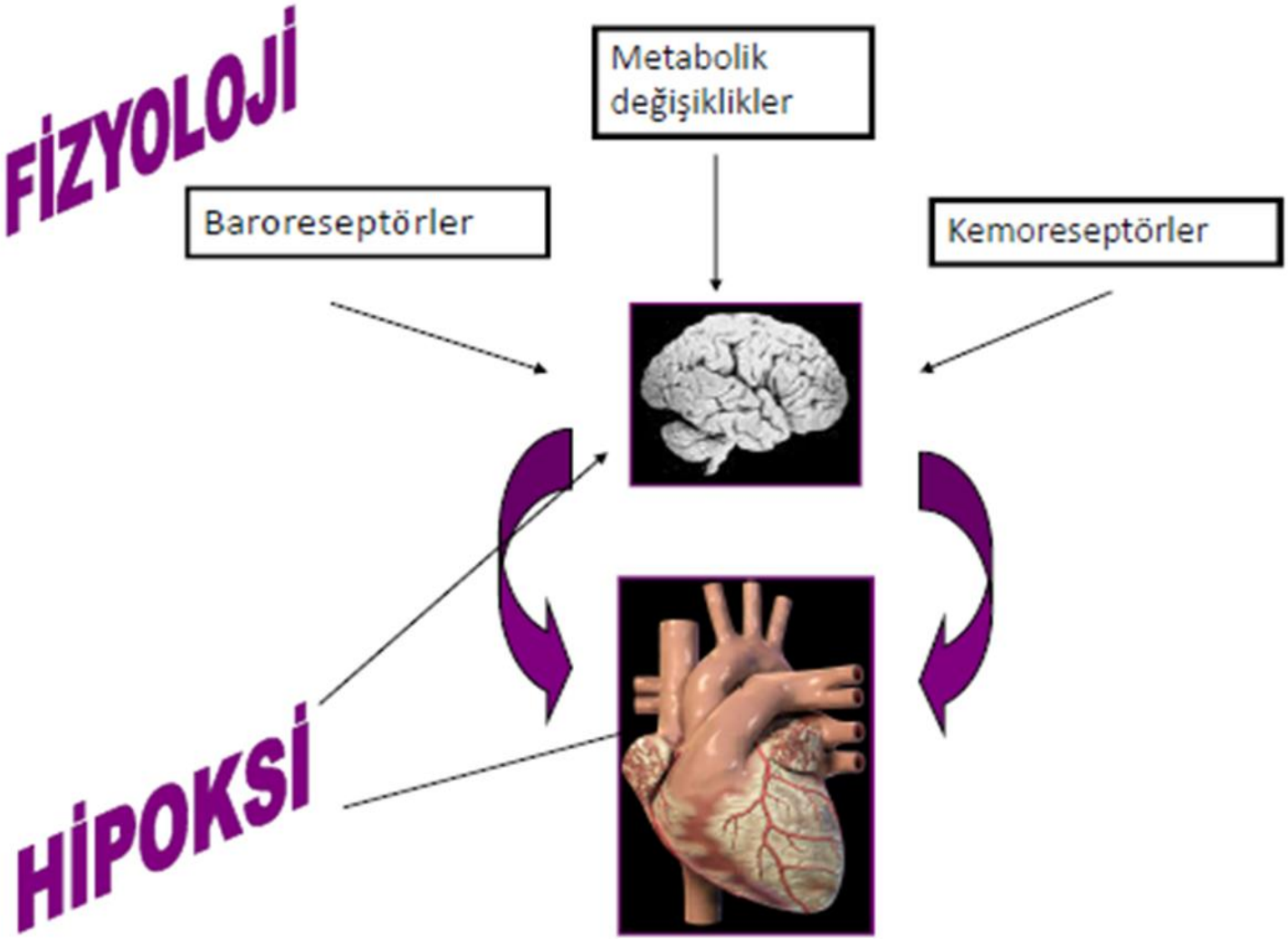
Elektronik Fetal Monitorizasyonda Optimal Yaklaşım: Kanıta Dayalı Tıp Verileri

(İntermittent-Sürekli, Cihaz-Teknolojisi)

Prof. Dr. Arda Lembet

Liv Hospital

İSÜ İSTİNYE ÜNİVERSİTESİ İSTANBUL


FİZYOLOJİ
Metabolik değişiklikler
Baroreseptörler
Kemoreseptörler
HİPOKSİ

Tarihçe

- 17.-18 yy: İlk fetal kalp atımı duyulması

- 19yy: Kergeradee

  Fetal kalp atımının klinik kullanımı??

  Çoğul gebelik

  Fetal hayat tanısını koymak için

  Fetal iyilikte bozulma

Grant A. Monitoring the fetus during labour. Effective Care in Pregnancy and Childbirth. Chalmers I, Enkin M, Keirse MJNC. Oxford: Oxford University Press, 1989:846–82.

- 1964: İlk Doppler US (FKA için)

Callagan DA, Rowland TC, Goldman DE. Ultrasonic Doppler observation of fetal heart. Obstet Gynecol 1964;23:637e44

- 1967: EFM doğuşu ve ilk ticari monitor

Stout MJ, Cahill AG. Electronic fetal monitoring: Past, present, and future. Clin Perinatol 2011;38:127.

