Milrinone

Milrinone is a vasodilator that works by relaxing themuscles in blood vessels to help them dilate (widen). This lowers blood pressure and allows blood to flow more easily through your veins and arteries. Milrinone is used as a short-term treatment for treating life-threatening heart failure.

Eagles ME, MacLean MA, Kameda-Smith MM, Duda T, Persad ARL, Almojuela A, Bokhari R, Iorio-Morin C, Elkaim LM, Rizzuto MA, Lownie SP, Christie SD, Teitelbaum J; Canadian Neurosurgery Research Collaborative. Subarachnoid Hemorrhage, Delayed Cerebral Ischemia and Milrinone Use in Canada. Can J Neurol Sci. 2022 Apr 28:1-23. doi: 10.1017/cjn.2022.44. Epub ahead of print. PMID: 35477442.

The current analysis shows that cerebral perfusion in the setting of secondary cerebral ischemia following SAH is measurably improved by milrinone and norepinephrine-based hyperdynamic therapy. A long-term clinical benefit by the addition of milrinone appears likely. Separation of the direct effect of milrinone from the effect of induced hypertension is not possible based on the present dataset [1)].

High dose IV milrinone therapy for symptomatic delayed cerebral ischemia (DCI) after subarachnoid hemorrhage (SAH) can lead to rapid neurological improvement with dramatic early angiographic improvement of cerebral vasospasm.

Although intrathecal milrinone injection via lumbar catheter to prevent DCI has been previously reported to be safe and feasible, its effectiveness remains unknown [2)].

Al-Jehani and Angle from the Montreal Neurological Institute/Hospital, McGill University, Montreal, Canada. and King Fahd University Hospital, presented the details of a case of a 38-year-old woman who suffered from an ischemic stroke. The clinical course of which showed a hemodynamic dependence to preserve her neurological function, prompting the use of the phosphodiesterase inhibitor milrinone to maintain her neurological function.

This case represents the first case in the literature in which a medical therapy is used to salvage brain tissue in the site of acute symptomatic large vessel occlusion. This has spared the patient from a potential significant morbidity and even mortality if a revascularization procedure had been attempted.

This innovative use of milrinone, if applied in more captured patients with internal carotid occlusion or those with reversible hemodynamic failure, would improve our understanding of the ischemic thresholds and cerebral vascular reserves and would improve the clinical outcome of this significant ischemic insult [3)].

The goal of a study was to evaluate whether intrathecal milrinone injection treatment after aSAH

significantly reduced the incidence of DCI. METHODS The prospectively maintained aSAH database was used to identify patients treated between January 2010 and December 2015. The cohort included 274 patients, with group assignment based on treatment with intrathecal milrinone injection or not. A propensity score model was generated for each patient group, incorporating relevant patient variables. RESULTS After propensity score matching, 99 patients treated with intrathecal milrinone injection and 99 without treatment were matched on the basis of similarities in their demographic and clinical characteristics. There were significantly fewer DCI events (4% vs 14%, p = 0.024) in patients treated with intrathecal milrinone injection compared with those treated without it. However, there were no significant differences between the 2 groups with respect to their 90-day functional outcomes (46% vs 36%, p = 0.31). The likelihood of chronic secondary hydrocephalus, meningitis, and congestive heart failure as complications of intrathecal milrinone injection therapy was also similar between the groups. CONCLUSIONS In propensity score-matched groups, the intrathecal administration of milrinone via lumbar catheter showed significant reduction of DCI following aSAH, without an associated increase in complications [4].

A 66-year-old female was admitted with a Hunt and Hess clinical grade 4, World Federation of Neurological Surgeons (WFNS) clinical grade 4, and SAH secondary to a left anterior choroidal artery aneurysm which was clipped. After bleed day 6, the patient developed symptomatic DCI. We planned for angioplasty of the proximal segments. We administered high dose IV milrinone bolus followed by continuous infusion which led to clinical improvement prior to angiography. The angiogram performed 1.5 hours after milrinone administration displayed resolution of the CT angiogram and MRI based cerebral vasospasm such that further intra-arterial therapy was aborted. She completed 6 days of continuous IV milrinone therapy, was transferred to the ward, and subsequently rehabilitated [5].

1)
Steiger HJ, Ensner R, Andereggen L, Remonda L, Berberat J, Marbacher S. Hemodynamic response and clinical outcome following intravenous milrinone plus norepinephrine-based hyperdynamic hypertensive therapy in patients suffering secondary cerebral ischemia after aneurysmal subarachnoid hemorrhage. Acta Neurochir (Wien). 2022 Mar;164(3):811-821. doi: 10.1007/s00701-022-05145-6. Epub 2022 Feb 9. PMID: 35138488; PMCID: PMC8913475.
2), 4)
Koyanagi M, Fukuda H, Lo B, Uezato M, Kurosaki Y, Sadamasa N, Handa A, Chin M, Yamagata S. Effect of intrathecal milrinone injection via lumbar catheter on delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage. J Neurosurg. 2018 Mar;128(3):717-722. doi: 10.3171/2016.10.JNS162227. Epub 2017 Mar 3. PubMed PMID: 28298035.
3)
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5)
Zeiler FA, Silvaggio J. Early Angiographic Resolution of Cerebral Vasospasm with High Dose Intravenous Milrinone Therapy. Case Rep Crit Care. 2015;2015:164597. doi: 10.1155/2015/164597. Epub 2015 Sep 17. PubMed PMID: 26457209; PubMed Central PMCID: PMC4589610.