

Retrospective analysis of 19 cases of acute intracranial epidural hematoma treated by a medical resident

Análisis retrospectivo de 19 casos de hematoma epidural intracraneal agudo tratados por un residente médico

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ABSTRACT

Introduction: Medical residency is a higher education approach offered at certified health institutions abiding laws established by the Ministry of Health and Culture. The Neurosurgery Medical Residency Program from the Beneficent Surgical Hospital Foundation offers a five-year program at the Beneficent Surgical Hospital Foundation and the Urgent Care Hospital of Sergipe. Throughout the neurosurgical residency we observed the magnitude of traumatic accidents in Sergipe state and the need for intracranial epidural hematoma neurosurgery.

Objective: This study aims to understand the outcomes of the surgical treatment of intracranial epidural hematoma conducted by neurosurgery residents. **Methods:** A convenient sample of 19 patients admitted from March 2014 to February 2017 and treated by one neurosurgery resident. Data collected included gender, age, Glasgow score at admission, hematoma location, diagnostic image, surgery duration, length of hospitalization and postoperative outcomes. **Results:** Descriptive analysis of the sample revealed a mean age of 32.4 years (± 11.1), with a mean hospital stay of 19 days and mean surgical time of 2.7 hours (± 0.9). Among the nineteen cases, eight required postoperative ICU care with a mean ICU stay of 9.4 days (± 13.1). A total of 89.3% of patients were male, primarily victims of motorcycle accidents. On admission most patients had RASS 5 (21%) and GCS 15 (21%). **Conclusion:** Medical residency is very important in professional training. The result of the surgical treatment of the epidural hematoma is similar to that of the preceptors of the resident's formation.

Keywords: intracranial epidural hematoma; medical residency neurosurgery; learning curve; education-based hospital.

RESUMEN

Introducción: El programa de residencia médica es una modalidad de formación de postgrado que se realiza en instituciones sanitarias acreditadas y cumple la normativa del Ministerio de Sanidad y Cultura. El programa de residencia médica en Neurocirugía de la Fundação de Beneficência Hospital de Cirurgia (FBHC) abarca cinco años y tiene como escenario práctico de aprendizaje la Fundação de Beneficência Hospital de Cirurgia (FBHC) y el Hospital de Urgência de Sergipe (HUSE). A lo largo de la residencia en neurocirugía, se puede observar la magnitud de los eventos traumáticos en el estado de Sergipe y las demandas neuroquirúrgicas del hematoma epidural intracraneal. **Objetivo:** El objetivo general fue conocer los resultados del tratamiento quirúrgico del hematoma epidural intracraneal realizado por neurocirujanos en formación. **Resultados:** la muestra no probabilística por accesibilidad estuvo formada por 19 pacientes, desde marzo de 2014 hasta febrero de 2017, intervenidos por un único residente de neurocirugía. Se incluyeron: sexo, edad, causa de la lesión, escala de coma de Glasgow al ingreso, localización del hematoma, hallazgos de imagen, tiempo quirúrgico, duración de la estancia hospitalaria y complicaciones. **Resultados:** El análisis descriptivo de la muestra reveló una edad media de 32,4 años ($\pm 11,1$), con una estancia hospitalaria media de 19 días y un tiempo quirúrgico medio de 2,7 horas ($\pm 0,9$). Entre los diecinueve casos, ocho requirieron atención postoperatoria en la UCI con una estancia media en la UCI de 9,4 días ($\pm 13,1$). El 89,3% de los pacientes eran hombres, principalmente víctimas de accidentes de motocicleta. Al ingreso, la mayoría de los pacientes tenían RASS 5 (21%) y GCS 15 (21%). **Conclusión:** La residencia médica es de suma importancia en la formación de los profesionales. El resultado del tratamiento quirúrgico del hematoma epidural es similar al de los preceptores de formación de residentes.

Palabras clave: hematoma epidural intracraneal; residencia medica neurocirugía; curva de aprendizaje; hospital universitario.