Tarihçe

- **2. jenerasyon CTG**
  - Geniş ultrason dalga
  - Sinyal iyileştirici fonksiyonlar(‘spike removal’, ‘signal modulation’,‘autocorrelation’)

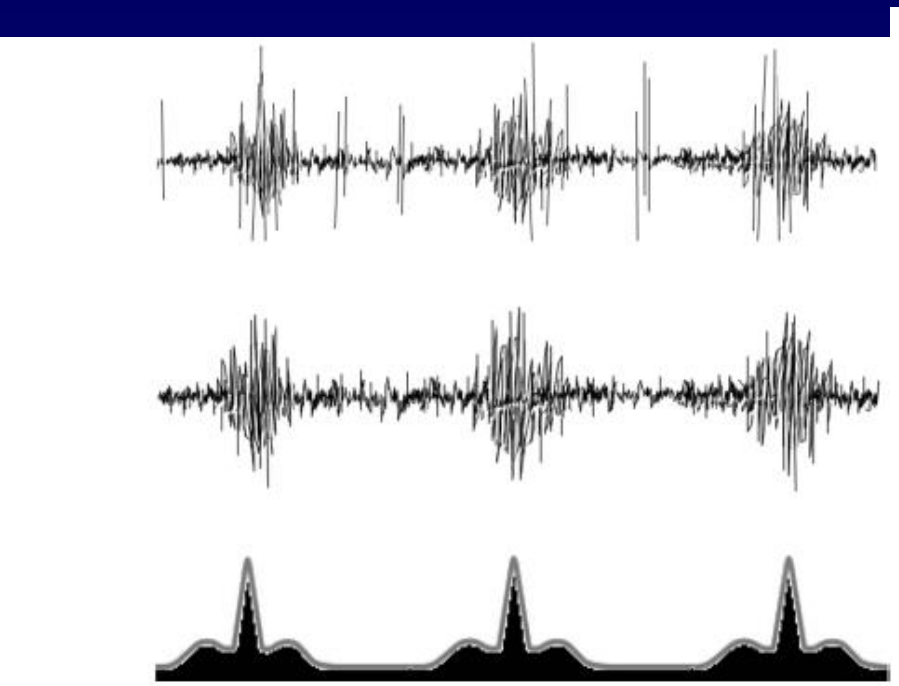


Fig. 2. Graphical representation of the FHR signal acquired with ultrasound, showing the original signals (top), after ‘spike r
(middle), and after signal modulation (below).

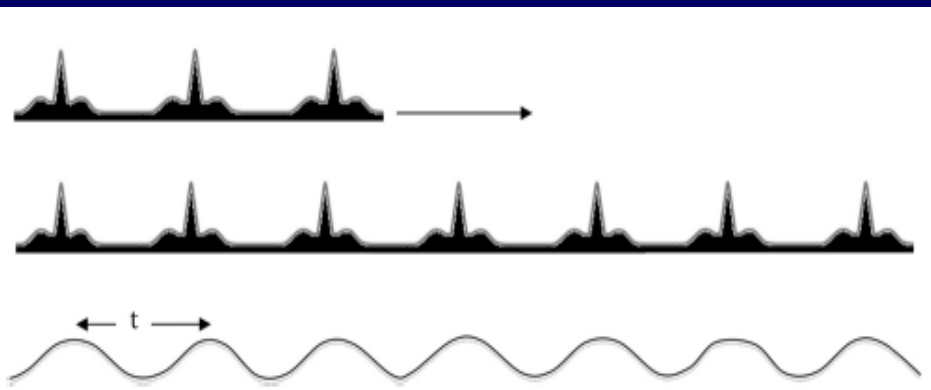


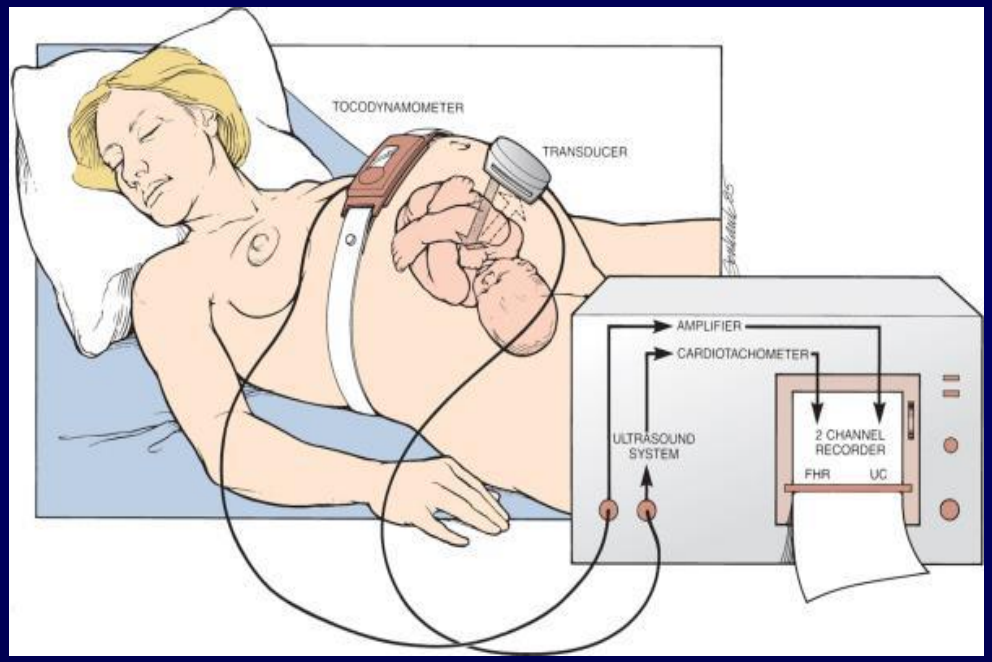
Fig. 3. Representation of the ‘autocorrelation’ function, showing a sample of previously acquired signals (above), incoming signals (middle) and the evaluation of the overlap between these two signals over time (bottom), which is used to calculate the interbeat interval (t).

