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Intracranial Suppurations: A Review of 201 Cases at Donka National Hospital, Guinea

Berete Ibrahima*, Bah Djénaba, Diallo Aminata Rouguiatou, Mansare Laiba, Komara Cheick, Diawara Seylan, Camara M'ma Aboubacar, Diallo Boubacar, Bah Alpha Boubacar, Souare Ibrahima Sory, Beavogui Luc Kezely

Department of Neurosurgery, Teaching Hospital of Conakry, Gamal Abdel Nasser University of Conakry, Conakry, Guinea
Email: *berete902@yahoo.fr

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Abstract

This retrospective study analyzes the clinical presentation, diagnosis, management, and outcomes of 201 patients with intracranial suppurations at Donka National Hospital in Guinea. The authors report a male predominance and identify otitis as the most common cause, with CT scans serving as the primary diagnostic tool. The study concludes that while surgical and antibiotic treatments are effective, the condition carries significant morbidity and mortality, necessitating early diagnosis.

Keywords

Intracranial Suppurations, Brain Abscess, Subdural Empyema, Epidural Abscess, Guinea

1. Introduction

Intracranial suppurations are collections of pus within the cranial cavity, which can be caused by bacterial, fungal, or parasitic infections. These infections can be life-threatening if not diagnosed and treated promptly. The objective of this study is to review the clinical presentation, diagnosis, treatment, and outcomes of patients with intracranial suppurations managed at the neurosurgery department of Donka National Hospital in Guinea.

2. Patients and Methods

2.1. Study Design

This was a retrospective study of patients diagnosed with intracranial suppurations at the neurosurgery department of Donka National Hospital in Guinea between January 1st, 2019, and October 31st, 2025.

2.2. Patient Selection

The study included 201 patients who met the following criteria: had complete medical records, were diagnosed with intracranial suppurations based on clinical presentation, imaging studies, and laboratory tests, and were managed at the neurosurgery department of Donka National Hospital in Guinea.

- *Inclusion criteria*: Patients of all ages and sexes. with a confirmed diagnosis of intracranial suppurations.
- *Exclusion criteria*: patients with incomplete medical records and who did not undergo imaging studies or laboratory tests.

2.3. Data Collection

For each patient, a pre-established patient information sheet was created, and the medical record review allowed us to collect the following parameters: age, sex, place of origin, medical history, clinical presentation, and admission timing (from onset of symptoms to consultation). Imaging studies, such as CT scan or MRI, were performed to confirm the diagnosis and assess the extent of the infection. type of collection, the location, and the size of the collection were identified. The imaging studies were reviewed by experienced radiologists. Laboratory tests, such as blood culture and CSF (cerebrospinal Fluid) analysis, were performed to identify the causative organism and assess the severity of the infection. Microbiological analysis was performed on CSF (cerebrospinal Fluid) and/or pus samples. The samples were cultured for aerobic bacteria, and fungal cultures were also performed. Typically involved antibiotics and surgical drainage. Antibiotics were administered empirically based on the suspected causative organism and then adjusted based on culture and the sensitivity results. Surgical drainage was performed in patients with the large volume abscesses or those who did not respond to medical treatment. The surgical procedures included drainage of the abscess, excision of the capsule, and debridement of necrotic tissue. Outcome Measures were estimated with Glasgow Outcome Scale (GOS):

✓ favorable outcomes (GOS 1-2):
- Good recovery (GOS 1): the patient has returned to their pre-illness level of functioning, with minimal or no neurological deficits.
- Moderate disability (GOS 2): the patient has some neurological deficits but can perform most daily activities independently.

✓ Unfavorable outcomes (GOS 3-5):
- severe disability (GOS 3): the patient is dependent on others for daily activities, but is conscious and able to communicate.
- vegetative state (GOS 4): the patient is unconscious and unable to communicate or respond to their environment.
- Death (GOS 5): the patient has died because of the intracranial suppuration.

2.4. Statistical Analysis

Descriptive statistics were used to summary the data. Categorical variables were presented as frequencies and percentages, while continuous variables were presented as means and ranges. To determine the predictors of mortality, we performed a multivariate logistic regression analysis on the data collected from patients with intracranial suppurations. The analysis included variables such as age, Glasgow Coma Scale (GCS) score, presence of multiple abscesses, delayed treatment, and other relevant clinical and laboratory parameters. Statistical analysis was performed using SPSS software.

