



POINT OF VIEW

Geriatric traumatic brain injury: An old challenge

Traumatismo craneoencefálico en el anciano: un viejo reto



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Up to one-quarter of trauma admissions to the intensive care unit (ICU) correspond to patients over 65 years.¹ It is expected that the progressive aging of the population will double the number of geriatric trauma admissions in the next decades.² Ground-level falls constitute the leading mechanism of injury because of decreased vision and hearing, slower reflexes, poorer balance, impaired motor and cognitive function, decreased muscle mass, strength, bone density and joint flexibility.^{2,3} Despite these conditions, geriatric patients are currently undergoing more recreational activities.

Specifically, traumatic brain injury (TBI) represents the major challenge. The central nervous system may be impaired because of cortical atrophy and plaque buildup in the cerebrovascular vessels, making the brain a more susceptible area to traumatic injury.² Subdural hematomas are common.⁴ Geriatric TBI patients have greater morbidity and mortality compared with younger counterparts.^{2,5}

Specific problems

- Under-triage: This is one of the major concerns in the attention of geriatric trauma patients⁶ and constitutes a modifiable factor. Mortality of these patients decreases when they are transferred to trauma centers with a high

volume of geriatric trauma patients.⁷ Underlying reasons of under-triage include low-energy mechanisms of injury, unconscious age bias, unreliability of vital signs, the use of medications that blunt the physiologic response to injury and the lack of specific triaging scores.⁸

- Unreliability of clinical scales: Due to the increment in the subarachnoid space, the performance of clinical scales such as the Glasgow Coma Scale (GCS) is poor. In this context, prompt evaluation, a high index of suspicion and a low threshold to perform repeated cranial tomography (CT) scans even with subtle clinical changes is mandatory.^{2,5}
- Use of antiplatelets and anticoagulants: According to the results of *RETRAUCI*, the use of antiplatelets or anticoagulants in trauma patients admitted to the ICUs of our environment reaches half of the patients over 75 years-old.⁵ The use of clopidogrel and anticoagulants is associated with progression of intracranial hemorrhages and poorer outcomes.⁹ The use of direct anticoagulants does not seem to be associated with worst prognosis when compared to warfarin.

How can we improve outcomes of geriatric TBI?

- Appropriate evaluation of comorbidity and frailty: Age itself is not an accurate indicator of the ability of the geriatric patient to respond to injury. Traditional vital signs and conventional severity scores do not work well

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in this population. Frailty refers to a decreased physiologic reserve in multiple organ systems which leads to an impaired ability to withstand physiological stress. Frailty can be evaluated using the 15-variable Trauma-specific Frailty Index¹⁰ and may help to determine the optimal hospital and treatment for geriatric trauma patients, since frail patients are at higher risk of poor outcomes following trauma.

- Prompt evaluation and reversal of anticoagulation: Ivascu et al. published an aggressive protocol for TBI patients on prior anticoagulant treatment. By performing a rapid CT scan of the head and correction of INR to less than 1.6 within 4 h of admission, they obtained a 75% decrease in mortality for posttraumatic intracranial hemorrhage in geriatric patients.¹¹ Another controversial topic is when to resume anticoagulation therapy in patients who presented TBI. In a large-retrospective study, Albrecht et al. reported that restarting warfarin following discharge was associated with a 51% increased risk of hemorrhagic events and a 23% reduction in thrombotic events over the following year.¹² No recommendations on the exact moment after TBI to restart anticoagulation can be made in the light of the current evidence and must be considered on an individual basis.
- Biomarkers constitute a promising tool in the initial management of TBI patients, since they could help to identify patients more likely to present complications or die. Whilst the number of biomarkers available is increasing, to date, no specific one has been developed for geriatric TBI patients.¹³ The aging process and comorbid conditions can affect biomarker production, distribution, metabolism and clearance.^{13,14} We believe that this is a potential area of improvement in the care of geriatric TBI patients.
- Design of prospective multicenter studies in geriatric patients: Geriatric patients are usually excluded from multicenter studies evaluating neuroprotective agents in TBI. In addition, classic prognostic models do not take into consideration comorbidities. Future studies will determine whether incorporating comorbidities, baseline function or measures of frailty into these models will improve their prognostic value.¹⁴
- Rehabilitation: Evidence suggests that intensive inpatient rehabilitation greatly benefits geriatric TBI patients.¹⁴ Unfortunately, geriatric patients are less likely to receive rehabilitation compared with younger patients.
- Preventive measures: Interventions to reduce frailty in the community, including exercise, nutrition, cognitive training, geriatric assessment and management and prehabilitation are potentially effective to improve the ability to prevent and recover from injuries.¹⁵ A more restrictive use of antiplatelets and anticoagulants in the community in patients with high risk of falls must be also considered.

How must the intensivist face geriatric TBI?

Classical studies showed an ominous prognosis in geriatric severe TBI patients. No patient with admission GCS less than 9 had good 6-month outcomes. Mortality achieved 80% in this group.¹⁶ Therefore, logical concerns about futility

surrounded the ICU care of these patients. Routine use of neuromonitoring is controversial. Czosnyka et al. showed that older patients had lower intracranial pressure and therefore higher cerebral perfusion pressure, combined with worse vascular pressure reactivity and autoregulation.¹⁷ Neurosurgical interventions and modern neurointensive care have improved outcomes geriatric TBI.⁴ In our opinion, aggressive initial treatment is mandatory. After a reasonable time-frame and taking into account the comorbidities and frailty, limitation of life-sustaining therapies and palliative care must be considered in non-responding patients.