Divon MY, Torres FP, Yeh S-Y, et al. Autocorrelation techniques in fetal monitoring. Am J Obstet Gynecol 1985

Elektronik fetal monitorizasyon

- Antepartum
  - Non-stress test (NST)
- İntrapartum
  - İntermitant oskültasyon (İO)
  - CTG -Sürekli monitörizasyon (EFM)
    - Fetal elektrokardiyografi
    - Fetal pulse-oksimetri vs

Eksternal Fetal Monitorizasyon



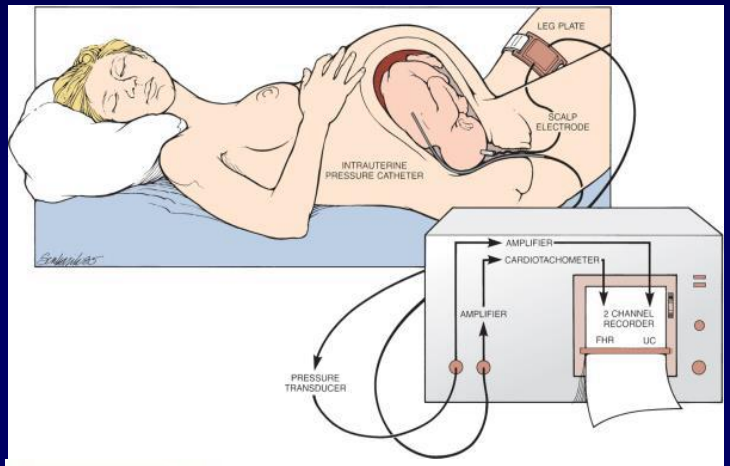
Avantaj :

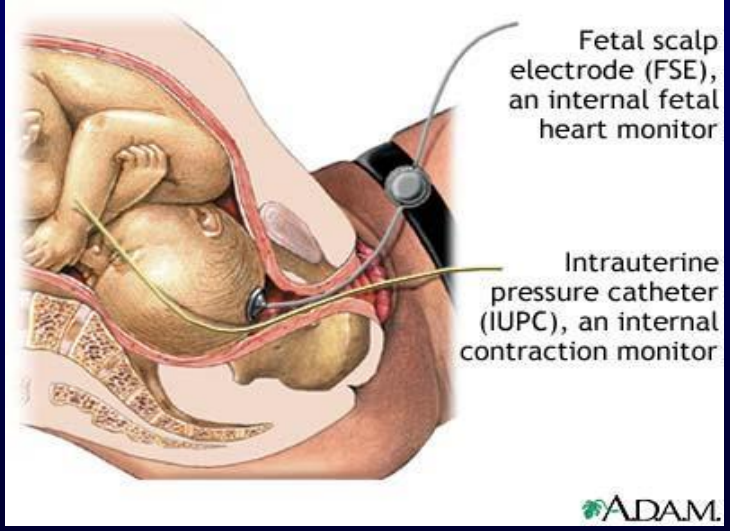
- Noninvazif
- Herzaman, heryerde

Dezavantaj:

- Artefakt
- İndirekt basınç ölçümü

İnternal Fetal Monitorizasyon





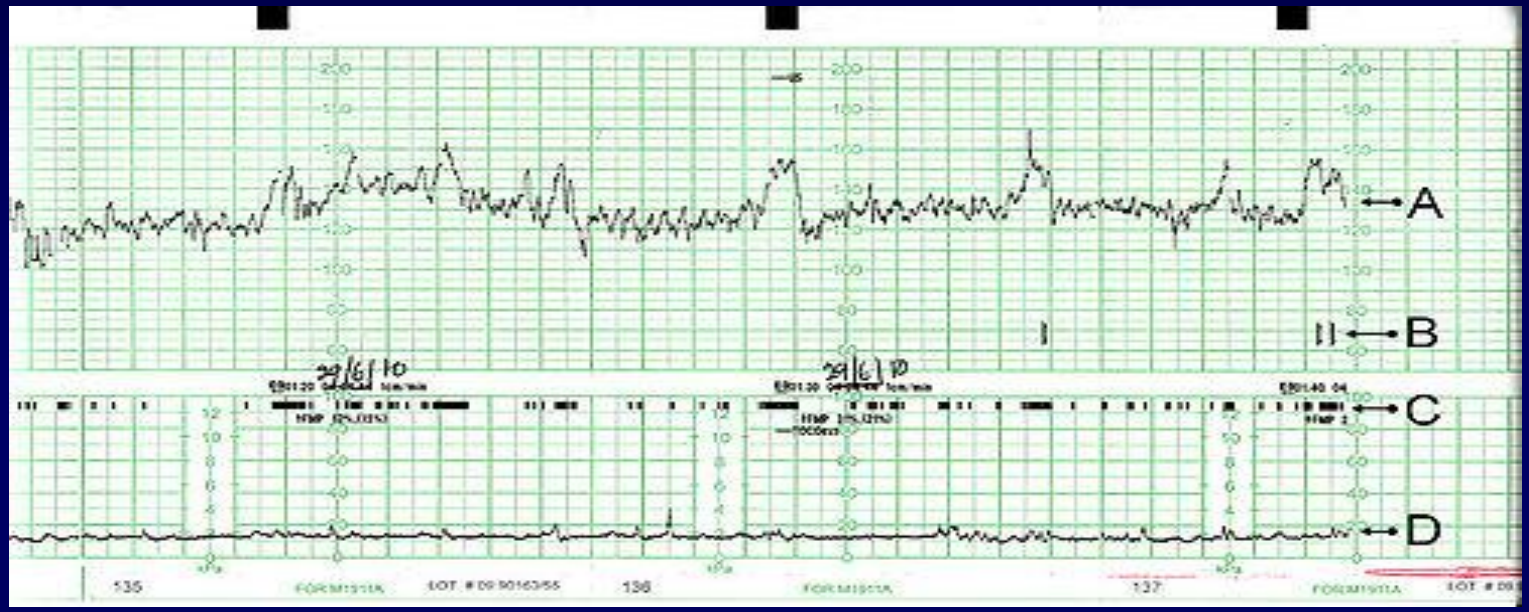
Avantaj:

