



Universiteit
Leiden
The Netherlands

Intrauterine blood transfusion : indications, risks, quality control and long-term outcome

Lindenburg, I.T.M.

Citation

Lindenburg, I. T. M. (2015, September 10). *Intrauterine blood transfusion : indications, risks, quality control and long-term outcome*. Retrieved from <https://hdl.handle.net/1887/35176>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/35176>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/35176> holds various files of this Leiden University dissertation

Author: Lindenburg, Irene

Title: Intrauterine blood transfusion : indications, risks, quality control and long-term outcome

Issue Date: 2015-09-10

Publications

van Klink JM, van Veen S, Smits-Wintjens V, **Lindenburg ITM**, Rijken M, Oepkes D, Lopriore E Immunoglobulins in Neonates with Rhesus Hemolytic Disease of the Fetus and Newborn: Long-Term Outcome in a Randomized Trial. *Fetal Diagn and Ther* 2015. Accepted for publication.

Lindenburg ITM, van Kamp IL, Oepkes D. Intrauterine Blood Transfusion: Current Indications and Associated Risks. *Fetal Diagn and Ther* 2014;36(4):263-71.

Lindenburg ITM, van Klink JM, Smits-Wintjens VE, van Kamp IL, Oepkes D, Lopriore E. Long-term neurodevelopmental and cardiovascular outcome after intrauterine transfusions for fetal anaemia: a review. *Prenat Diagn* 2013;33(9):815-22.

Lindenburg ITM, van Kamp IL, van Zwet EW, Middeldorp JM, Klumper FJ, Oepkes D. Increased perinatal loss after intrauterine transfusion for alloimmune anaemia before 20 weeks of gestation. *BJOG* 2013;120(7):847-52.

Rath ME, Smits-Wintjens VE, **Lindenburg ITM**, Folman CC, Brand A, van Kamp IL, Oepkes D, Walther FJ, Lopriore E. Postnatal outcome in neonates with severe Rhesus c compared to rhesus D hemolytic disease. *Transfusion* 2013;53(7):1580-5.

Verduin EP, Schonewille H, Brand A, Haasnoot GW, Claas FH, **Lindenburg ITM**, Lopriore E, Oepkes D, Roelen DL, Doxiadis II. High anti-HLA response in women exposed to intrauterine transfusions for severe alloimmune hemolytic disease is associated with mother-child HLA triplet mismatches, high anti-D titer, and new red blood cell antibody formation. *Transfusion* 2013;53(5):939-47.

De Jong EP, **Lindenburg ITM**, van Klink JM, Oepkes D, van Kamp IL, Walther FJ, Lopriore E. Intrauterine transfusion for parvovirus B19 infection: long-term neurodevelopmental outcome. *Am J Obstet Gynecol* 2012;206(3):204.e1-5

Smits-Wintjens VE, Rath ME, **Lindenburg ITM**, Oepkes D, van Zwet EW, Walther FJ, Lopriore E. Cholestasis in neonates with red cell alloimmune hemolytic disease: incidence, risk factors and outcome. *Neonatology* 2012;101(4):306-10.

Lindenburg ITM, Smits-Wintjens VE, van Klink JM, Verduin E, van Kamp IL, Walther FJ, Schonewille H, Doxiadis II, Kanhai HH, van Lith JM, van Zwet EW, Oepkes D, Brand A, Lopriore E; LOTUS study group. Long-term neurodevelopmental outcome after intrauterine transfusion for hemolytic disease of the fetus/newborn: the LOTUS study. Am J Obstet Gynecol 2012;206(2):141.e1-8.

Smits-Wintjens VE, Walther FJ, Rath ME, **Lindenburg ITM**, te Pas AB, Kramer CM, Oepkes D, Brand A, Lopriore E. Intravenous immunoglobulin in neonates with rhesus hemolytic disease: a randomized controlled trial. Pediatrics 2011;127(4):680-6.

Lindenburg ITM, Wolterbeek R, Oepkes D, Klumper FJ, Vandenbussche FP, van Kamp IL. Quality control for intravascular intrauterine transfusion using cumulative sum (CUSUM) analysis for the monitoring of individual performance. Fetal Diagn Ther 2011;29(4):307-14.

Verduin EP, **Lindenburg ITM**, Smits-Wintjens VE, van Klink JM, Schonewille H, van Kamp IL, Oepkes D, Walther FJ, Kanhai HH, Doxiadis II, Lopriore E, Brand A. Long-Term follow up after intra-Uterine transfusionS; the LOTUS study. BMC Pregnancy Childbirth 2010;10:77.

Rath ME, Smits-Wintjens VE, **Lindenburg ITM**, Brand A, van Kamp IL, Oepkes D, Walther FJ, Lopriore E. Exchange transfusions and top-up transfusions in neonates with Kell haemolytic disease compared to Rh D haemolytic disease. Vox Sang 2011;100(3):312-6.