In summary, the management of geriatric TBI patients constitutes a challenge for intensivists. New prognostic models including baseline conditions, appropriate triaging and prompt reversal of anticoagulation may improve outcome. Aggressive neurosurgical and neurointensive care can achieve better outcomes than expected. Limitation of life-sustaining therapies and palliative care must be considered.

Authors' contribution

Juan Antonio Llopart-Pou: Reviewed literature. Wrote the first and final drafts of the manuscript.

Jon Pérez-Bárcena: Reviewed literature. Critical review of the first draft. Gave final approval of the submitted version.

Conflict of interest

The authors declare no conflict of interest related to this manuscript.

References

1. Chico-Fernández M, Llopart-Pou JA, Guerrero-López F, Sánchez-Casado M, García-Sáez I, Mayor-García MD, et al. en representación del Grupo de Trabajo de Trauma y Neurointensivismo SEMICYUC. Epidemiology of severe trauma in Spain. Registry of trauma in the ICU (RETRAUCI). Pilot phase. *Med Intensiva*. 2016;40:327–47.
2. Brooks SE, Peetz AB. Evidence-based care of geriatric trauma patients. *Surg Clin North Am*. 2017;97:1157–74.
3. Llopart-Pou JA, Pérez-Bárcena J, Chico-Fernández M, Sánchez-Casado M, Raurich JM. Severe trauma in the geriatric population. *World J Crit Care Med*. 2017;6:99–106.
4. Merzo A, Lenell S, Nyholm L, Enblad P, Lewén A. Promising clinical outcome of elderly with TBI after modern neurointensive care. *Acta Neurochir (Wien)*. 2016;158:125–33.
5. Llopart-Pou JA, Chico-Fernández M, Sánchez-Casado M, Alberdi-Odriozola F, Guerrero-López F, Mayor-García MD, et al. en representación del Grupo de Trabajo de Trauma y Neurointensivismo SEMICYUC. Age-related injury patterns in Spanish trauma ICU patients. Results from the RETRAUCI. *Injury*. 2016;47 Suppl. 3:S61–5.
6. Kozar RA, Arbabi S, Stein DM, Shackford SR, Barraco RD, Biffi WL, et al. Injury in the aged: geriatric trauma care at the crossroads. *J Trauma Acute Care Surg*. 2015;78:1197–209.
7. Zafar SN, Obirieze A, Schneider EB, Hashmi ZG, Scott VK, Greene WR, et al. Outcomes of trauma care at centers treating a higher proportion of older patients: the case for geriatric trauma centers. *J Trauma Acute Care Surg*. 2015;78:852–9.

8. Chang DC, Bass RR, Cornwell EE, Mackenzie EJ. Undertriage of elderly trauma patients to state-designated trauma centers. *Arch Surg*. 2008;143:776–81, discussion 782.
9. Peck KA, Calvo RY, Schechter MS, Sise CB, Kahl JE, Shackford MC, et al. The impact of preinjury anticoagulants and prescription antiplatelet agents on outcomes in older patients with traumatic brain injury. *J Trauma Acute Care Surg*. 2014;76:431–6.
10. Joseph B, Pandit V, Zangbar B, Kulvatunyou N, Tang A, O’Keeffe T, et al. Validating trauma-specific frailty index for geriatric trauma patients: a prospective analysis. *J Am Coll Surg*. 2014;219, 10–17.e1.
11. Ivascu FA, Howells GA, Junn FS, Bair HA, Bendick PJ, Janczyk RJ. Rapid warfarin reversal in anticoagulated patients with traumatic intracranial hemorrhage reduces hemorrhage progression and mortality. *J Trauma*. 2005;59:1131–7.
12. Albrecht JS, Liu X, Baumgarten M, Langenberg P, Rattinger GB, Smith GS, et al. Benefits and risks of anticoagulation resumption following traumatic brain injury. *JAMA Intern Med*. 2014;174:1244–51.
13. Gordillo-Escobar E, Egea-Guerrero JJ, Rodríguez-Rodríguez A, Murillo-Cabezas F. Usefulness of biomarkers in the prognosis of severe head injuries. *Med Intensiva*. 2016;40:105–12.
14. Gardner RC, Dams-O’Connor K, Morrissey MR, Manley G. Geriatric traumatic brain injury: epidemiology, outcomes. Knowledge gaps, and future directions. *J Neurotrauma*. 2017, <http://dx.doi.org/10.1089/neu.2017.5371>
15. Puts MT, Toubasi S, Andrew MK, Ashe MC, Ploeg J, Atkinson E, et al. Interventions to prevent or reduce the level of frailty in community-dwelling older adults: a scoping review of the literature and international policies. *Age Ageing*. 2017;46:383–92.
16. Utomo WK, Gabbe BJ, Simpson PM, Cameron PA. Predictors of in-hospital mortality and 6-month functional outcomes in older adults after moderate to severe traumatic brain injury. *Injury*. 2009;40:973–7.
17. Czosnyka M, Balestreri M, Steiner L, Smielewski P, Hutchinson PJ, Matta B, et al. Age, intracranial pressure, autoregulation, and outcome after brain trauma. *J Neurosurg*. 2005;102:450–4.