
Conservative management outcomes of traumatic acute subdural hematomas

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Background: Traumatic brain injury represents a significant cause of mortality and permanent disability in the adult population. Acute subdural hematoma is one of the conditions most strongly associated with severe brain injury. Knowledge on the natural history of the illness and the outcomes of patients conservatively managed may help the neurosurgeon in the decision-making process.

Methods: We present the clinical course and outcomes of a group of 38 patients with traumatic acute subdural hematomas conservatively treated. Outcomes analysis taking into consideration age, Glasgow Coma Scale scores on admission, and radiological findings is provided.

Results: Patients less than 65 years old had a

favorable or functionally independent outcome in 85% of the cases. Patients with Glasgow Coma Scale scores greater than 8 had a functionally independent outcome in 78% of the cases. Patients with acute subdural hematomas with thicknesses ≤ 10 mm and midline shifts ≤ 5 mm showed functionally independent outcomes in 82% of the cases.

Conclusion: The conservative management of patients with acute subdural hematomas can be a viable alternative in certain cases. Those patients younger than 65 years old, with small acute subdural hematomas and Glasgow Coma Scale scores greater than 8, will have the best functional outcomes.

Key words: Acute subdural hematoma, Conservative treatment, Traumatic brain injury.

Traumatic brain injury represents a significant cause of mortality and permanent disability in the adult population. Significant health care costs involve hospitalizations, rehabilitation, and loss of independence. Acute subdural hematoma (SDH) is one of the conditions most strongly associated with severe brain injury with an incidence of 12%-29%. The mean age reported in the literature ranges from 31-47 years, mostly involving males (1-4).

Mortality and outcomes in patients with acute SDHs using the Glasgow Outcome Scale (GOS) (5) and the Glasgow Coma Scale (GCS) (6) have not changed significantly over the last decades. Mortality ranges from 50%-90% (4,7-9), but increases to 90%-100% in patients receiving anticoagulation therapy (8,10). Associated injuries have been reported to occur in 47%-57% of patients, accounting for a higher morbidity and mortality (1,11). Management decisions should take into account guidelines and recommendations for all the lesions involved. Mortality

has been demonstrated to drop to 30% if adequate surgical intervention for evacuation of hematoma is performed within four hours of the trauma (2,8). Other authors have not found a correlation between the timing of operative intervention and the outcome of the patient (4,12). The time from the onset of neurological deterioration to surgery is significantly related to the outcome (1,13).

Despite available guidelines for surgical (1) or conservative (7) management of acute SDHs, management of the patients has to be individualized. The knowledge of the natural course of the illness and the outcomes of patients conservatively managed may help tailor the strategies and algorithms in those cases where management has not yet been clearly defined. Dent, et al. (2) reviewed all patients with an acute SDH admitted over a 6-year period to a single trauma center and found that 61% of the patients received conservative management. The patients conservatively managed tended to fare better, but they also had better initial GCS scores, smaller hematomas, less shift of midline cerebral structures, less associated brain injuries and less cerebrospinal fluid (CSF) basal cistern effacement. They concluded that the operated and non-operated patients represented two different patient populations. Studies evaluating the conservative management of traumatic acute SDHs should only include patients conservatively treated, and the factors that are independently predictive of outcome

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should be analyzed. Three retrospective studies only analyzing the conservative management of traumatic acute SDHs were found in the literature (7,12,14). Another study compared comatose patients who were treated either with surgical or conservative management (15). In our study, we evaluated the clinical course and outcomes of a group of patients with traumatic supratentorial acute SDHs conservatively treated.

Methods

This study evaluated patients who arrived to our emergency room during a six-month period (July 2003 to December 2003) with a diagnosis of acute traumatic supratentorial SDH. Head computed tomographic (CT) scans were used to evaluate all the patients. Patients with a midline shift greater than 10 mm in the head CT scan or with neurological deterioration due to the hematoma were excluded from the study. Pediatric patients younger than 15 years old were not included. Thirty-eight adult patients between the ages of 15 and 90 years old admitted to the Puerto Rico Medical Center with a diagnosis of acute traumatic supratentorial SDH conservatively treated were prospectively evaluated. Radiological assessment was provided using the maximum thickness of the hematoma and the amount of midline shift. Patients with GCS score ≤ 8 were managed with intracranial pressure monitoring, admission to the intensive care unit, and a repeat head CT scan within 24 hours. Those with GCS score > 8 were observed for neurological changes and a follow-up head CT scan was done within 24 hours.

Collection of demographic data, co-morbid conditions, associated intracranial and extracranial injuries, GCS score after initial resuscitation, radiological findings (thickness of the hematoma and midline shift on the head CT scan), course of illness and GOS were registered. The GOS was used to assess the outcome. Favorable or functionally independent outcome includes those patients who return to normal life and live independently but may have mild to moderate disability (GOS > 3). Those patients who required assistance for daily living, remained in a vegetative state, or died were classified as unfavorable outcome (GOS ≤ 3). Follow-up was given at the neurosurgery clinic and by phone interviews. Institutional Review Board and HIPAA Committee approvals were granted at our institution prior to the start of the study.