- Obez anne
- Hareketli fetus

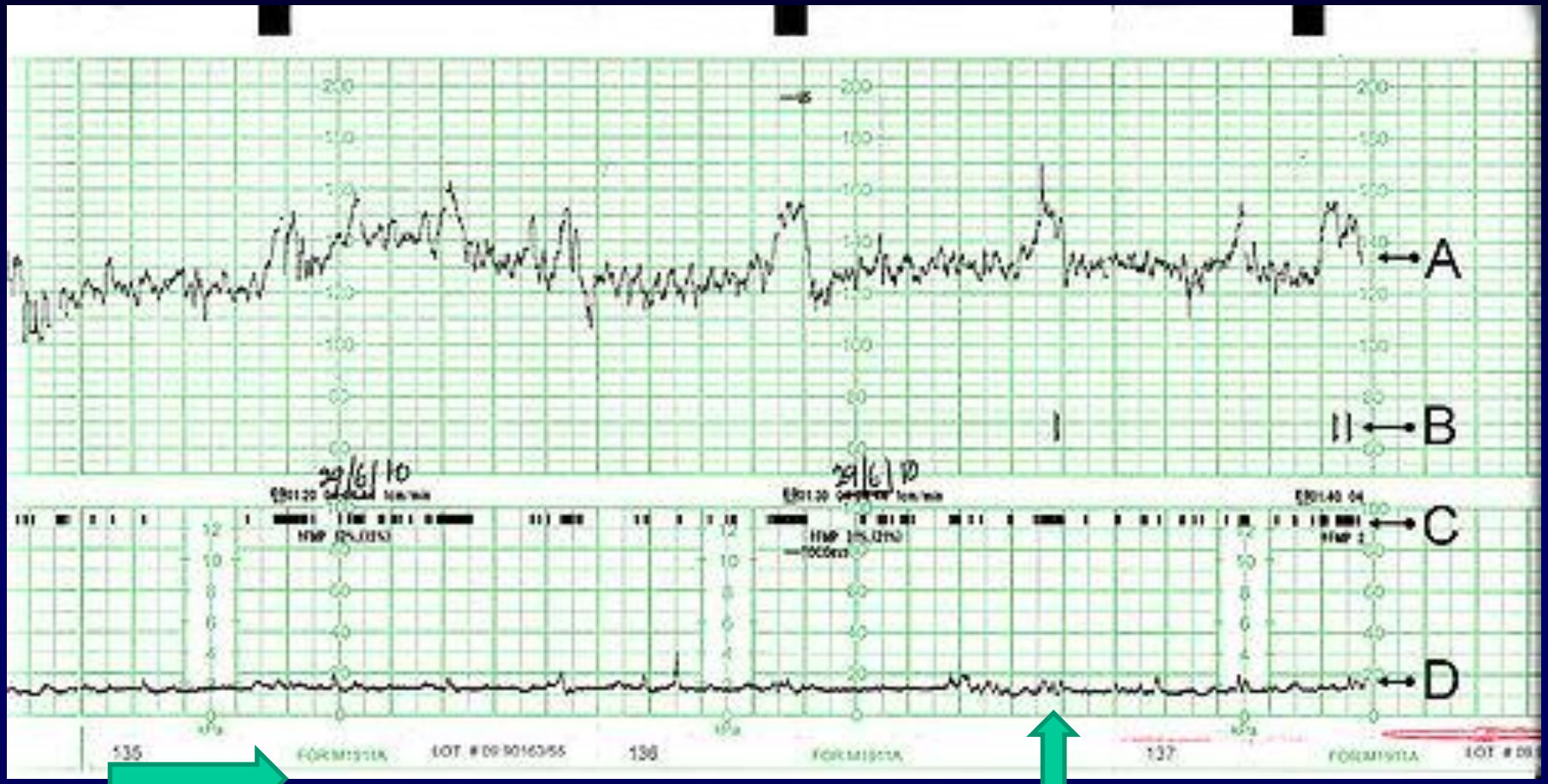
Dezavantaj:

- İnvazif
- Daha masraflı (tek kullanımlık elektrod)
- Membranlar yırtılmış
- Enfeksiyon riski

CTG Temel Özellikler



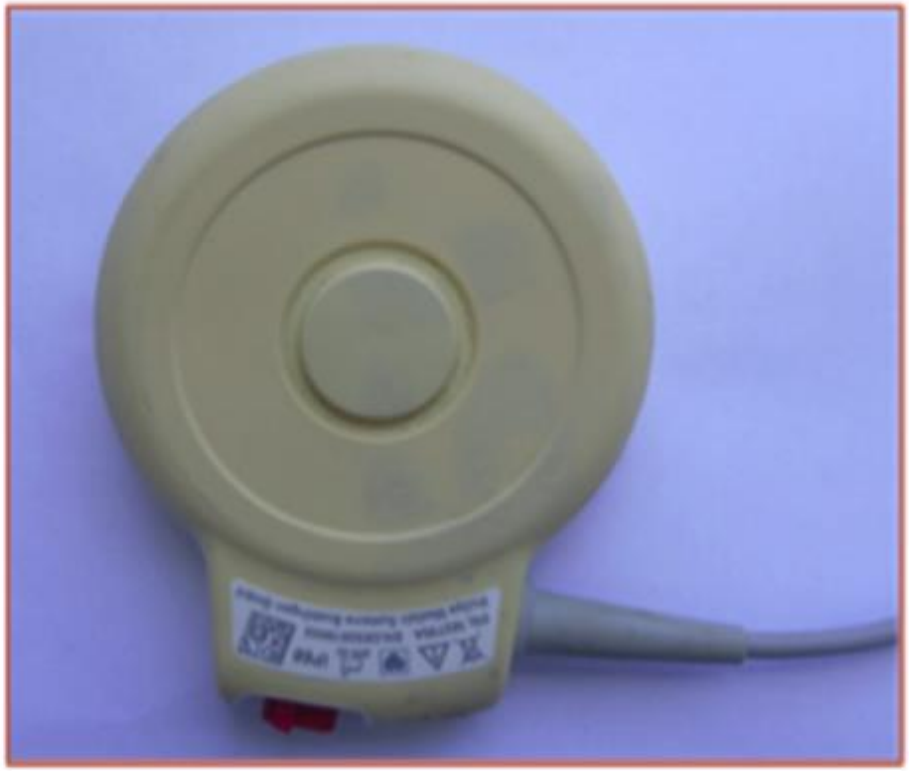
A: Fetal kalp atımı
B: Annenin hissettigi hareketler
C: Fetal hareket
D: Uterin kontraksiyonlar