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1 INTRODUCTION

Medical residency is a postgraduate training program in which physicians who fully meet the specialty requirements are certified as specialists. The theoretical and practical activities take place in healthcare institutions under the supervision of ethically and professionally qualified medical professionals, as established by Decree No. 80,281 of September 5, 1977, which created the National Medical Residency Commission (CNRM)¹. The Medical Residency Committee (COREME) is an auxiliary body of both the National Medical Residency Commission (CNRM) and the State Medical Residency Commission (CEREM). According to the law, it is established by healthcare institutions offering medical residency programs to plan, coordinate, supervise, and evaluate both the institution's programs and related selection processes².

An epidural hematoma (EDH) is a collection of blood between the skull's inner table and the dura mater^{3,4}. This neurosurgical emergency most often occurs after traffic accidents or falls⁵. About 70-80% of cases occur in the temporoparietal region⁶. The typical cause is rupture of the middle meningeal artery or its branches during traumatic brain injury (TBI)⁶. EDH occurs in 1-2% of all TBI cases^{6,7} and primarily affects young adult males^{4,8,9}.

This study aims to analyze the surgical outcomes of intracranial EDH operated on by a single neurosurgery resident as the primary surgeon, with a supervising attending physician as mentor and assistant. Additionally, it seeks to compare findings, complications, and mortality rates with existing literature.

2 PATIENTS AND METHODS

This was a retrospective, document-based, exploratory study with a quantitative approach, approved under CAAE: 70273317.0.0000.5546, conducted in the Medical Records Section (SAME) of the *Hospital de Urgência de Sergipe* (HUSE).

Sample selection

- Non-probabilistic convenience sampling of 19 EDH (epidural hematoma) cases operated on by a single neurosurgery resident in training between March 2014 and February 2017.

● Inclusion criteria

- Patients requiring surgical treatment
- Both sexes, all ages
- Admitted to the HUSE emergency department

Data collection

Data were extracted from Emergency Care Records and surgical records, using a three-part form:

1. Identification

- Sex, age, admission date
- Cause of EDH
- Surgical time
- Length of stay in the Intensive Care Unit (ICU)

2. Neurological Assessment

- Richmond Agitation-Sedation Scale (RASS) score
- Glasgow Coma Scale (GCS) score at admission and discharge

3. Outcome

- Discharge or death

Statistical analysis

Data were stored in Microsoft Excel for Windows 2013 and analyzed using BioEstat 5.3.

- Categorical variables were expressed as absolute and relative frequencies.
- Numerical variables were analyzed using measures of central tendency.
- Pearson's chi-square test (significance set at $p < 0.05$) was applied to assess associations between categorical variables.
- Simple linear regression was used to evaluate trends/relationships in neurological exam scores (at admission vs. hospital discharge after surgical treatment).
- A Type I error rate of 5% ($\alpha = 0.05$) and a 95% confidence interval were adopted for all analyses.

3 RESULTS

Between March 2014 and February 2017 (covering the third to fifth year of residency) at Sergipe's reference trauma hospital, 19 surgical treatments for EDH were performed by a single resident.

Descriptive analysis of the sample revealed a mean age of 32.4 years (± 11.1), with a mean hospital stay of 19 days and mean surgical time of 2.7 hours (± 0.9). Among the nineteen cases, eight required postoperative ICU care with a mean ICU stay of 9.4 days (± 13.1) (Table 1).

Table 2 shows that 89.3% of patients were male, primarily victims of motorcycle accidents. On admission to the neurological examination, most patients had RASS 5 (21%) and GCS 15 (21%).

Table 1. Descriptive statistics of age, hospitalization days, and surgical time.

Variables	Mean (95% CI)	SD	Minimum	Maximum
Age (years)	32.4 (27.0–37.7)	± 11.1	11	54
Hospital stay (days)	19.0 (8.9–29.0)	± 20.8	2	71
Surgical time (hours)	2.7 (2.2–10.1)	± 0.9	1	4
ICU stay (days)	9.4 (3.0–15.7)	± 13.1	0	35

n = 19 / CI = 95% confidence interval / SD = Standard deviation.

Table 2. Characteristics regarding sex, trauma mechanism, neurological exams at admission and post-surgery, and outcomes.

