

COMMENT

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Rethinking the clinical impact of timing in ICP monitoring initiation

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The decision to initiate intracranial pressure (ICP) monitoring is invariably a point of dialogue, and at times debate, between intensivists and neurosurgeons. In clinical practice, ICP monitor insertion by intensivists remains rare. As highlighted in the Synapse-ICU study, neurointensivists performed only 2% of insertions across the cohort [1].

In this context, the recent TIMING-ICP study by Mariani et al. [2] addresses a key operational question in neurocritical care: can intensivists safely and effectively initiate ICP monitoring more promptly than neurosurgeons? This prospective, multicenter investigation revealed a noteworthy 76-minute reduction in time from indication to device placement when the procedure was performed by intensivists at the ICU bedside. This shorter interval was expected: placing the probe directly in the ICU avoids the logistical delays associated with operating room transfer and coordination with on-call surgical teams, particularly during night shifts.

This reduction in procedural delay may be clinically meaningful. There is a well-established association between the “dose” of intracranial hypertension, encompassing both intensity and duration, and adverse neurological outcomes [3, 4]. Earlier identification and treatment of elevated ICP are thus fundamental pillars of secondary brain injury prevention.

Importantly, in the TIMING-ICP study, the decision to initiate monitoring was based on joint consultation between intensivists and neurosurgeons, aligned with

international consensus recommendations, even if some indications remain blurry defined in the guidelines.

The study primarily assessed intraparenchymal catheters (IPCs), as these were the devices most commonly placed by intensivists at the bedside. Neurosurgeons, in contrast, inserted both IPCs and external ventricular drains (EVDs), the latter often in the operating room. It is essential to recognise that specific clinical scenarios, such as subarachnoid haemorrhage or acute hydrocephalus, may necessitate EVD placement not only for monitoring but also for therapeutic cerebrospinal fluid drainage [5]. The technical complexity of EVD insertion may limit its feasibility in non-surgical hands, highlighting the need for nuanced consideration of which invasive techniques should fall within the intensivist’s scope of practice.

Nonetheless, the clinical impact of reducing the time to monitor insertion remains uncertain. The study did not account for pre-procedural medical interventions that could transiently normalise ICP, and no data were presented on ICP burden during the early monitoring period (the 76-minute advantage) or on therapeutic decisions made in response to early monitoring. Notably, opening ICP values were similar in patients who underwent early versus delayed monitoring. This observation raises questions: did earlier monitoring result in a measurable reduction in the burden of elevated ICP, a known driver of secondary brain injury? Without such data, a shorter time to monitor insertion, while operationally appealing, cannot yet be equated with clinical benefit.

From a safety standpoint, the study reported similarly low complication rates between intensivist- and neurosurgeon-performed insertions, supporting the procedural feasibility of bedside monitoring when performed by adequately trained staff. Implementing this approach in clinical practice, however, requires rigorous attention

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to training, sterility, and ongoing procedural competence. The authors rightly note that procedural volume and experience may vary considerably between providers, potentially influencing complication risk. Operator experience in inserting ICP monitoring devices and high procedural volume are critical factors contributing to safer procedures with fewer complications, including infections, haemorrhage, and catheter malposition. Experienced operators are more likely to adhere to sterile technique, optimize burr hole placement, and complete the procedure efficiently, thereby minimizing tissue exposure, manipulation, and procedural delays, all factors associated with reduced infection and hematoma risk. In high-volume centers or among clinicians who perform these procedures regularly, accumulated technical proficiency enables better management of anatomical variation, faster troubleshooting, and early recognition of complications. In many academic centers, the placement of an ICP probe is among the first procedures performed by neurosurgical residents under direct supervision, serving as a foundational component of their surgical training. Moreover, the act of device insertion by a neurosurgeon often signifies more than a technical manoeuvre. It formalises case acceptance, establishes shared ownership of care, and fosters multidisciplinary engagement. This collaboration between intensivists and neurosurgeons can shape the trajectory of management decisions, including escalation of care, timing of neurosurgical intervention, and overall prognostic framing, impacting patient outcomes in ways that extend well beyond the initial timing or technique of probe placement.

Another important point warrants consideration. Despite the study's multicenter design, the relatively low number of enrolled patients raises concerns about potential selection bias and limited external validity. Over a 34-month recruitment period, only 112 patients were included across 7 centers, resulting in a median of approximately 16 patients per center, or roughly one patient every two months. This low enrolment rate may reflect center-level heterogeneity in screening practices, varying thresholds for initiating ICP monitoring, or differences in resource availability, including the presence of an intensivist trained and available to perform probe insertion. These factors could have introduced systematic differences in patient selection across sites, potentially limiting the generalizability of the findings.

Recent evidence from a systematic review and meta-analysis by Abdollahifard et al. [6] offers important context to the question of ICP monitoring timing. The review, which included 5884 patients across 7 observational studies, found no significant difference in mortality, hospital length of stay or ICU length of stay between early and late initiation of invasive ICP monitoring. Notably, subgroup analyses based on age, severity of TBI,

and time thresholds also yielded nonsignificant results, suggesting that early monitor placement does not independently drive improved outcomes. Heterogeneity among included studies was considerable, and no clear inflection point was identified beyond which monitoring became clinically advantageous. These findings raise critical questions about the assumption that earlier ICP data invariably translates to better outcomes. They also reinforce the idea that secondary brain injury evolves dynamically, with some studies showing a late rise in ICP occurring days after injury. Consequently, both timing of insertion and removal of monitors may influence clinical outcomes, and the "window of utility" for monitoring may be longer and more patient-specific than commonly assumed.

Finally, while observational in nature, the review complements the TIMING-ICP findings by highlighting that earlier monitoring, although operationally efficient, does not inherently reduce mortality or hospitalization time. Together, these data call for refined, individualized decision-making and suggest that future research should emphasize dynamic ICP trajectories, indications for prolonged monitoring, and the integration of ICP with other multimodal data. In summary, the TIMING-ICP study sheds light on how workflow adaptations can reduce delays in ICP monitoring. Yet, to demonstrate true clinical value, future studies must go further: capturing longitudinal ICP trajectories, therapeutic responses, and patient-centred outcomes. Only then can we fully define the impact of timing on care quality and recovery. In neurocritical care, as in life, what we do with time is more important than how quickly it passes.

Abbreviations

EVD	External Ventricular Drain
ICP	Intracranial Pressure
ICU	Intensive Care Unit
IPC	Intraparenchymal Catheter
OR	Operating Room

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Consent for publication

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Competing interests

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