Results

During a period of 6 months, 38 patients with a mean age of 56 years old were conservatively treated for traumatic acute supratentorial SDHs. Mean follow-up was 19

months. We divided the patients into two age groups, those less than 65 years old and those aged 65 years old and over. Fifty-three percent of the patients were less than 65 years old. There was no significant statistical difference between the age groups ($p=0.375$) using a normal approximation to a binomial data distribution. Eighty-four percent of the patients were male ($p<0.0002$). Eighty-five percent of the patients younger than 65 years old had a GOS > 3 ($p=0.0008$). No statistical difference in the outcome, either favorable or unfavorable, was noted in patients aged 65 years old and over ($p=0.17$).

Initial neurologic presentation was evaluated using the GCS. Ninety-five percent of the patients had a GCS > 8 ($p<0.0002$). Seventy-eight percent of the patients with a GCS > 8 had a GOS > 3 ($p=0.0004$). No conclusive results can be stated for the GCS ≤ 8 group because it only included two patients, yet both died, one from pneumonia and the other from malignant brain edema. Of the GCS > 8 group, 39% had other associated intracranial or extracranial injuries. These injuries included brain contusions, chest/intra-abdominal organ lacerations, and long bone/pelvic fractures. The presence of associated injuries was not significant for the outcome in our study ($p=0.098$). Six patients (16%) died from medical complications, predominantly pneumonia. One of these patients (3%) required surgery for drainage of a chronic hematoma with significant mass effect.

Eighty-seven percent of the patients had hematomas with thicknesses ≤ 10 mm and midline shifts ≤ 5 mm ($p<0.0002$). Six of these patients (16%) had history of anticoagulant or antiplatelet agent use, requiring withhold of medications and blood component transfusions in some cases. None of them required surgery. No significant difference was noted in the group of patients with anticoagulant or antiplatelet medications in terms of outcomes (50% GOS ≤ 3 and 50% GOS > 3). Five patients (13%) had hematomas with thicknesses greater than 10 mm and/or midline shifts greater than 5 mm. The decision for conservative management in these cases was based on a high cardiac risk and informed consent from relatives. Eighty-two percent of the patients with hematomas with a thickness ≤ 10 mm and a midline shift ≤ 5 mm had a GOS > 3 ($p<0.0002$). Those patients with a hematoma thickness > 10 mm and/or a midline shift > 5 mm showed a tendency for GOS ≤ 3 in 80% of the cases, though not statistically significant ($p=0.09$), most likely due to the small sample size. One of these patients required surgical evacuation of the hematoma through a craniotomy due to neurological deterioration.

Discussion

Head trauma represents one of the causes of significant morbidity and permanent disability in the adult population.

Emergency room traumatic brain injury admissions include a spectrum that goes from concussions to significant intra-axial and extra-axial cerebral hematomas. Among them, acute SDHs represent a significant proportion of the injuries (1). Improvements in functional independent survival (GOS>3) are largely due to advances in neuroradiology, critical care, and surgical techniques, which grant an earlier diagnosis and improved prevention of secondary damage. Guidelines and recommendations for the surgical management of these patients have recently been published (1). Most of our surgical management is directed to traumatic acute SDHs with thicknesses >10 mm or midline shifts >5 mm, regardless of the patient's initial GCS score. Mathew, et al. proposed guidelines for the conservative management of traumatic acute SDHs (7). Their criteria include a GCS \geq 13, midline shift <10mm, absence of CSF basal cisternal effacement, and absence of other associated intraparenchymal lesions. Croce, et al. found that patency of the perimesencephalic cisterns significantly correlated with a favorable outcome in patients conservatively managed, but recommended that hematomas greater than 10 mm should be surgically evacuated (12).

To our knowledge, our study is the only prospective analysis of conservative management of traumatic acute SDHs. Information regarding outcomes of patients conservatively managed is important for orientation of the patient and their relatives. Informed consent is based on treatment alternatives when available, with the corresponding risks/benefits ratio. Conservative treatment in patients with acute SDHs is the usual recommendation in patients with small SDHs who are in good neurological condition. Croce, et al. reported a functionally independent outcome in 93% of the patients conservatively managed presenting acute SDHs that measure 10 mm or less at the thickest diameter and a GCS \geq 11 (12). Servadei, et al. recommended conservative treatment in comatose patients (GCS \leq 8) with SDHs less than 10 mm thick and midline shifts less than 5 mm who have an improved or stable GCS score since the injury, show no pupillary abnormalities, and an intracranial pressure less than 20 mm Hg or between 20 and 30 mm Hg if the cerebral perfusion pressure is greater than 75 mm Hg (15). In patients with larger SDHs, but with high medical and anesthetic risks, yet adequate neurological condition, expectant management can be a viable alternative.