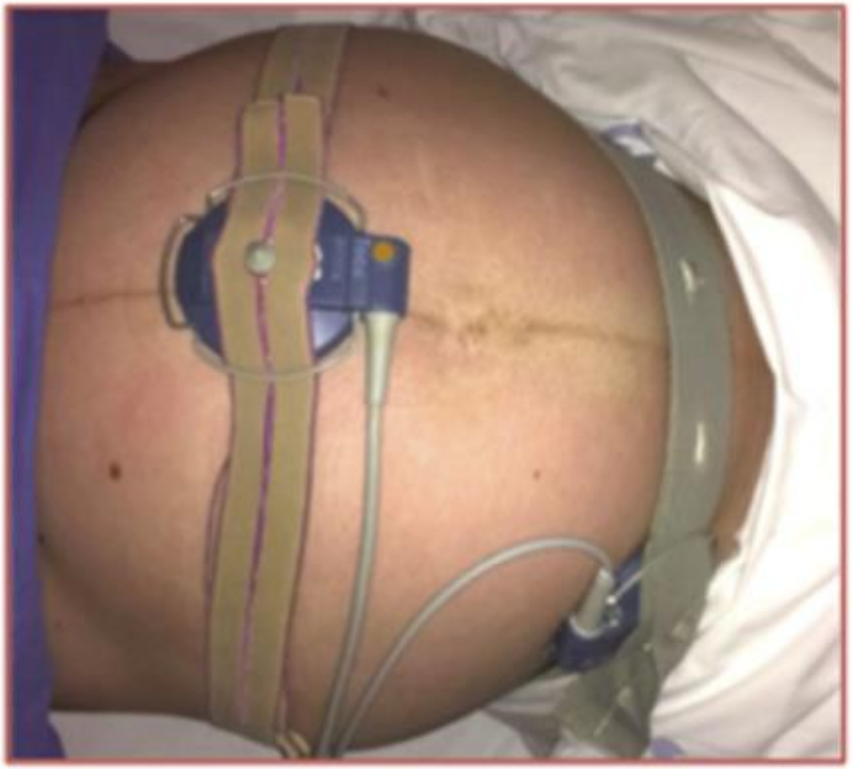


Kağıt hızı: 1, 2 or 3 cm/sn
1cm/sn: Az maliyet, kağıt tüketim
2-3cm/sn: Detaylı trase değerlendirme

