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ORIGINAL ARTICLE

Urokinase in Hypertensive Capsuloganglionic Hemorrhage with Intraventricular Hemorrhage: A Randomized Control Trial

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Abstract

Background: Capsuloganglionic hemorrhage with intraventricular hemorrhage (IVH) is always associated with higher mortality and morbidity [12]. So, we did a randomized control trail in patients requiring External ventricular Drain (EVD) for hypertensive IVH with and without instilling Urokinase; to know it's effectiveness [19]. **Methods**: A computerized randomized controlled trial was carried out on 30 patients who needed EVD for hypertensive capsuloganglionic hemorrhage with IVH. Patients were randomly assigned to one of two groups: test (EVD + urokinase) or control (EVD only). Graeb scores, Glasgow Outcome Scale (GOS), ICU stay, GCS, and complications were compared before and after treatment. **Results**: The EVD + urokinase group had better functional outcomes, a shorter ICU stay (5.8 vs. 7.8 days, p=0.044), and a much larger drop in Graeb scores (p<0.001). There was no increased risk of infection or rebleeding. **Conclusion**: In Hypertensive Capsuloganglionic Hemorrhage with IVH, intraventricular fibrinolysis with urokinase is a safe and effective to improve the outcome of the patient.

Keywords: IVH, Gareb score, Urokinase fibrinolysis, Capsuloganglionic ICH with IVH

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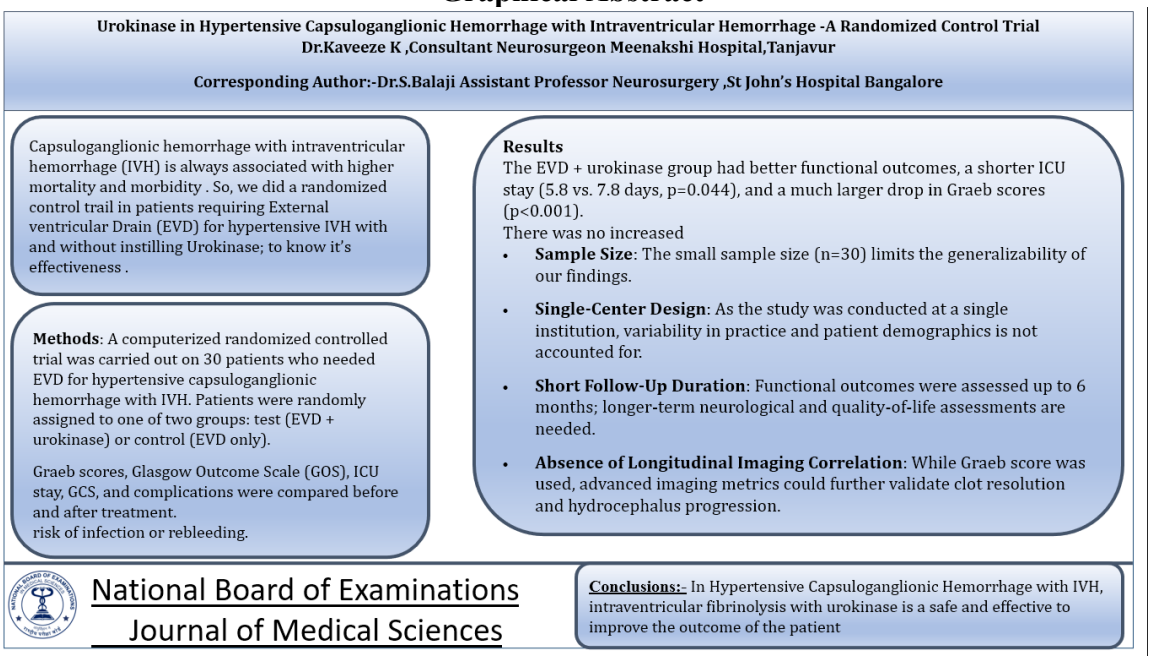
Graphical Abstract



Introduction

The term "hypertensive capsuloganglionic hemorrhage with intraventricular hemorrhage" (IVH) describes bleeding into the intra ventricular system of the brain, due to subarachnoid or intra parenchymal hemorrhage [2,3]. It gives rise to grave prognosis due to increase in intra cranial pressure and development of hydrocephalus [4,5], due to catheter blockage and need of aseptic precaution patients with EVD usually kept in Neuro Critical Care ICU [6,7].

