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# Outcomes of Evacuating Subacute Extradural Hematoma Through a Minicraniectomy: A 5-Year Study

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## Abstract

**Background** Extradural hematoma (EDH) is a hematoma between the dura and the inner surface of the skull, found in 1 to 3% of all head-injured patients, rising to 9% among the unconscious ones. It is said to be subacute when about 2 to 4 days old. Further enlargement of the burr hole to about 3 to 5 cm wide (minicraniectomy) may allow its total evacuation.

**Objective** To recommend it as a treatment option, this study aims to evaluate the surgical outcomes of evacuating a subacute EDH through a minicraniectomy.

**Method** This was a 5-year prospective study in a Nigerian tertiary health institution.

**Results** In total, 108 patients, consisting of 96 males and 12 females with a male to female ratio of 8:1 were included. Their ages ranged from 10 to 69 years. Etiologies were road traffic accident (RTA, 73.2%), assault (18.5%), and falls (8.3%). Hematoma ages were 2 days (61.1%), 3 days (25%), 4 days (13.9%). GCS were mild (11%), moderate (56%), and severe (33%). Locations were right-sided (59.3%), left-sided (40.7%) with 73.1% in parietotemporal area. Active bleeding was encountered in 15% only. Postoperative complications were seizure (13.9%), death (12%), and surgical site infection (4.6%) among others. Outcomes at 2 weeks were good (83, 76.9%), moderate disability (12, 11.1%), severe disability (10, 9.3%), vegetative (1, 0.9%), and death (2, 1.9%).

**Conclusion** Considering the significant morbidity and mortality and the need for urgent interventions in EDH, most patients presenting in the subacute acute (2–4 days) stage can be evacuated via a minicraniectomy with good outcomes.

**Keywords**
- subacute
- extradural hematoma
- evacuation
- minicraniectomy
- outcome

## Introduction

Extradural hematoma (EDH) is a collection of blood between the skull's inner surface and the outer layer of the dura.[1] It is found in 1 to 3% of all head-injured patients.[2] Eighty-five percent (85%) of the bleeding is from the middle meningeal artery.[3]

Seventy-five percent (75%) of EDHs in adults occur in the temporal region.[4] Among children, it occurs with similar frequency in the temporal, occipital, frontal, and posterior fossa regions.[4] Radiographically, type II: subacute EDH is 2 to 4 days old,[4] accounting for about 31% of all intracranial EDHs.[5]

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Urgent evacuation is indicated in patients with coma, anisocoric, and volume of more than 30 $cm^3$, irrespective of the Glasgow Coma Scale (GCS) score.[6]

Minicraniectomy (3–5 cm large) for rapid evacuation/ drainage of EDH in patients under an emergency setting is a well-documented fact.[7,8]

We aimed at determining the outcomes of evacuating a subacute (EDH) via a minicraniectomy.

## Materials and Methods

It was a prospective study in two tertiary healthcare facilities in Northeastern Nigeria from January 2017 to December 2021 (5 years). Ethical clearances were obtained.

Patients with subacute EDH (2–4 days duration) were included in the study; those excluded were poly traumatized patients, those who had a conversion to craniotomy, and those with another coexisting hematoma. Data on demographic profiles, duration of injury, etiology of injury, conscious levels (GCS), hematoma location, surgical findings, complications, and outcomes (GOS) at discharge were collected.

The burr holes were centered over the hematoma, enlarged to a minicraniectomy of about 3–5 cm in diameter. The hematoma scooped out/aspirated gently, the space filled with normal saline, then aspirated (slow rinsing) until the effluent became clear. Two to four craniostomies were placed at equidistance within 0.5 cm to the edge of the craniectomy to allow the dura (dura tack-up sutures) tenting using vicryl 3/0 suture. There was no need of placing a drain.

All the collected data were stored electronically and analyzed using IBM SPSS 27 - 2019. Descriptive statistics were applied to calculate the mean and mode. Frequency and percentages were calculated for qualitative variables such as gender and the surgical outcomes of the evacuation. Overall, a $p$-value of less than 0.05 was considered statistically significant.

## Results

One hundred eight patients were considered, consisting of 96 males and 12 females, with a male to female ratio of 8:1. Their ages range from 10 to 69 years. Their mean age was 30 years with a mode of 33 years. Cause/age relationship revealed falls in the 10 to 19 years (09, 8.3%), assault in the 20 to 39 years (20, 18.5%), road traffic accidents in the 20 to 69 years (79, 73.2%), with none in the less than 10-year-olds.