Rath ME, Smits-Wintjens VE, **Lindenburg ITM**, Brand A, Oepkes D, Walther FJ, Lopriore E. Top-up transfusions in neonates with Rh hemolytic disease in relation to exchange transfusions. Vox Sang 2010;99(1):65-70.

Kamphuis MM, **Lindenburg ITM**, van Kamp IL, Meerman RH, Kanhai HH, Oepkes D. Implementation of routine screening for Kell antibodies: does it improve perinatal survival? Transfusion 2008;48(5):953-7.

Met veel dank aan:

Alle kinderen en hun ouders/verzorgers die deelnamen aan de LOTUS studie



Inge van Kamp, Dick Oepkes & Enrico Lopriore



Humphrey Kanhai, Frans Klumper, Frank Vandenbussche & Annemieke Middeldorp



Arts-assistenten, verloskundigen, echoscopisten, verpleging en staf Gynaecologie, HagaZiekenhuis, Den Haag



AIOS, verloskundigen, verpleging en staf Gynaecologie/Verloskunde, LUMC, Leiden



Bart Hellebrekers



Jan van Lith



Reünisten Krokettenlunch & Lemmonkamer



Anneke Brand, Henk Schonewille & Esther Verduin



Robertjan Meerman, Suzanne Pasman, Katinka Teunissen, Phebe Adama van Scheltema & Jochem Kist



Ivanka Bekker, Gladys Laterveer & Wendy Matthijzen



Jennie Verdoes



Vivianne Smits-Wintjens, Ruben Witlox, Frans Walther & Mirjam Rath



Jeanine van Klink



Paranimfen Merel Gouverneur & Florentine de Vries



Mijn familie, vrienden en ouders Henk en Trees Lindenburg



Daniel & Samuel Verloop

Curriculum Vitae

Irene Verloop-Lindenburg

Geboren op 14 januari 1982 te Schiedam

1994 - 1999	HAVO, S.G. Spieringshoek in Schiedam
1999 - 2001	Atheneum, S.G. Spieringshoek in Schiedam
2001 - 2008	Studie Geneeskunde, Universiteit Leiden
2005	Klinische stage General Surgery, Royal Cornwall Hospital in Engeland
2006	Wetenschapsstage afdeling Verloskunde, Leids Universitair Medisch Centrum (LUMC)
2010 - 2011	Arts-echoscopist, Afdeling Prenatale Diagnostiek & Foetale Behandeling, LUMC
2011 - 2012	Arts-assistent Gynaecologie, HagaZiekenhuis in Den Haag
2012 - 2014	Opleiding Gynaecologie, Leidse Cluster HagaZiekenhuis, Dr. B.W.J. Hellebrekers LUMC, Prof. dr. J.M.M. van Lith
2008 – 2015	Promotieonderzoek (o.a. de LOTUS-studie), Afdelingen Verloskunde en Neonatologie, LUMC
2015	Arts Verzekeringsgeneeskunde UWV in Arnhem

List of Abbreviations

ADCC	Antibody-Dependent Cellmediated Cytotoxic assay
BSID	Bayley Scales of Infant Development
B19V infection	Parvovirus B19 infection
CI	Confidence Interval
CP	Cerebral Palsy
CT	Computed Tomography scan
CUSUM	CUmulative SUM
FMH	FetoMaternal Hemorrhage
GA	Gestational Age
Hb	Hemoglobin
HDFN	Hemolytic Disease of the Fetus and Newborn
HLA	Human Leucocyte Antigen
IgG	Immunoglobuline type Gamma
IPT	Intraperitoneal Transfusion
IUFD	IntraUterine Fetal Death
IUT	IntraUterine blood Transfusion
IVIG	IntraVenous ImmunoGlobulin
MC twins	MonoChorionic twins
MCV – PSV	Middle Cerebral Artery – Peak Systolic Velocity
MDI	Mental Developmental Index
MND	Minor Neurological Dysfunction
MRI	Magnetic Resonance Imaging
NPR	Not-Procedure-Related
LOTUS	LOng-Term outcome after intraUterine transfusionS
LUMC	Leiden University Medical Center
OR	Odds Ratio
PR	Procedure-Related
RBC	Red Blood Cell
Rh	Rhesus
SD	Standard Deviation
SES	Social Economic Status
TAPS	Twin Anemia Polycythemia Sequence
TTTS	Twin-To-Twin Transfusion Syndrome
US	UltraSound
WISC	Wechsler Intelligence Scale for Children
WPPSI	Wechsler Preschool Performance Scale of Intelligence
NDI	NeuroDevelopmental Impairment
Z-Hemoglobin	Z-score of Hemoglobin