Variables	Categories	n	%	p*
Sex	Male	17	89.3	0.01
	Female	2	10.5	
Trauma mechanism	Motorcycle accident	12	63.1	<0.01
	Assault	2	10.5	
	Ground-level fall	2	10.5	
	TBI 3 days prior	1	5.2	
	TBI 1 day prior	1	5.2	
Admission neurological exam	RASS 3	1	5.2	0.00
	RASS 5	4	21.0	
	GCS 4	2	10.5	
	GCS 5	1	5.2	
	GCS 10	2	10.5	
	GCS 13	2	10.5	
	GCS 14	3	15.7	
	GCS 15	4	21.0	
Discharge neurological exam	GCS 10	6	31.6	<0.01
	GCS 14	3	15.8	
	GCS 15	8	47.4	
Outcome	Discharge	18	94.8	0.02
	Death	1	5.2	
Total		19	100	

TBI: Traumatic brain injury. RASS: Richmond Agitation-Sedation Scale. GCS: Glasgow Coma Scale.

*Pearson's chi-square test ($p < 0.05$).

4 DISCUSSION

The present work addresses the results of the surgical treatment of intracranial epidural hematoma (EDH) during the training period of a neurosurgery resident. This aspect is of utmost importance to highlight the professional skills acquired in dealing with the focal problem, as well as to report the rehabilitative impact of neurosurgery in the care of TBI victims.

The literature has reported excellent results in the surgical treatment of chronic subdural hematoma operated on by residents^{10,11}. In our literature, there are no reports of surgical procedures performed by physicians in training in the neurosurgery specialty. However, this disclosure is necessary, considering that surgical or conservative treatment for EDH is recommended and is one of the first procedures to be performed by residents starting from the third year of training in the specialty.

EDH is frequent in neurosurgical practice but remains associated with a high morbidity and mortality rate. EDH predominates in males⁸, a fact also observed in our study. Motorcycle accidents were the most common cause of EDH¹², which aligns with the literature.

EDH has been associated with mild TBI, but it is more commonly linked to moderate and severe TBI^{4,13}. The clinical findings of intracranial EDH are highly variable. The classic clinical presentation of intracranial EDH includes a brief decrease in consciousness level, followed by a lucid interval of varying duration, accompanied by headache, decreased consciousness, contralateral hemiparesis, and ipsilateral mydriasis. Worsening occurs due to the formation of internal brain herniation.

Computed tomography (CT) is the imaging modality of choice¹⁴, as it can assess the location, presence of associated intracranial injuries, midline shift, and cerebral edema. Based on CT findings, we can decide between conservative or surgical treatment, primarily relying on the patient's neurological status and hematoma size.

The surgical treatment of EDH is standardized, either through osteoplastic craniotomy or craniectomy, depending on the location and presence of associated intracranial injuries.

Hematoma drainage via craniotomy is accepted as a treatment method for pure EDH following TBI¹⁵. When diagnosed and treated appropriately, EDH has a good prognosis, as observed in our study.

The presence of midline shift on CT, uncal herniation of the temporal lobe, associated cerebral contusion, diffuse axonal injury, and extracranial injuries are factors that determine prognosis^{6,8}. Other authors report that poor prognosis is associated with low Glasgow Coma Scale (GCS) scores upon admission^{5,6,8,16,17}. Mortality ranges from 0% to 17%⁶. Death often occurs due to respiratory arrest caused by uncal herniation of the hippocampus, leading to brainstem compression. In our study, there was minimal morbidity and no deaths, highlighting the importance of technical, anatomical, and pathophysiological knowledge of TBI. EDH can lead to severe consequences if not promptly diagnosed and properly treated¹².

In addition to the resident physician acquiring knowledge of anatomy and the natural history of the disease, EDH is now considered a safe surgery, even when performed by a neurosurgeon in training, as long as it is under the direct supervision of a specialist.

5 CONCLUSION

This work is the result of reflection on medical training and, above all, specialization in a surgical field—in this case, neurosurgery. We believe that the medical residency system, though sometimes criticized, is the best method for the continuity of medical education and is of extreme importance in surgical specialties. Tutoring helps mitigate the harmful effects of the “trial and error” learning approach. The data from our findings show that the surgical outcomes of a neurosurgeon in training are similar to the expected results for the condition in question.

Beyond outcomes, what stands out are the benefits for patients who receive appropriate treatment, even when that treatment is performed by a neurosurgeon in training. In a country as vast as Brazil, the public healthcare system (SUS) relies on medical residency programs as a crucial tool for delivering quality healthcare assistance.

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