IUGR / SGA Update 2017

- Nur ~**2/3** aller IUGR werden entdeckt.
- IUGR für ~**1/3** der Fälle von IUFT verantwortlich
- Spät IUGR: Biometrie in **36+ SSW** besser als 32 +
- Doppler: anders als früher immer alle arteriellen Gefäße, auch die **ACM**

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Recklinghausen 22.02.2017

G Model
EURO-8339; No. of Pages 5

ARTICLE IN PRESS

European Journal of Obstetrics & Gynecology and Reproductive Biology xxx (2013) xxx–xxx

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Dezember 2013

Definition and management of fetal growth restriction: a survey of contemporary attitudes

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Top drei Definitionen

ABSTRACT

Objective: To evaluate opinions among Irish obstetricians and obstetric trainees regarding the optimal definition, assessment and management of pregnancies affected by intrauterine growth restriction (IUGR).

Study design: An anonymous, structured, web-based survey that comprised 14 questions was sent to 200 obstetricians and obstetric trainees in Ireland.

Results: Of the 113 participants (57% response rate), the majority (50%) were consultants, with over 10 years' clinical experience (46%), who worked in large maternity units (58%) with neonatal units providing care for preterm IUGR fetuses (94%). Eighty-three clinicians (74%) agreed that an estimated fetal weight (EFW) below the 10th centile constitutes small-for-gestational age (SGA). The majority (n = 93; 82%) would deliver the SGA fetus between 37^{+0} and 39^{+6} weeks gestation. In total, the survey yielded 30 different IUGR definitions; the top three definitions were (i) an EFW below the 5th centile (n = 18; 16%), (ii) an EFW below the 10th centile with oligohydramnios and abnormal umbilical artery (UA) Doppler (n = 16; 14%), and (iii) an EFW below the 10th centile (n = 12; 11%). In the evaluation of the preterm IUGR fetus with abnormal UA Doppler, the assessment of amniotic fluid volume, middle cerebral artery, ductus venosus, cardiotocograph (CTG) and biophysical profiling was performed in 74%, 60%, 60%, 54% and 52% respectively. The majority of clinicians applied three or more assessment modalities and 60% referred to a maternal-fetal medicine (MFM) subspecialist. Interestingly, even among MFM subspecialists there was no common consistent management approach. Most doctors (81%) would deliver the IUGR fetus for CTG abnormalities but MFM subspecialists more commonly deliver on the basis of absent end-diastolic flow in the UA alone (37% vs. 10%; p = 0.006). Two-thirds of doctors (n = 74) would implement customised growth charts if they became available for their population and over 80% thought that a national guideline on IUGR would be beneficial.

Conclusion: The results of this survey confirm the inconsistencies surrounding the clinical management of IUGR pregnancies and highlight the need for standardisation of terminology and antenatal surveillance, implementation of fetal weight customisation and national guidance for Ireland.

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- IUGR pathologischer Prozess, bei dem der Fetus sein genetisches Wachsumspotential nicht errreicht hat.

- **Fetal growth restriction (FGR)**
  - Will be used as a general term to describe fetuses with EFW <10th centile
- **Small-for-gestational age (SGA) or isolated FGR**
  - Will be used to describe a physiologically small fetus (ie EFW<10th centile, normal amniotic fluid volume and normal umbilical artery Doppler)
- **Intrauterine growth restriction (IUGR)**
  - Will be used to describe a pathologically small fetus (ie EFW<10th centile, oligohydramnios, abnormal UA Doppler AND/ OR poor interval growth velocity AND/ OR EFW <3rd centile)

Neue Definition IUGR

- Gewicht **< 3.** Perzentile [Porto study, 2013]
- Auffällige Dopplerwerte [Porto study, 2013]
- **Kein** Perzentilen-gerechtes Wachstum
- Spätform: **> 32^{+0}** SSWo.

Evaluation of an Optimal Gestational Age Cut-Off for the Definition of Early- and Late-Onset Fetal Growth Restriction

Fetal Diagn Ther
DOI: 10.1159/000355525

IUGR Definition uneinheitlich

verschiedene
Grenzwerte

Verschiedene Zeitpunkte

Frühe Wachstumsrestriktion (vor 32-34 SSW)

Späte Wachstumsrestriktion (nach 32-34 SSW)

Definition IUGR

	Early onset FGR	**Late onset FGR**
	selten	häufig
	<34.SSW	>34.SSW
Problem	Management	Richtig Erkennen
Folgen	Schwere Hypoxie, hohe Morbidität/ Mortalität	Leichte/ mäßige Hypoxie, schlechtes Langzeitoutcome

Schneider u. Lobmaier 2014, Obergurgl

Early- versus late-onset IUGR

	Early-onset IUGR	Late-onset IUGR
Problem	Management	Diagnose
Plaz. Veränderungen	ausgeprägt	mild
Hypoxie	++, systemische Adaptation	+/-, zentrale Adaptation
Fet	unreif	reif
Morbidität/Mortalität	hoch	niedriger
Prävalenz	1 – 2 %	3 – 5 %

Figueras & Gratacos, 2014

IUGR: Definitionen

- AU <2,5%, <3%, <5%, <10%
- Keine Zunahme von AU oder KU
- KU/AU > 2 Standardabweichungen
- Fetales Schätzgewicht unter < 10%
- Geburtsgewicht < 2 SD
- Geburtsgewicht < 3%, <5%, <10%
- Geburtsgewicht < 2500g

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- Geburtsgewicht < 2500g

Gutachterkommission

n	Gegenstand	BF positiv
39	Fehlbildung	26%
28	Retardierung	54%
15	maternale Erkrankung	33%
9	Chromosomenanomalie	56%
7	Geburtsleitung	1/7
2	invasive Diagnostik	1/2

IUGR / SGA- was ist abzuklären?

- wrong dates
- abnormal small
- starving small
- normal small

Nicolaides FMF

Schwangerschaftsdauer

- **AWMF**: Terminkorrektur nach Früh-US bei rechnerischer Diskrepanz von > 5 Tagen
- **International**: Immer Früh-US (SSL) zur Datierung verwenden (Mandruzzato et al., 2011)

Unklares Gestationsalter ?

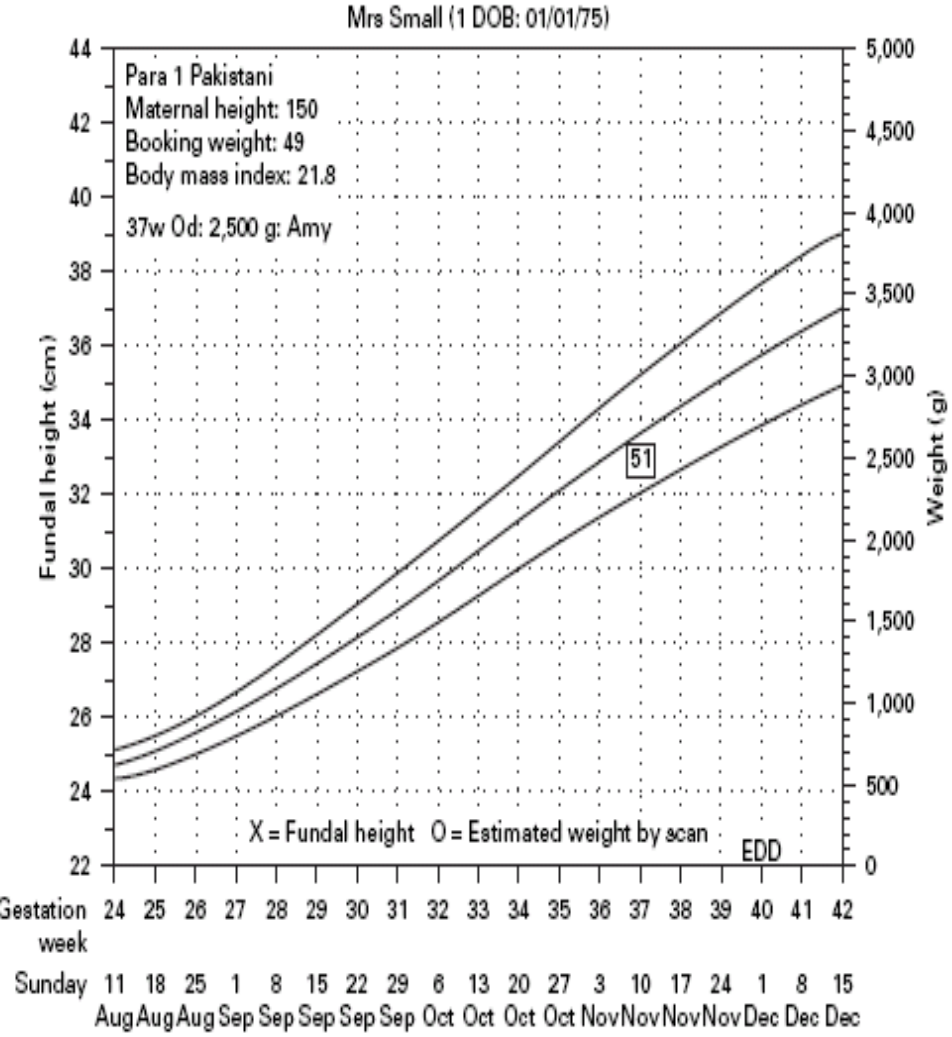
- Cerebellum 17 - 22 Wo.: **mm = Wo.**
- Calcaneus, Metatarsalia: ab **22.** Wo.
- Distaler Femurkern: ab **32.** Wo.
- Proximaler Tibiakern: ab **36.** Wo.

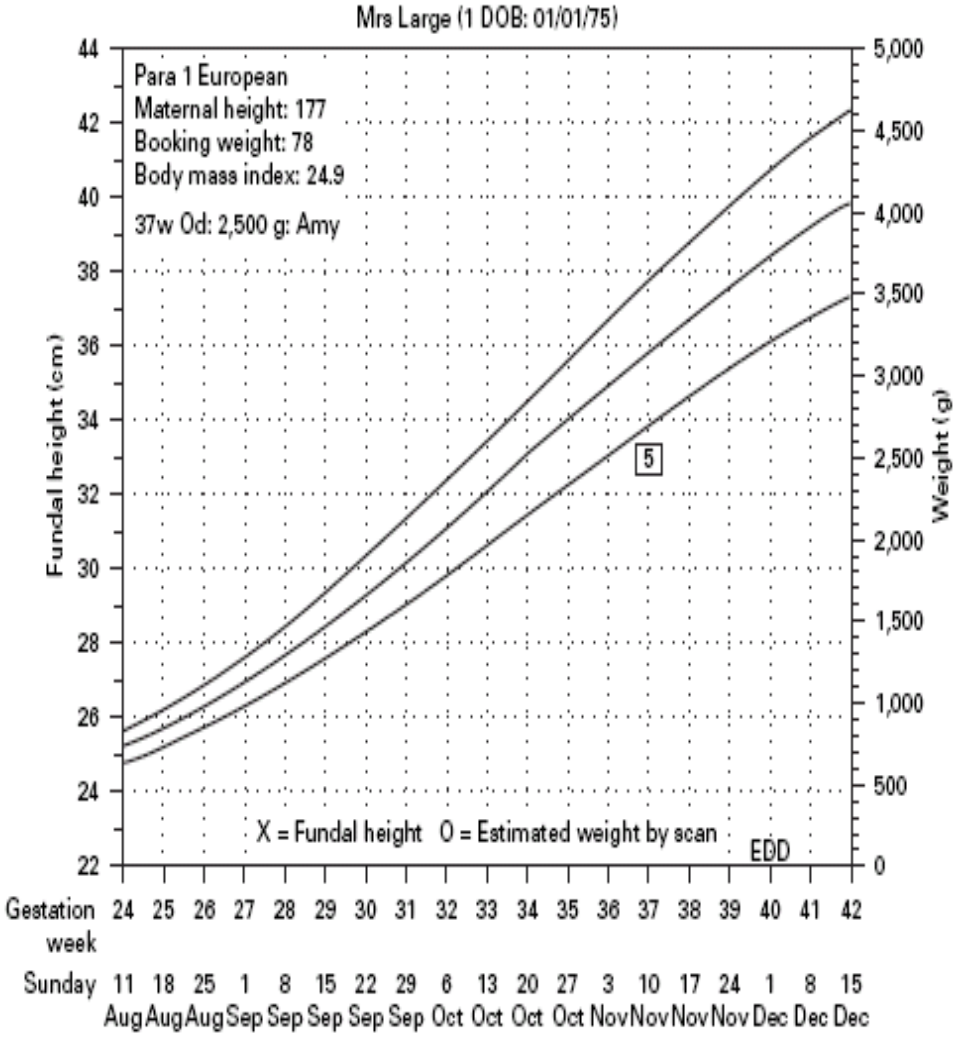
- **Warum ist das Kind zu klein?**

TABLE 10-1 Differential Diagnosis of FGR

Wrong dates	Structurally normal
	Symmetrically small
	Normal amniotic fluid index (AFI), activity and Doppler
	Normal growth velocity over 2 weeks
Normal small	Structurally normal
	Symmetrically small
	Normal AFI, activity and Doppler
	Decreased growth velocity over 2 weeks
Starving small	Structurally normal
	Asymmetrically small (AC, FL >HC)
	Reduced AFI and activity
	Increased pulsatility index (PI) in the uterine/umbilical arteries; reduced PI in middle cerebral artery (MCA); abnormal ductus venosus ± abnormal CTG
	Marked decrease in growth over 2 weeks
Abnormal small	Fetal abnormalities
	Symmetrically small or asymmetrical decrease in the head or limbs
	AFI and fetal activity decreased, increased or normal
	CTG and Dopplers normal or abnormal
	Decreased growth over 2 weeks

AC: abdominal circumference, HC: head circumference, FL: femur length, CTG: cardiotocograph.


