

Early surgery

In neurocritical care and neuro-oncology, the decision for early surgery is often driven by the patient's condition, the nature of the pathology, and the expected outcomes. Early surgery is typically considered when:

- 1. Tumor Growth:** Rapidly growing brain tumors or spinal lesions causing significant neurological deficits. Early intervention can prevent further neurological deterioration and improve recovery.
- 2. Hematoma:** In cases of brain hemorrhage, an early surgical evacuation may be necessary to relieve intracranial pressure, especially in cases where the bleed is large or causing midline shift.
- 3. Trauma:** In traumatic brain or spinal injuries with compressive lesions (like an epidural hematoma), early surgery can be life-saving by reducing pressure on critical structures.
- 4. Infections or Abscesses:** Brain or spinal abscesses may require early surgery to remove the infected material and improve antibiotic penetration.
- 5. Severe Hydrocephalus:** Acute hydrocephalus due to obstruction (such as from a tumor) may require early surgical intervention, like ventricular drainage, to relieve pressure.

In planning for early surgery, considerations such as the patient's overall health, the feasibility of complete resection, and the potential benefits and risks are carefully evaluated to optimize outcomes.

There is skepticism about the benefit of surgery in elderly patients affected by traumatic brain injury (TBI) due to the negative effect of age on the outcome and surgical complications. However, there are few studies that have investigated differences in patient's outcome between surgically and conservatively managed patients after adjusting for the imbalance in preinjury characteristics and clinical and radiological features. The primary aim of this study was to evaluate the effect of early surgery on mortality and functional recovery in a cohort of older adults with acute traumatic intracranial lesions after adjustment by Propensity Score (PS) matching. **MATERIALS AND METHODS:** We conducted a [retrospective](#) cohort study on older adult patients (≥ 65 years) admitted for TBI between 2013 and 2023 to a single level 1 trauma center. Patients were categorized based on whether they underwent early surgery (< 48 h after TBI) for a space-occupying lesion evacuation. PS model was constructed based on age, frailty, comorbidities (Charlson comorbidity index and American Society of Anaesthesiologists score), anticoagulants, hypoxia, shock, pupillary abnormalities and GCS motor response upon admission, midline shift, basal cistern effacement, volume of subdural and intracerebral hematomas, and limitation of life-sustaining treatment decisions. The effect of early surgery on 30-day mortality and unfavorable functional outcomes (GOSE 1-3) at 6 and 12 months were investigated after matching by paired test.

Results: We identified and reviewed 301 patients who met all inclusion criteria and contained no exclusions. After matching, 62 patients (31 pairs of conservative and surgical patients) remained as the matched datasets. Our key finding was that older adult TBI patients who underwent early surgery had a statistically significant reduction in the risk of 30-day mortality (OR 0.313, 95% CI 0.114-0.853, $p = 0.023$) and unfavourable outcome at 12 months after TBI (OR 0.286, 95% CI 0.094-0.868, $p = 0.027$).

Conclusions: Early surgery was associated with decreased 30-day mortality and better functional outcome at 12 months after TBI in older adults with few comorbidities and good functionality when clinically affected by acute traumatic intracranial lesions with mass effect ¹⁾.

Limitations and Considerations Single-Center Retrospective Design: Although propensity score matching addresses some biases, the retrospective nature of the study and the single-center setting limit the generalizability of the findings. Variability in treatment protocols and patient demographics at other institutions could affect the applicability of these results to broader populations.

Small Sample Size After Matching: After PS matching, only 31 pairs (62 patients) remained in the analysis. This small sample size reduces statistical power and may limit the robustness of the findings. A larger matched cohort would strengthen the reliability of the conclusions.

Limited Adjustment for Functional Status Post-Injury: While the study adjusts for baseline frailty and comorbidities, it does not provide detailed information on post-injury functional status and recovery trajectories between the initial injury and the end points at 6 and 12 months. Future research could enhance these findings by tracking recovery trends and incorporating rehabilitation data.

Exclusion of Patients with Severe Comorbidities: The study's conclusion that early surgery is beneficial applies primarily to those with limited comorbidities and good baseline functionality. This leaves open questions about the broader applicability to frail patients with multiple comorbidities, who represent a substantial portion of elderly TBI patients.

Outcome Focus on Mortality and Functional Scores: While the Glasgow Outcome Scale Extended (GOSE) is a standard measure, it may not capture more nuanced aspects of quality of life, cognitive function, and independence post-surgery. Including other outcome measures, such as neuropsychological assessments, could offer a more comprehensive picture of recovery.

Conclusion This study contributes to the evidence supporting early surgery in selected elderly TBI patients, demonstrating potential benefits in reducing mortality and improving functional outcomes at one year. The findings challenge the common hesitancy to operate on elderly patients with TBI, highlighting the importance of considering individual pre-injury characteristics and functional status. However, given the study's limitations, especially its retrospective nature and small sample size post-matching, further prospective, multi-center studies with larger cohorts are needed to confirm these results and refine patient selection criteria for surgery.

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