SSM07

Emergency Radiology (Neurologic Emergencies)

Wednesday, Dec. 2 3:00PM - 4:00PM Location: S403B

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Clint W. Sliker, MD, Ellicott City, MD (Moderator) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (Moderator) Institutional research agreement, Siemens AG

Sub-Events

SSM07-01 Utility of Repeat Head CT in Mild Traumatic Brain Injury (mTBI) Patients Presenting with Small Isolated Falcine or Tentorial Subdural Hematoma (SDH)

Wednesday, Dec. 2 3:00PM - 3:10PM Location: S403B

Kavi K. Devulapalli, MD, MPH, San Francisco, CA (Presenter) Nothing to Disclose
Alisa D. Gean, MD, San Francisco, CA (Abstract Co-Author) Medical Advisory Board, Samsung Electronics Co Ltd Speakers Bureau, Educational Symposium International Stockholder, Global Indemnity plc Spouse,Employee, Global Indemnity plc
Jared A. Narvid, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Esther L. Yuh, MD, PhD, Stanford, CA (Abstract Co-Author) Nothing to Disclose
Bhavya Rehani, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Michael C. Huang, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
David McCoy, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Alina Uzelac, MD, Mill Valley, CA (Abstract Co-Author) Nothing to Disclose
Jason F. Talbott, MD, PhD, San Francisco, CA (Abstract Co-Author) Data Safety Monitoring Board, StemCells, Inc

PURPOSE

In cases of mTBI with acute intracranial hemorrhage, serial head CT (hCT) scans to evaluate stability are routinely performed, even in cases of isolated small hematomas which are not easily accessible for surgical decompression. This practice has not been validated, and repeat exams frequently necessitate increased emergency room stay times, ICU monitoring, and additional exposure to ionizing radiation. The goal of this study is to evaluate clinical and imaging features of isolated falcine and tentorial SDH at presentation and short term follow-up.

METHOD AND MATERIALS

A retrospective analysis of all patients presenting to our Level 1 trauma center from January 2013 through March 2015 undergoing initial and short-term follow-up hCT with initial findings positive for isolated SDH along the falx and/or tentorium was performed. Patients with penetrating trauma, other sites of intracranial hemorrhage, brain contusion, or depressed skull fractures were excluded. Clinical information including gender, age and history of anticoagulation was obtained through review of electronic medical records.

RESULTS

90 patients met inclusion criteria (55 males; 35 females; average age 57.8 years). 63% of SDHs were falcine, 32% tentorial and 5% mixed. On average, isolated falcotentorial SDHs were small (mean thickness = 2.7mm; range 2-8mm), without significant mass effect, and decreased in size on follow-up hCT with an average follow-up time of 8.4 hours. Increase in SDH size was seen in 3 patients (3%) with average increase in SDH thickness of 3.3-mm. No new intracranial hematomas were seen on follow-up hCT. 2 of 3 patients with increase in SDH were anti-coagulated (average INR = 3.8) and the remaining patient had a depressed platelet count. In total, nine patients (10%) were anti-coagulated at presentation with mean INR=3.2 (range 2.1-4.9).

CONCLUSION

Isolated falcine and tentorial SDHs in mild TBI are small and rarely increase in size on short term follow-up hCT. Present data suggest repeat hCT in mTBI patients with isolated falcine or tentorial SDH who are not anti-coagulated is unnecessary for assessing stability of hemorrhage. In anti-coagulated patients and patients with low platelet counts, follow-up imaging is advisable.

CLINICAL RELEVANCE/APPLICATION

Isolated parafalcine and paratentorial SDH are common findings after trauma and often necessitate repeat imaging. This project may help guide clinical decision making with regards to repeat imaging.