Mrs Small (1 DOB: 01/01/75)
Para 1 Pakistani
Maternal height: 150
Booking weight: 49
Body mass index: 21.8
37w Od: 2,500 g: Amy
51
X = Fundal height O = Estimated weight by scan
EDD
Fundal height (cm)
Weight (g)
Gestation week
Sunday


Mrs Large (1 DOB: 01/01/75)
Para 1 European
Maternal height: 177
Booking weight: 78
Body mass index: 24.9
37w Od: 2,500 g: Amy
5
X = Fundal height O = Estimated weight by scan
EDD
Fundal height (cm)
Weight (g)
Gestation week
Sunday

- Warum ist das Kind zu klein?

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Starving small ?....

-Mehrlinge

-Plazentares Mosaik oder plazentare Unterversorgung (z.B. Präeklampsie) oder bei Nabelschnur- und Plazentaanomalien (Insertio velamentosa)

-alle mütterlichen Erkrankungen, die die plazentare Durchblutung beeinflussen (z.B. Herzerkrankungen, Anämie, COPD)

-Leben in großer Höhe

-Niedriges mütterliches Ausgangsgewicht

Tab. 1 Illegaler Substanzkonsum und mögliche Auswirkung auf den Feten/das Neugeborene.

Substanz	Schwangerschaft	Geburt	Weitere Gefahren
Heroin	IUGR, Frühgeburt. Fehlbildungen?	Anpassungsstörungen, NAS	Streckungsmittel. Abrupter Entzug: vorzeitige Wehen, Alteration fetaler Herzfrequenz
Kokain	Fehlgeburt, IUGR, Frühgeburt	Anpassungsstörungen	Akute plazentare Vasokonstriktion, vorzeitige Plazenta-lösung, IUFT
Crack	Herzfehler, Neuralrohrdefekte, LKG-Spalte	Neurologisch-kognitive Auffälligkeiten	
Cannabis	IUGR		Neurologisch-kognitive Spätfolgen?
Amphetamine	Herzfehler, Fußfehlstellung	Hyperexzitabilität	
Crystal	s. o., Neurotoxizität	Zittrigkeit, Gedeihstörung	Maternaler Hyper-tonus mit vorzeitiger Plazentalösung
Benzodiazepine (nicht illegal, aber i. S. eines Abusus)	IUGR, Fehlbildungen?	Anpassungsstörungen, NAS	Abrupter Entzug: maternale Krampfanfälle, IUFT
Neue psychoaktive Substanzen	Situation unklar: Kombination mit anderen Substanzen in der Auswirkung für Schwangerschaft/kindliche Entwicklung nicht abschätzbar!		

Modifiziert nach: Deutsche Hauptstelle für Suchtfragen e. V. Du bist schwanger...und nimmst Drogen. Informationen und Hilfen für Drogen, Alkohol und Nikotin konsumierende Schwangere. Broschüre 2012

IUGR: intrauterine Wachstumsrestriktion; NAS: neonatales Abstinenz(Entzugs-)syndrom; IUFT: intrauteriner Fruchttod; LKG-Spalte: Lippen-Kiefer-Gaumen-Spalte

Zeitsch. f. Geb. und Neo. August 2014

- Warum ist das Kind zu klein?

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Mit IUGR assoziierte Chromosomenstörungen

- Trisomien 8, 13, 18, 21
- 4p-Syndrom
- 5p-Syndrom
- 13q, 18p, 18q Syndrome
- Triploidie
- X0 (Turner-Syndrom)
- XXY, XXXY, XXXXY
- XXXXX

Syndrome, die mit IUGR assoziiert sind

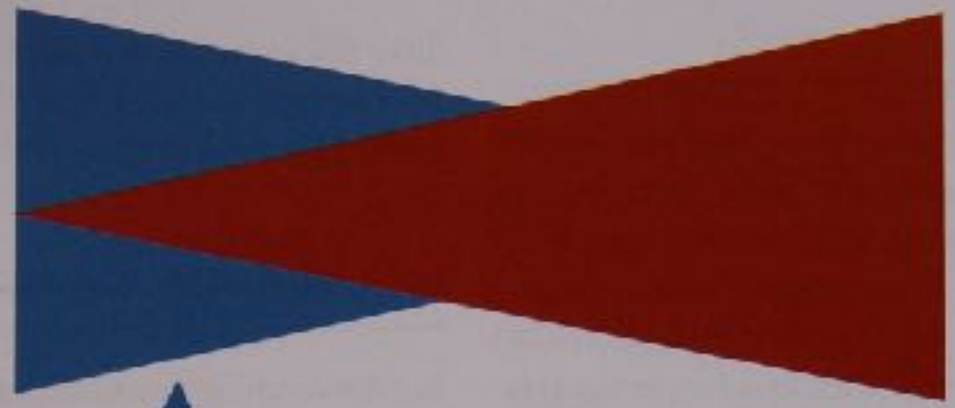
- Aarskog-Scott Syndrom
- Anencephalus
- Bloom Syndrom
- Cornelia de Lange Syndrom
- Dubowitz Syndrom
- Zwergenwuchs (Achondrogenesis, Achondroplasie)
- Ellis-van Creveld Syndrom
- Familial dysautonomia
- Fanconi pancytopenia
- Hallerman-Streiff Syndrom
- Meckel-Gruber Syndrom
- Mikrocephalie
- Mobius Syndrom
- Multiples Fehlbildungssyndrom
- Osteogenesis imperfecta
- Potter Syndrom
- Prader-Willi Syndrom
- Progeria
- Prune-belly Syndrom
- Radiusaplasie; Thrombocytopenie
- Robert Syndrom
- Robinow Syndrom
- Rubinstein-Taybi Syndrom
- Silver Syndrom
- Seckel Syndrom
- Smith-Lemli-Opitz Syndrom
- VATER und VACTERL
- Williams Syndrom
- …

Wahrscheinlichkeiten…

- Bei asymmetrischen IUGR vor der 26. SSW Anteil der Aneuploidien (vorwiegend Triploidien) wesentlich höher als im 3. Trim. (vorwiegend Trisomie 18)

- Bei isolierter IUGR ohne Fehlbildungen wesentlich weniger Aneuploidien (2%) als bei assoziierten Fehlbildungen (40%)

IUGR symmetrisch / asymmetrisch



Zellhyperplasie
Zellzahl < 16.SSW

Zellhypertrophie
Zellgröße > 16. SSW

FW-Menge ↑

Symmetrische IUGR (30%)

(irreversibel)
Intelligenzdefekte

FW-Menge ↓

Asymmetrische IUGR (70%)

(reversibel)

Hemmung der Zellproliferation ↑

Chron. Zentralisation ↑

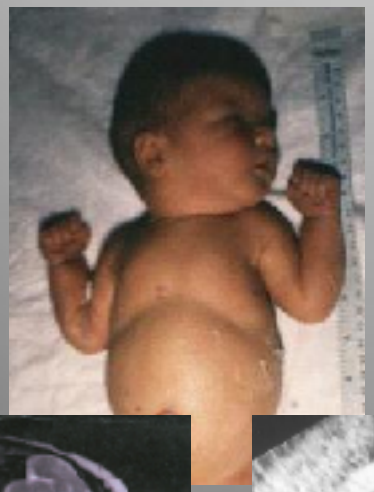
Chromosomale Aberrationen
Fehlbildung
virale Infektionen (CMV)
Drogen, Alkohol

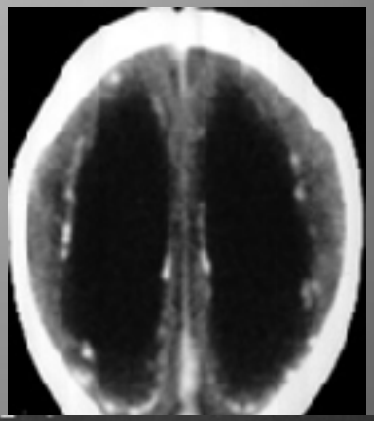
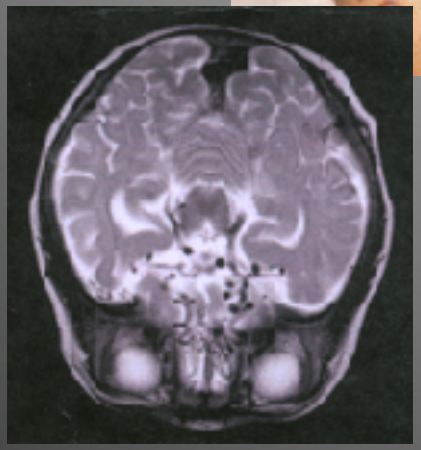
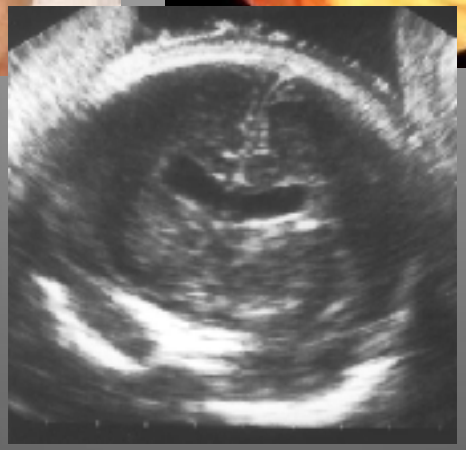
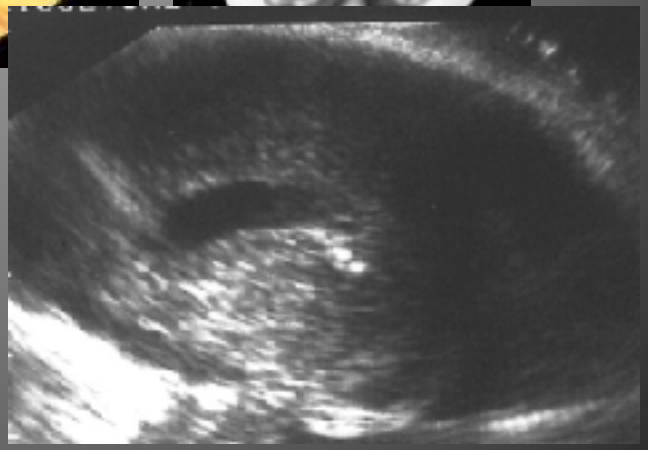
mütterliche Erkrankung – gefäßrelevant
Path. Plazentaveränderungen
Praeeklampsie

Galan et al. 02,

…infektiöse Ursachen für IUGR (max. 5-10 %)

v.a.
CMV
Toxo
Zika



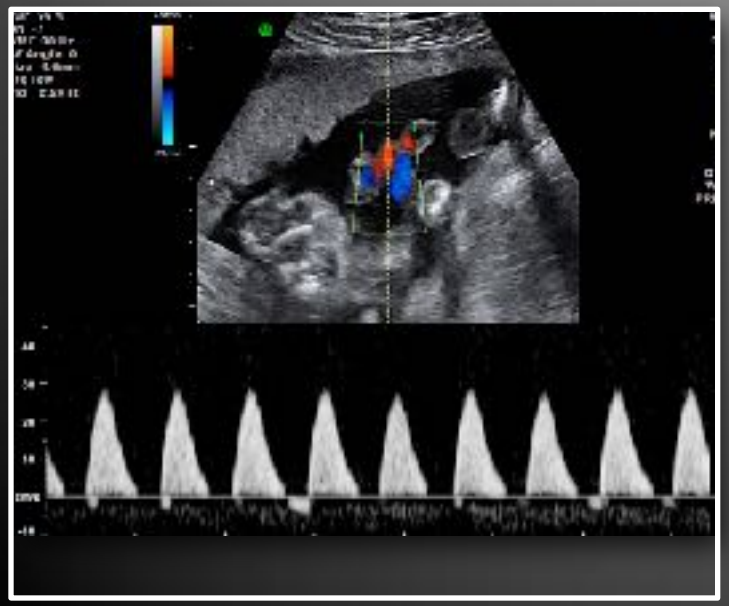





Account for 5 to 10% of FGR. Cytomegalovirus (CMV) and toxoplasmosis are the most common infectious etiologies of FGR in developed countries. Other viruses and parasites that may cause FGR include rubella, varicella-zoster, malaria, syphilis, and herpes simplex. Malaria is a common infectious cause of FGR where the infection is endemic.

Überwachung bei SGA / IUGR

„In the preterm growth restricted fetus, the decision to deliver is usually made only when signs of substantial worsening of the fetal condition are observed by visual or qualitative assessment of a cardiotocograph tracing or changes in biophysical status because these changes correlate with fetal hypoxaemia.“

Zitat aus der Einleitung des TRUFFLE-Trial
Lees et al. Lancet 2015; 385: 2162–72



Indikation:

Anamnese:

Vorausgegangene Schwangerschaften: Gravida: 4 Para: 2

Geburtstermin nach Ultraschall: 20.7.2013.