FKH alternatif 20, 30 atım /cm

Tokodinamometre-UC





Tokodinamometre-UC

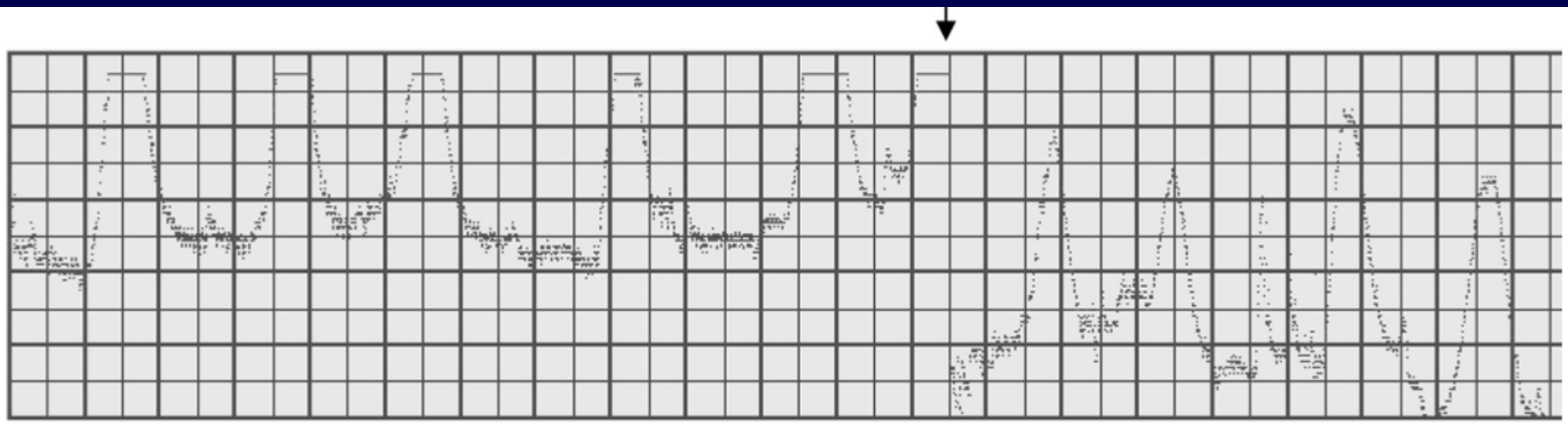
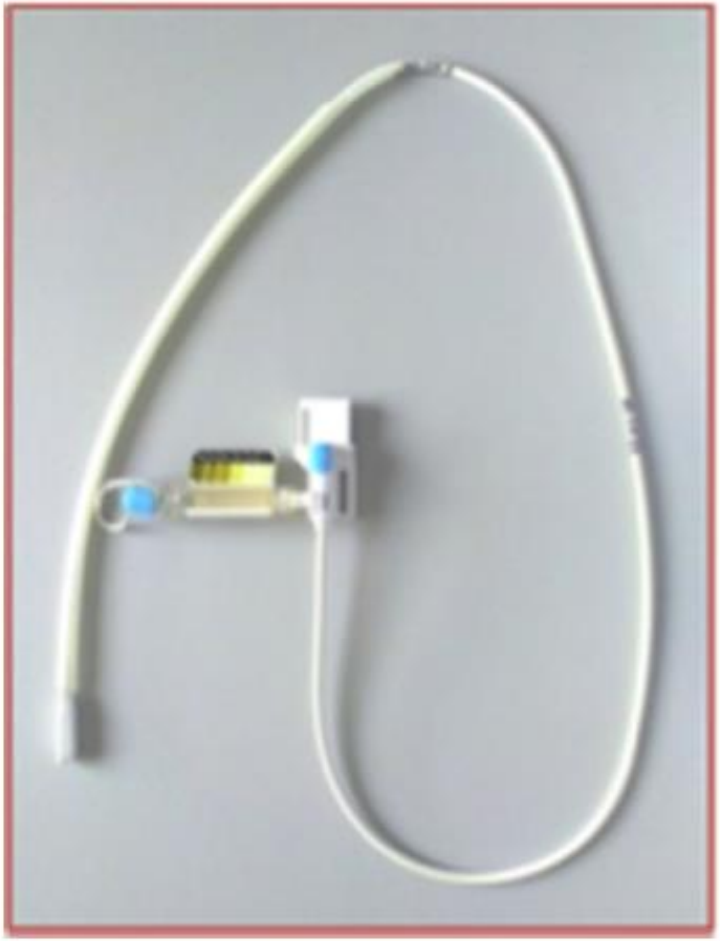
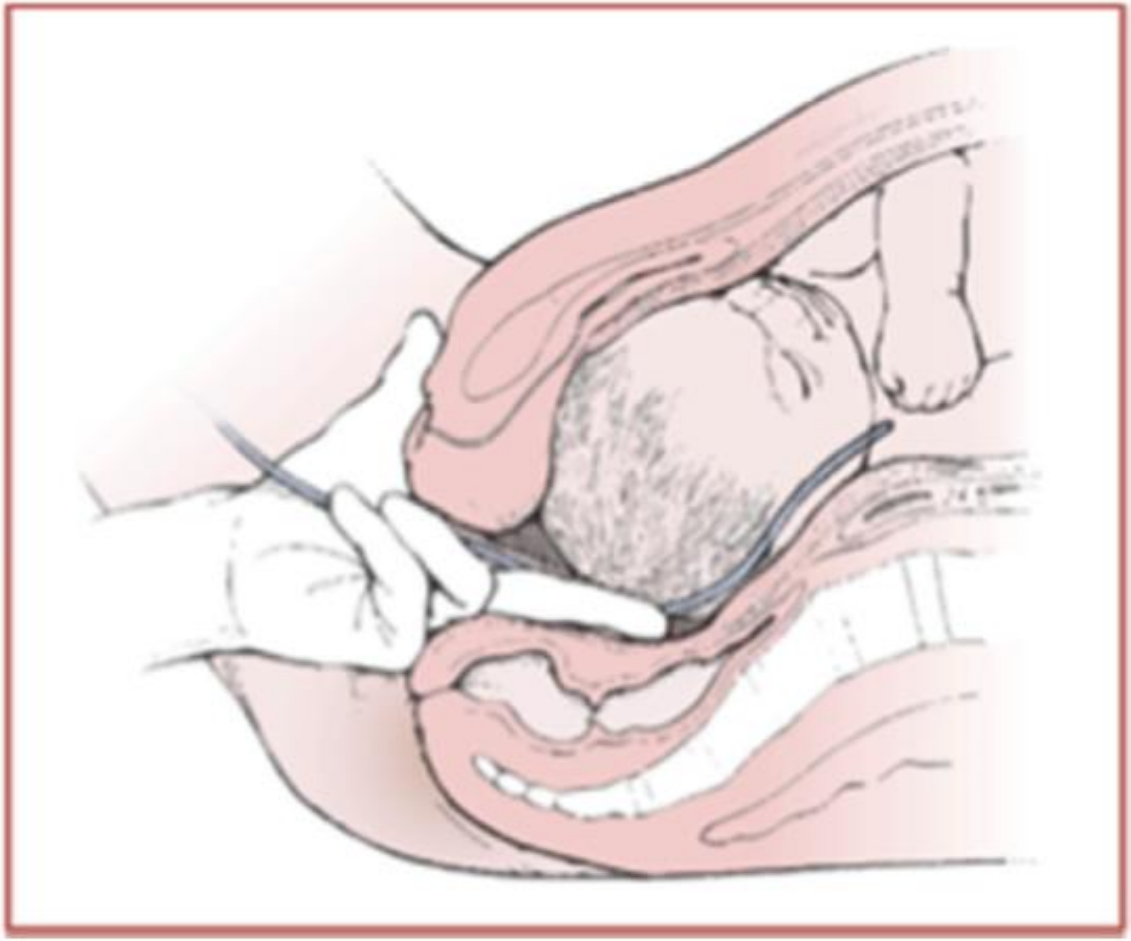


Fig. 6. A UC signal acquired with a tocodynamometer. High basal value in the initial part, leading to sectioning of the peak of uterine contractions. After pressing the 'TOCO zero' button (arrow), all signals are lowered allowing visualisation of the whole amplitude of UC.

İntrauterin Basınç Kateteri





Maternal Monitorizasyon

Fig. 9. Continuous maternal heart rate monitoring using electrocardiography (left), finger pulse oximeter (middle) or pulse oximeter incorporated in the tocodynamometer (right).

Antepartum / İntrapartum Elektronik Fetal Monitorizasyon

Amaç ????

- İntrauterin fetal kayıp
- İntrauterin asfiksiye sekonder komplikasyonların önlenmesi
- Gereksiz girişimleri (CS vs) önlemek

Table 2. Adverse fetal and neonatal outcomes associated with antepartum asphyxia*

Fetal outcomes	Neonatal outcomes
Stillbirth	Mortality
Metabolic acidosis at birth	Metabolic acidosis
	Hypoxic renal damage
	Necrotizing enterocolitis
	Intracranial hemorrhage
	Seizures
	Cerebral palsy
	Neonatal encephalopathy

* Asphyxia is defined as hypoxia with metabolic acidosis

Elektronik Fetal Monitorizasyon Kaygılar- CTG

- Yalancı pozitifliği yüksek
- Güven vermeyen FKA traselerinin asidemiyi öngermede
  - Sensitivitesi % 63
  - Yalancı pozitiflik oranı % 89
- Yorumlama subjektif
  - Yüksek interobserver ve intraobserver varyabilite.

