MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2023.158.162

Evaluation of Prognostic Factors in Acute Subdural Hematoma Due to Traumatic Brain Injury

Kankane Vivek Kumar, Jeswani Mayank, Shukla Avdhesh, Sutradhar Sridham and Sharma Avinash

Department of Neurosurgery, Gajra Raja Medical College, Gwalior, India

ABSTRACT

Head injury, often resulting from accidents or falls, is a severe form of trauma. Unconscious patients frequently exhibit acute subdural hematoma as a consequence, which is associated with a high mortality rate ranging from 55-80%, even in specialised medical facilities. The causes of mortality can be attributed to various factors, including co-existing medical conditions and the severity of associated brain injury. Multiple studies have examined the impact of factors such as age, level of consciousness, brain stem reflexes, computed tomography (CT) findings and the timing of surgical intervention on the prognosis of acute subdural hematoma. These factors play a critical role in determining the outcome of this condition. The purpose of this study was to assess the various factors which affect the outcome in acute traumatic subdural hematoma in local population. This retrospective study included all operated 108 patients admitted with traumatic acute subdural hematoma under department of neurosurgery , GRMC and associated J.A. group of Hospitals from January 2021 to December 2022 who seek medical or surgical management. No randomisation done. A total of 224 patients were admitted to the head injury unit with acute subdural hematoma. Out of these, 108 cases underwent surgical intervention. The highest proportion of operated patients 75.9% with acute subdural hematoma fell within the 21-50 age group. In terms of pupillary examination, 46.2% of patients exhibited normal pupillary size with sluggish light reflex and preserved doll's eye movement. The majority of patients 79.6% had computed tomography findings indicating midline shift and effaced basal cisterns. No patients presented for surgery within 3 hrs of injury. Most patients 83.3% underwent surgery between 6-12 hrs after injury. The age group of 21-40 years showed a higher rate of good survival, while the outcome was poorer in the age group above 60 years. The overall survival rate for patients was 27%. Patients with GCS scores of 13-15 had better outcomes, whereas those with GCS scores of 3-8 had poorer outcomes. The presence of preserved pupillary light reflex and doll's eye movement correlated with a favourable outcome, while impaired or absent doll's eye movement with impaired or absent light response correlated with a poor outcome. The time interval between injury and surgery was found to significantly impact the outcome in this study. Traumatic acute subdural hematoma remains associated with a high mortality rate despite advancements in neurosurgery. Initially low Glasgow Coma Scale scores and hypoxia are important predictors of mortality. Different surgical procedures, such as craniotomy and decompressive craniotomy, have shown effectiveness without clear superiority. The GCS scores, pupillary reaction and CT findings are potential indicators of salvageability and outcome.

OPEN ACCESS

Key Words

Acute traumatic subdural hematoma, road traffic accidents, head injury, Glasgow coma scale (GCS)

Corresponding Author

Kankane Vivek Kumar,
Department of Neurosurgery, Gajra Raja Medical College, Gwalior, India
Tel: 9039965510

Received: 2 June 2023
Accepted: 15 June 2023
Published: 28 June 2023

Citation: Jeswani Mayank, Shukla Avdhesh, Sutradhar Sridham and Sharma Avinash, 2023. Evaluation of Prognostic Factors in Acute Subdural Hematoma Due to Traumatic Brain Injury. Res. J. Med. Sci., 17: 158-162, doi: 10.59218/makrjms.2023.158.162

INTRODUCTION

Head injuries resulting from road traffic accidents and falls can have serious consequences. Among the potential outcomes, acute subdural hematoma is commonly observed in patients who are admitted unconscious following trauma. Unfortunately, this condition carries a high mortality rate, ranging from 50-80% even in specialised medical centres[1]. The causes of mortality are multifactorial, including co-morbid conditions and the severity of associated brain injuries. Prognostic factors for acute subdural hematoma have been extensively studied and found to include age, level of consciousness, brain stem reflexes, computed tomography (CT) findings and the timing of surgical intervention. These factors play a crucial role in determining the outcome of patients with acute subdural hematoma[2].