Their post-resuscitation Glasgow Coma Scale (GCS) scores is shown in ►**Fig. 1**.

A typical computed tomography scan (CT scan) and an intraoperative image of the same patient showing the minicraniectomy with an extruding hematoma is shown in ►**Fig. 2**.

The surgical site, intraoperative finding, postoperative complications, and outcomes at 2 weeks are shown in ►**Table 1**.

## Discussion

The commonly affected age group is the young (73.2%), between 10 and 39 years. This finding conforms with Gaillard[1] and Khairat[4] (20–30 years). In contrast, Kiboi's[9] patients were older (26–45 year old). Though rare after 50 years (Khairat[4]), four of our patient's ages were between 50 and 69 years.

Males (88.9%) outnumbered the females (11.1%), similar to the finding of Kiboi,[9] probably because males are the ones mainly in transit while fending for the family.

The main etiological factor is the RTA among adults (73.2%), then assault (adults) and fall from heights (children). It is nearly similar to a report[10] but at variance with Kiboi[9] that found assault as a leading cause.

The earliest (2–3 days) presenting group (73.2%) is from RTA. In contrast, Kiboi[9] found only 23.2% early presenters. Delay presenters are assaults (3–4 days) and falls (fourth day) related, probably due to the circumstances surrounding the assault, falls, and most likely because their GCS were mild to moderate.

Moderate and severe head injuries constitute 89%, with a few mild ones. In contrast, Kiboi[9] observed a high number in the mild group (59.4%). We found a mean GCS of 11/15, at variance with Kandregula[10] (13/15).

Minicraniectomy allowed for easy and complete hematoma evacuation. As suggested by Wilson,[11] the burr holes were placed appropriately. Minicraniectomy in the evacuation of such EDH had been found useful.[12]

The hematoma is mainly on the right. Parietal locations are common, then temporal, frontal, and occipital, respectively. Parietal and temporal (parietotemporal) locations constitute 73.1%. Gaillard[1] found only 60% in parietotemporal location. We did not find any bilateral EDH, just as it is rare[1](5%).

Active bleeding is found in only 15% of patients (all are arterial). Bullock[3] had reported arterial bleeding as a common source of EDH.

Complications are in 39 patients (36.1%), commonly postoperative seizure, death and superficial surgical site infection. Our mortality rate is similar to the finding of Khan[13] (12.5%). O' Sullivan[14] found fewer mortalities than ours (less than10%). Mortalities within the broader range of 10% to 30% were found by Kiboi[9] (26.6%). Mortalities are high among RTA patients, older patients, and those with a severe head injury.

Our outcomes were mainly good, followed by a few with moderate to severe disabilities. Slightly better outcomes than ours had been reported by Khan[13] (79.2%), and Kiboi[9] (90%) although their evacuations were via craniotomy and presented within 24 hours. Their outcomes bettered ours probably because our patients presented later (after 24 hours). The residual disabilities include hemiparesis (9, 8.3%) and speech (3, 2.8%) disorder; this is similar to the finding by Kiboi[9] (7.2%).

## Conclusion

Mortality and morbidity from EDH are high. We found that in the subacute stage, an enlarged burr hole (minicraniectomy)

