 (0.3) | 0.12 (0.1) | 0.028 |
| MTONS (mean) (DS) (cm) | 0.6 (0.1) | 0.48 (0.1) | 0.016 | 0.6 (0.1) | 0.47 (0.1) | 0.012 |
| Ipsilat MCA PI (mean) (DS) | 1.5 (0.4) | 1.1 (0.3) | 0.055 | 1.5 (0.3) | 1.1 (0.3) | 0.032 |
| Contralat MCA PI (mean) (DS) | 2.1 (2) | 1.1 (0.3) | 0.118 | 2.3 (2) | 1.1 (0.3) | 0.055 |
| Ipsilat MCA MV (mean) (DS) (cm/seg) | 32 (14) | 47 (16) | 0.040 | 32 (15) | 47 (15) | 0.046 |
| Contralat MCA MV (mean) (DS) (cm/seg) | 34 (20) | 43 (11) | 0.145 | 29 (17) | 45 (12) | 0.042 |

**Results:**

33 patients were included (Table1).Correlation analysis between measurements performed by CT scan and TCD performed within 2 hours (n=12) was good regarding both HV (ICC=0.93) and MLS (ICC=0.82). Crude logistic regression analysis showed an association of HV, MLS, mean velocity in ipsilateral MCA and MTONS with both END and DDH (Table 2). After adjustment for age and baseline NIHSS, MTONS>0.535 cm (Se 87,5%; Sp 73.9%) was independently associated with DDH (OR=8.5, p<0.001) (Figure 2). No prognostic value of the variation of any of these variables was found.

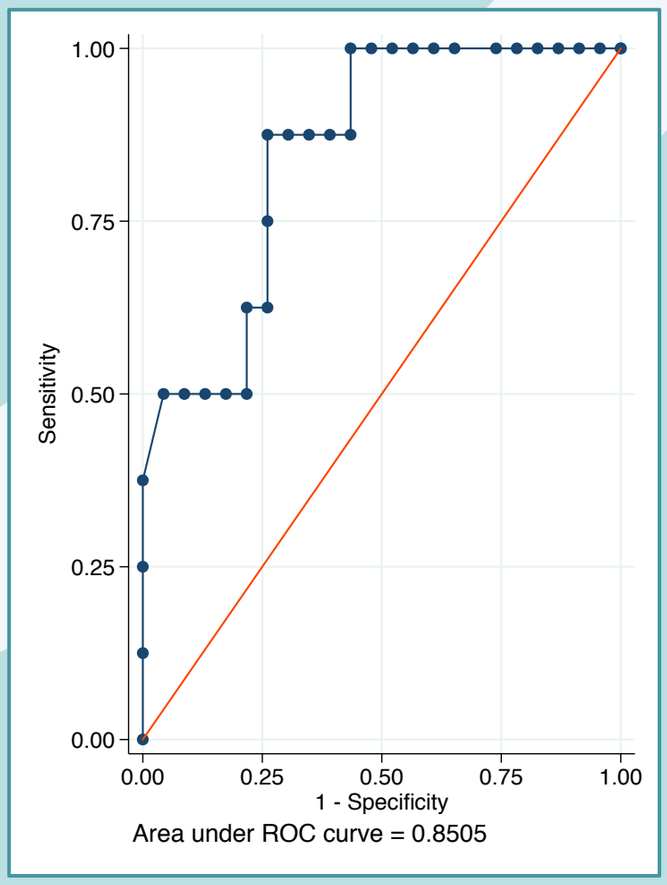
**Conclusions:**

TDS has an excellent correlation with CT. TDS may be used as a complementary tool in ICH**.** We found some prognostic neurosonological markers in patients with ICH. MTONS larger than 0.535 cm was an independent predictor of DDH.

**Table 1:** clinical and hematoma characteristics

| Characteristics | |
|---|---|
| Men (Nº) (%) | 26 (78) |
| Age (Me) (IQR) | 74 (67-80) |
| Baseline mRS 0-2 (Nº) (%) | 26 (79) |
| NIHSS score (Me) (IQR) | 9 (5-13) |
| Lobar ICH (Nº) (%) | 11 (33) |
| Left ICH (Nº) (%) | 16 (48) |
| Right ICH (Nº) (%) | 15 (45) |
| Hypertension (Nº) (%) | 20 (61%) |
| Previous ICH (Nº) (%) | 2 (6) |
| Anticoagulants (Nº) (%) | 13 (39) |
| Antiplatelets (Nº) (%) | 7 (21) |
| HV ml (Median) (IQR) | 16.9 (6.6-34.1) |

**Figure 2:** area under ROC curve for MTONS and DDH

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