2.5. Ethics

The study was approved by the institutional review board of Donka Nation Hospital. Informed consent was not required due to the retrospective nature of the study. The data were collected and analyzed by experienced researchers.

2.6. Study Limitations

The study had some limitations, including its retrospective design and the potential for selection bias. Additionally, the study was conducted at a single center, which may limit the generalizability of these findings.

3. Results

The global mean age was 29.28 ± 14.58 with a male predominance (sex ratio = 1.48) (**Table 1**).

Table 1. Demographic and clinical characteristics of patients with intracranial suppurations.

characteristics	Number of patients	Percentage
Age		
Mean age of children (years)	10.2 ± 4.5 (range, 0 - 15)	
Mean age (years)	35.6 ± 15.6 (range, 16 - 80)	
Sex (M/F)	120/81	59.70%/40.30%
Underlying comorbidities		
Diabetes	35	17.41%
Immunodepression	21	10.45%
Chronic Media Otitis	23	11.44%
Head trauma	12	05.97%
Symptoms		
Headache	161	80.10%
Fever	152	75.62%
Vomiting	123	61.19%
Altered mental status	101	50.24%
Focal neurological deficits	94	46.77%
Seizures	78	38.81%

Continued

Signs		
GCS		
≤8	12	05.97%
9 - 12	89	44.28%
13 - 15	103	51.24%
Papilledema	46	22.88%
Meningismus	38	18.91%
Cranial nerve palsies	13	06.47%

Table 1 and Figure 1 provide a detailed overview of the age demographics of patients in the series, highlighting the children's age. Comparison of age group children had a mean age of 10.2 ± 4.5 years, with the majority (70%) between 6 and 15 years old (Figure 1). Adults had a mean age of 35.6 ± 15.6 years, with the majority (60%) between 31 and 70 years old.

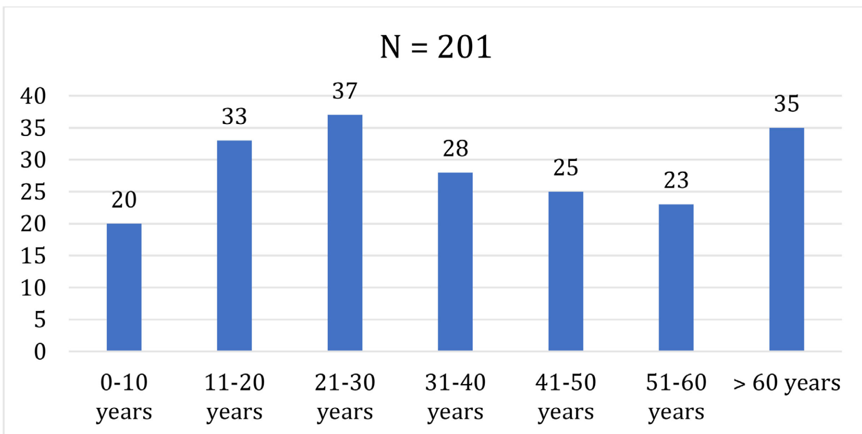

Figure 1. A histogram showing the age distribution of patients with intracranial suppurations.

3.1. Imaging Findings

The neuroimaging studies, such as cranial CT scan in 89.05% cases and brain MRI, were performed for diagnosis in 22 cases (10.95%). The imaging characteristics of types of intracranial suppurations are shown in Figure 2.

The most common locations of intracranial suppurations were frontal (30.35%), parietal lobe (19.40%), temporal lobe (34.83%), and cerebellum (15.42%). Brain abscess was the most common type of intracranial suppuration across all age groups (Figure 2).

Mean was 87.23 ± 28.34 hours. The time to surgery within 24 hours was achieved in 18% of cases, which is crucial in improving outcomes for patients with intracranial suppuration, and delayed response (>72 hours) occurred in 57% of cases (Table 2).