Urokinase helps in prevention of catheter blockage and helps in faster clearance of IVH[10,11]. The usefulness of EVD alone and EVD plus urokinase-assisted intraventricular fibrinolysis in patients with hypertensive capsuloganglionic hemorrhage with IVH is studied in this article [19,20].

Materials and Methods

At Meenakshi Mission Hospital, a computerized randomized controlled trial was carried out on 30 patients who needed EVD for hypertensive capsuloganglionic hemorrhage with IVH. Patients were randomly assigned to one of two groups: test (EVD + urokinase) or control (EVD only).

Inclusion criteria encompassed adults aged 18–70 years with Hypertensive Capsuloganglionic Hemorrhage with IVH.

Exclusion criteria included traumatic IVH[21], vascular malformations, pregnancy, and delayed presentation (>48 hours).

Urokinase was administered intraventricularly at a dose of 10,000 IU every 12 hours for 5 days. Graeb scores [1], GCS, ICU stay, GOS, and complications were analyzed (Figure 1).

Results

Significant reduction in post-operative Graeb scores was observed in the urokinase group compared to the control group (mean 2.47 vs 6.6; $p<0.001$) (Figs 1 and 2).

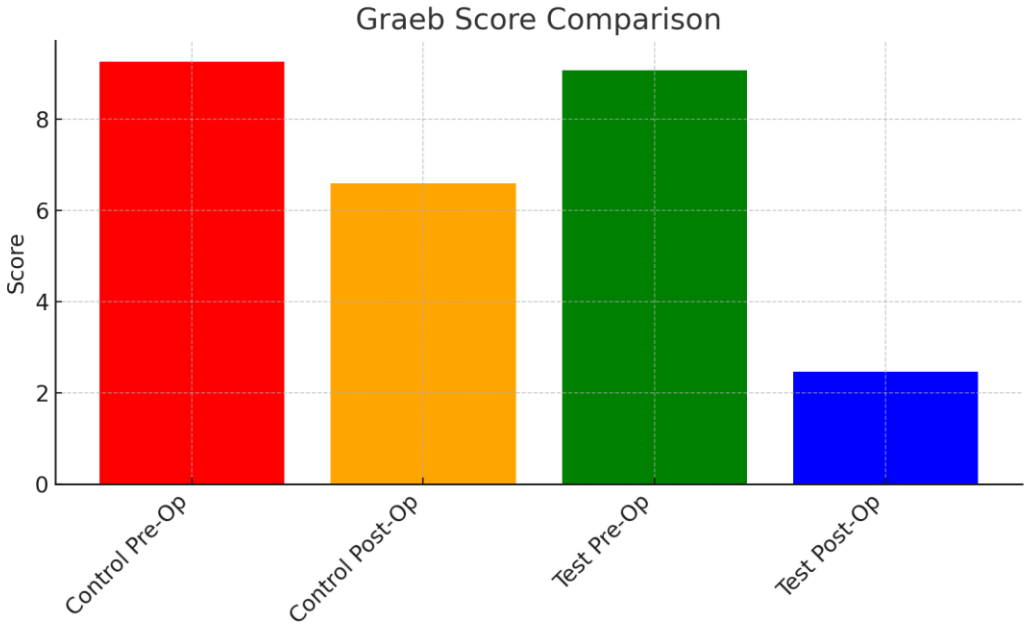


Figure 1. Graeb Score Comparison

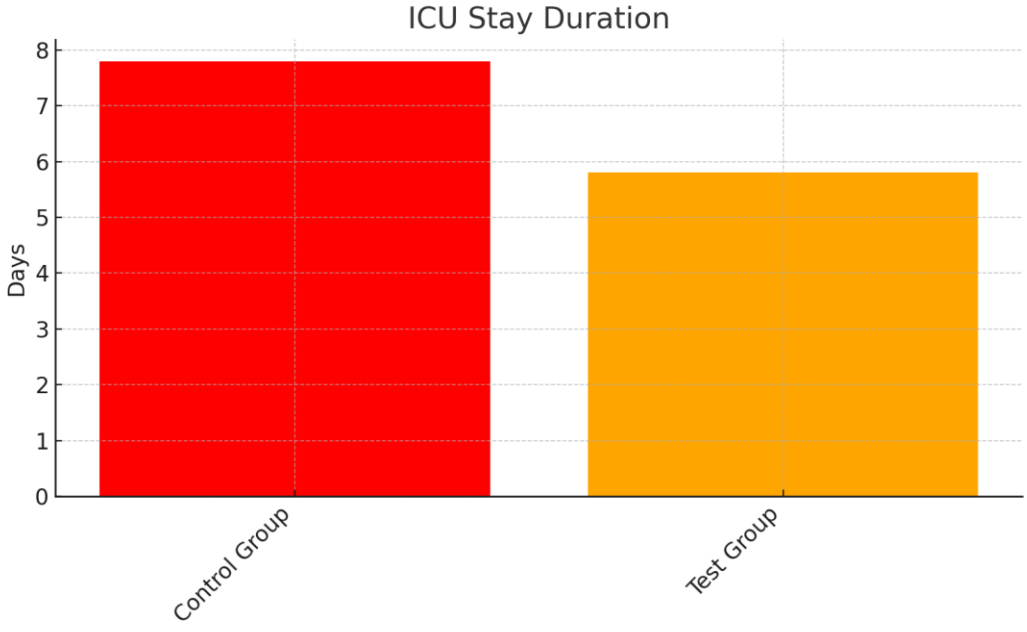


Figure 2. ICU Stay Duration

Patients in the urokinase group had significantly shorter ICU stays than those in the control group (5.8 vs 7.8 days; p=0.044) [14,26] (Figure 3).

