

Maximal Care After Intracerebral Hemorrhage

Giving Patients a Chance

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Few survivors of intracerebral hemorrhage (ICH) regain independence.¹ Trials of intensive blood pressure control, hemostatic agents, and new surgical approaches have not appreciably improved functional outcomes, though in-hospital mortality continues to fall.² This dichotomy raises concern that aggressive care for patients with ICH might simply be delaying the inevitable at a significant cost.

The ICH score was initially developed as a clinical severity score to improve communication and guide treatment selection.³ It uses a few easily obtained clinical variables available at presentation to grade ICH severity, supported by escalating 30-day mortality. Unfortunately, early care limitations in the sickest patients skewed the results. The ICH score creators have since demonstrated lower mortality rates than predicted by the original cohort among those receiving maximal care.⁴

In this issue of *Neurology*®, Abulhasan et al.⁵ ask the question: does maximal care benefit patients, simply delay death, or convert death to severe disability? The authors present a retrospective cohort of patients treated for primary ICH at a single center over a 7-year period. They analyzed data from 319 patients who received aggressive medical and surgical therapies for at least 72 hours to determine 30-day and 90-day mortality rates and rates of unfavorable functional outcomes (defined as a modified Rankin scale [mRS] of 4–6). They found 30-day and 90-day mortality to be 16% and 22%, respectively. Half of the patients had unfavorable outcomes at a median of 3 months from onset. These findings corroborate those from a larger multicenter study of patients who received full medical support for at least 5 days.⁴

A strength of the study conducted by Abulhasan et al. is their evaluation of patients with supratentorial ICH who were treated surgically. Negative trials of both open and minimally invasive surgical hematoma evacuation have excluded moribund patients undergoing lifesaving surgery. From their cohort, the authors share outcomes of 41 patients with deteriorating neurologic examinations associated with large supratentorial ICH with midline shift, brainstem compression, or obstructive hydrocephalus. In a propensity score analysis, they compared outcomes among patients who received craniotomies or craniectomies with outcomes among those who did not. They performed subgroup analyses in those who received hematoma evacuation only (as opposed to decompression without evacuation) and those with ICH scores 3 and 4.

The surgical cohort was indeed quite ill. The median Glasgow coma scale (GCS), ICH volume, and midline shift were 7, 45 mL, and 12 mm, respectively. The authors report that in the overall cohort of patients with supratentorial ICH, surgical interventions did not reduce mortality nor unfavorable outcomes. Their subgroup analyses found that surgery improved 30-day mortality in both prespecified subgroups. Unfortunately, the improvement was not sustained at the 90-day follow-up. The analysis is limited by unmeasured confounders not accounted for in the propensity score model.

Finally, the authors performed an external validation of the ICH score. Mortality for patients with ICH scores 3 and 4 was much less than predicted by the original cohort, bolstering claims

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that the ICH score does not discriminate mortality as the original score suggested. While age, hematoma volume, and GCS remained valid predictors of mortality, additional variables such as hemoglobin level, platelet count, hyperglycemia, and hydrocephalus contributed to 90-day mortality as well. These findings echo those from a recent analysis of the ERICH study, a multicenter prospective study of 3,000 patients with ICH. In the analysis from ERICH, premorbid medications, genetics, and hospital complications contributed important discriminatory information to 90-day outcomes beyond the variables identified in the ICH score. Taken together, we gain an increasing appreciation for the myriad variables that affect outcome. Emerging neuroimaging and electrophysiologic paradigms promise further prognostic insight.⁶

The work conducted by Abulhasan et al. highlights that early aggressive care reduces short-term mortality after ICH. It also underscores the limitations of the ICH score as a prognostic tool. While the 90-day outcomes are disheartening, several recent studies provide hope. A post hoc analysis from the MISTI-III and CLEAR-III randomized controlled trials found that among 715 patients with ICH who had survived but had an unfavorable outcome (mRS 4 or 5) at 30 days, 43% had improved at 1 year (mRS 0–3).⁷ Similarly, a recent report from the Intracerebral Hemorrhage Deferoxamine Trial investigators found that the proportion of patients who reached a favorable outcome from both the intervention group and the placebo group continually increased from day 7 to day 180, with the intervention having a favorable effect on the trajectory, specifically between days 90 and 180.⁸ Perhaps negative trials have missed clinically relevant effects through premature outcome assessment.

Abulhasan et al. dichotomize favorable and unfavorable outcomes as 0–3 and 4–6, respectively. The mRS, which is heavily dependent on mobility independence, may be insensitive to important functional recovery that continues 12 months poststroke.⁹ “Favorable outcome,” as defined by walking, is a value-laden judgment that may not represent patients’ perspective. The SETPOINT 2 trial investigators adjusted their favorable outcome to an mRS of 0–4 according to demands of severe stroke survivors involved in trial planning.¹⁰ The emergence of improving neurorehabilitative technologies such as brain-computer interfaces and exoskeletons will further challenge traditional outcome measurement. These innovations can only be tested in patients, given the chance to survive.

Precise prognostication after ICH during admission is usually impossible. Our efforts should focus on a multipronged approach: avoid premature prognostication based solely on the ICH score, optimize survival with early aggressive intervention, prevent secondary injuries that compromise recovery, advance assessment of the capacity for recovery, identify outcomes important to patients, realign our standard checkpoints for progress to match the time course for neurologic recovery, and invest in promising postacute neurorehabilitation efforts. The answer to Abulhasan et al.’s question regarding the outcome of maximal care? Maximal care gives patients with ICH a chance.

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