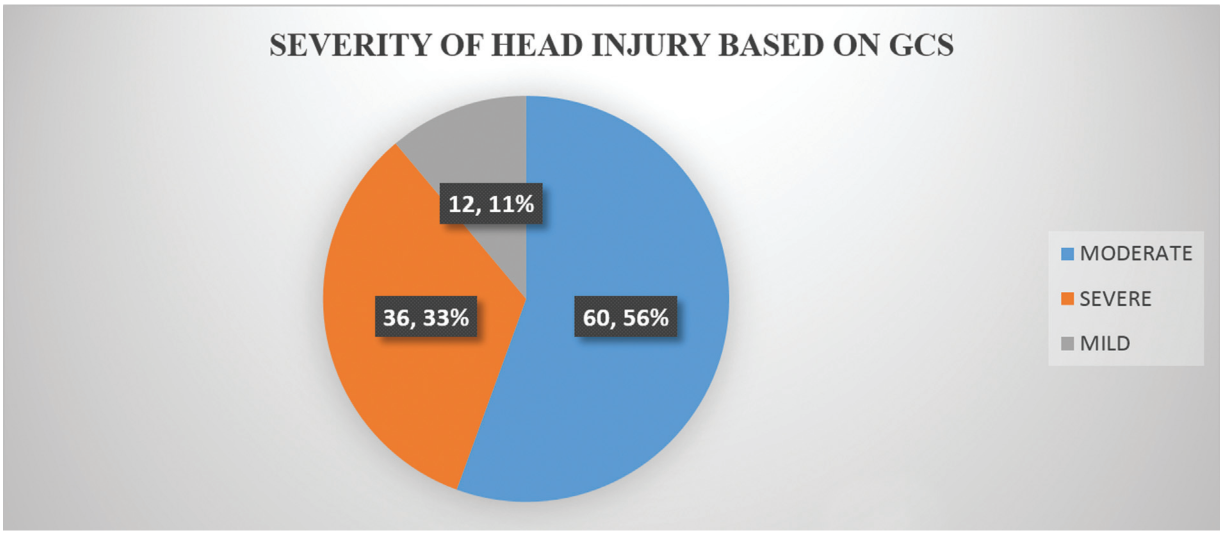


**Fig. 1** Pie chart showing the severity of head Injury among patients with subacute extradural hematoma.

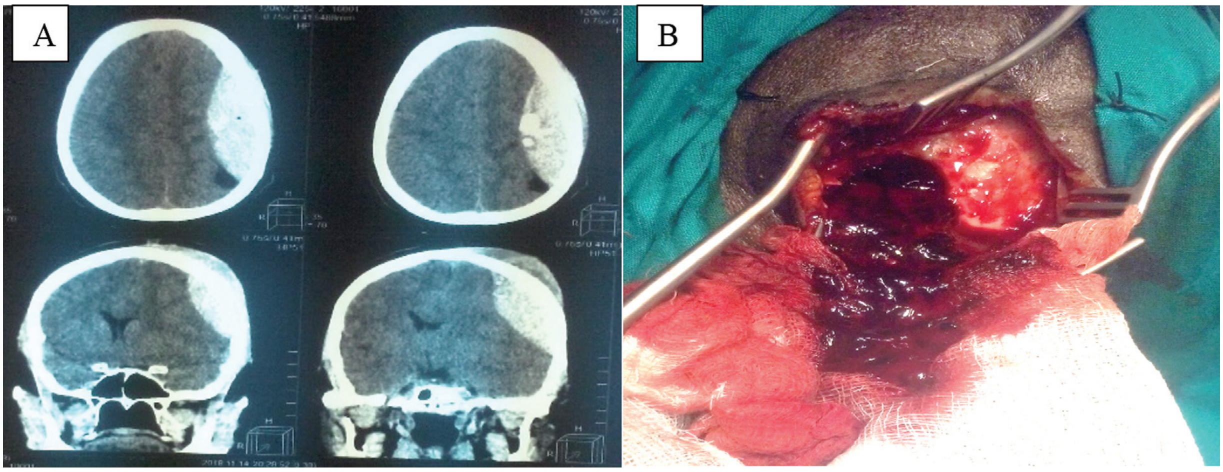


**Fig. 2** A left-sided parietotemporal subacute extradural hematoma in axial and coronal cuts (**A**) and an intraoperative picture showing extruding blood clot through the minicraniectomy (**B**).

**Table 1** Minicraniectomy findings and outcomes

| Minicraniectomy findings and outcomes ($N = 108$) |
|---|
| Surgical side |
| Right side: 64 (59.3%) |
| Left side: 44 (40.7%) |
| Any intraoperative “active” bleeding? |
| Yes: 16 (14.8%) |
| No: 92 (85.2%) |
| Postoperative complications |
| Superficial surgical site infection: 5 (4.6%) |
| Cerebrospinal fluid leakage: 2 (1.9%) |
| Growing skull fracture: 3 (2.8%) |
| Prolonged III cranial nerve palsy: 1 (0.9%) |
| Postoperative seizure 15 (13.9%) |
| Immediate postoperative death: 13 (12.0%) |
| Outcome at 2 weeks postoperative period |
| GOS 1 (death): 2 (1.9%) |
| GOS 2 (vegetative state): 1 (0.9%) |
| GOS 3 (severe disability): 10 (9.3%) |
| GOS 4 (moderate disability): 12 (11.1%) |
| GOS 5 (good functional recovery): 83 (76.9%) |

drainage of subacute subdural hematoma without the need for more invasive craniotomy produces good outcomes.

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**Conflict of Interest**
None declared.

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