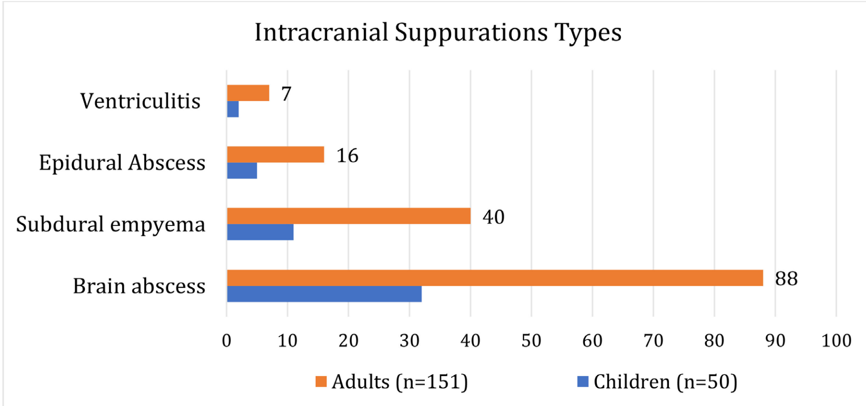

Figure 2. A bar chart showing the proportion of different types of intracranial suppurations in the study population.

Table 2. Comparison of surgical interventions, surgical techniques used, and time to surgery.

Characteristics	Children (50)	Adults (151)
Time to surgery	87.23 ± 28.34 Hours	
Surgical techniques		
Burr Hole	21 (42%)	73 (48.34%)
Stereotaxic aspiration	0 (00%)	1 (0.66%)
Craniotomy	16 (32%)	88 (58.28%)
Craniectomy	11 (22%)	3 (01.99%)
EVD	3 (06%)	4 (02.65%)
Endoscopic Surgery	0 (00%	1 (0.66%)
Surgical Complications		
Seizures	5 (10%)	4 (02.65%
Reinfection	6 (12%)	14 (09.27%
hemorrhage	9 (18%)	23 (15.23%)
Cerebral edema	43 (86%)	59 (39.07%)
Neurological Deficits	10 (20%)	35 (23.18%)
Mortality	2 (04%)	20 (13.25%)

Otitis was the most common cause found in 75/201 (37.31%) of cases, against the sinusitis, which was found in 34.33% of cases, and the *streptococcus pneumonia* was the most common microorganism identified in both children and adults (Table 3).

Treatment included the antibiotics it was the broad-spectrum antibiotics to treat the underlying infection for all cases (100%), Surgical drainage or excision of the abscess in 121 cases (60.20%) cases with large abscesses; significant mass effect, all patients have the supportive care: management of increased intracranial pressure with corticosteroids in 81 cases (40.30%) and seizures with anticonvulsants in 79 cases (39.30%) and others complications in 12 cases (5.97%) (Figure 3).

Table 3. Laboratory blood test, microbiology of patients.

Characteristics	Children (50)	Adults (151)
Blood test		
Elevated white Blood Cell Count	34 (68%)	109 (72.19%)
Elevated ESR	23 (46%)	89 (58.94%)
Elevated CRP	41 (82%)	143 (94.70%)
Positive Blood Culture	5 (10%)	32 (21.19%)
Microorganism		
Streptococcus pneumoniae	12 (24%)	40 (26.49%)
Staphylococcus aureus	11 (22%)	29 (19.21%)
Escherichia coli	6 (12%)	16 (10.60%)
Klebsiella pneumoniae	2 (4%)	13 (08.61%)
Others	21 (42%)	65 (43.05%)

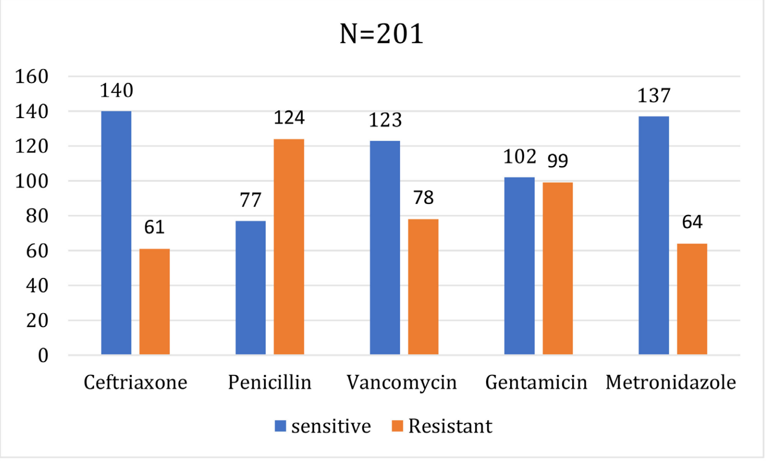

Figure 3. Antibiotic sensitivity testing of patients.