Gestationsalter: 27 Wochen + 4 Tage

Ultraschallbefund:

II.Schädellage

Anhydramnie

Sonoanatomie

Gehirn:

Beurteilung.

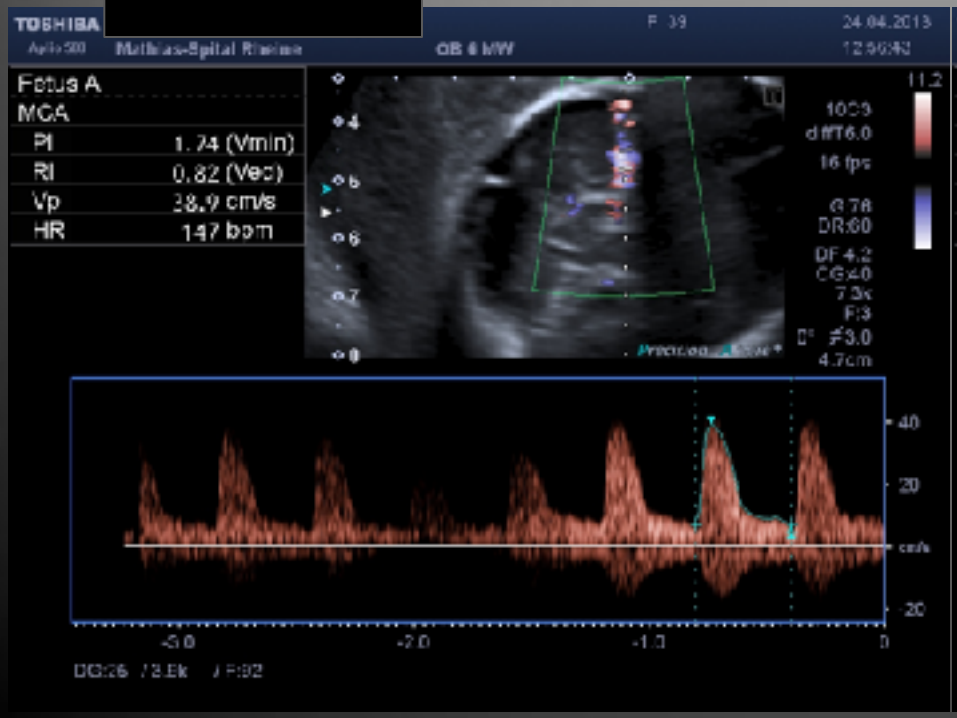
Dopplersonographie:

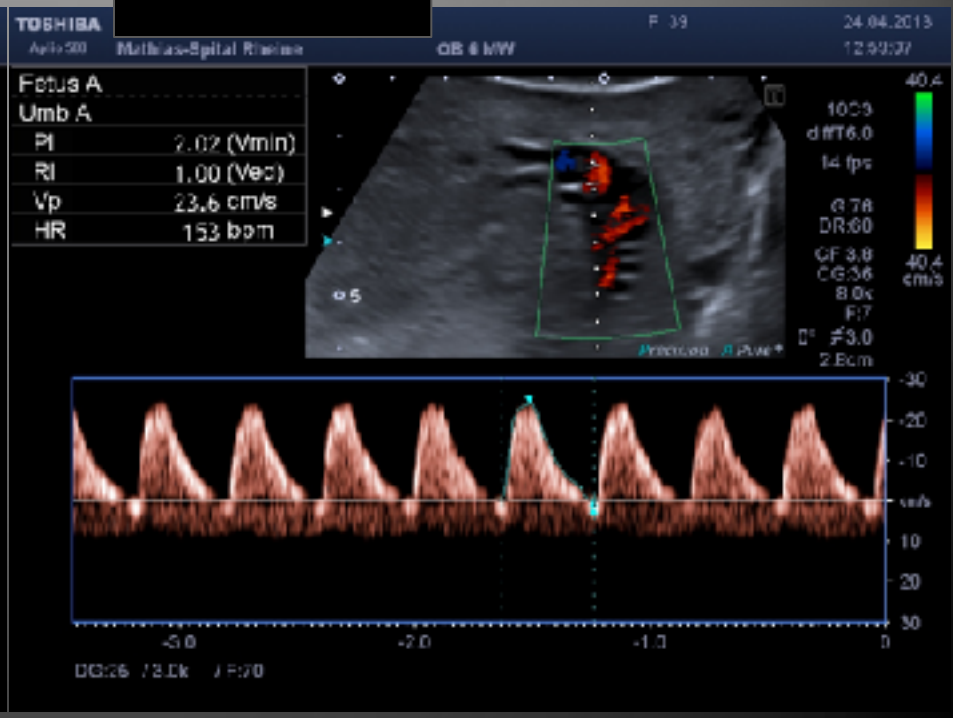
PI

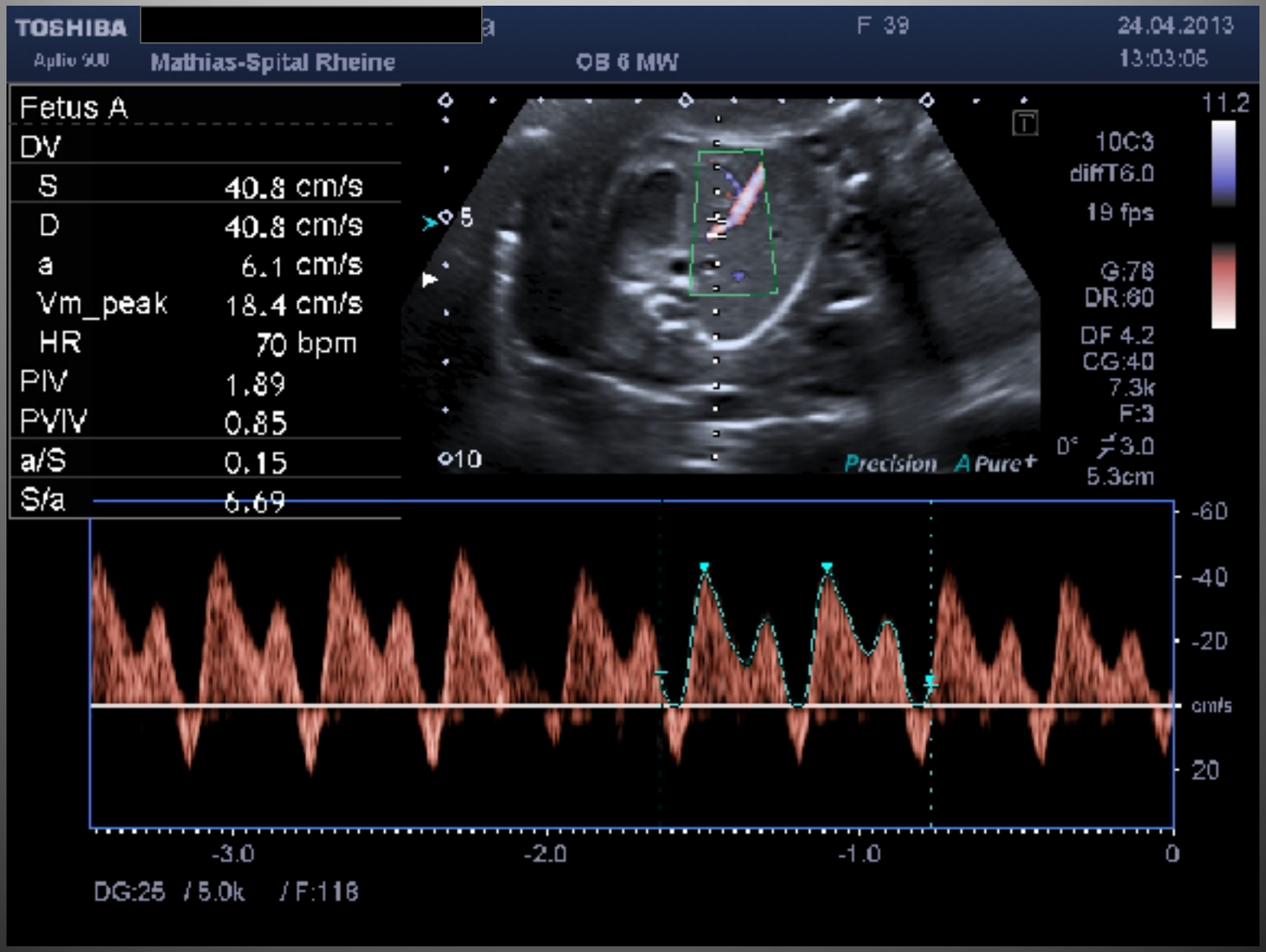
RI

TAMX

32 j IIIg/IIp, Schätzgew. 350g, 27+4 SSW, Karyotyp ?



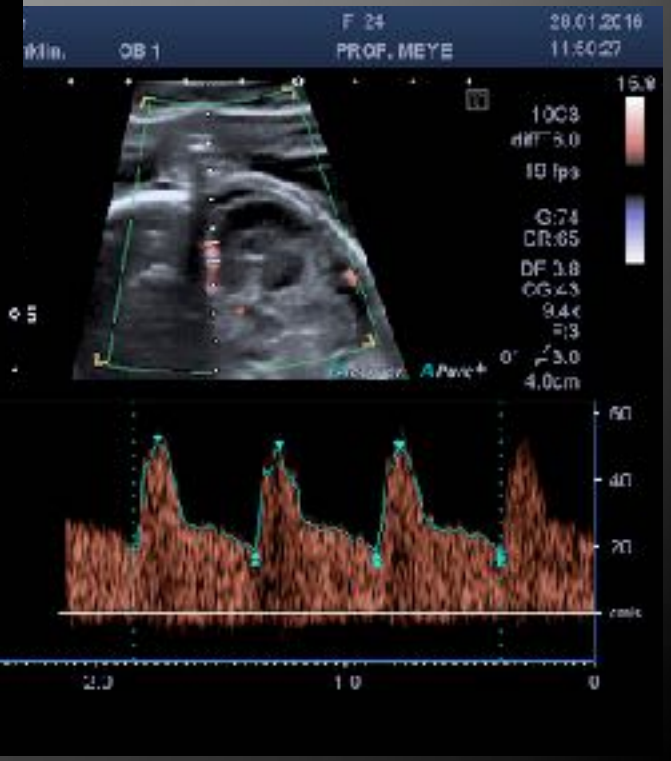


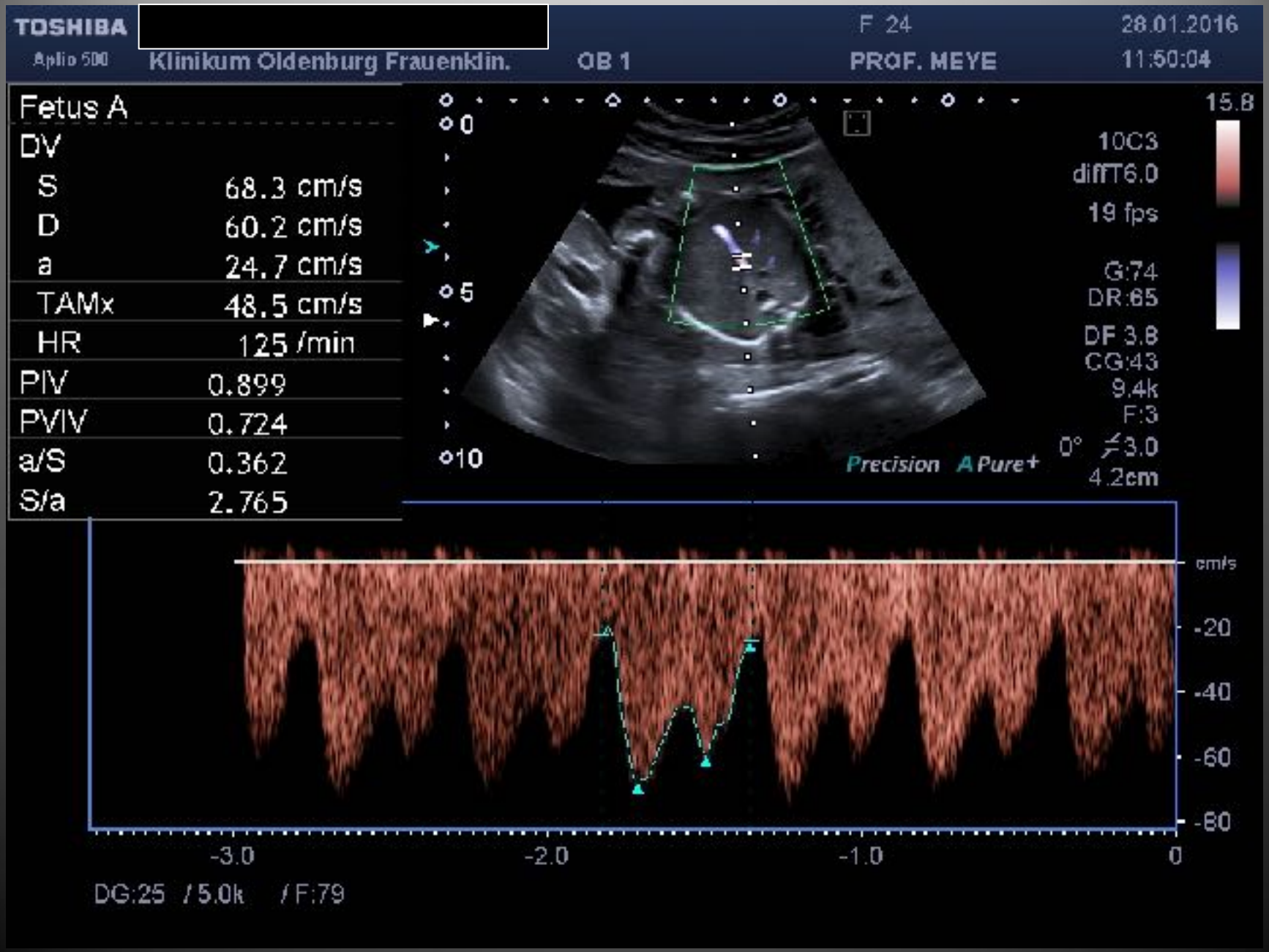

TOSHIBA
Aplio 500
Mathias-Spital Rheine
OB 6 MW
F 39
24.04.2013
13:03:06
Fetus A
DV
S 40.8 cm/s
D 40.8 cm/s
a 6.1 cm/s
Vm_peak 18.4 cm/s
HR 70 bpm
PIV 1.89
PVIV 0.85
a/S 0.15
S/a 6.69
10C3
diffT6.0
19 fps
G:76
DR:60
DF 4.2
CG:40
7.3k
F:3
5.3cm
Precision A Pure+
11.2
-60
-40
-20
cm/s
20
-3.0
-2.0
-1.0
0
DG:25 / 5.0k / F:116

