EVALUATION OF THE ROLE OF INTRAVENOUS METOPROLOL IN THE OUTCOME OF SEVERE TRAUMATIC BRAIN INJURY

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Introduction

Traumatic brain injury (TBI) is a non-degenerative, non-congenital insult to the brain from an external mechanical force, possible lead to permanent or temporary impairment of cognitive, physical, and psychological functions, associated with diminished or altered state of consciousness. severe TBI presented by a headache, vomiting or nausea, convulsions, weakness or numbness in the limbs, loss of coordination, confusion. Signs of increased ICP which is Cushing's triad (wide pulse pressure, bradycardia, irregular respiration) indicates significantly raised ICP.
A hyper-adrenergic state found with severe TBI presentsas a mild formas SIRS or up to the paroxysmal sympathetic storms (PSS), which is the most severe form of the hyper-adrenergic states (called “brain storms”).
Beta blockers have Neuroprotective effects through decreased cerebral blood flow and decreased glucose and oxygen consumption, thus reducing cerebral metabolism. But this potential benefit remains purely speculative and restricted only to B-blockers that can cross blood brain barriers.

Aim of the work

The aim of this study was to compare the effect of intravenous metoprolol vs placebo in severe traumatic brain injury patients and how it affected patient heart rate control, mortality, hospital stay, mechanical ventilation (MV) days, ICU stay.

Patients and Methods

Patients: 80 Adult patients of both sex with recent (within 24 hours) isolated severe traumatic brain injury who had Glasgow Coma Scale (GCS) from four to eight (patients with a GCS of 3 were excluded as they reflect the extreme of a given neurological insult).
Methods: a prospective observational cohort study was conducted :
On admission, all patients with isolated severe TBI subjected to the following: full History (past medical and drug history), complete physical examination, laboratory and radiological investigations to search for injuries (full survey).

Risk stratification data as age, sex, post resuscitation GCS, systolic and diastolic blood pressures, partial pressure of oxygen (Pa02) and carbon dioxide (PaCO2), type of brain injury to ensure both groups are comparable.
Management: In the ICU, all selected patients treated as per in- house protocol conducted by the treating critical care team according to the latest guidelines of management of severe traumatic brain injury.

Results

Table 1: Comparison of heart rate long different follow-up periods and between patientsreceiving Metoprolol and placebo group.

	Total		Control group (n=40)		Metoprolol group (n=40)		Sig.
	Mean	SD.	Mean	SD.	Mean	SD.	
HR at admission	114.02	5.59	114.88	4.74	113.18	6.26	
HR at 6 hours	106.16	7.84	112.60	3.29	99.73	5.37	P^1<.001*
HR at 12 hours	96.80	10.50	106.28	3.39	87.33	5.30	P^2<.001*
HR at 18 hours	91.71	8.96	99.77	4.45	83.65	3.08	P^3<.001*
HR at 24 hours	88.21	6.90	93.68	5.25	82.75	2.62	

Mixed design repeated measures ANOVA test to assess main effect of follow-up period on HR [1], main effect of Metoprolol intervention [2] and interaction to assess the pattern of change of HR along time by different groups.*Significant results≤.05

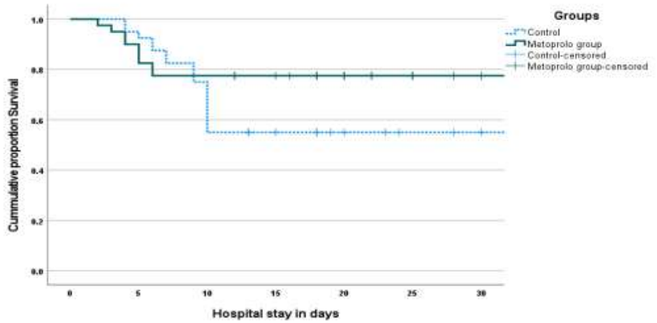

Fig 1: Kaplan-Meier curve for 30-days mortality between patient sreceiving Metoprolol and placebo group.

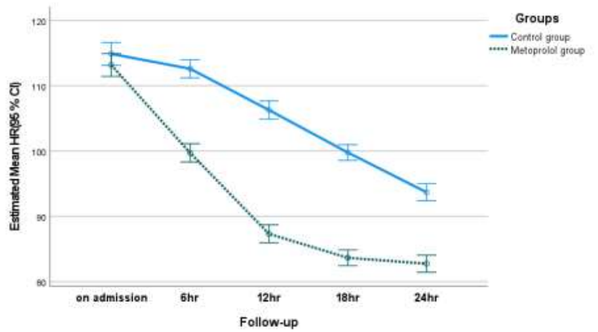

Fig 2: Error bar graph displaying results of mixed design repeated measures analysis of variance (ANOVA) test for average HR with respective 95% confidence interval (CI) separately for patients receiving Metoprolol and placebo group

Conclusion

- Metoprolol had a beneficial effect in cases of acute isolated blunt severe traumatic brain injuries regarding reduction of mortality, improvement of Glasgow outcome score, reducing of length of ICU stay and length of hospital stay.
- Metoprolol has a mortality benefit in patients with severe traumatic brain injuries when initiated early on the day of admission and when the target heart rate (80-90 b/min) is achieved rapidly.