3.2. Treatment Outcomes

Globally, the outcome was favorable in 71.14% of cases (**Table 4** and **Figure 4**), with a mortality rate of 10.95%.

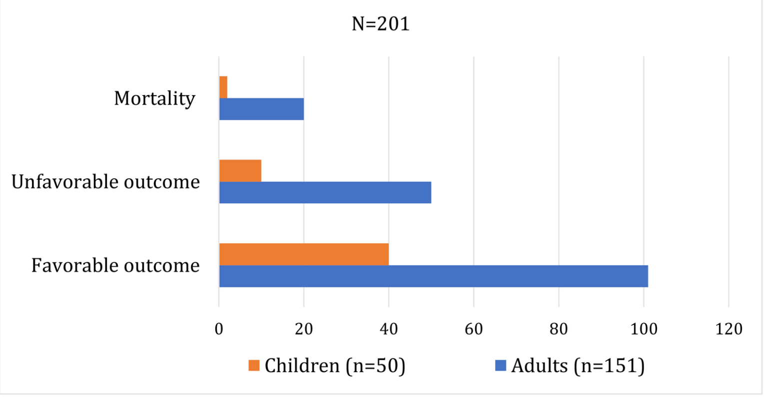

Figure 4. Outcome of patients with intracranial suppurations.

Table 4. Comparison of treatment outcomes.

Outcome	Children (50)	Adults (151)
Complete Recovery (GOS 1)	43 (86%)	100 (66.23%)
Residual Deficits (GOS 3 - 4)	5 (10%)	28 (18.54%)
Mortality (GOS 5)	2 (04%)	20 (13.25%)

3.3. Univariate Analysis

We also found that age > 60 years, Glasgow Coma Scale < 8, and multiple abscesses were predictors of mortality (Table 5).

Table 5. Predictors of mortality.

Predictor	Odds ratio	95% CI	p-value
Age (children) ≤ 5 years	2.5	3.2 - 4.5	0.03
Age (adults) > 60 years	3.5	1.5 - 7.9	0.003
Glasgow Coma Scale ≤ 8	4.2	2. 3 - 11.2	0.001
Multiple abscesses	2.8	1.5 - 6.8	0.04
Delayed treatment	2.2	1.1 - 4.5	0.045
Underling comorbidity	2.5	1.2 - 3.3	0.324

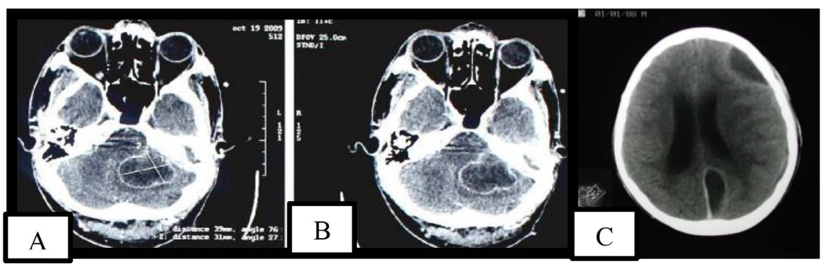

Figure 5. CT scan shows cerebellum abscess (A and B) and multiple empyema frontal and interhemispheric location (C).

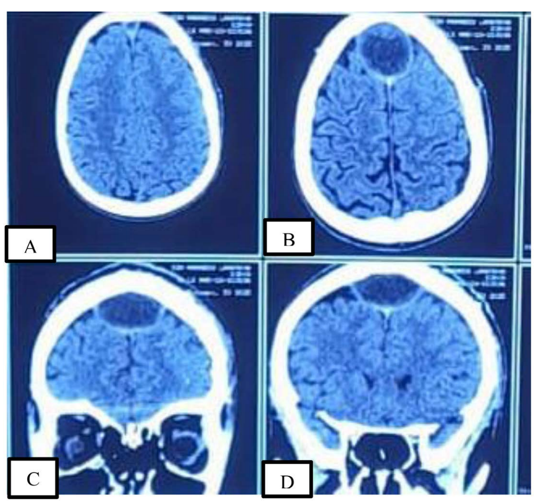

Figure 6. CT scan with contrast (A and B) axial slide and (C and D) coronal slide shows the midline frontal empyema.