TOSHIBA
Aplio 500
Klinikum Oldenburg Frauenklin.
OB 1
F 24
PROF. MEYE
28.01.2016
11:46:28

Fetus A	
A umb	
PI	2.75 (Vmin)
RI	0.97 (Vmin)
Vp	21.8 cm/s
HR	133 /min

10C3
diffT6.0
20 fps
G:74
DR:65
DF 3.8
CG:43
9.4k
F:3
0°
3.0
3.4cm
A Pure+
15.8
20
10
cm/s
-10
-3.0
-2.0
-1.0
0
DG:25 / 2.0k / F:31



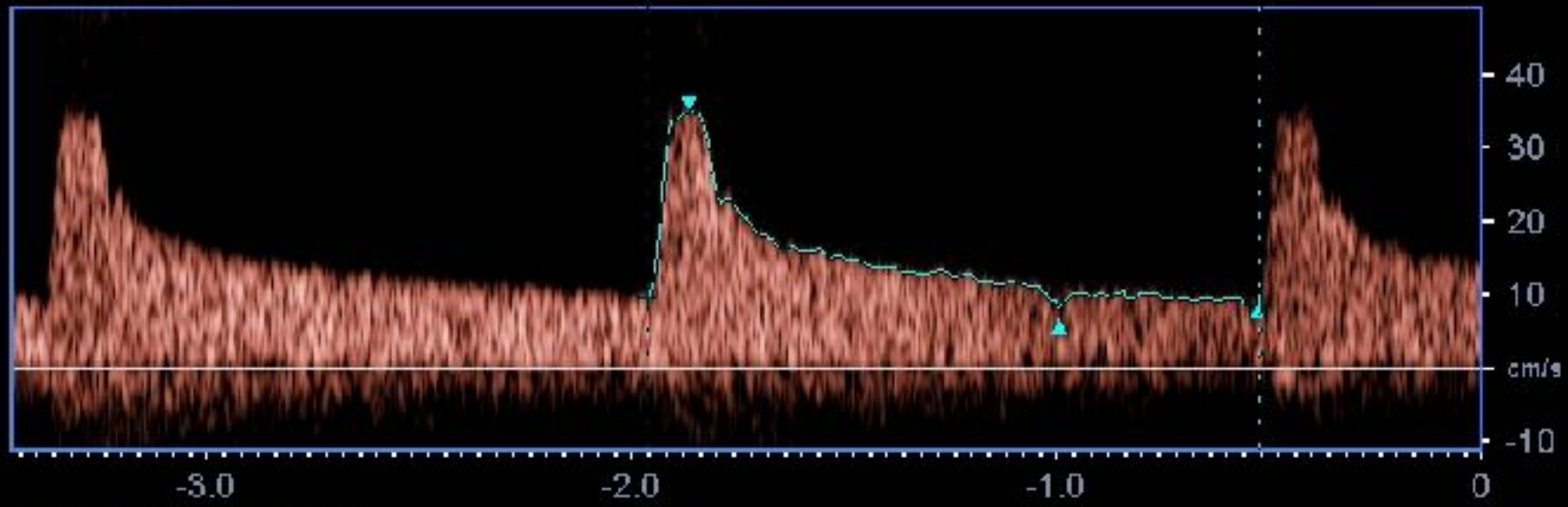

TOSHIBA
Aplio 500
[redacted]
Klinikum Oldenburg Frauenklin.
OB 1
F 24
PROF. MEYE
28.01.2016
11:50:04
Fetus A
DV
S 68.3 cm/s
D 60.2 cm/s
a 24.7 cm/s
TAMx 48.5 cm/s
HR 125 /min
PIV 0.899
PVIV 0.724
a/S 0.362
S/a 2.765
15.8
10C3
diffT6.0
19 fps
G:74
DR:65
DF 3.8
CG:43
9.4k
F:3
0°
3.0
4.2cm
Precision
A Pure+
cm/s
-20
-40
-60
-80
-3.0
-2.0
-1.0
0
DG:25 / 5.0k / F:79

TOSHIBA
Aplio 500
[redacted]
Klinikum Oldenburg Frauenklin.
OB 1
F 24
PROF. MEYE
28.01.2016
11:47:15

Fetus A
MCA

PI	1.84 (Vmin)
RI	0.77 (Vmin)
Vp	34.9 cm/s
HR	42 /min

15.8
10C3
diffT6.0
20 fps
G:74
DR:65
DF 3.8
CG:43
9.4k
F:3
0°
3.0
4.0cm



DG:25 / 3.0k / F:47

Die Ductus venosus Dopplerflusskurve vor intrauterinem Fruchttod bei schwerer Plazentainsuffizienz mit dopplersonografisch enddiastolischem Null- und Rückfluss in der Art. Umbilicalis

Ductus Venosus Blood Flow Prior to Intrauterine Foetal Death in Severe Placental Insufficiency can be Unaffected as shown by Doppler Sonography

Autoren: I. Frauenschuh[1], T. Framback[2], S. Karl[3], J. Uetz[1], I. Müller[4]

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Schlüsselwörter
- Doppler-Ultraschall
- Ductus venosus
- fetale Überwachung
- intrauterinen Fruchttod
- Plazentainsuffizienz

Key words
- doppler ultrasound
- ductus venosus
- foetal monitoring
- intrauterine foetal demise
- placental insufficiency

Zusammenfassung

Die ausgeprägte Plazentainsuffizienz mit dopplersonografisch nachweisbarem enddiastolischem Null- oder Rückfluss (absent or reversed enddiastolic velocity, AREDV) in der Art. umbilicalis ist assoziiert mit einer hohen Morbidität und Mortalität. Die Detektion einer Veränderung der Flusskurve des Ductus venosus als Zeichen einer fortgeschrittenen Gefährdung bzw. Dekompensation hilft intrauterin bedrohte Feten zu selektieren. Allerdings wurde die Annahme einer sequentiellen Veränderung von Dopplerparametern bei zunehmender Beeinträchtigung des Feten jüngst in Frage gestellt. 4 Hochrisikoschwangerschaften mit umbilikalem AREDV wurden dopplersonografisch vor intrauterinem Fruchttod seriell untersucht. Unsere Ergebnisse bestätigen, dass die dopplersonografische Untersuchung der Ductus venosus Blutflusskurve selbst bei bevorstehendem IUFT unauffällig sein kann.

Abstract

Significant placental insufficiency with Doppler ultrasound findings of absent or reverse end-diastolic flow velocities (AREDV) is associated with increased morbidity and mortality. An analysis of blood flow in the ductus venosus assists in the early recognition of threatened foetuses. However, the prognostic value of multivessel Doppler assessment for the timing of delivery is being questioned. Four high-risk pregnancies with umbilical AREDV were repeatedly examined prior to intrauterine foetal demise. Our results demonstrate that ductus venosus Doppler flow velocimetry can be normal prior to intrauterine foetal death

eingereicht 03.04.2014
angenommen 06.06.2014
nach Überarbeitung

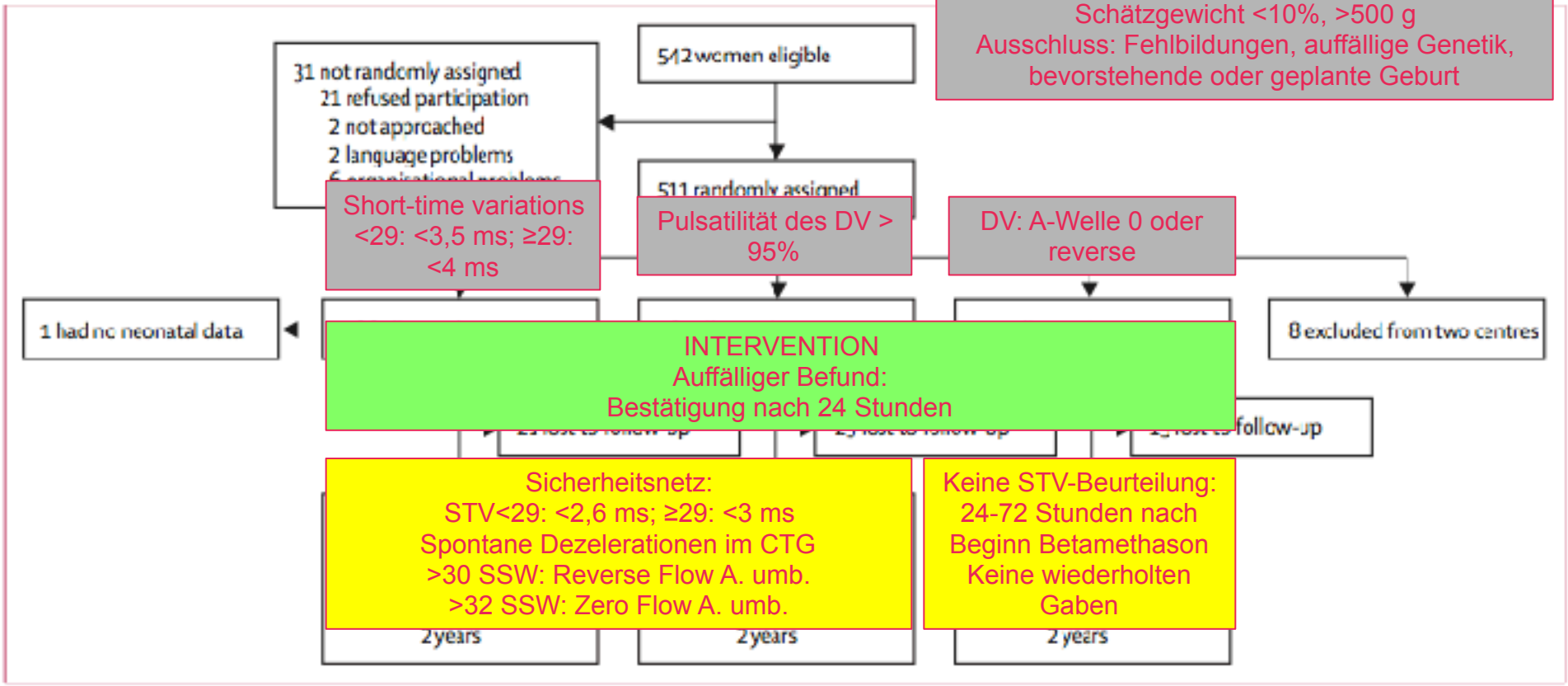
Einleitung

Die dopplersonografische Analyse der Ductus ve-

Truffle-Trial

Lancet 2015; 385: 2162–72

Einschluss: Frühe IUGR, 26+0-31+6, Schätzgewicht <10%, >500 g
Ausschluss: Fehlbildungen, auffällige Genetik, bevorstehende oder geplante Geburt



