



Differences in Morbidity & Mortality from Traumatic Subdural Hematoma due to Ground Level Falls While on Anticoagulation

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Abstract

The purpose of this study is to discern the degree of increased morbidity & mortality from traumatic subdural hematomas due to ground level falls while taking anticoagulation. All ground level falls have an approximately similar level of force and impact providing a consistent degree of injury. This study will compare patients on anticoagulation vs. those who are not on anticoagulation. This study compares the radiologic criteria of total subdural volume, degree of midline shift, and maximal diameter of the subdural hematoma. This study will also assess the patients presenting neurological status including GCS and focal deficits. Finally, this study will also assess the need for invasive interventions such as subdural drain placement and emergent decompressive craniotomy for evacuation of subdural hematoma. This was a retrospective study with all information obtained from an American College of Surgeons certified level II trauma center with a high volume of annual traumatic brain injuries. This study may be used for the future recommendations of trauma alert guidelines to be issued for patients with traumatic head wounds while on anticoagulation. While it might seem intuitive that a patient on anticoagulation would be more susceptible to hemorrhage, this study actually quantifies the level of morbidity and mortality associated with subdural hematomas caused by ground level falls in patients who are anticoagulated.

Methods

All patients must have met the following criteria: No significant predisposing intrinsic coagulopathy present. Exclusion criteria include liver dysfunction, kidney disease, cancer, sepsis due to DIC, ETOH intoxication, illicit drug use. In order to properly assess patient's neurological status, exclusion criteria included dementia, hypotension, hypoglycemia, excessive hyperglycemia, significant electrolyte abnormalities, positive urine drug screen, use of psychiatric medications that would affect mental status. The use of antiplatelet agents or platelet count below 100,000 was excluded as this would impair bleeding. Patients with significant brain atrophy were also excluded as this would predispose excessive subdural hematoma formation. Any history of seizure disorder was also excluded due to postictal state interfering with neurologic exam. Any other significant intracranial bleeds such as epidural hematoma, intraparenchymal hemorrhage or subarachnoid hemorrhage were excluded as these would cause additional neurological deficit. All patients' material was collected from a trauma registry at Arrowhead Regional Medical Center from the time period of April 2015 until present. All subdural hematomas were status post ground level fall as this was a similar approximation of level of force, impact and injury. The control group met all of the criteria above except they were not on any coagulation. The primary studied group met all of the above criteria with use of anticoagulation. Age was not a criteria for exclusion however; any significant cerebral atrophy was excluded. The degree of midline shift measured must have been primarily attributed to the subdural hematoma. Any other significant intracranial mass such as tumor, encephalomalacia, or asymmetry due to other cause were exclusionary criteria. Inclusionary criteria required the patient have a document subdural hematoma by not contrast CT of the head and was either trauma alert or trauma activation. Trauma alert or trauma activation includes a complete trauma panel of bloodwork which includes CBC, CHEM 10, and coagulation profile, urine vs. serum drug screen, urinalysis, and urine function test. The morbidity vs. mortality was assessed by need for surgical intervention presenting neurological examination including GCS, size of the hematoma's maximal diameter, measurement of midline shift, and total hematoma volume. The

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overall mortality at 30 days was also assessed including clinical brain death examination.

Results

This was a retrospective study which took place at Arrowhead Regional Medical Center an American College of Surgeons certified Level II Trauma Center. There were 77 patients who met all of the inclusion and none of the exclusion criteria. The anticoagulated patients accounted for 28 of the total 77 in this study. The remaining 49 patients who suffered subdural hematomas due to ground level falls were not anticoagulated and belonged to the control group. There were no reported deaths in the 49 control patients who were not anticoagulated. All of these patients were eventually discharged to home, an acute rehab center or a skilled nursing facility. Only 15 out of the 49 control patients required any invasive neurosurgical intervention to decompress and drain the subdural hematoma. In these 15 patients in the control group who required neurosurgical intervention, 6 went directly to the operating room for a decompressive craniectomy or craniotomy, 8 received a less invasive subdural drain procedure at bedside in the intensive care unit performed with a twist drill under strict sterile conditions and a single patient had their family decide to decline any neurosurgical intervention which was offered by the neurosurgery team. In the anticoagulated group only 7 out of these 28 patients did not require any invasive neurosurgical intervention. Out of the 28 anticoagulated patients with subdural hematoma secondary to ground level fall, 6 had their legal medical decision maker decline offered neurosurgical intervention of which two of these patients expired shortly after this difficult decision was made. In the anticoagulated group an additional 6 were taken immediately to the operating room for immediate decompressive craniotomy versus craniectomy. A less invasive subdural drain procedure at bedside in the intensive care unit performed with a twist drill under strict sterile conditions was performed on 9 of the anticoagulated patients.

