

PER R. HILDEBRANDT\*, MD, NIELS E. BRUUN†, MD, OLAV W. NIELSEN‡, MD, EMIL PANTEV§, MD, FARZAD SHIVA¶, MD, LARS VIDEBÆK\*\*, MD, GERHARD WIKSTRÖM††, MD & LARS L. THOMSEN, MD

\*Glostrup University Hospital, Glostrup;

†Gentofte University Hospital, Hellerup;

‡Bispebjerg University Hospital, Copenhagen, Denmark;

§Helsingborg Hospital, Helsingborg; Karlstad Hospital, Karlstad, Sweden;

\*\*Odense University Hospital, Odense, Denmark;

††Uppsala University Hospital, Uppsala, Sweden;

‡‡Pharmacosmos A/S, Holbaek,

Correspondence to:

Dr P.R. Hildebrandt, Department of Cardiology, Glostrup University Hospital, Ndr Ringvej 57, 2600 Glostrup, Denmark

E-mail: [p.hildebrandt@dadlnet.dk](mailto:p.hildebrandt@dadlnet.dk)

- 
- 
- 
- 

( )

1000 ( ) – ,

,

1000

8-

1000 ( 868 , 650-1000 ).

- , ,

,

49%.

1000

( )

1,2,

(Hb)

3,4

2.

3,5-9

" / "

1000 (Monofer, Pharmacosmos A/S, Holbaek, ).

1000,

1000

( )

( ),

( ),

(

),

(

)

).

(TSAT),

1, 2, 4 8

;

;

(LASA) 4 8 ,

LASA .

LASA - ,

100 (0 - ),

, .

18 ,

11 / , 800 / ,

12 .

800 /

, .

, .

, .

11,5 /

12 / .

, ,

( , ),

( , ),

-

, ,

, ,

, ,

, .

3

8-

, 1000 4

100-200 / 1, 2 4

( ,

800 )

, 4

,

20 / ,  
7 ( ).

Ganzoni<sup>10</sup>:  
Hb) ( / ) \* 0,24 + ( ) = ( ) \* ( Hb -  
1000, ( 500 ).  
( )

, ,  
, ,  
(Hb,  
) ( , , ,  
) ,  
, 1, 2, 4 8 .  
[ , (HCT), TSAT,  
] 1, 2, 4 8  
8 .

6 8 8 . LASA

) ( ,  
( )

( )

, ,

(Hb, , TSAT, , ),

(ANOVA)

---



---



---



---

95%

Hodges-Lehmann CI.

4 8

(LASA)

20

1000, ,

( )

13

2

1

800 / 1

- 1 . 20

10 (50%)

10 (50%)

75 ( 61-88 ).

« »,

, 18

8

20

( ).

20

59,8 ( 50-67 ).  
8- 650 1000 ,  
868 .

20 , 1000, 13 (65%)  
25 , 18 , 7 -  
( . 1).

( ) /

, 2 - , 1- : 4 - , 2 -  
4 -

2 3.

TSAT

8 .

2 0,47 /

LASA

4 8

4.

LASA ( « » ,

«

» « »)

4

49%, 38% 23%, 8

34%, 20% 13%, ,

8- ( .4).

1.

	n (%)
	13 (65.0)
	25
	1 (5.0)
	1 (5.0)
	1 (5.0) *
( )	1 (5.0) *
	1 (5.0)
	1 (5.0) *
( )	1 (5.0) *
( )	1 (5.0)
-	
	1 (5.0)
	1 (5.0)
	1 (5.0)
	1 (5.0)
	1 (5.0)
	1 (5.0) *
	1 (5.0)
	1 (5.0) *
,	
	1 (5.0)
	1 (5.0)
-	
	1 (5.0)
,	
	1 (5.0)
	1 (5.0)
	1 (5.0) *
	1 (5.0)
	1 (5.0)
	1 (5.0)

; (ii) ( ; (iv) ); (iii) / ; (v)  
 / ; (vi) . \*7

2.

, m±SD

		1- *	2- *	4- *	8- *
Hb (g/dl)	10,88±0,76	11,09±0,39	11,22±0,69	10,94±0,89	11,23±0,82
Hb (mmol/l)	6,75±0,47	6,88±0,24	6,96±0,43	6,79±0,55	6,97±0,51
Hct	0,34±0,03	0,34±0,02	0,35±0,02	0,34±0,03	0,35±0,03
TSAT (%)	22,06±9,72	39,5±24,05	29,11±11,74	30,0±10,52	28,11±10,46
( / )	12,47±5,55	20,05±10,6	14,56±6,08	14,78±5,06	13,79±4,97
( / )	180,0±183,5	753,0±326,4	645,0±307,0	456,9±252,2	409,7±333,6

\* Hb- ; Hct- ; TSAT-

3.