SSM07-02 Traumatic Midline Subarachnoid Hemorrhages on Initial Computed Tomography as Markers of Severe Diffuse Axonal Injury

Wednesday, Dec. 2 3:10PM - 3:20PM Location: S403B

Daddy Mata Mberba, MD, PhD, Sendai, Japan (Presenter) Nothing to Disclose
Shunji Mugikura, MD, PhD, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
Atsuhiro Nakagawa, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
Takaki Murata, MD, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
Yasuko Tatewaki, MD, Sendai, Japan (Abstract Co-Author) Nothing to Disclose

Awards

Trainee Research Prize - Fellow

Daddy Mata Mberba, MD, PhD, Sendai, Japan (Presenter) Nothing to Disclose
Shunji Mugikura, MD, PhD, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
Atsuhiro Nakagawa, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
Takaki Murata, MD, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
Yasuko Tatewaki, MD, Sendai, Japan (Abstract Co-Author) Nothing to Disclose
The presence of intraventricular hemorrhage (IVH) on initial CT (iCT) has been recently reported to predict diffuse axonal injury (DAI) located in the corpus callosum or brain stem (severe DAI) on subsequent MRI. We aimed to test the hypothesis that midline (interhemispheric and perimesencephalic) subarachnoid hemorrhages (SAH) commonly associated with IVH on iCT could have a similar clinical value in predicting severe DAI.

METHOD AND MATERIALS
Consecutive 270 head trauma patients who underwent iCT within 24 hours and MRI within 30 days were included. First, as potential CT predictors of DAI, we used the following 6 CT items included in Marshall or Rotterdam CT scores: status of basal cistern, status of midline shift, epidural hematomas, IVH, SAH, and volume of hemorrhagic mass. Next, SAH were searched at cerebral cortices, Sylvian fissures, Sylvian vallecula, cerebellar folia, interhemispheric fisure, and perimesencephalic cisterns and a 7-grade (0 to 6, 0 means no SAH) SAH severity score based on these locations was assigned to each patient. Based on MRI results, patients were divided in two groups of DAI positive and DAI negative, and were assigned a following DAI staging reported to be prognostic of functional outcome, stage 3 being the worst: stage 0: no DAI, 1: DAI in the lobar white matter or cerebellum, 2: DAI in the corpus callosum or without stage 1 lesions, and 3: DAI in the brain stem with or without stage 1 or 2 lesions.

RESULTS
77 (28.5%) of 270 patients had DAI. Of the 6 CT items, IVH and SAH were independently associated with DAI (both P<0.05). Of the locations, the interhemispheric and perimesencephalic SAH were the independent predictors of DAI (both P<0.05). SAH score and DAI staging showed significant positive correlation (P<0.0001). SAH score in DAI stage 3 or stage 2 was significantly higher than that of DAI stage 0 (both, P < 0.0001). No statistical significant difference was noted in SAH score between DAI stages 0 and 1. The presence of midline SAH on iCT had sensitivity of 60.7%, specificity of 81.8%, PPV of 43.6% and NPV of 90% in predicting severe DAI.

CONCLUSION
Midline SAH on iCT are makers of DAI, specifically severe DAI. Using them as markers could greatly reduce unnecessary MRI in head trauma patients.

CLINICAL RELEVANCE/APPLICATION
Knowing that midline SAH on iCT has the same value as IVH in predicting severe DAI assists clinician to properly select head trauma patients who should undergo subsequent MRI.

SSM07-03 Delayed Intracranial Hemorrhage (ICH) in Patients Receiving Anti-coagulant or Prescription Anti-platelet (ACAP) Medication after Mild Blunt Trauma: Is Repeat hCT Necessary?

Wednesday, Dec. 2 3:20PM - 3:30PM Location: S403B

Kavi K. Devulapalli, MD, MPH, San Francisco, CA (Presenter) Nothing to Disclose
Alina Uzelac, MD, Mill Valley, CA (Abstract Co-Author) Nothing to Disclose
Esther L. Yuh, MD, PhD, Stanford, CA (Abstract Co-Author) Nothing to Disclose
David McCoy, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Alisa D. Gean, MD, San Francisco, CA (Abstract Co-Author) Medical Advisory Board, Samsung Electronics Co Ltd Speakers Bureau, Educational Symposium International Stockholder, Global Indemnity plc Spouse,Employee, Global Indemnity plc
Michael C. Huang, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Jason F. Talbott, MD, PhD, San Francisco, CA (Abstract Co-Author) Data Safety Monitoring Board, StemCells, Inc

PURPOSE
Current literature is conflicted with respect to the risk of delayed intracranial hemorrhage (ICH) in patients undergoing ACAP medication after blunt head trauma. Short interval follow-up hCT after an initially negative hCT is routine practice at many institutions. Given the increase in patients on ACAP therapy, we sought to formally evaluate our institution's 6-hour repeat hCT protocol in this population who present with an initially negative hCT after blunt trauma.