Short-time variations <29: <3,5 ms; ≥29: <4 ms

Pulsatilität des DV > 95%

DV: A-Welle 0 oder reverse

INTERVENTION
Auffälliger Befund:
Bestätigung nach 24 Stunden

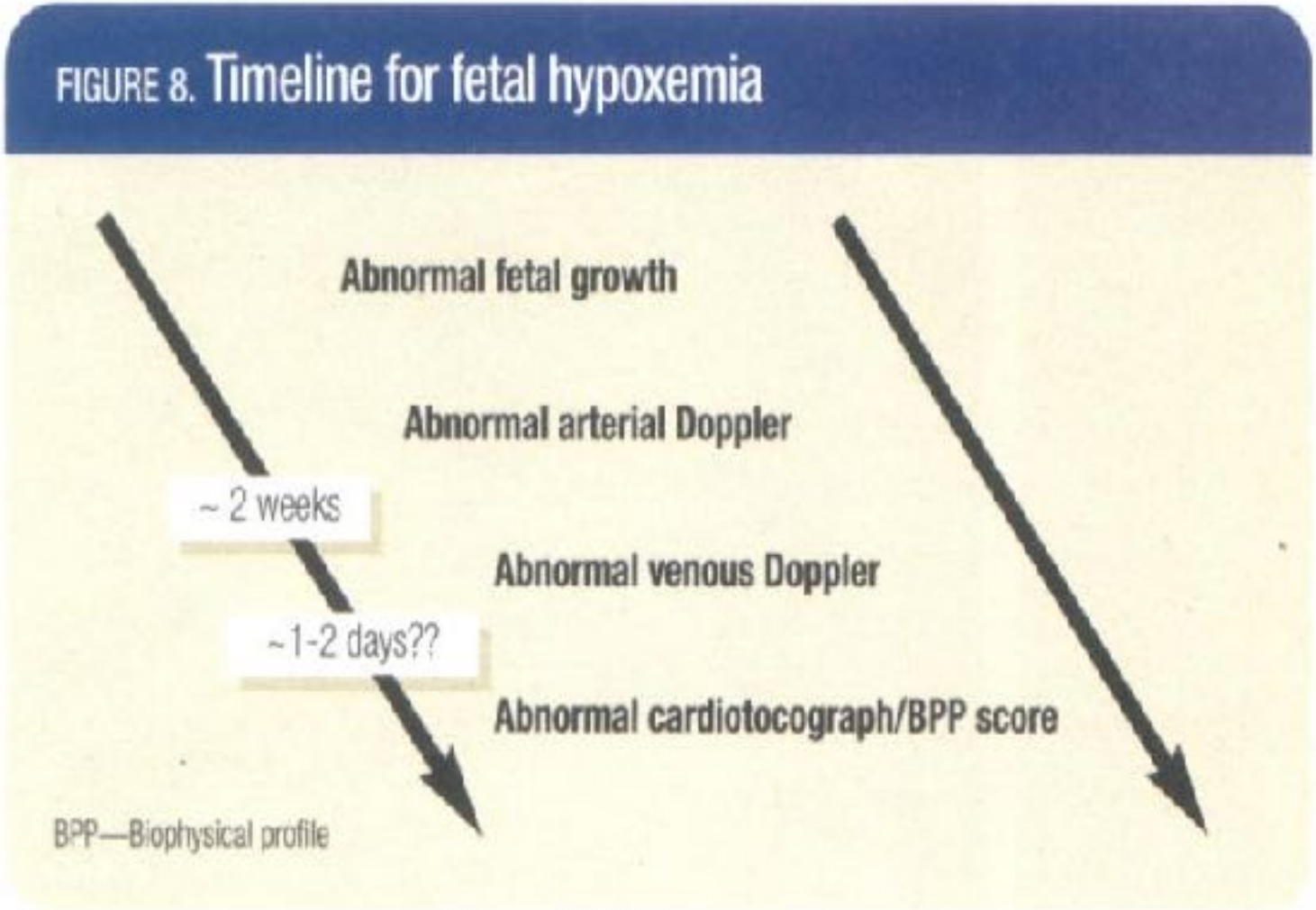
Sicherheitsnetz:
STV<29: <2,6 ms; ≥29: <3 ms
Spontane Dezelerationen im CTG
>30 SSW: Reverse Flow A. umb.
>32 SSW: Zero Flow A. umb.

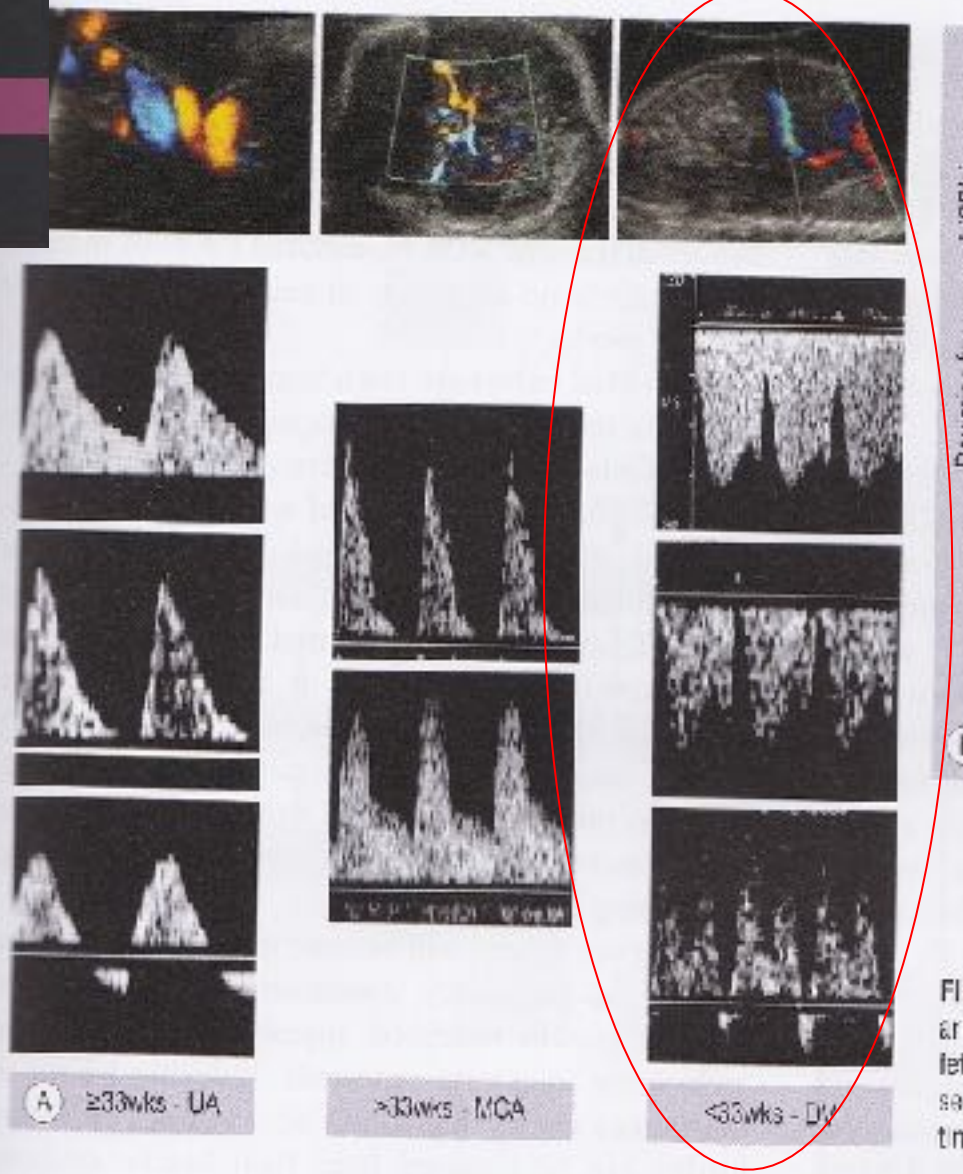
Keine STV-Beurteilung:
24-72 Stunden nach Beginn Betamethason
Keine wiederholten Gaben

Nach 32: weiteres Procedere nach Standard des jeweiligen Zentrums

- entweder Entbindung wenn STV im Oxford CTG < 3,5/4 msec
- Oder Entbindung wenn Ductus Venosus PI > 95. Perzentile
- oder Entbindung wenn Nullfluss im Ductus venosus

Wann muss das Kind auf die Welt geholt werden ?





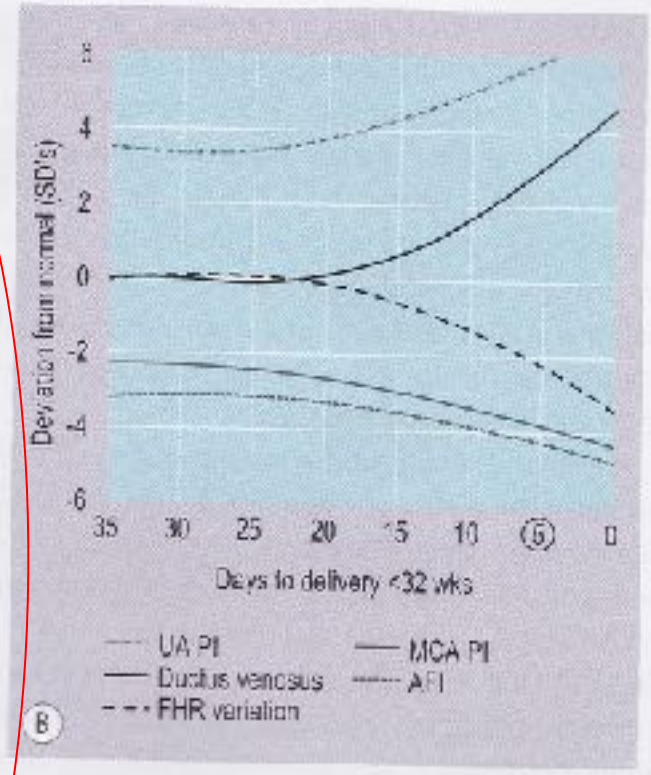


FIGURE 10-5 (A) The changes that occur in the umbilical artery, middle cerebral artery and ductus venosus as the fetus becomes hypoxic and then acidotic. (B) The sequence of Doppler, FHR variation and AFI changes with time before delivery in FGR fetuses.

Truffle-Trial

Lancet 2015; 385: 2162–72

	CTG STV	DV p95	DV no A	Total
Demographic characteristics				
Maternal age, years	31 (5)	31 (6)	31 (6)	31 (6)
Caucasian ethnicity	135 (81%)	138 (83%)	150 (88%)	423 (84%)
Nulliparous	101 (61%)	103 (62%)	115 (68%)	319 (63%)
Body-mass index, kg/m²	25 (5)	25 (6)	24 (5)	25 (6)
Smoking during pregnancy	31 (19%)	24 (12%)	22 (13%)	77 (15%)
Diabetes	3 (2%)	3 (2%)	3 (2%)	9 (2%)
Chronic hypertension	14 (8%)	23 (14%)	19 (11%)	56 (11%)
Renal morbidity	5 (3%)	5 (3%)	1 (1%)	11 (2%)
Other medical disease	33 (20%)	29 (17%)	29 (17%)	91 (18%)
Any gestational hypertensive morbidity	98 (59%)	100 (60%)	105 (62%)	303 (60%)
Pre-eclampsia—HELLP	58 (35%)	68 (41%)	69 (41%)	195 (39%)
Gestational age at entry, weeks	29·3 (27·9–30·1)	29·1 (27·9–30·3)	29·1 (27·9–30·4)	29·1 (27·9–30·3)
Estimated fetal weight by ultrasound, g	868 (201)	887 (229)	887 (221)	881 (217)
Umbilical artery pulsatility index	2·0 (0·6)	2·0 (0·5)	2·0 (0·5)	2·0 (0·5)
Absent or reversed end diastolic flow	62 (37%)	70 (42%)	77 (45%)	209 (42%)
U/C ratio	1·4 (0·6)	1·5 (0·6)	1·5 (0·6)	1·5 (0·6)
Ductus venosus pulsatility index	0·6 (0·1)	0·6 (0·1)	0·6 (0·1)	0·6 (0·1)
Short-term variation fetal heart rate, ms	6·4 (1·9)	6·7 (2·4)	6·7 (2·2)	6·6 (2·2)

Truffle

Lancet 201

	CTG STV (n=166)	DV p95 (n=167)	DV no A (n=170)	Total (n=503)
Any hypertensive morbidity	117 (70%)	124 (74%)	121 (71%)	362 (72%)
Preeclampsia—HELLP	80 (48%)	83 (50%)	88 (52%)	251 (50%)
Antihypertensive medication	80 (48%)	90 (54%)	92 (54%)	262 (52%)
Magnesium treatment	29 (18%)	24 (14%)	33 (19%)	86 (17%)
Antenatal corticosteroid	149 (90%)	156 (93%)	156 (92%)	461 (92%)
Interval to delivery days	7 (0·5–61)	7 (0·5–56)	9 (0·5–88)	8 (0·5–88)
Fetal death	2 (1%)	4 (2%)	6 (4%)	12 (2%)
Delivered using criteria off protocol at <32 weeks				
Fetal condition*	13 (8%)	19 (11%)	23 (14%)	55 (11%)
Maternal pre-eclampsia	17 (10%)	15 (9%)	22 (13%)	54 (11%)
Delivery indication ≥32 weeks, local protocol	46 (28%)	51 (31%)	50 (29%)	147 (29%)
Gestational age at delivery, weeks	30·6 (29·0–32·0)	30·7 (29·0–32·4)	30·7 (29·4–32·1)	30·7 (29·1–32·1)
Neonatal characteristics, liveborn	164 (99%)	163 (98%)	164 (96%)	491 (98%)
Birthweight, g	998 (238)	1036 (356)	1023 (320)	1019 (322)
Male sex	81 (49%)	77 (47%)	86 (52%)	244 (50%)
Apgar score <7 at 5 min	16 (10%)	14 (9%)	21 (13%)	51 (10%)
Umbilical arterial pH				
Data available	138 (83%)	131 (78%)	135 (79%)	404 (80%)
Median	7·26 (6·8–7·4)	7·26 (6·8–7·4)	7·26 (7·0–7·4)	7·26 (6·8–7·4)
<7·0	4 (3%)	1 (1%)	0 (0%)	5 (1%)

Data are n (%), mean (SD), or median (IQR). CTG STV=cardiotocography short term variation. DV p95=early ductus verous changes (pulsatility index >95th percentile). DV no A=late ductus venous changes (A wave at or below baseline). *Results include clinical suspicion of impending fetal compromise.