Beard RW, Filshie GM, Knight CA, et al. The significance of the changes in the continuous fetal heart rate in the first stage of labour. J Obstet Gynecol Br C'wlth 1971;78:865e81.

Donker DK, van Geijn HP, Hasman A. Interobserver variation in the assessment of fetal heart rate recordings. Eur J Obstet Gynecol Reprod Biol 1993 Nov;52(1):21e8.

Spesifik FKH anormallikleri

fetal kayıp ve beyin hasarı (CP) ile sonuçlanan fetal hipoksi ile ilişkili ?????

HAYAL KIRIKLIĞI

The New England
Journal of Medicine

Volume 334 MARCH 7, 1996 Number 10

UNCERTAIN VALUE OF ELECTRONIC FETAL MONITORING IN PREDICTING CEREBRAL PALSY

KARIN B. NELSON, M.D., JAMES M. DAMBROSIA, PH.D., TRICIA Y. TING, B.S., AND JUDITH K. GRETHER, PH.D.

Abstract *Background.* Electronic monitoring of the fetal heart rate is commonly performed, in part to detect hypoxia during delivery that may result in brain injury. It is not known whether specific abnormalities on electronic fetal monitoring are related to the risk of cerebral palsy.

Methods. Among 155,636 children born from 1983 through 1985 in four California counties, we identified singleton infants with birth weights of at least 2500 g who

est or lowest fetal heart rate recorded for each child and the risk of cerebral palsy. Even after adjustment for other risk factors, the association of abnormalities on fetal monitoring with an increased risk of cerebral palsy persisted (adjusted odds ratio, 2.7; 95 percent confidence interval, 1.4 to 5.4). The 21 children with cerebral palsy who had multiple late decelerations or decreased variability in heart rate on fetal monitoring represented only 0.19 percent of singleton infants with birth weights of 2500 g or more who had these fetal-monitoring findings, for a false positive rate of 99.8 percent.

Conclusions. Specific abnormal findings on electronic monitoring of the fetal heart rate were associated with an increased risk of cerebral palsy. However, the false

	Pozitif test	Negatif test
Cerebral palsi	21	74
Normal	10770	115511

Cerebral Palsi - FPR 99.85

Elektronik Fetal Monitorizasyon Sorunlar??

- Cerebral palsi; antepartum>>>>>intrapartum durumlar
- Cerebral palsi ile doğan çocukların çoğunda belirgin intrapartum anormallik yoktur
- FHR anormaliklerin çoğu fetal asidoz-hipoksemi ile ilişkisiz
- Fetal asidoz-hipoksemilerin az kısmı nörolojik morbiditeyle birlikte
- 99,8% güven vermeyen FKH traseleri CP ile ilişkisiz

» ***Nelson N Eng J Med 1996***
» ***Phelan Semin Perinatol 2000***

Terminoloji ve Klinik Yönetim

- 1997 National Institute of Child Health and Human Development Working Group (NICHD)
- 2001 RCOG kılavuz
- 2005 ACOG Bülten
- 2008 NICHD, ACOG, SMFM (Electronic Fetal Monitoring Workshop)
- 2015 FIGO kılavuz

FKH monitorizasyon

1. TERMİNOLOJİ
2. YORUMLAMA
3. YÖNETİM

Ortak Dil

Antepartum CTG

Table 3. Obstetrical history and current pregnancy conditions associated with increased perinatal morbidity/mortality where antenatal fetal surveillance may be beneficial

Previous obstetrical history	
Maternal	Hypertensive disorder of pregnancy
	Placental abruption
Fetal	Intrauterine growth restriction
	Stillbirth
Current pregnancy	
Maternal	Post-term pregnancy (> 294 days, > 42 weeks)[9,10]
	Hypertensive disorders of pregnancy[11]
	Pre-pregnancy diabetes[12]
	Insulin requiring gestational diabetes[13]
	Preterm premature rupture of membranes[14]
	Chronic (stable) abruption[15]
	Iso-immunization[8]
	Abnormal maternal serum screening (hCG or AFP > 2.0 MOM) in absence of confirmed fetal anomaly[16]
	Motor vehicle accident during pregnancy[17]
	Vaginal bleeding
	Morbid obesity[18,19]
	Advanced maternal age
	Assisted reproductive technologies
Fetal	Decreased fetal movement[20,21]
	Intrauterine growth restriction[22]
	Suspected Oligohydramnios/Polyhydramnios
	Multiple pregnancy
	Preterm labour

- Maternal:
  - HT, Preeclampsia, renal ve otoimmun hst, diabet vs
  - Postterm gebelik, vajinal kanama, azalmış fetal hareket, uzamış EMR
- Fetal :
  - FGR, fetal enfeksiyon, çoğul gebelik

Artmış fetal morbidite-mortalite riski

Antepartum CTG

- Amaç : Fetal kaybı ve fetal nörolojik hasarı önleyebilmek
- Sorun:
  - Antepartum CTG gebelik sonuçlarını iyileştiribiliyor mu?
  - Potansiyel maternal-fetal olumsuz sonuçlar var mı?
  - Standart monitorizasyon var mı?

Cochrane Library

Cochrane Database of Systematic Reviews

Antenatal cardiotocography for fetal assessment (Review)

Grivell RM, Alfirevic Z, Gyte GML, Devane D

Antenatal cardiotocography for fetal assessment

Rosalie M Grivell[1], Zarko Alfirevic[2], Gillian ML Gyte[3], Declan Devane[4]

[1]Discipline of Obstetrics and Gynaecology, Robinson Research Institute, The University of Adelaide, Women's and Children's Hospital, Adelaide, Australia. [2]Department of Women's and Children's Health, The University of Liverpool, Liverpool, UK. [3]Cochrane Pregnancy and Childbirth Group, Department of Women's and Children's Health, The University of Liverpool, Liverpool, UK. [4]School of Nursing and Midwifery, National University of Ireland Galway, Galway, Ireland

Contact address: Rosalie M Grivell, Discipline of Obstetrics and Gynaecology, Robinson Research Institute, The University of Adelaide, Women's and Children's Hospital, 72 King William Road, Adelaide, South Australia, SA 5006, Australia. rosalie.grivell@adelaide.edu.au. rmgrivell@hotmail.com.