Acute subdural hematoma is characterized by the accumulation of blood in the subdural space, often accompanied by contusion, intracerebral hemorrhage and subarachnoid hemorrhage. It typically presents clinically within 0-48 hrs after the injury. In contrast, subacute subdural hematoma manifests with clinical symptoms beyond 48 hrs after the initial injury, while chronic subdural hematoma presents with symptoms more than 3 weeks after the injury. These different subtypes of subdural hematoma have distinct clinical presentations and timelines of symptom onset[3].

Head injuries from various causes, such as accidents and falls, subject the brain to impact forces, resulting in acceleration and deceleration within the skull. The strain primarily affects the brain surface and bridging veins, leading to injury. Prolonged acceleration can cause deeper brain involvement and diffuse axonal injury[4]. Subdural hematomas can also occur from lacerations or ruptures of brain tissue and blood vessels. Injuries may result in coup or countercoup hematomas, depending on the location of impact.

Surgical evacuation is indicated for subdural hematomas with a thickness greater than 10 mm and a midline shift exceeding 5 mm on computed tomography, regardless of the patient's Glasgow coma scale (GCS). In comatose patients with a GCS score less than 9, surgical evacuation is also recommended for subdural hematomas with a thickness less than 10 mm and a midline shift less than 5 mm on imaging. Immediate surgical intervention is advised if there is a decrease of 2 or more points in the patient's GCS score between the time of injury and hospital admission. Furthermore, patients presenting with asymmetrical dilated or fixed dilated pupils, as well as those with intracranial pressure exceeding 20 mm Hg, should undergo prompt surgical evacuation. These recommendations aim to address the urgent management of subdural hematomas based on specific clinical and radiological criteria[5].

MATERIALS AND METHODS

This was a retrospective study on 108 patients who were operated for acute subdural hematoma under department of neurosurgery, GRMC and associated J.A. group of Hospitals, Gwalior from January 2021 to December 2022 who underwent conservative or surgical management and after analysing the patient's signs and symptoms, radiological features, intraoperative findings and outcome, the results were obtained.

In this retrospective analysis, patients who presented with acute subdural hematoma due to road traffic accidents, fall from height, assault or any other mode were included. Demographic information such as age and sex, as well as clinical manifestations including symptoms and signs, were recorded. Imaging results (Fig. 1), such as NCCT head scans, were also collected to aid in the prognosis assessment in patients of operated acute subdural hematoma.

Furthermore, surgical findings, were documented for patients who underwent surgical intervention. The patients' outcomes and progress were evaluated 24 hrs after surgery, at the time of discharge and followed up after a period of 1 month post-discharge.

This study aimed to provide valuable insights into the clinical presentation, imaging characteristics and surgical outcomes of patients with acute subdural hematoma. By analysing the collected data, researchers can gain a better understanding of the disease and potentially improve patient management and treatment strategies. Clinical outcomes were classified based on the Glasgow outcome scale as either symptomatically improved, deteriorated or expired.

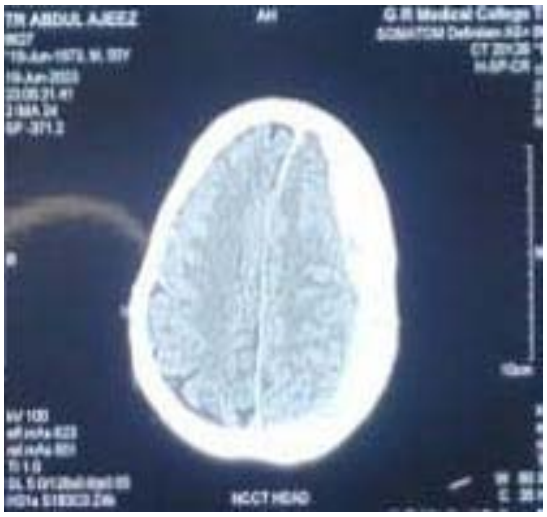

Fig. 1: Pre operative NCCT head showing left frontoparietal acute subdural hematoma