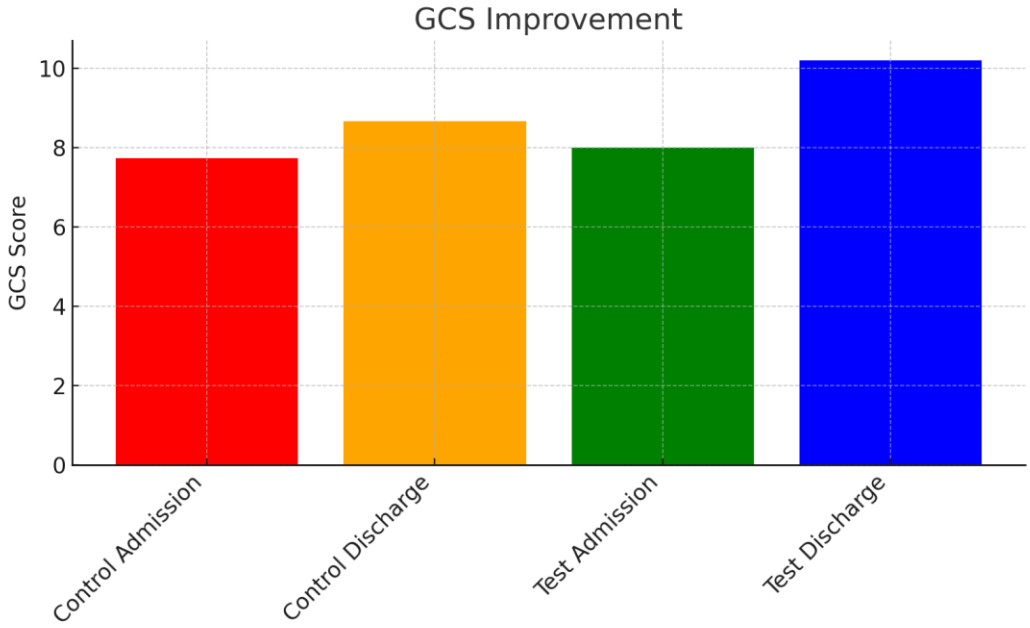


Figure 3. GCS Improvement

Both groups showed GCS improvement at discharge, with a higher mean GCS in the urokinase group (10.2 vs 8.7), though not statistically significant [24,25] (Figure 4).

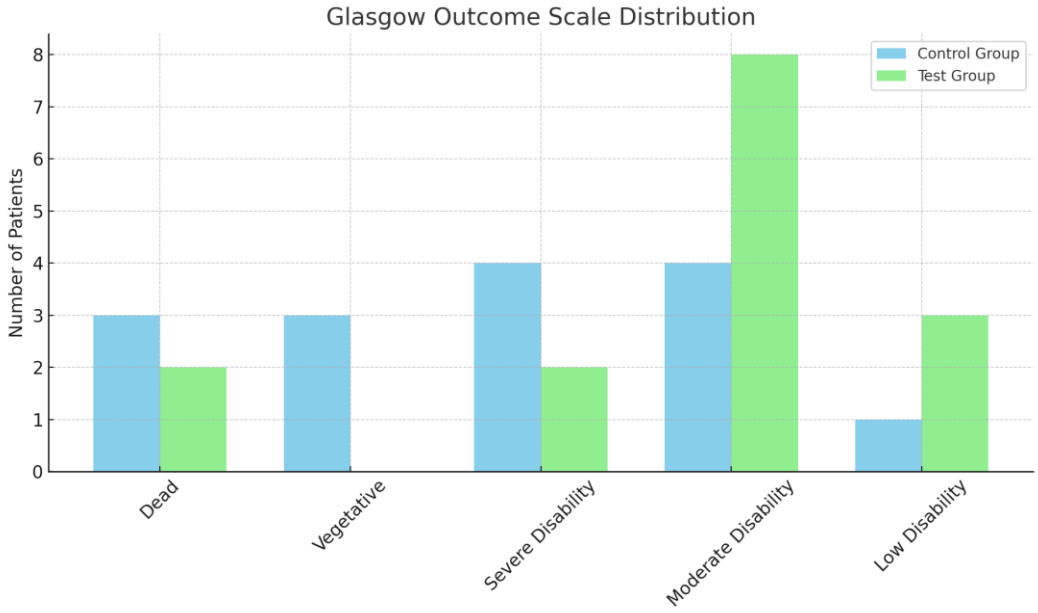


Figure 4. Glasgow Outcome Scale Distribution

The urokinase group had more patients with favorable outcomes (moderate to low disability), while the control group had higher mortality and vegetative states [13,15,27].

Discussion

This prospective comparative study supports the growing evidence that intraventricular fibrinolysis (IVF) using urokinase can significantly improve outcomes in patients with Hypertensive Capsuloganglionic Hemorrhage with intraventricular hemorrhage (IVH). Despite equivalent baseline characteristics between groups, the test group (EVD + urokinase) showed a greater reduction in ventricular blood burden (Graeb score), shorter ICU stay, and a trend toward improved GCS scores and GOS at discharge. These findings are in agreement with prior studies suggesting that timely clot removal can reduce secondary injury from hemoglobin breakdown products, inflammation, and elevated intracranial pressure (ICP) [8,9] (Figure 5 and 6) (Table 1).