METHOD AND MATERIALS
A retrospective query of our radiologic database was performed to identify all consecutive non-contrast hCT studies performed between January 2013 and November 2014 using search terms for generic and commercial names of ten common anticoagulation and prescription anti-platelet medications in addition to the general terms "anticoagulant," "antiocoagulation" and "blood thinner." Studies were further screened on the basis of a prior CT within 24 hours, which was performed because of trauma and negative for intracranial traumatic pathology. Patients with indications for follow-up imaging other than ACAP use were excluded.

RESULTS
A total of 216 patients met inclusion criteria with only 2/216 (0.9%) developing delayed ICH. Both patients with delayed ICH were found to have trace volume subarachnoid hemorrhage in the ambient cistern, however without associated neurologic deficit or new symptoms. Both of these patients were receiving Coumadin anticoagulation with average INR of 2.5 at the time of admission and were subsequently treated to reverse their anticoagulation and discharged after short ICU observation without adverse event.

CONCLUSION
In our study, the incidence of delayed intracranial hemorrhage in patients receiving ACAP therapy was very small (<1%). The rare cases with delayed ICH were clinically silent. Present data build upon previous literature and lend further evidence that a short-interval follow-up CT among patients receiving ACAP therapy with an initially negative hCT after trauma may be unnecessary.

CLINICAL RELEVANCE/APPLICATION
Head CT is commonly performed after blunt trauma. Results from this study may help to guide clinical decision making regarding
Dual Energy in Noncontrast Head CT: Differentiation of Calcification from Acute Hemorrhage

Wednesday, Dec. 2 3:50PM - 4:00PM Location: S403B

Christopher A. Potter, MD, Boston, MA (Presenter) Nothing to Disclose
Andrew Primak, PhD, Malvern, PA (Abstract Co-Author) Employee, Siemens AG
Aaron D. Sodickson, MD, PhD, Wayland, MA (Abstract Co-Author) Research Grant, Siemens AG; Consultant, Bracco Group

PURPOSE

To evaluate whether a novel DECT postprocessing application that separates calcification from hemorrhage can reliably differentiate these materials in non-contrast head CT foci in an indeterminate Hounsfield Unit (HU) range.

METHOD AND MATERIALS

DECT acquisitions of noncontrast head CTS were performed in the Emergency Department on a 128x2 slice dual-energy scanner (Siemens FLASH, Forchheim Germany). All scans containing foci of intracranial calcification or hemorrhage of 50-85 HU were included. Foci were designated as calcium or hemorrhage based on typical morphology or confirmatory imaging. DECT acquisitions were reconstructed with adaptive statistical iterative reconstruction (ADMIRE), in group 1 with FBP and standard deviation (std) in the mixed high/low kVp image, and the corresponding virtual non-calcium (VNCa) and calcium-map (Ca) images. CTDIvol and DLP values were recorded.

RESULTS

Median CTDIvol (2.76 vs. 2.66 vs. 0.66 vs. 0.69 mGy) and DLP (58 vs. 41 vs. 13 vs. 14 mGycm) were significant lower in group 3 and 4 scanned on the third-generation DSCT with AEC (-76%/75% and -75%/74%; p < 0.0001) without significant difference among each other. Subjective image quality was rated best in group 2 followed by group 3, both with a pitch factor of 2.2 (average scores: 1.87/1.70 vs. 1.40/1.30 vs. 1.63/1.50 vs. 2.43/2.27). Due to strong high-pitch artefacts the subjective image quality of group 4 was inferior to all other groups. Median acquisition time was significant faster using third-generation DSCT (450 ms vs. 300 ms vs. 380 ms vs. 270 ms; p < 0.05).

CONCLUSION

Third-generation DSCT yields faster acquisition times and substantial radiation dose reduction using AEC. A pitch of 2.2 should be preferred since high-pitch artefacts are reduced. Although AEC was used, subjective image quality remains stable and reliable with iterative reconstruction.

CLINICAL RELEVANCE/APPLICATION

Faster CT examination of agitated patients with suspected maxillofacial trauma with reduced radiation exposure and reliable image quality.
CLINICAL RELEVANCE/APPLICATION

DECT shows promise in differentiating foci of hemorrhage from calcification in ranges where HU values overlap, which may be beneficial when HU values alone are not definitive.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Aaron D. Sodickson, MD, PhD - 2014 Honored Educator