In the anticoagulated group only 25% of the patient's did not require any invasive neurosurgical intervention compared to the 67% of patients in the control group who did not require any invasive neurosurgical intervention. The total days of hospital admission and time in the intensive care unit were measurably lower in the control group compared to the ICU group. The control group also required less invasive interventions such as intubation, central line placement, percutaneous endoscopic gastrostomy tube placement and tracheostomy tube placement. In the anticoagulated patients who experienced subdural hematoma secondary to ground level fall the average maximal thickness of the subdural hematoma was 14.1 millimeters, compared to just 8.77 millimeters in the control group. The anticoagulated patients who experienced subdural hematoma status post ground level fall had an average of 9.29 millimeters of midline shift on Computerized Tomography Scans of the Head without Contrast compared to the control group which had averaged only 6.68 millimeters of midline shift. A total of 34 out of the 49 patients in the control group had 1 mm or less of recorded midline shift. In the 49 control patients who were not under anticoagulation the presenting Glasgow Coma Scale ranged from 8T to 15. The average presenting Glasgow Coma Scale in this group was calculated to be 14.38 and the mode was 15. A total of 32 out of the 49 patients who were not anticoagulated had a Glasgow Coma Scale of 15 with no focal neurologic deficits.

In the 28 patients who experienced subdural hematoma after

ground level fall while under anticoagulation the presenting Glasgow Coma Scale ranged from 3T with clinical brain death criteria to 15. The average calculated Glasgow Coma Scale was 13.08 in the anticoagulated group compared to 14.38 in the control group. It is important to consider that this study does not take into account patients who may have died before every reaching the hospital after suffering from subdural hematomas from ground level falls while on anticoagulation. This means this study may underestimate the full degree of morbidity and mortality associated with subdural hematomas from ground level falls while on anticoagulation. Furthermore there are likely a high number of non anticoagulated patients who suffer ground level falls and sustain minimal to asymptomatic small subdural hematomas who never seek medical attention.

Conclusion

The results of this study clearly demonstrate that patients who experience traumatic subdural hematomas from ground level while on anticoagulation have an increased level of morbidity and mortality. There was a statistically significant increase radiographically in subdural size, volume, mass effect and degree of midline shift on non-contrast CT Scans of the head in patients who had taken anticoagulation compared to those who had not. In the two groups of patients who had experienced subdural hematoma as a result of ground level fall, the ones using anticoagulation on average presented with a lower Glasgow Coma Scale score and had a higher rate of reported focal neurologic deficits. The study further demonstrated that patients in the anticoagulation group required a higher rate of invasive neurosurgical interventions such as bedside subdural drain and catheterization in addition to full decompressive craniectomy and craniotomy in the operating room compared to the control group. The purpose of this study was to consider if future trauma alert guidelines should be adjusted for patients with traumatic head injury from ground level falls while on anticoagulation. This could include upgrading of alert status to redirect patients who have traumatic head injury due to ground level fall while on Coumadin to dedicated trauma centers with a higher level of care and full neurosurgical coverage. There is no question that anticoagulation prevents stroke, venothromboembolism and is required after invasive interventions such as prosthetic heart valve implantation. Anticoagulation undoubtedly saves lives and reduces the mortality and morbidity in individuals requiring these medications. However, when a patient experiences a traumatic head injury while anticoagulated the increase in morbidity and mortality is undeniable. This is why we are recommending studies like these can be used to adjust the current trauma alert guidelines for patients who have traumatic head injuries while on anticoagulation even if the mechanism is a mechanical or syncopal ground level fall.

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