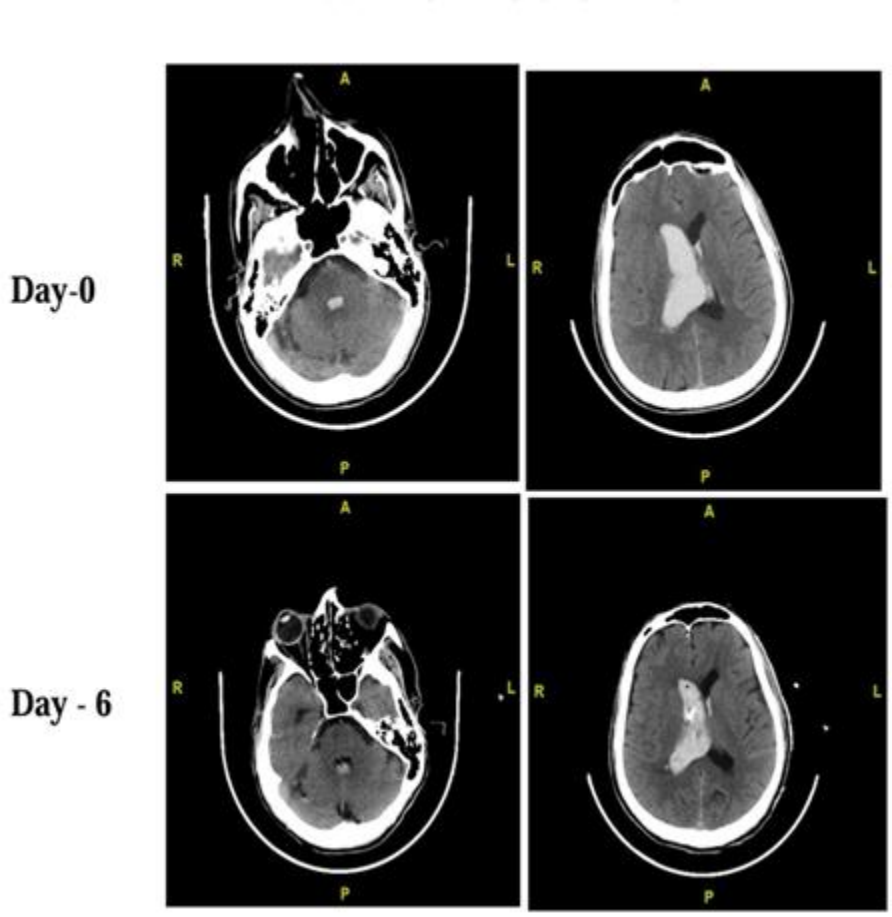


Figure 5. Non contrast CT of Primary IVH which was treated with EVD alone and the grab et al. score remains the same -7 even after 6 days of EVD