Table 2: Obstetric data after study entry and neonatal data at delivery

Truffle-Tri

Lancet 2015; 38

	CTG STV (n=166)	DV p95 (n=167)	DV no A (n=170)	Total (n=503)
Fetal death no intervention*	2 (1%)	1 (1%)	2 (1%)	5 (1%)
Unexpected death†	0	3 (2%)	4 (2%)	7 (1%)
Livebirth	164 (99%)	163 (98%)	164 (96%)	491 (97%)
Neonatal death	10 (6%)	6 (4%)	11 (7%)	27 (6%)
Death due to congenital abnormality	0	0	2 (1%)	2 (1%)
Overall mortality	12 (7%)	10 (6%)	17 (10%)	39 (8%)
Neonatal data missing	1 (1%)	0	0	1 (<1%)
Survival at discharge	153 (92%)	157 (94%)	153 (90%)	463 (92%)
Neonatal morbidity				
Received mechanical ventilation	72 (44%)	63 (39%)	69 (42%)	204 (42%)
Received supplemental oxygen	98 (60%)	96 (59%)	103 (63%)	297 (61%)
BPD >28 days	32 (20%)	28 (17%)	31 (19%)	91 (19%)
BPD >36 weeks‡	16 (10%)	17 (10%)	16 (10%)	49 (10%)
Sepsis (proven)‡	33 (20%)	31 (19%)	23 (14%)	87 (18%)
NEC pneumatosis‡	3 (2%)	3 (2%)	1 (1%)	7 (1%)
Perforation‡	2 (1%)	2 (1%)	5 (3%)	9 (2%)
GMH grade III or IV‡	0 (0%)	4 (2%)	8 (5%)	12 (2%)
PVL grade II or III‡	1 (1%)	2 (1%)	2 (1%)	5 (1%)
Death following severe morbidity†	10 (6%)	6 (4%)	9 (5%)	25 (5%)
Adjusted age of survivors at discharge, days§	−9 (−17 to 6)	−7 (−15 to 2)	−10 (−17 to 2)	−9 (−16 to 3)
Survival following severe neonatal morbidity (% of survivors)	38 (25%)	42 (27%)	38 (25%)	118 (25%)
Survival without severe neonatal morbidity (% of all study entrants)	115 (69%)	115 (69%)	115 (68%)	345 (69%)

Data are n (%) or median (IQR). BPD=bronchopulmonary dysplasia. NEC=necrotising enterocolitis. GMH=germinal matrix haemorrhage. PVL=cystic periventricular leucomalacia. CTG STV=cardiotocography short term variation. DV p95=early ductus venous changes (pulsatility index >95th percentile). DV no A=late ductus venous changes (A wave at or below baseline). *Parents declined delivery despite this being indicated according to study criteria. †Fetal death not anticipated between scheduled follow-up appointments. ‡Components of severe morbidity: BPD (supplemental oxygen at 36 weeks' gestational age), GMH (grade III or IV), PVL (grade II or III), NEC, or proven sepsis. §Adjusted age at discharge calculated from expected date of delivery at 40 weeks' gestation.

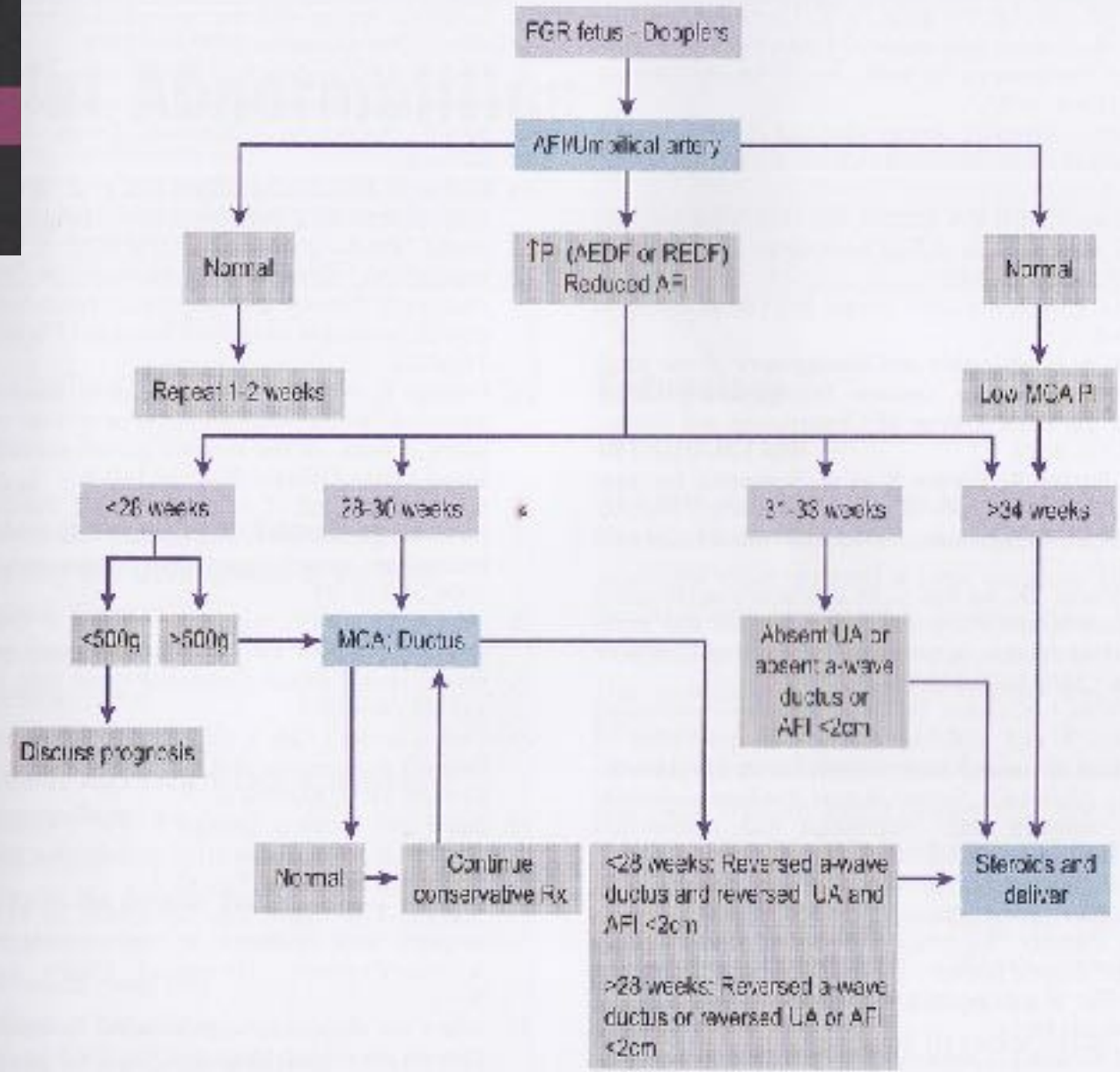
Table 3. Short-term fetal and neonatal outcomes

Lees CC et al.: TRUFFLE-Studie, Lancet, 2015

2 Jahres-Outcome	CTG STV (n=166)	DV p95 (n=167)	DV no A (n=170)	Total (n=503)
Infants with known outcome*	144 (87%)	142 (85%)	157 (92%)	443 (88%)
Survivors assessed for neurodevelopment†	131 (86%)	131 (84%)	140 (92%)	402 (87%)
Survival without impairment	111	119	133	363
Percentage of assessed surviving infants‡	85%	91%	95%	90%
Percentage of all infants with known outcome§	77%	84%	85%	82%
Components of abnormal outcome				
Perinatal or infant death before 2 years*¶	13 (8%)	11 (7%)	17 (10%)	41 (8%)
Impairments at 2 years¶	20 (15%)	12 (9%)	7 (5%)	39 (10%)
Cerebral palsy (GMFCS >grade 1)¶	5 (4%)	1 (1%)	0 (0%)	6 (1%)
Neurosensory impairment¶	3 (2%)	1 (1%)	1 (1%)	5 (1%)
DQ <85¶	13 (10%)	8 (6%)	5 (4%)	26 (6%)
No test result, but reported impaired¶	7 (5%)	3 (2%)	1 (1%)	11 (3%)

Lees CC et al.: TRUFFLE-Studie, Lancet, 2015

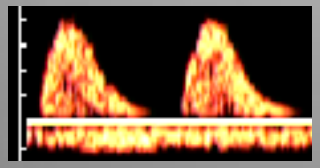
- die neurologische Entwicklung unterscheidet sich nicht in den drei Überwachungsgruppen *(CTG, DV >95%, DV mit neg./retrog. a-Welle)*
- Intrauterine Mortalität (=2%), neonatale Mortalität (=6%)
- 82% der IUGR-Neugeborenen überleben ohne neuromotorische Defizite
- Intensives antenatales Monitoring *(Ductus venosus, Kurzzeitvariation)* und spezifische Kriterien für die Entbindung sind für ein gutes Outcome entscheidend
- Eine negative oder retrograde a-Welle geht nicht mit einer neurologischen Verschlechterung im Vergleich zum computerisierten CTG einher
- Betreuung der schweren frühen IUGR gehört in die Hand eines Spezialisten

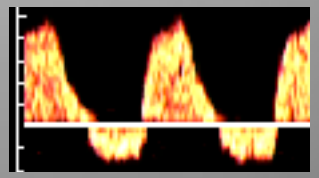


6 Proposed pathway for the antenatal monitoring of FGR pregnancies. AEDF, absent end diastolic flow; REDF, reversed end diastolic

Intrauterine Wachstumsrestriktion

Blutgase arteriell

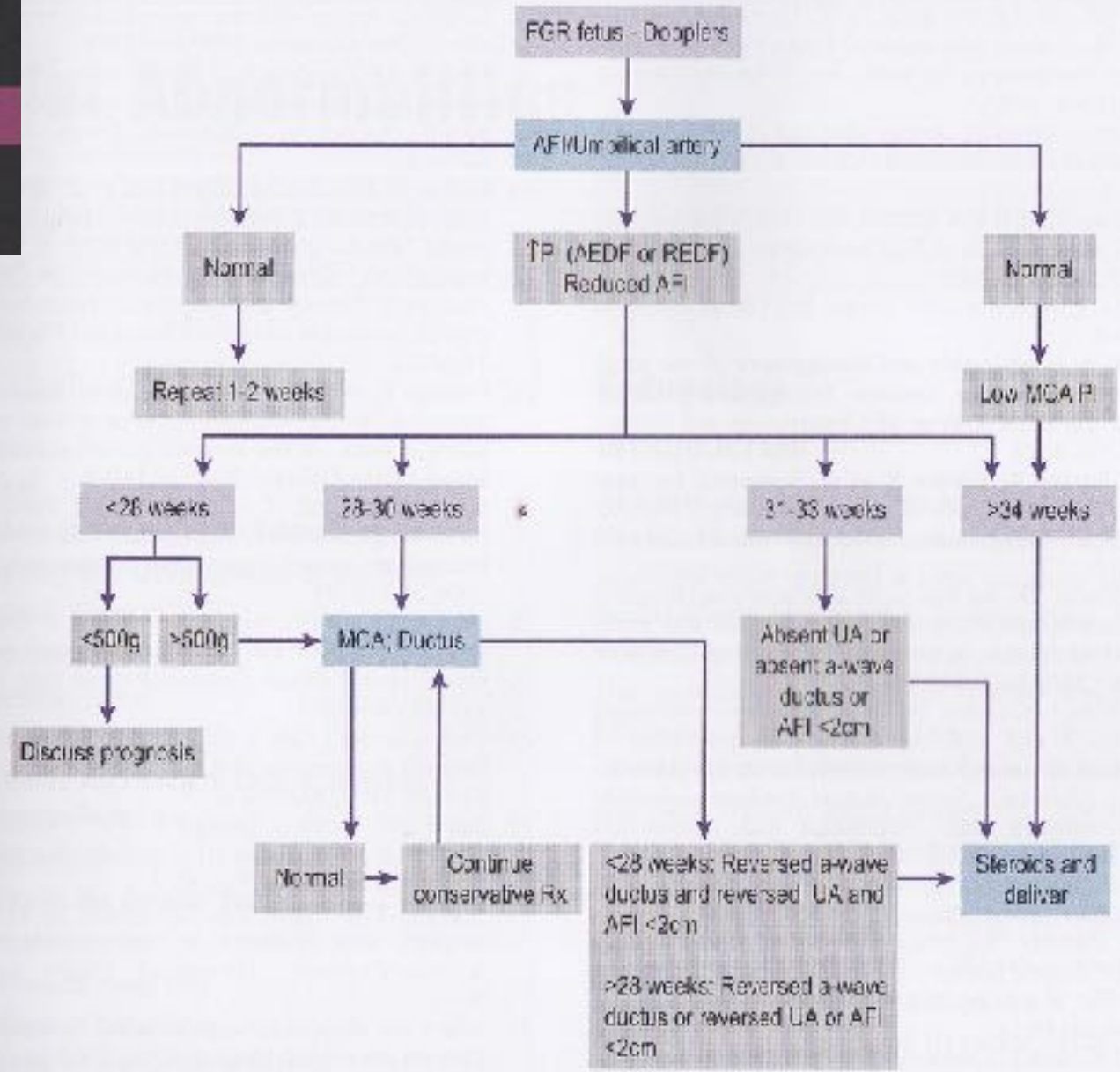




	(n=87)	(n=39)	p-Wert
pH	7,25	7,17	0.004
$pO_{2(mmHg)}$	18,1	15,3	0.09
$pCO_{2(mmHg)}$	56,9	64,2	0.01
$BE_{(mmol/l)}$	-2,9	-6,6	0.01
$Laktat_{(mmol/l)}$	3,3	5,6	0.02