The use of anticoagulation and/or antiplatelet medications had no significant effect in the outcome of our patients, contrary to that stated in the literature (8,10). Some patients may develop progressive enlargement of the hematoma associated to its liquefaction, and require surgical drainage. In our series, only one patient (3%) required drainage of the hematoma through craniotomy.

In the literature, 6%-26% of patients conservatively managed developed chronic SDHs requiring evacuation (7,12). These patients may require surgery as early as 11-20 days after the initial injury (7) or as late as 3-7 months after the initial injury (12). Mathew, et al. noted that all patients with a hematoma thickness greater than 10 mm and conservatively managed initially required subsequent burr hole drainage (7).

Age and initial GCS score on presentation were found to be significantly associated to the patient's outcome. The younger patient group (<65 y/o) and the GCS>8 group had a significant favorable outcome. A tendency for an unfavorable outcome was noted in patients with a GCS \leq 8 on admission. The association between age and GCS score with outcome has been previously documented in the literature (1,2,4,11,13,16). Patients with small SDHs, a thickness \leq 10 mm, and a midline shift \leq 5 mm had favorable outcomes in 82% of the cases. Those with larger SDHs had unfavorable outcomes in 80% of the cases.

Zumkeller, et al. showed that the amount of midline shift is very important in survival rate with the survival function decreasing as the midline shift increases (9). In our study, no patient had a midline shift greater than 10 mm due to the exclusion criteria. Some studies have recommended surgical management on those patients with a midline shift >15 mm (16) while others had operated all patients with a midline shift >5 mm (4); or when midline shift was evident (12). Mathew, et al. recommended conservative management with a midline shift <10 mm in conscious patients (7), but Wong recommended it only on those patients with a GCS score of 15 (14). Wong found that a midline shift >5 mm in patients with a GCS score <15 was significantly related to conservative management failure due to exhaustion of the cerebral compensatory mechanisms within three days of injury (14). Therefore, he recommended that the minimal hospital stay for patients with small SDHs under conservative management should be three days. He also found that the thickness of the hematoma was non predictive of the outcome. Servadei, et al. showed that hematoma thickness and midline shift were significant factors in deciding surgical management in comatose patients (15). In our study, most patients with a hematoma thickness >10 mm and/or midline shift >5 mm showed a poor outcomes tendency. This finding does not imply that these patients should be surgically treated. Radiological findings should be evaluated in light of the age, comorbidities, neurological and overall clinical condition of the patient. These patients had high cardiac risk, and were conservatively treated after discussion with their families. Surgical treatment may not change the outcomes in this group of patients.

Studies of surgical and conservative management of high-risk medical patients need to be designed, taking into consideration the association with cardiac and anesthetic risks and other medical conditions. These studies may provide neurosurgeons and other clinicians adequate information in order to obtain better informed consents from relatives when decisions regarding surgery versus conservative management need to be taken.

Conclusion

Conservative management in patients with acute subdural hematomas can be a viable alternative in certain cases. Radiological findings should be evaluated in light of the age, co-morbidities, and the neurological and overall clinical condition of the patient. It is essential to take into consideration a prudent period of observation, inpatient radiological follow-up as well as an adequate outpatient surveillance when applicable. Patients younger than 65 years of age, with small traumatic acute SDHs and initial GCS scores greater than 8 show better outcomes. Relatives should provide informed consent for conservative treatment. Close observation at an intensive care unit should be provided, with intracranial monitoring when applicable.

Resumen

El daño cerebral traumático representa una causa significativa de mortalidad e impedimentos permanentes en la población adulta. Los hematomas subdurales agudos están fuertemente asociados a un daño cerebral severo. El conocimiento sobre la historia natural de esta enfermedad y los resultados de los pacientes tratados de manera conservadora pueden ayudar al neurocirujano en la toma de decisiones. Presentamos el curso clínico y los resultados de un grupo de 38 pacientes con hematomas subdurales agudos tratados de manera conservadora, no quirúrgica. Se provee, a su vez, un análisis de los resultados tomando en cuenta la edad, la escala de coma de Glasgow al momento de la admisión y los hallazgos radiológicos. Los pacientes menores de 65 años tuvieron un resultado favorable o funcional independiente en un 85% de los casos. Aquellos con una puntuación en la escala de Glasgow mayor de 8 tuvieron un resultado funcional independiente en un 78% de los casos. Los pacientes con hematomas subdurales agudos de un espesor

menor o igual a 10 mm y un desviamiento de línea media menor o igual a 5 mm demostraron un resultado funcional independiente en un 82% de los casos. El manejo conservador, no quirúrgico, puede ser una alternativa viable en determinados pacientes de trauma cerebral. Aquellos menores de 65 años con hematomas subdurales pequeños y puntuaciones en la escala de Glasgow mayor de 8 tendrán los mejores resultados.

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