Improved diagnostics for patients with traumatic brain injuries

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A new study published in *PLOS Medicine* shows that by improving the classification of patients with traumatic brain injuries, a more accurate diagnosis and prognosis can be made. The results are the product of a collaboration between Karolinska Institutet, Karolinska University Hospital and Helsingfors University Hospital.

Traumatic brain injury (TBI) is one of the most common causes of death and permanent disability in people worldwide. Traumatic brain injuries are caused by external forces directed towards the head such as falls, car accidents or physical abuse. This may result in bleeding inside the skull, in or around the brain. Previously, TBI was considered a disease of the young. Yet, today more and more elderly people are affected and treated for TBI because of the aging population and the increasing use of antithrombotic medications.

Patients who are suspected of having a bleed inside the skull are primarily diagnosed by computed tomography (CT) scanning of the brain. The CT scan provides a rapid diagnosis and shows if there are any bleedings that requires acute neurosurgical interventions. However, interpreting the results of CT scans is highly complex, particularly as different types of bleedings are often found.

Various types of CT classification systems have been developed to standardise the interpretation of CT images in patients with traumatic brain injury (TBI). These take into consideration information from the CT scan and are used to determine the severity of the injury and to

estimate patient outcome.

"The problem with the earlier CT classification systems is that they are very crude and based on old patient materials. Improved and more updated CT classification systems have long been necessary", says the study's first author, Eric Thelin, doctor and researcher at the Department of Clinical Neuroscience, Karolinska Institutet.

In order to get more information from CT scans, researchers and doctors at Karolinska Institutet and Karolinska University Hospital as well as Helsingfors University Hospital have developed a new way of classifying the brain injuries one can see using CT, the so-called "Stockholm CT score" or "Helsinki CT score". A collaboration study has compared 1,115 patients who were treated for TBI in the Department of Neurosurgery Intensive Care Units in Stockholm and Helsinki.

"The results show that by making a correct assessment of the first images obtained by CT, we can better predict how well the patients will fare. This is extremely useful as it gives the clinicians better information as to how their care can be optimised", comments Eric Thelin.

The study showed that classification using the Stockholm or Helsinki CT score can more reliably predict how well patients will progress in the next 6 to 12 months than previously used classification systems. It also found that the extent of diffuse brain injury a type of injury that without good treatment options, was the type of injury that most affected the patients' prognosis.

"Unfortunately, up to date there is little we can do to treat these diffuse brain injuries. But, aided by our results, we know that future research should be directed into the treatment of diffuse brain injuries. Finding effective treatment strategies for patients affected by this type of injury must be prioritised", comments Rahul Raj, Adjunct Professor in

Experimental Neurosurgery at Helsingfors University Hospital.

More information: Eric Peter Thelin et al. Evaluation of novel computerized tomography scoring systems in human traumatic brain injury: An observational, multicenter study, *PLOS Medicine* (2017). DOI: 10.1371/journal.pmed.1002368