Entbindungszeitpunkt bei early onset IUGR

- möglichst Prolongation > 28 SSW
- Kurzzeitvariation und Ductus venosus (a-Welle)
- Individuelles Vorgehen
- Abhängig von der Erfahrung des Geburtshelfers
- Entscheidung oft aus dem „Bauchgefühl“ heraus



6 Proposed pathway for the antenatal monitoring of FGR pregnancies. AEDF, absent end diastolic flow; REDF, reversed end diastolic

Perinatales Management bei IUGR

- stationäre Aufnahme im Perinatalzentrum bei IUGR mit ARED-Flow in der A. umb, gefolgt von Lungenreifeinduktion < 34. SSW, Sectio- und Anästhesieaufklärung, Neo-Gespräch
- Oxford-CTG 2/die, Doppler der ACM, DV, AFI und Kindsbewegungen detektieren
- Fetale Zentralisation, PI DV ↑führt zu täglichen Dopplerkontrollen

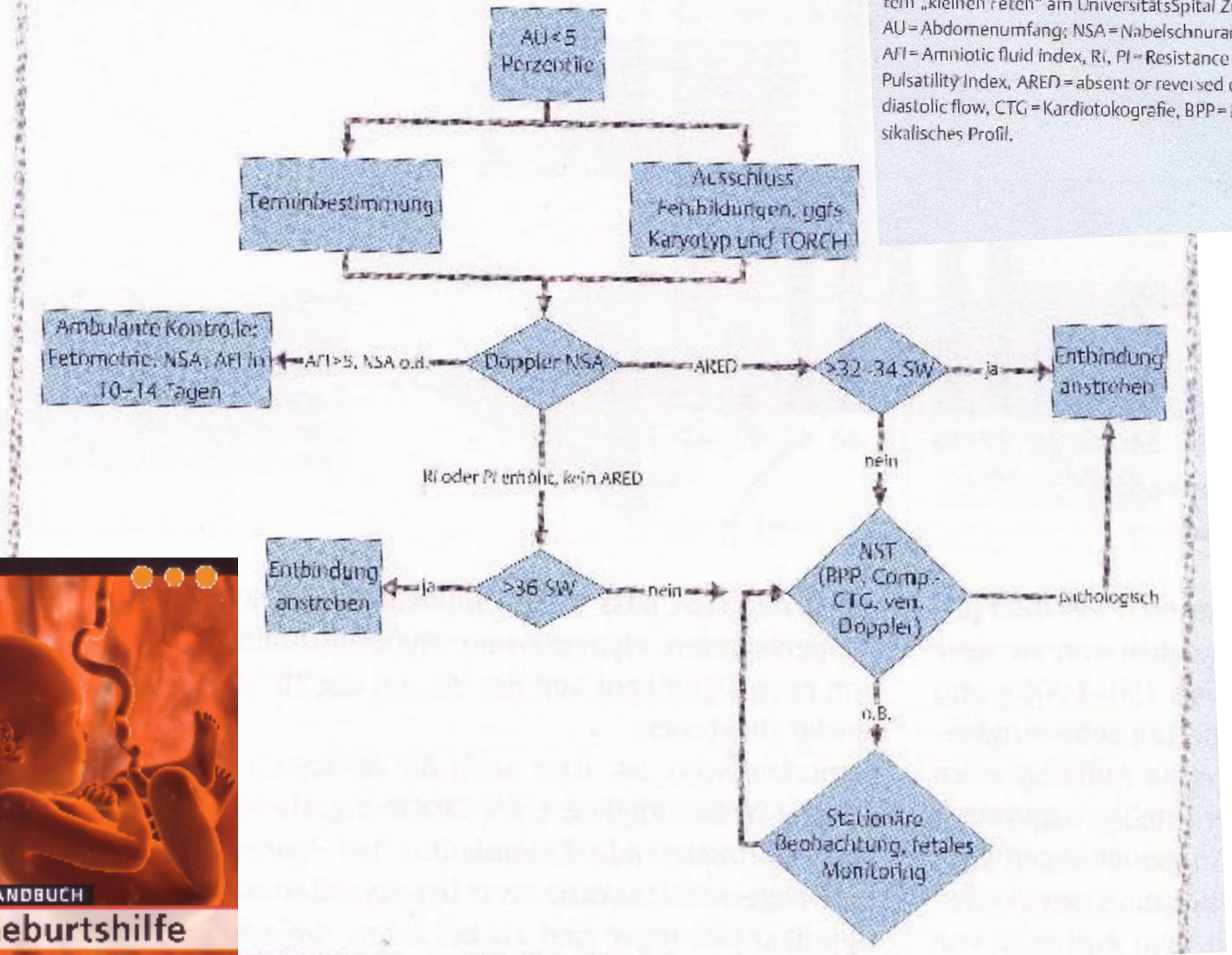
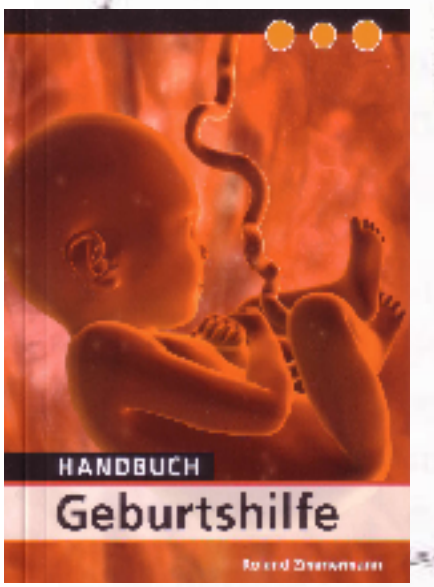
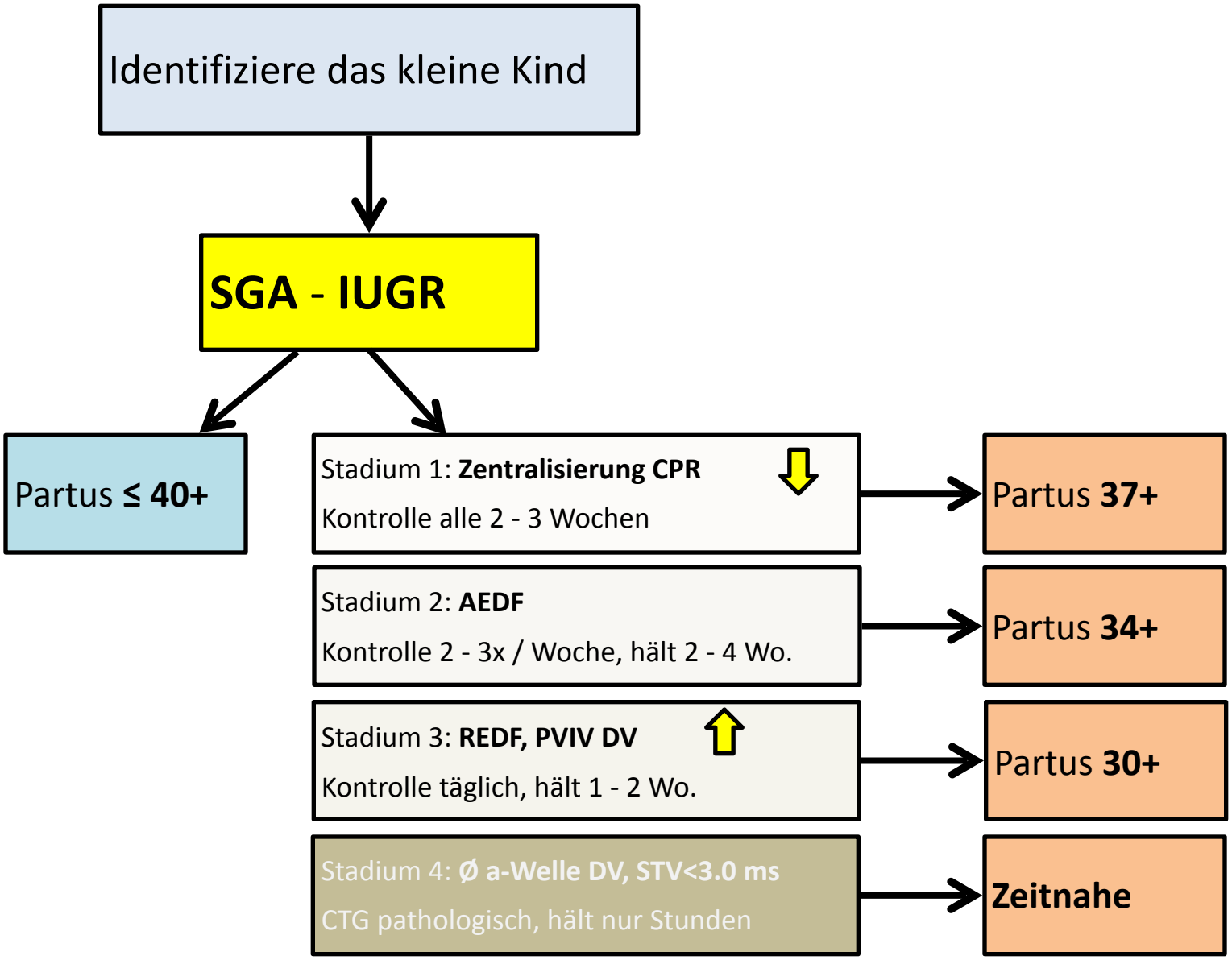
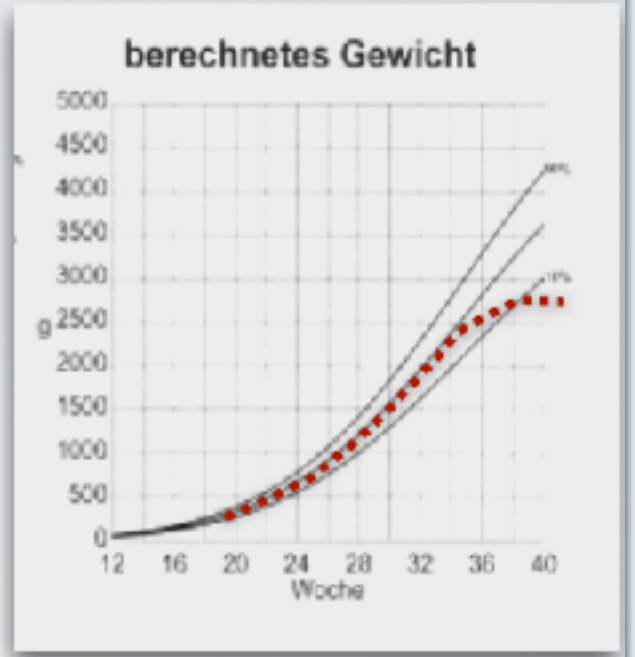


Abb. 6 Vorgehen bei sonografisch festgestelltem „kleinen Feten" am UniversitätsSpital Zürich. AU = Abdomenumfang; NSA = Nabelschnurarterie, AFI = Amniotic fluid index, RI, PI = Resistance und Pulsatility Index, ARED = absent or reversed end-diastolic flow, CTG = Kardiotokografie, BPP = Biophysikalisches Profil.