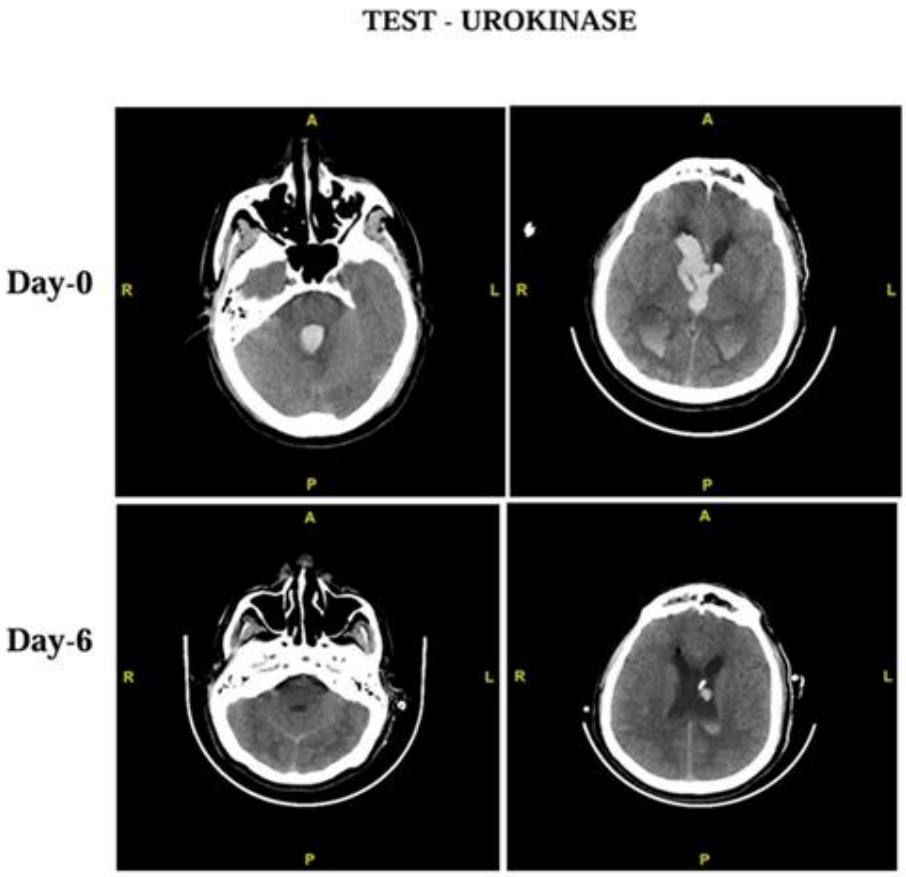


Figure 6. Non contrast CT of Primary IVH which was treated with EVD and intra ventricular fibrinolysis using urokinase and gareb et al. score pre operatively and post operatively are 11 and 2, respectively

Table 1. Intraventricular Haemorrhage Scoring

Localization	Number of points
Lateral ventricles (each ventricle was counted separately)	0 – no blood
	1 – traces of blood or minor hemorrhage
	2 – less than half of the ventricle is filled with blood
	3 – more than half of the ventricle is filled with blood
	4 – the ventricle is filled and stretched with blood
The third and the fourth ventricles	0 – no blood
	1 – the presence of blood, the ventricle is not enlarged
	2 – the ventricle is filled and stretched with blood
Number of points	0 - 12

Tuhrim et al. and Young et al. have previously emphasized the prognostic importance of intraventricular clot volume in the context of intracerebral hemorrhage. Our results affirm their findings and highlight that intraventricular administration of urokinase leads to a more substantial reduction in clot volume compared to EVD alone. Importantly, no increase in rebleeding or infections was observed, echoing findings by Coplin et al. on the safety of urokinase in this setting [16,17,18].

The increased incidence of shunt dependence in the urokinase group, although unexpected, may be linked to faster clot resolution leading to earlier assessment and decision for permanent CSF diversion. This observation warrants further investigation in larger cohorts [23,24,28].

Conclusion

Intraventricular fibrinolysis using urokinase is an effective adjunct to external ventricular drainage for the management of intraventricular hemorrhage. The approach facilitates faster blood clot clearance, reduces ICU stay, and improves functional outcomes, without increasing the risk of adverse events such as infection or rebleeding.

Our findings support the inclusion of urokinase in the management algorithm for Hypertensive Capsuloganglionic Hemorrhage with IVH in appropriately selected patients. Further large-scale, randomized controlled trials are necessary to establish optimal dosing protocols and long-term outcomes.

Limitations

- **Sample Size**: The small sample size (n=30) limits the generalizability of our findings.
- **Single-Center Design**: As the study was conducted at a single institution, variability in practice and patient demographics is not accounted for.
- **Short Follow-Up Duration**: Functional outcomes were assessed up to 6 months; longer-term neurological and quality-of-life assessments are needed.
- **Absence of Longitudinal Imaging Correlation**: While Graeb score was used, advanced imaging metrics could further validate clot resolution and hydrocephalus progression.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

Funding

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