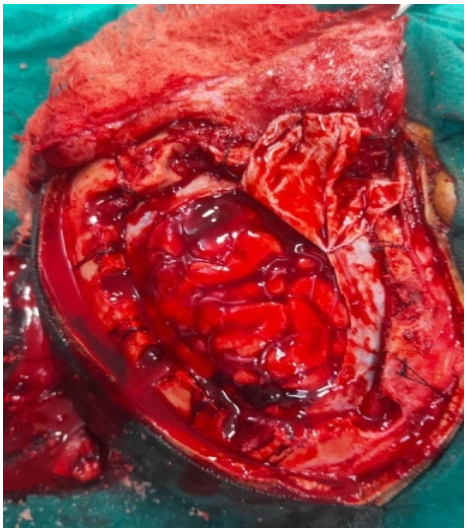

Fig. 2: Intraoperative photo of acute subdural hematoma

Inclusion criteria:

- Patients having traumatic acute subdural hematoma admitted at trauma ward in the year 2021-2022
- Only Patients who were treated surgically were included

Exclusion criteria:

- Patients with acute SDH of non-traumatic cause.
- Thin subdural hematoma managed conservatively
- Patients with acute subdural hematoma who are not operated due to other reasons

In cases of acute subdural hematoma, an emergency craniotomy procedure was performed with the patient in a supine position and the head tilted to the opposite side of the hematoma. The surgery was conducted under general anaesthesia in an operating theatre dedicated to trauma cases. A trauma flap was created over the frontal, temporal and parietal regions on the side of the hematoma and the scalp flap was elevated toward the temporal base. Six burr holes were made over the frontal, temporal and parietal regions and a bone flap was raised through the craniotomy. The temporal base bone was carefully removed to prevent uncal herniation. The dura mater was opened in a stellate shape to minimise brain swelling, with special attention given to exposing the frontal and temporal poles and along the sagittal sinus (Fig. 2). The clot was removed by suctioning and bleeding points on the cortical surface were coagulated. Diffuse oozing was controlled using hemostatic agents such as thrombin-soaked gelfoam or surgifoam. Any brain contusion was carefully removed using suction and electro coagulation. Dural closure was attempted if there was no brain oedema, followed by the replacement of the bone flap. The wound was closed in layers and the patient was transferred to the head injury intensive care unit for postoperative care, including ventilator support, administration of antibiotics, anti-oedema drugs, anti-epileptics and analgesics. Adequate physiotherapy and tracheostomy care were provided. It should be noted that mortality rates were higher in severely injured polytrauma patients.

RESULTS

A non-randomised, retrospective, single institute study was conducted between January 2021 to December 2022, in GR Medical College and JA group of hospitals (GRMC), Gwalior over a period of two years in the department of Neurosurgery on 108 patients diagnosed with traumatic acute subdural hematoma. In the analysis of sociodemographic data, clinical characteristics, CT findings, pre op GCS and pupillary reaction of patients presenting with acute subdural hematoma were noted and results were made.

A total of 224 patients with acute subdural hematoma were admitted to the head injury unit, while 108 cases underwent surgery. The majority of operated patients 75.9% fell within the 21-50 age group. Among the operated patients, 68.5% had a Glasgow coma scale (GCS) score ranging from 3-8. Approximately 46.2% of the patients had normal pupillary size with sluggish light reflex and preserved doll's eye movement. The most common CT finding in operated patients 79.6% was midline shift and effaced basal cisterns. No patients presented within 3 hours of injury and the majority of cases 83.3% presented for surgery between 6-12 hrs after injury. Better survival rates were observed in the age group of 21-40 years, while poorer outcomes were seen in patients above 60 years of age. The overall percentage of survival was 27%. Patients with GCS scores of 13-15 had better outcomes compared to those with GCS scores of 3-8. Preserved pupillary light reflex and doll's eye movement were associated with favourable outcomes, while impaired or absent doll's eye movement with impaired or absent light response correlated with poorer outcomes. The time interval between injury and surgery was found to have a significant impact on the overall outcome in this study.