Identifiziere das kleine Kind
SGA - IUGR
Partus ≤ 40+
Stadium 1: Zentralisierung CPR
Kontrolle alle 2 - 3 Wochen
Partus 37+
Stadium 2: AEDF
Kontrolle 2 - 3x / Woche, hält 2 - 4 Wo.
Partus 34+
Stadium 3: REDF, PVIV DV
Kontrolle täglich, hält 1 - 2 Wo.
Partus 30+
Stadium 4: Ø a-Welle DV, STV<3.0 ms
CTG pathologisch, hält nur Stunden
Zeitnahe

LATE ONSET IUGR



- nach 34.SSW
- A. umbilikalis meist unauffällig
- IUGR nur mild ausgeprägt
- erkennbar oft erst durch Wachstumsdynamik und cerebroumbilikale Ratio
- erhöhte Komplikationsrate unter Geburt

Ultrasound Obstet Gynecol 2011; 37: 191–195
Published online 14 January 2011 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/uog.7738

Longitudinal changes in uterine, umbilical and fetal cerebral Doppler indices in late-onset small-for-gestational age fetuses

D. OROS, F. FIGUERAS, R. CRUZ-MARTINEZ, E. MELER, M. MUNMANY and E. GRATACOS

Department of Maternal-Fetal Medicine, ICGON, Hospital Clinic-IDIBAPS, University of Barcelona and Centre for Biomedical Research on Rare Diseases (CIBERER), Barcelona, Spain

Conclusions Late-onset SGA fetuses with normal Doppler velocimetry upon diagnosis show progression from 37 weeks' gestation with worsening CPR followed by a decrease in MCA-PI. *Copyright © 2011 ISUOG. Published by John Wiley & Sons, Ltd.*

Ultrasound Obstet Gynecol 2011; 37: 191–195
Published online 14 January 2011 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/uog.7758

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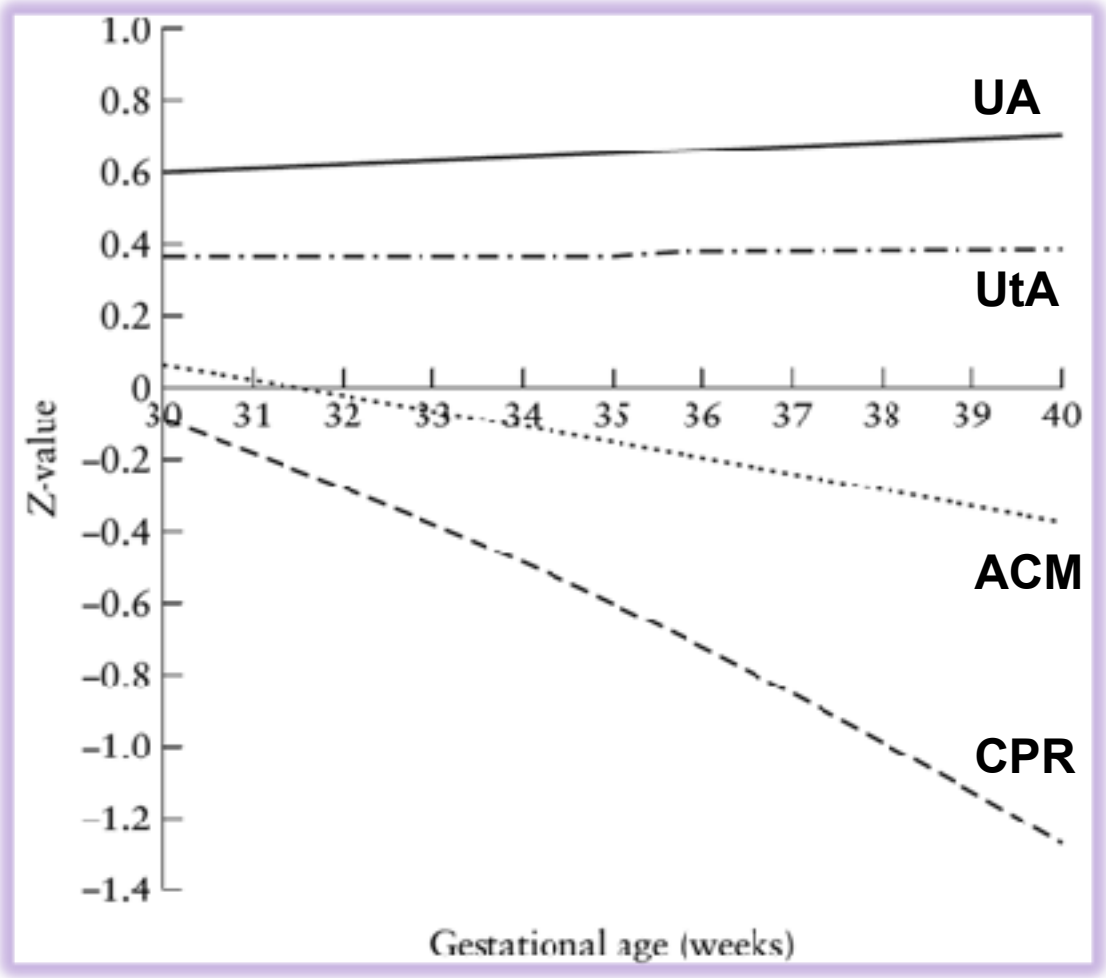


OBSTETRICS

The importance of the cerebroplacental ratio in the evaluation of fetal well-being in SGA and AGA fetuses

Greggory R. DeVore, MD

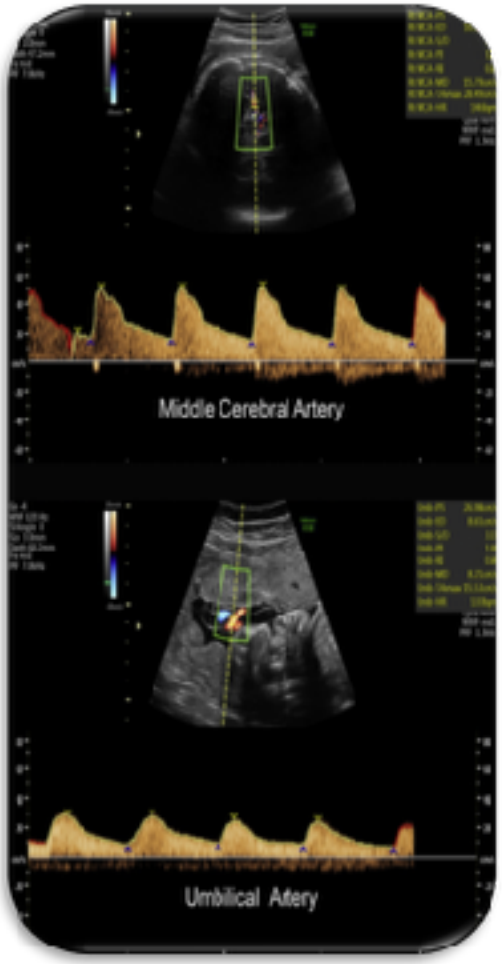
TABLE 1

Studies reporting the value for an abnormal cerebroplacental ratio

Study	Year	Study type	Doppler indices	Computation of ratio	Abnormal criteria
Arbeille et al[1]	1998	Cross-sectional	S-D/S	MCA/UA	Ratio <1
Arias[8]	1994	Cross-sectional	RI	MCA/UA	Ratio <1
Gramellini et al[9]	1992	Cross-sectional	PI	MCA/UA	Ratio <1.08
Baltadu-Singh et al[6]	1999	Cross-sectional	PI	MCA/UA MoM	Ratio <0.05 MoM
Baschat and Gembruch[7]	2003	Cross-sectional	PI	MCA/UA	Less than fifth centile
Odibo et al[10]	2005	Cross-sectional	PI	MCA/UA	Ratio <1.08
Ebbing et al[11]	2007	Longitudinal	PI	MCA/UA	<2.5th centile
Morales et al[12]	2014	Cross-sectional	PI	MCA/UA	Less than fifth centile or MoM <0.6765

MCA, middle cerebral artery; MoM, multiple of the median; PI, pulsatility index; RI, resistance index; S/D, systolic/diastolic ratio; UA, umbilical artery.

DeVore. Cerebroplacental ratio in fetal well-being in SGA and AGA fetuses. Am J Obstet Gynecol 2015.



The importance of the cerebroplacental ratio in the evaluation of fetal well-being in SGA and AGA fetuses

JULY 2015 American Journal of Obstetrics & Gynecology 5

Sensitivities, specificities, and odds ratio for CPR computations for detecting adverse perinatal outcome[a30]

Cerebroplacental ratio	Measurement standard	Sensitivity	Specificity	Odds ratio
<1	Pulsatility index	66%	85%	11.7
<1	Resistance index	66%	84%	11.8
Less than fifth centile (cross-sectional study)[9]	Centile	80%	60%	6.2
Less than fifth centile (longitudinal study)[11]	Centile	85%	41%	4.1

Prediction of intrapartum fetal compromise using the cerebroumbilical ratio: a prospective observational study

Am J Obstet Gynecol 2013;208:124.e1-6.

400 AGA-Feten am ET

- **CPR** ↓

  6 x **höhere** sekundäre **Sectiorate**

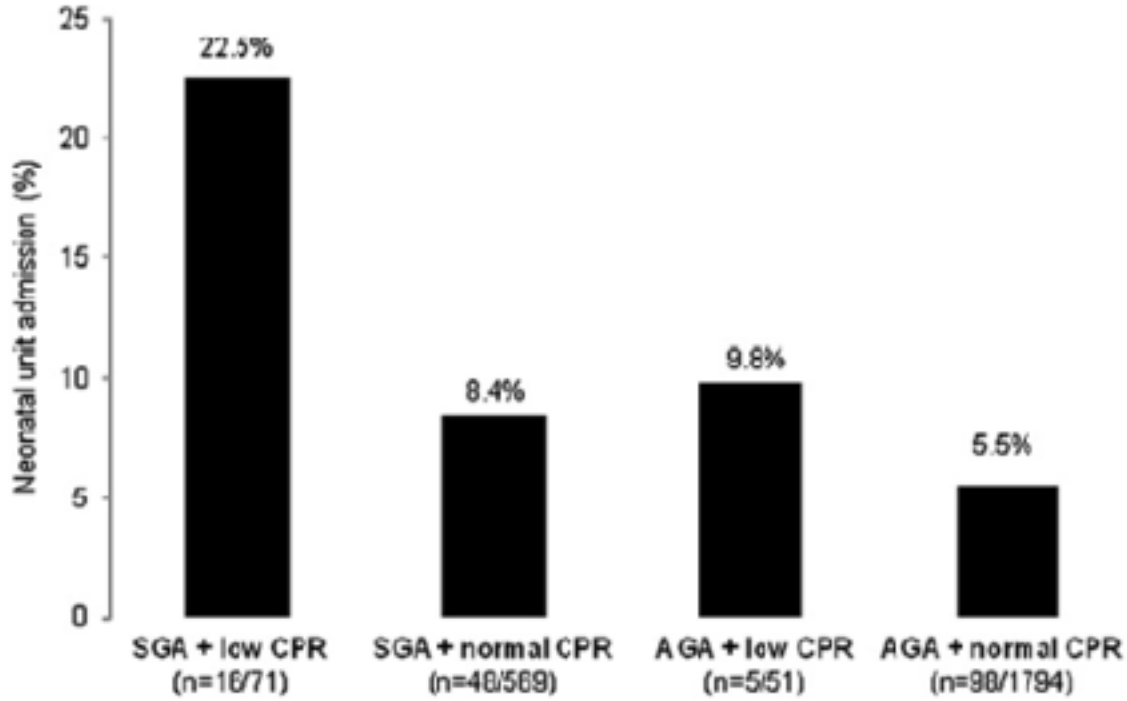
- **CPR** ↑

  Negativer Vorhersagewert **100 %**

The association between fetal Doppler and admission to neonatal unit at term

JULY 2015 American Journal of Obstetrics & Gynecology 57.e1

Rates of neonatal unit admission in the 4 study groups



IUGR - Wann entbinden bei milder Ausprägung?

CPR ⬇

Gewicht < 10. Perzentile

Entbindung zwischen 37+ und ET

→ Einleitung der Geburt mit mechanischen Methoden

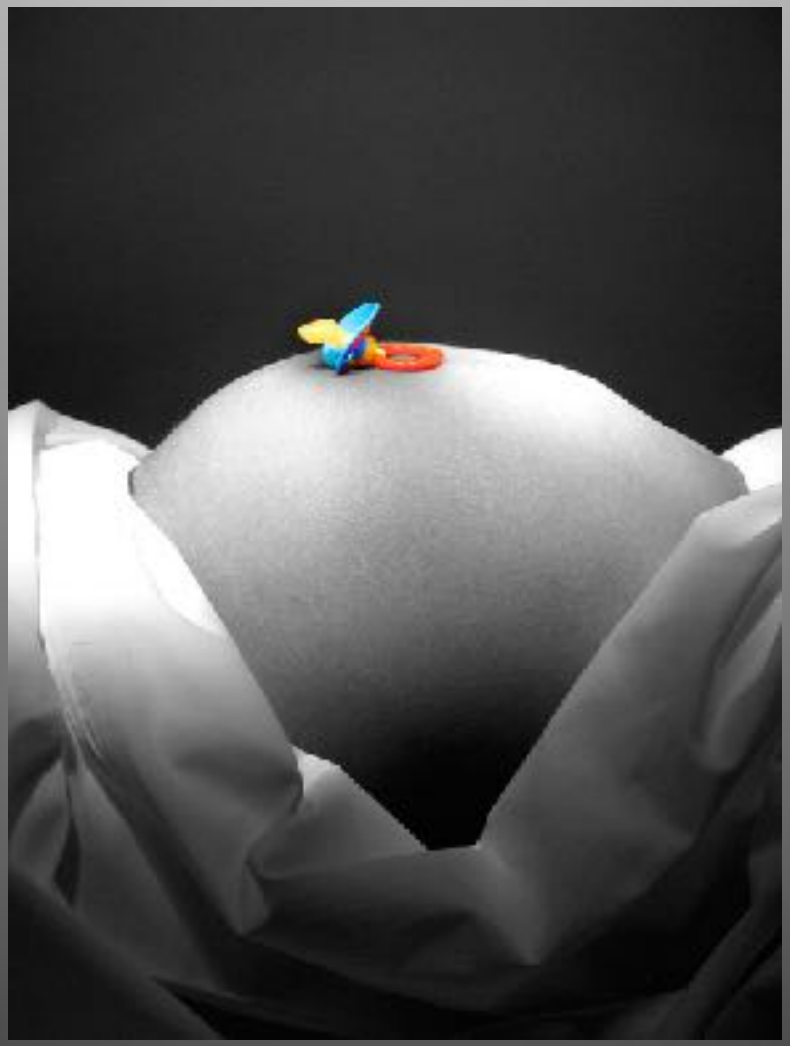
→

315 Growth restricted fetuses don't tolerate labor: perhaps a misconception?

Janine S. Rhoades[1], Roxane M. Rampersad[1], Methodius G. Tuuli[1], George A. Macones[1], Alison G. Cahill[1], Molly J. Stout[1]

Supplement to JANUARY 2016 American Journal of Obstetrics & Gynecology S179

Danke für`s Zuhören



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