Hemorrhagic Stroke: Introduction

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The last form of stroke without a primary treatment is intracerebral hemorrhage (ICH). The past decade has brought significant understanding of hematoma expansion, ICH volume, and intraventricular hemorrhage extension as independent severity factors. The Surgical Treatment for Ischemic Heart Failure (STICH) trials indicate that craniotomy is not the answer for deep hematomas but has created enthusiasm for site-selective surgery; a subsequent post hoc analysis suggests that limited craniotomy for lobar ICH to reduce volume of hematomas within 1 cm of the surface may be promising. The Fluid Accumulation Status Trial (FAST) trial achieved stability by 24 hours, but was insufficient to alter either 72-hour edema volume or 90-day functional outcome. A subsequent meta-analysis proposes that reductions of \( \geq 12.5 \text{ mL} \) are more likely to lead to favorable shifts of important outcomes, such as modified Rankin Scale in a group with large expansions that account for 11\% of the ICHs at presentation. With this background, Gonzales describes a full range of clinical trial targets with the potential to limit secondary damage begun by bleeding. Of these targets, 2 are particularly promising: (1) early reduction of blood pressure to limit hematoma volume growth, and (2) minimally invasive surgery to reduce hematoma volume in subjects not experiencing active hematoma growth. These targets are not mutually exclusive, as blood pressure control is needed at ICH presentation, and the time window for surgery seems to be long (up to 72 hours) and may be enhanced by early blood pressure control. Both offer the possibility of reducing brain injury by limiting growth (\( \geq 12.5 \text{ mL} \)) of clot volume size. Qureshi describes the evolution of data supporting early treatment of blood pressure. Zia describes the cascade of inflammatory factors, which drives the progression of mass effect over several weeks when blood products alter the blood brain barrier. This is followed by Vespa describing 2 different minimally invasive methods for hematoma volume reduction and limitation of inflammation/edema. Data presented from Minimally Invasive Surgery + rtPA for Intracerebral Hemorrhage (MISTIE) and Intraoperative CT-Guided Endoscopic Surgery for Intracerebral Hemorrhage (ICES) demonstrate that minimally invasive reduction of clot volume is effective at the deep basal ganglia sites where STICH was not beneficial.

When these presentations are considered together, the total evidence suggests the strategic priority for ICH is to (1) determine the value of early stability and (2) acquire scientific knowledge about the volume reduction hypothesis. Vespa presents a biologically plausible argument that minimally invasive techniques limit tissue damage and maximize reduction of the inflammatory triggers. From the pending Interventions to Reduce Acute Care Transfers II (INTERACT II) and Antihypertensive Treatment of Acute Cerebral Hemorrhage II (ATTACH) results and the potential MISTIE III trials, it can be expected that improved knowledge of disease severity factors, patient selection, and timing of interventions will occur. Thus, these presentations demonstrate that independent investigation of well-defined disease factors, and interventions designed to mitigate these factors, can produce new knowledge that will likely unravel the disease process of the last untreated form of stroke.

Disclosures

None.

References


**Key Words:** blood pressure ▶ craniotomy ▶ intracerebral hemorrhage ▶ rt-PA ▶ stroke
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