DISCUSSIONS

A prospective study by Klun and Fettich[6] examined 330 cases of acute subdural hematoma to investigate the prognostic factors influencing patient

outcomes. The study focused on assessing clinical signs, including age, pupillary changes, dynamics of clinical progression and level of consciousness. Through rigorous analysis, the researchers identified significant associations between these factors and the prognosis of acute subdural hematoma, providing valuable insights into the potential impact of these clinical indicators on patient outcomes.

In a 2007 review conducted by Nett[7], the predictive capacity of the Glasgow Coma Scale (GCS) in head-injured patients was investigated. The study demonstrated that the combination of GCS scores with patient age and pupillary response, especially when using broad categories, resulted in the most accurate prediction of outcomes. Additionally, the motor component of the GCS score exhibited similar predictive capabilities to the summed GCS score, with improved accuracy observed at very high or low GCS scores. These findings highlight the importance of incorporating supplementary factors with the GCS score to enhance its predictive value in assessing head-injured patients.

In a 2007 study conducted by D'Amato *et al*.[4], the prognosis of isolated acute post-traumatic subdural hematoma without associated mass lesions was examined in Italy. The study focused on analysing factors such as hematoma thickness, midline shiftand acute subdural hematoma volume using computed tomography (CT). Patient outcomes were assessed at 6 months using the Glasgow outcome scale (GOS). The findings revealed that the presence and extent of midline shift had a greater impact on prognosis compared to acute subdural hematoma volume or thickness. This suggests that midline shift is a crucial determinant in predicting the prognosis of isolated acute post-traumatic subdural hematoma.

In a 2008 study conducted by Taussky *et al*.[8], in Switzerland on the outcome after acute traumatic subdural and epidural hematoma and reported a mortality rate of 41%. Factors such as age, initial Glasgow coma scale (GCS) score and pupil abnormalities were identified as significant predictors of outcome. These findings highlight the importance of considering these factors in determining the prognosis and outcome of patients with acute traumatic subdural and epidural hematoma.

Few studies identified specific criteria for surgical intervention, including a CT thickness of the hematoma greater than 10 mm, a midline shift exceeding 5 mm and a Glasgow coma scale (GCS) score of less than 9. These criteria were considered definitive indications for surgery in patients with acute subdural hematoma. The study aimed to provide guidance on the appropriate surgical management of acute subdural hematoma based on specific radiological and clinical parameters[9].

Several studies have reported that the initial pupillary response and eye movement have a significant influence on the prognosis of patients with head injuries. Taussky *et al*.[8] and Koc *et al*.[10] are among the authors who have explored this relationship. These studies support the notion that assessing pupillary response and eye movement at the initial presentation can provide valuable prognostic information in patients with head injuries. By examining these parameters, clinicians can gain insight into the severity and potential outcomes of the injury, aiding in appropriate management and treatment decisions.

The study, which included 73 cases, identified the Glasgow coma scale (GCS) score at admission as an important prognostic factor. The findings suggested that early surgical intervention for ASDH was associated with a decrease in the mortality rate. These results underscore the significance of timely surgical management in improving outcomes for patients with ASDH, particularly when considering the initial GCS score as an indicator of prognosis[11].

In studies conducted by Dent *et al*.[12], Duhaime *et al*.[13] , Gennarelli *et al*.[14] and Ucar *et al*.[15], a total of 211 cases of acute subdural hematoma were evaluated. Out of these cases, 128 patients were managed conservatively, while 83 patients underwent craniotomy. The study aimed to identify predictors of outcome in ASDH and considered several factors including the Glasgow Coma Scale, Injury Severity Scale, intracranial pressure, direct admission to a trauma centre, presence of subarachnoid hemorrhage and the timing of the operation. The researchers analysed these factors to determine their association with the patients' outcomes, providing insights into the management and prognosis of acute subdural hematoma.

