EVMS EM JC CRITICAL REVIEW FORM: THERAPY ARTICLES

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Citation:
Nicholson J, Czosnowski Q, Flack T, Pang PS, Billups K. Hemodynamic comparison of intravenous push diltiazem versus metoprolol for atrial fibrillation rate control. Am J Emerg Med. 2020 Jun 21;38(9):1879-1883

Study Objective:
Compare the hemodynamic effect of IVP diltiazem (10-25mg) and IVP metoprolol (2.5mg-5mg) on systolic blood pressure

Study Methodology:
Single center retrospective chart review of patients treated for A. fib with RVR in a tertiary emergency department with an EM residency over a 10 year period (7/08-7/18).

GUIDE	COMMENTS
I. Are the results valid?	
A. Did experimental and control groups begin the study with a similar prognosis?	Yes, but baseline data were limited concerning other comorbid diseases and CHADS-2 risks such as HTN, DM and CVA.
1. Were patients randomized?	This was a retrospective study and it is unclear why authors would use a random number generator to assist in screening for exclusion criteria "until the a priori sample size was met for each treatment arm."
2. Was randomization concealed (blinded)? In other words, was it possible to subvert the randomization process to ensure that a patient would be "randomized" to a particular group?	No, this was retrospective, and choice of medication was entirely operator biased.
3. Were patients analyzed in the groups to which they were randomized?	Yes. The authors do not mention intention to treat analysis however they were able to f/u all patients to study conclusion or 6 hrs..
4. Were patients in the treatment and control groups similar with respect to known prognostic factors?	Possibly. History of AF, CHF, Age, BMI, home meds were compared and similar at baseline except for use of B-blocker which was statistically different between the diltiazem (60%) and B-blocker (96%) groups p=0.01 . Also, information related to race, ethnicity, and CHADS-2 comorbid conditions (HTN, CVA, DM) were not reported. .
5. Were patients aware of group allocation?	Likely patients would have been informed regarding meds being used.

6. Were clinicians aware of group allocation?	Yes. Clinicians selected medications. he study was a retrospective analysis.
7. Were outcome assessors aware of group allocation?	Probably. The authors make no mention as to whether the data analysis was performed by individuals who were blinded to the research question which in retrospective studies is a way to avoid some inherent bias.
8. Was follow-up complete?	Yes. Patients were essentially followed for a brief study period defined as the time from the first IVP dose of diltiazem or metoprolol to 30min after the last IVP dose or initiation of a secondary intervention,whichever came first. There was an extended study period was defined as time from the first IVP dose of diltiazem or metoprolol to 6 h after the last IVP dose.
What are the results ?	Primary outcome: Mean SBP reduction from baseline to nadir, was 18 ± 22 mmHg compared to 14 ± 15 mmHg for diltiazem and metoprolol patients (**p = .33**) Clinically relevant hypotension was also similar between diltiazem and metoprolol patients (9 (14%) vs. 7 (16%); **p = .86**) More patients receiving diltiazem obtained rate control (35 (56%) vs. 16 (36%); **p = .04**) Six hour extended study period was 33 ± 20 mmHg for diltiazem and 26 ± 15 mmHg for metoprolol patients (**p = .13**)
1. How large was the treatment effect?	SBP reduction 30 min after last IVP Diltiazem 18 ± 22. Metoprolol 14 ± 15 SBP reduction 6 hours after last IVP Diltiazem 33 ± 20 Metoprolol 26 ± 15 Rate control **p=0.04** Diltiazem 35/63 (56%) Metoprolol 16/45 (36%)
2. How precise was the estimate of the treatment effect? (CI's?)	Authors did not report CI's which would have also demonstrated non-significance and likely imprecision (very wide) because of the small N. SBP reduction 30 min p = 0.33 SBP reduction 6 hours p = 0.13 Rate control p = 0.04

III **How can I apply the results to patient care?**	
1. Were the study patients similar to my patient?	Probably not. African Americans represent 8.8% of demographic in Indianapolis which is much less than Norfolk (42%). No reporting on other comorbidities. Also, a majority of these patients were not medication naïve and a majority had a history of AF.
2. Were all clinically important outcomes considered?	Not really. No reported patient centered outcomes such as hospital LOS were reported. No assessment of pre-treatment compliance was reported. Study was likely underpowered to report on harms.
3. Are the likely treatment benefits worth the potential harm and costs?	Inconclusive. Very small N with over 1500 potentially eligible patients never screened. Did not even reach a priori sample size for B-blocker. Almost all patients were underdosed according to current guidelines.

Limitations:

- Retrospective chart-review study. Unclear if they used retrospective study guidelines described here
- Single-center design and practice variation (diltiazem dosing)
    - Only 13 diltiazem patients (21%) received a weight-based dose 0.2–0.3 mg/kg similar to what is recommended by current AF guidelines
- Limitations of documentation (vitals, comorbid conditions, EKGs, timing, etc)
- Insufficient power as priori sample size was not met for metoprolol arm
    - Low use, only 20% of all encounters
    - Poor documentation of vitals
    - More likely to be excluded for extreme dose of intervention.

Clinical Bottom Line:

In patients with non-valvular atrial fibrillation with RVR both diltiazem and metoprolol IVP can lead to reductions in systolic blood pressure and decrease heart rate. The study was not adequately powered to assess differences in systolic blood pressure reduction between groups however in patients taking B-blockers who have a history of AF, diltiazem may have a higher likelihood of obtaining adequate rate control.