**Acute CT findings and the relation to traumatic axonal injury on early MRI in a large prospective Norwegian cohort of patients with moderate and severe traumatic brain injury**

Halvor Solheim[1], Anne Mari Holte Flusund[1,2], Joakim Stray-Andreassen[1,3], Anne Vik[1,3], Toril Skandsen[1,3], Alexander Løve Røsberg[1,3], Tiril Svaasand Eliassen[1], Nina Sjogren[1], Erik Magnus Berntsen[1,3], Cathrine Elisabeth Einarsen[1,3], Turid Follestad[1], Kent Gøran Moen[1,3,4]

[1] Norwegian University of Science and Technology (NTNU), [2] Møre and Romsdal Hospital Trust, Molde Hospital, [3] St. Olavs University Hospital, Trondheim, [4] Vestre Viken Hospital Trust, Drammen Hospital

Background: Patients with moderate or severe traumatic brain injury (TBI) routinely undergo acute admission CT imaging. We aimed to describe CT findings in a large prospective Norwegian cohort and assess their relation to traumatic axonal injury (TAI) on early MRI and functional outcome at 12 months.

Methods: From 01.10.2004-01.10.2021, 866 patients with moderate or severe TBI were admitted to St. Olavs University Hospital. We excluded those who died of extracranial injuries within 24 hours (n=8), declined consent (n=6), were lost to follow-up (n=92), had no acute CT (n=6) or were younger than 16 years (n=62), leaving 692 patients. Of these, 303 (45%) had moderate and 377 (55%) severe TBI. CT was scored according to a predefined template by residents or senior consultants in radiology. A subgroup of 290 patients <70 years (53%) underwent complete early MRI within 6 weeks (median 9 days). Functional outcome was assessed at 12 months with the Glasgow Outcome Scale–Extended (GOSE). Statistical analyses including multivariable analysis were performed in R

Results: The most frequent CT findings were traumatic subarachnoid hemorrhage (tSAH) (n=479, 70%), brain contusion(s) (n=419, 62%), subdural hematoma (n=413, 61%), and cranial fractures (n=400, 59%). After adjustment for age, GCS score, and pupil status, the CT findings most predictive of unfavorable outcome (GOSE ≤6) were basal tSAH (OR=2.8), generalized edema (OR=2.7), and multiple contusions (OR=2.0). In the MRI subgroup, 79% (n=229) had TAI on early MRI, but only 35% (n=81) of these TAI patients had signs of TAI on admission CT.

Conclusion: tSAH was the most prevalent CT finding. Basal tSAH was the strongest CT predictor of unfavourable outcome independent of other known prognostic factors. TAI was frequent on early MRI (79%), but CT suggested TAI in only 35%, highlighting the limited sensitivity of CT for detecting TAI.