CONCLUSION

Acute subdural hematoma represents a severe condition and the initial Glasgow coma scale score upon admission is strongly associated with both mortality and morbidity outcomes. When there is concurrent brain injury, the presence of acute subdural hematoma further exacerbates the risks of mortality and morbidity. Early surgical evacuation of the hematoma, employing decompressive craniotomy, is a critical strategy aimed at managing elevated intracranial pressure, minimising midline shift and substantially reducing the rates of mortality and morbidity.

ACKNOWLEDGMENTS

The authors are acknowledged to present part of this paper in the form of poster presentation at MPCG chapter NSICON 2023.

REFERENCES

1. Bradshaw, D.R.S., J. Ivarsson, C.L. Morfey and D.C. Viano, 2001. Simulation of acute subdural hematoma and diffuse axonal injury in coronal head impact. J. Biomech., 34: 85-94.
2. Cook, R.J., M.R. Fearnside, P. McDougall and R.J. McNeil, 1996. The westmead head injury project: Outcome prediction in acute subdural haematoma. J. Clin. Neurosci., 3: 143-148.
3. Cruz, J., G. Minoja and K. Okuchi, 2001. Improving clinical outcomes from acute subdural hematomas with the emergency preoperative administration of high doses of mannitol: A randomized trial. Neurosurgery, 49: 864-871.
4. D'Amato, L., O . Piazza, L. Alliata, G. Sabia and G. Zito *et al*., 2007. Prognosis of isolated acute post-traumatic subdural haematoma. J. Neurosurg. Sci., 51: 107-111.
5. Faleiro, R.M., L.C.M. Faleiro, E. Caetano, I. Gomide and C. Pita *et al*., 2008. Decompressive craniotomy: Prognostic factors and complications in 89 patients. Arquivos Neuro-Psiquiatria, 66: 369-373.
6. Klun, B. and M. Fettich, 1984. Factors influencing the outcome in acute subdural haematoma: A review of 330 cases. Acta Neurochirurgica, 71: 171-178.
7. McNett, M., 2007. A review of the predictive ability of Glasgow coma scale scores in head-injured patients. J. Neurosci. Nurs., 39: 68-75.
8. Taussky, P., H.R. Widmer, J. Takala and J. Fandino, 2008. Outcome after acute traumatic subdural and epidural hematoma in Switzerland: A single center experience. Swiss Med. Weekly, 138: 19-20.
9. Bullock, M.R., R. Chesnut, J. Ghajar, D. Gordon and R. Hartl *et al*., 2006. Surgical management of traumatic parenchymal lesions. Neurosurgery, 58: S25-S46.
10. Koç, R.K., H. Akdemir, I.S. Öktem, M. Meral and A. Menkü, 1997. Acute subdural hematoma: Outcome and outcome prediction. Neurosurgical Rev., 20: 239-244.
11. Kaptanoğlu, E., I. Solaroğlu, M.D. Uçar, M.O. Okutan, E. Beşkonakli and Y. Taşkin, 2001. Acute subdural hematomas: Surgical treatment. Retrospective analysis of 73 cases. Ulus Travma. Derg., 7: 246-249.
12. Dent, D.L., M.A. Croce, P.G. Menke, B.H. Young and M.S. Hinson *et al*., 1995. Prognostic factors after acute subdural hematoma. J. Trauma: Injury, Infec., Crit. Care, 39: 36-43.
13. Duhaime, A.C., L.M. Gennarelli and A. Yachnis, 1994. Acute subdural hematoma: Is the blood itself toxic? J. Neurotrauma, 11: 669-678.
14. Gennarelli, T.A., G.M. Spielman, T.W. Langfitt, P.L. Gildenberg and T. Harrington *et al*., 1982. Influence of the type of intracranial lesion on outcome from severe head injury. J. Neurosurg., 56: 26-32.
15. Ucar, T., M. Akyuz, S. Kazan and R. Tuncer, 2005. Role of decompressive surgery in the management of severe head injuries: Prognostic factors and patient selection. J. Neurotrauma, 22: 1311-1318.