Ironing out the options: A quality improvement study comparing the use of Monofer and Venofer in pregnancy

Karen Jiang B.Sc, James Hayward MD, Shannon Cross RN, Sannifer Hoi RPh
Island Health, University of British Columbia

Background

Anemia in Pregnancy

- Anemia is associated with fatigue, depression, severe outcomes from postpartum hemorrhage, and adverse perinatal outcomes including small for gestational age, preterm birth, and perinatal mortality.[1]
- Anemia affects 40% of pregnant women worldwide, and iron deficiency is the most common cause.[2]

Iron Therapy

- Oral iron is frequently used for iron deficiency anemia (IDA). However, it is frequently ineffective in pregnancy due to increased iron requirements, poor absorption and side effects limiting adherence.[3]
- Intravenous iron is an established alternative associated with improved hemoglobin and iron stores in all populations.[4,5]

IV Iron – Monofer and Venofer

- Iron sucrose (Venofer) and ferric derisomaltose (Monofer) are two IV iron formulations.
- Venofer has a smaller elemental iron concentration (20 mg/mL), often requiring 3 or more infusions, whereas Monofer has a larger concentration (100 mg/mL) and typically requires a single dose.[1]
- In the general population, Monofer is safe and superior to Venofer, increasing Hgb in a shorter time and with a single dose, and is becoming first-line.[6,7]

Monofer in Pregnancy

- There is limited research on the use of Monofer in the pregnant population, who could greatly benefit from a more convenient and rapid treatment alternative, especially later in pregnancy.[8]
- We have recently begun using Monofer to treat patients with more severe iron deficiency anemia at our site due to the above benefits.

Aim

To review outcomes of efficacy, safety, and cost-effectiveness of Venofer and Monofer at our centre, to inform our selection of the best IV iron formulation for our population.

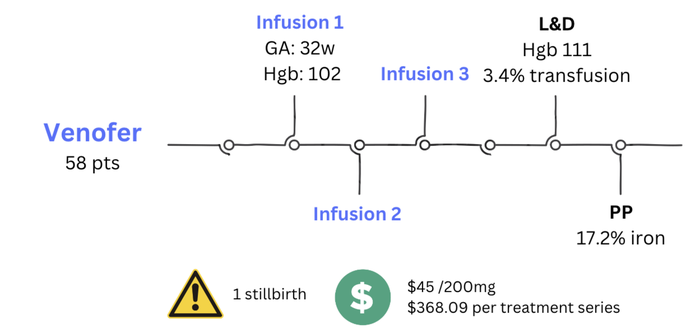
Results

- 76 patients were included, 58 (76.3%) received Venofer and 18 received Monofer.
- Patients receiving Venofer had an average of 2.5 infusions, all Monofer patients received a single infusion.
- Patients receiving Monofer were earlier in gestational age at first infusion (29 weeks vs. 32 weeks, p = 0.024) and had lower mean Hgb at time of referral (97 vs. 102, p = 0.011). This may represent a selection bias of early advanced IDA patients towards Monofer infusion.
- There was no statistically significant difference in outcomes (mean Hgb at labour, rate of transfusion, and rate of postpartum IV iron infusion) between groups.

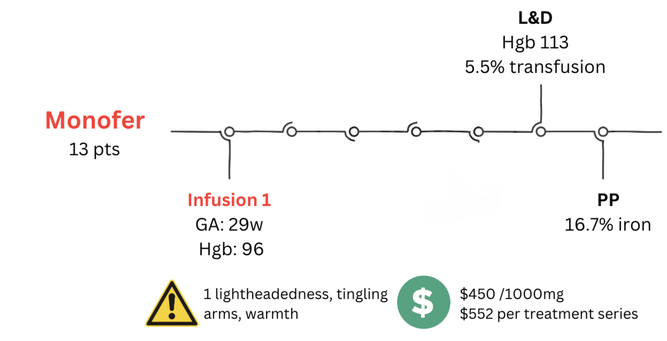
- Two adverse outcomes occurred, one in each group. One patient receiving Monofer had symptoms of lightheadedness, tingling arms, and warmth, with stable vitals and full resolution of symptoms after adjusting the infusion rate accordingly, and completed treatment. One patient receiving Venofer had a stillbirth at term with a suspected cord accident, likely unrelated to the iron therapy.

- The cost of a treatment course with Venofer (with average 2.5 infusions) was lower than with Monofer ($368 vs. $552). However, Monofer infusion has fewer equipment, staffing, and time demands.
- A treatment course of Venofer infuses 600mg of iron whereas Monofer infuses 1000mg.

Venofer outcomes



Monofer outcomes



Pre-infusion statistics

	Venofer	Monofer	p-value
Mean Hgb at referral	**102**	**96**	**0.011**
# patients Hgb >110 (cutoff at our site)	3 (5.2%)	1 (5.6%)	0.959
Mean ferritin at referral	12	13	0.653
GA at first infusion	32.0	28.9	**0.024**
# SVD	39 (67.2%)	11 (61.1%)	0.632

Outcomes at labour & delivery

	Venofer	Monofer	p-value
Mean Hgb at labour	**111**	**113**	**0.953**
# patients Hgb < 100	3 (5.2%)	3 (16.7%)	0.114
# patients Hgb < 110	17 (29.3%)	3 (16.7%)	0.287
# patients given PP transfusion	2 (3.4%)	1 (5.5%)	0.688
# patients given PP iron	10 (17.2%)	3 (16.7%)	0.955

Cost Analysis

	Venofer	Monofer
Staff Wages		
Nursing Staff	$68.95 (/hour)	$68.95 (/hour)
Pharmacy Technician	$8.30 (/15 mins)	$8.30 (/15 mins)
Medication Cost	$45/200mg ($225/1000mg)	$450/1000mg
Equipment	$23.74	$25.21
Cost per appointment	$145.99	$552.46
Cost per treatment series	**$364.96 (600mg given)**	**$552.46 (1000mg given)**

Methods

This is a quality improvement project including all patients from December 2022 to July 2023 who received IV iron infusions for IDA during pregnancy at the Victoria General Hospital outpatient antenatal clinic.

The primary outcomes were:

- Adverse reactions
- Hgb at labour
- Blood transfusions at labour/delivery
- Post-partum IV iron infusions

We also completed a cost analysis of each IV iron treatment series, including costs for staffing, medication, and equipment.

Conclusion

The use of Monofer for IDA in pregnancy is safe and effective compared to Venofer. Outcomes were equivalent and Monofer may have been superior because mean Hgb at labour, transfusion rate, and postpartum iron infusion rate were similar between groups, despite Monofer patients having lower mean Hgb at referral. Monofer infusion only required one appointment, thus is more accessible and convenient for patients.

Monofer was on average infused earlier in the pregnancy compared to Venofer. This was due to a deliberate selection bias towards patients with more severe anemia receiving Monofer due to known more rapid effect and higher iron content. However, a treatment series with Monofer was more expensive than Venofer.

In conclusion, the use of Monofer in pregnant patients at VGH was safe and effective during our study period. A change towards universal Monofer treatment will result in 225 fewer patient visits for IV iron therapy per year, with an average reduction of 1.5 visits per patient, and will free nursing time for other necessary work. We are pursuing this policy change now!

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