The images illustrate the topographic locations and intraoperative findings of intracranial suppurations in our series. The cerebellum abscess represented 15.42% in our series (Figure 5(A) and Figure 5(B)) and frontal suppuration location was 30.35% in cases (Figure 6 and Figure 7). We found the temporal lobe location in 34.83% (Figure 8 and Figure 9).

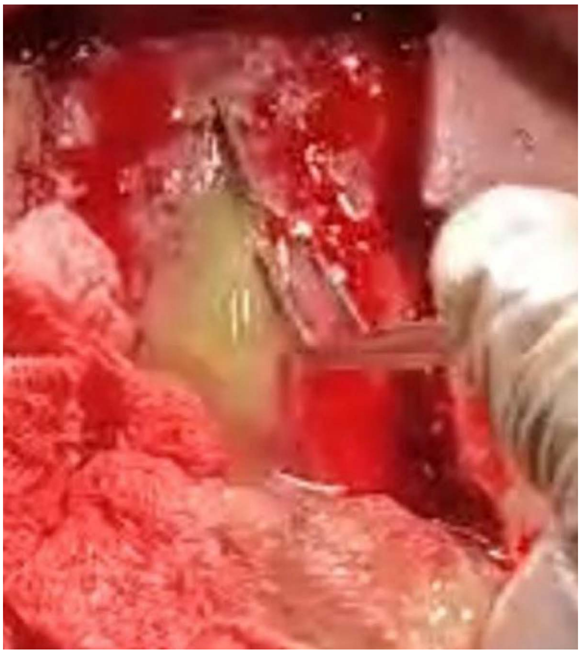

Figure 7. Intraoperative image showing the middle line approach for frontal empyema.

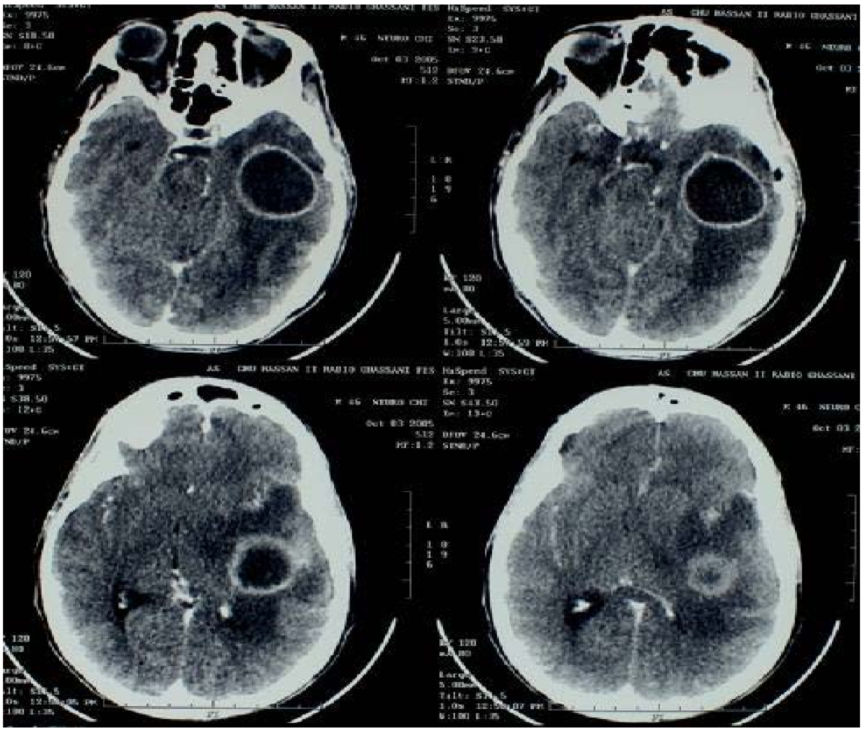

Figure 8. CT scans with contrast show the left temporal abscess.