, m±SD

	1- *	2- *	4- *	8- *
Hb (g/dl)	0,2±0,7	0,47±1,0	0,23±1,1	0,44±1,2
Hb (mmol/l)	0,122±0,44	0,294±0,60	0,144±0,69	0,271±0,75
p-	0,3223	0,1509	0,7626	0,1171
Hct	0,004±0,02	0,016±0,03	0,007±0,03	0,017±0,04
p-	0,6195	0,1150	0,4207	0,0230
TSAT (%)	12,59±14,17	6,88±9,56	7,07±9,75	4,44±11,69
p-	0,0006	0,3580	0,1140	0,3240
( / )	5,59±7,09	2,50±5,11	2,13±5,48	0,75±6,70
p-	0,0016	0,4030	0,2576	0,5539
( / )	582,2±238,0	446,2±199,8	297,6±177,2	216,8±198,0
P-value	<0,0001	<0,0001	<0,0001	<0,0001

\* Hb- ; Hct- ; TSAT-

#### 4. LASA

	4- *	8- *
( )	45,30±32,51	67,47±29,18
( )	47,45±35,72	65,60±29,46
( )	57,10±35,37	70,13±30,01

\* LASA -



5,6 ( )  
( . . - )  
3,7,8 35  
12 ,  
FAIR-HF<sup>7</sup> (Ferric-  
carboxymaltose in patients with heart failure and iron deficiency –  
) 459

(self-reported Patient  
Global Assessment), 6-  
NYHA

70

13

14,15

13

, / .  
,  
(Ferumoxytol) (Feraheme, AMAG Pharmaceuticals, Inc, Lexington,  
, ), (Ferinject, Pharma, - ,  
) 1000 (Monofer).

,  
,  
,  
Monofer,  
(  
1800 )<sup>16</sup>.

1000. ,

17.

8

( ,

50 ).

800 /

13 / .

8 11,2 / .

1000

20

1. Anand IS. Anemia and chronic heart failure implications and treatment options. *J Am Coll Cardiol* 2008; 52: 501–11.
2. Nanas JN, Matsouka C, Karageorgopoulos D, et al. Etiology of anemia in patients with advanced heart failure. *J Am Coll Cardiol* 2006; 48: 2485–9.
3. Bolger AP, Bartlett FR, Penston HS, et al. Intravenous iron alone for the treatment of anemia in patients with chronic heart failure. *J Am Coll Cardiol* 2006; 48: 1225–7.
4. Ezekowitz JA, McAlister FA, Armstrong PW. Anemia is common in heart failure and is associated with poor outcomes: insights from a cohort of 12 065 patients with new-onset heart failure. *Circulation* 2003; 107: 223–5.
5. Silverberg DS, Wexler D, Blum M, et al. The use of subcutaneous erythropoietin and intravenous iron for the treatment of the anemia of severe, resistant congestive heart failure improves cardiac and renal function and functional cardiac class, and markedly reduces hospitalizations. *J Am Coll Cardiol* 2000; 35: 1737–44.
6. Silverberg DS, Wexler D, Sheps D, et al. The effect of correction of mild anemia in severe, resistant congestive heart failure using subcutaneous erythropoietin and intravenous iron: a randomized controlled study. *J Am Coll Cardiol* 2001; 37: 1775–80.
7. Anker SD, Comin Colet J, Filippatos G, et al. Ferric carboxymaltose in patients with heart failure and iron deficiency. *N Engl J Med* 2009; 361: 2436–48.
8. Toblli JE, Lombraña A, Duarte P, Di Gennaro F. Intravenous iron reduces NT-pro-brain natriuretic peptide in anemic patients with chronic heart failure and renal insufficiency. *J Am Coll Cardiol* 2007; 50: 1657–65.
9. Usmanov RI, Zueva EB, Silverberg DS, Shaked M. Intravenous iron without erythropoietin for the treatment of iron deficiency anemia in patients with moderate to severe congestive heart failure and chronic kidney insufficiency. *J Nephrol* 2008; 21: 236–42.
10. Ganzoni AM. [Intravenous iron-dextran: therapeutic and experimental possibilities]. *Schweiz Med Wochenschr* 1970; 100: 301–3.
11. Medical Dictionary for Regulatory Activities Maintenance and Support Services Organization. Accessed at [http:// www.meddramsso.com/](http://www.meddramsso.com/)
12. Okonko DO, Grzeslo A, Witkowski T, et al. Effect of intravenous iron sucrose on exercise tolerance in anemic and nonanemic patients with symptomatic chronic heart failure and iron deficiency FERRIC-HF: a randomized, controlled, observer-blinded trial. *J Am Coll Cardiol* 2008; 51: 103–12.
13. Macdougall IC. Evolution of iv iron compounds over the last century. *J Ren Care* 2009; 35(Suppl. 2): 8–13.
14. Chertow GM, Mason PD, Vaage-Nilsen O, Ahlmén J. On the relative safety of parenteral iron formulations. *Nephrol Dial Transplant* 2004; 19: 1571–5.
15. Chertow GM, Mason PD, Vaage-Nilsen O, Ahlmén J. Update on adverse drug events associated with parenteral iron. *Nephrol Dial Transplant* 2006; 21: 378–82.
16. Wikström B, Bhandari S, Barany P, et al. Iron isomaltoside 1000: a novel intravenous iron for treating iron deficiency in chronic kidney disease. *J Nephrol* 2010 (in press).

17. Peebles G, Stanley S. Evaluation of a service reconfiguration for managing intravenous iron supplementation in non-haemodialysis patients with chronic renal failure. *J Outcomes Res* 2004; 8:15–25.