Background

The lack of neurosurgical co-management for patients with minimal traumatic brain injury (MTBI, with GCS 13-15) is increasingly accepted. Subsequent head CT (HCT) is an important diagnostic tool to assess MTBI progression and is used to drive clinical decision-making. Criteria that describe risk factors for MTBI progression are unclear. Most hospitals opt to subject all patients to repeat CT scans and neurosurgical consultations, which may expose patients to unnecessary radiation and lead to the potential misallocation of resources. The objective of this study was to identify clinical and radiographic features on initial HCT of patients with MTBI that predict radiographic progression and correlate with clinical parameters.

Methods

This is a retrospective study over 3 years of patients with MTBI not requiring neurosurgical consultation per institutional criteria who underwent at least 2 HCTs during admission. Exclusion criteria include: age less than 18, chronic SDH, GCS less than 13, and obvious depressed skull fracture. HCTs were evaluated for radiographic progression of MTBI defined as: any increase in size of existing hematomas, development of new hematomas, or new/ increasing edema. Patients were divided into 2 groups based on the presence or absence of progression. Secondary outcomes include neurologic deterioration and need for neurosurgical intervention. In the first phase of the study, logistic regression analysis was used to determine risk factors for progression. In the second phase, a clinical decision tree was developed using risks factors identified previously in the first phase.

Results

1,090 patients met inclusion criteria for our study. 232 patients had radiographic progression on repeat HCT; 27.6% of these patients had neurologic deterioration with 13.8% requiring intervention. 4.2% of those without progression had neurologic deterioration with 0.7% requiring intervention. ISS, anticoagulation or antiplatelet use, need for blood products, and type/number/size of hematomas were positively correlated with progression on repeat HCT.

Conclusions

Certain patient and radiographic characteristics are associated with higher rates of progression. ISS, anticoagulation or antiplatelet use, need for blood products, and type/number/size of hematomas were significant independent risk factors. Progression on CT increases risk of neurologic deterioration and need for interventions. As such, repeat imaging remains critical in evaluation of these patients. While vigilance should be high in the treatment of all patients who present with MTBI, close observation and early neurosurgery consultation should be considered in patients with above risk factors. In addition, further studies can assess accuracy of our model for patients who require immediate, initial neurosurgical consultation.