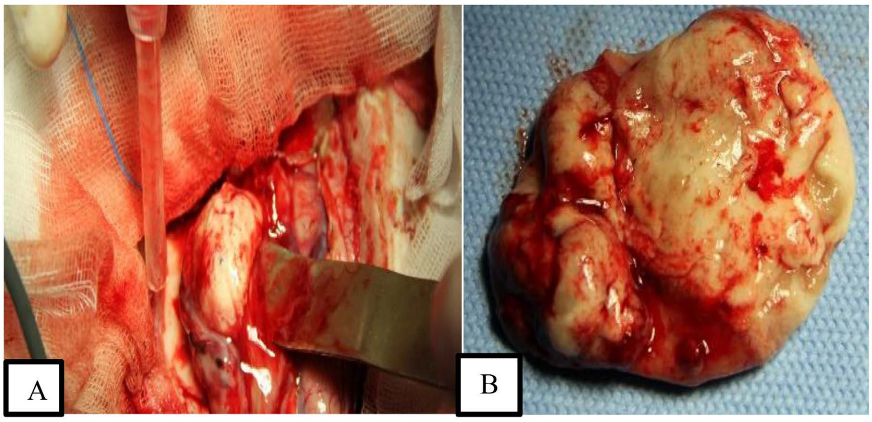

Figure 9. Intraoperative image showing (A) the right craniotomy temporal abscess resection and (B) showing the surgical specimen, the abscess wall, for histopathological examination.

4. Discussion

Intracranial suppurations, including brain abscesses and subdural empyemas, are serious and potentially life-threatening infections that require prompt diagnosis and treatment. The clinical presentation can vary depending on the location and size of the abscess, as well as the patient's immune status [1]. In this study, we found that the majority of patients (59.70%) were male, which is consistent with previous studies [1] [2]. The mean age of patients was 29.28 ± 14.58 years, which is similar to other studies [2].

The pathogenesis of intracranial suppurations involves the spread of bacteria or other microorganisms to the brain parenchyma, either through direct inoculation, hematogenous spread, or contiguous spread from adjacent structures [3]. The most common causative organisms are Streptococcus pneumoniae, Haemophilus influenzae, and Neisseria meningitidis [4].

Imaging studies, such as CT scan or MRI, are essential for diagnosis. In this study, we found that CT scan was the most common imaging modality used in 89.05% cases, which is consistent with previous studies [5]. MRI was used in 10.95% of patients, which is similar to other studies [2]. A study by Brouwer *et al.* [1] found that MRI is more sensitive than CT scan in detecting brain abscesses, especially in the early stages. The imaging characteristics of brain abscesses typically include a ring-enhancing lesion with surrounding edema and mass effect [6]. In some cases, the abscess may be multiloculated or have a complex appearance [7].

Treatment typically involves antibiotics and surgical drainage. In this study, we found that 140 patients (70%) had a favorable outcome, while 61 patients (30%) had an unfavorable outcome. The mortality rate was 10.95%, which is consistent with previous studies [2]. A study by Helmy *et al.* [5] found that the outcome of patients with brain abscesses is influenced by several factors, including the size and location of the abscess, the patient's immune status, and the effectiveness of treatment.

We also found that age > 60 years, Glasgow Coma Scale < 8, and multiple abscesses were predictors of mortality. These findings are consistent with previous studies that have shown that these factors are associated with poor outcomes in patients with intracranial suppurations [5] [8]. The results of this study have several implications for practice. Firstly, they highlight the importance of prompt diagnosis and treatment of intracranial suppurations. Secondly, they emphasize the need for a multidisciplinary team approach to patient care [9]-[11]. Finally, they suggest that imaging studies, such as CT scan or MRI, should be performed promptly in patients with suspected intracranial suppurations. Future studies should aim to identify new predictors of outcome and develop more effective treatment strategies for patients with intracranial suppurations. Additionally, the role of adjunctive therapies, such as corticosteroids and hyperbaric oxygen, should be further investigated [12]-[15].

5. Conclusion

Intracranial suppurations (ICS) remain a significant health problem in Guinea and other limited-resource countries, causing high mortality rates. Our study proves that intracranial suppurations are potentially life-threatening infections that require prompt diagnosis and treatment. Early recognition and management can improve outcomes and reduce mortality. The main challenges include limited access to diagnosis, inadequate treatment, and poor sanitation and hygiene. Further studies are needed to confirm the findings of this study and to identify other predictors of outcome.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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