Editorial group: Cochrane Pregnancy and Childbirth Group.
Publication status and date: New search for studies and content updated (no change to conclusions), published in Issue 9, 2015.
Review content assessed as up-to-date: 26 June 2015.

Citation: Grivell RM, Alfirevic Z, Gyte GML, Devane D. Antenatal cardiotocography for fetal assessment. *Cochrane Database of Systematic Reviews* 2015, Issue 9. Art. No.: CD007863. DOI: 10.1002/14651858.CD007863.pub4.

- **6 çalışma 2105 hasta**
  - **4 CTG vs no CTG**
  - **2 computerize CTG vs konvansiyonel CTG**

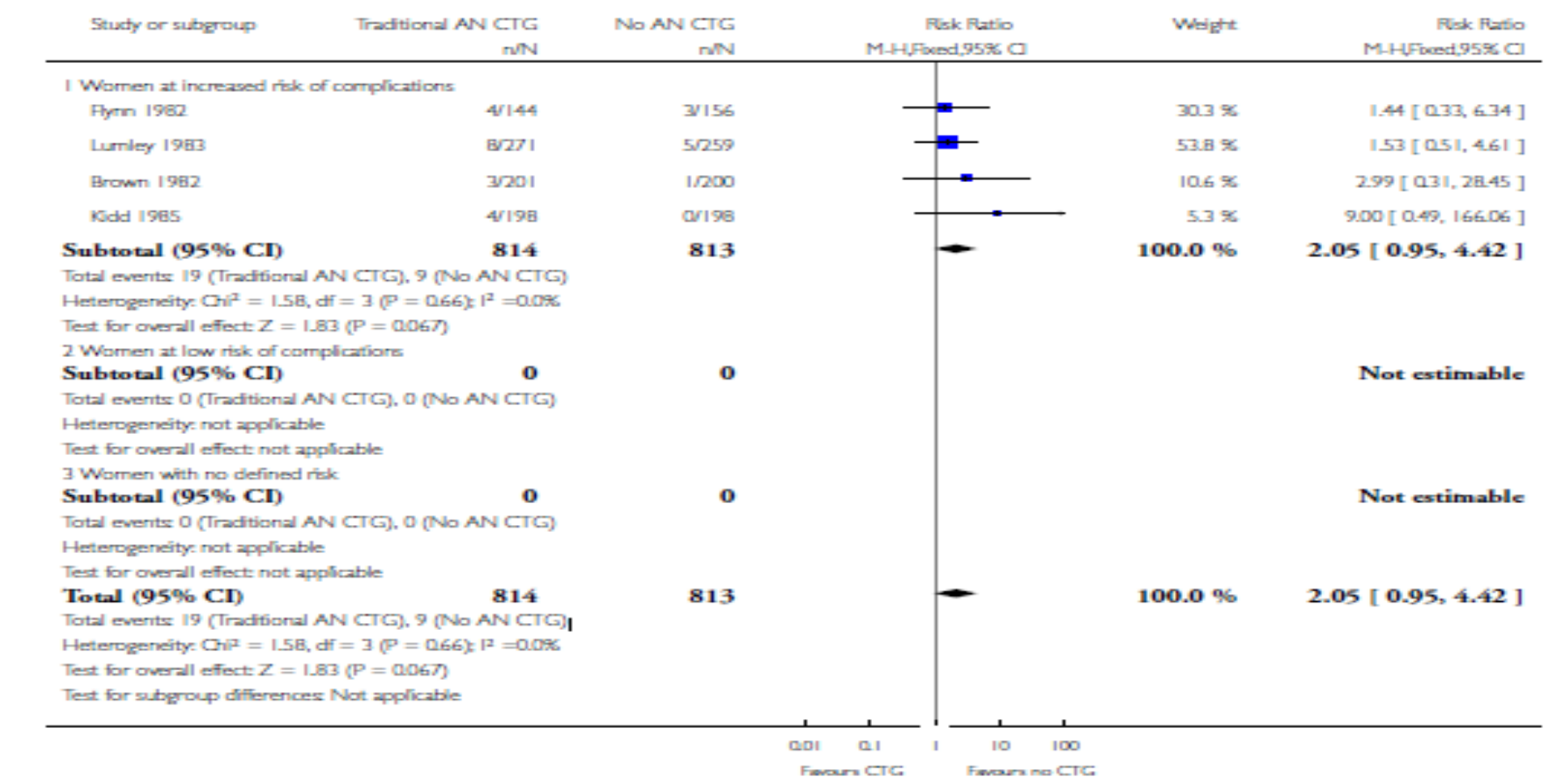
Primary outcomes

1. Perinatal mortality
2. Caesarean section

Secondary outcomes

1. Potentially preventable perinatal mortality (perinatal mortality excluding lethal congenital anomalies)
2. Apgar less that seven at five minutes
3. Apgar less than four at five minutes
4. Cord pH less than 7.10 or low pH/low base excess as defined by trialists
5. Admission to neonatal special care or intensive care unit
6. Length of stay in neonatal special care or intensive care unit
7. Preterm birth (less than 37 completed weeks, less than 34 completed weeks, less than 28 completed weeks)
8. Gestational age at birth
9. Neonatal seizures (seizures in the neonatal period, either apparent clinically or detected by electro-encephalographic recordings)
10. Hypoxic ischaemic encephalopathy, as defined by trialists
11. Cerebral palsy at 12 months
12. Neurodevelopmental disability at more than 12 months (assessed by a validated tool, e.g. Bayley Scale)
13. Caesarean section for non-reassuring or abnormal fetal heart rate patterns (in the absence of known fetal hypoxia, i.e. fetal blood sampling, lactate)
14. Induction of labour
15. Antenatal hospital admission
16. Length of antenatal hospital stay
17. Emotional distress/depression/anxiety
18. Women's satisfaction with care

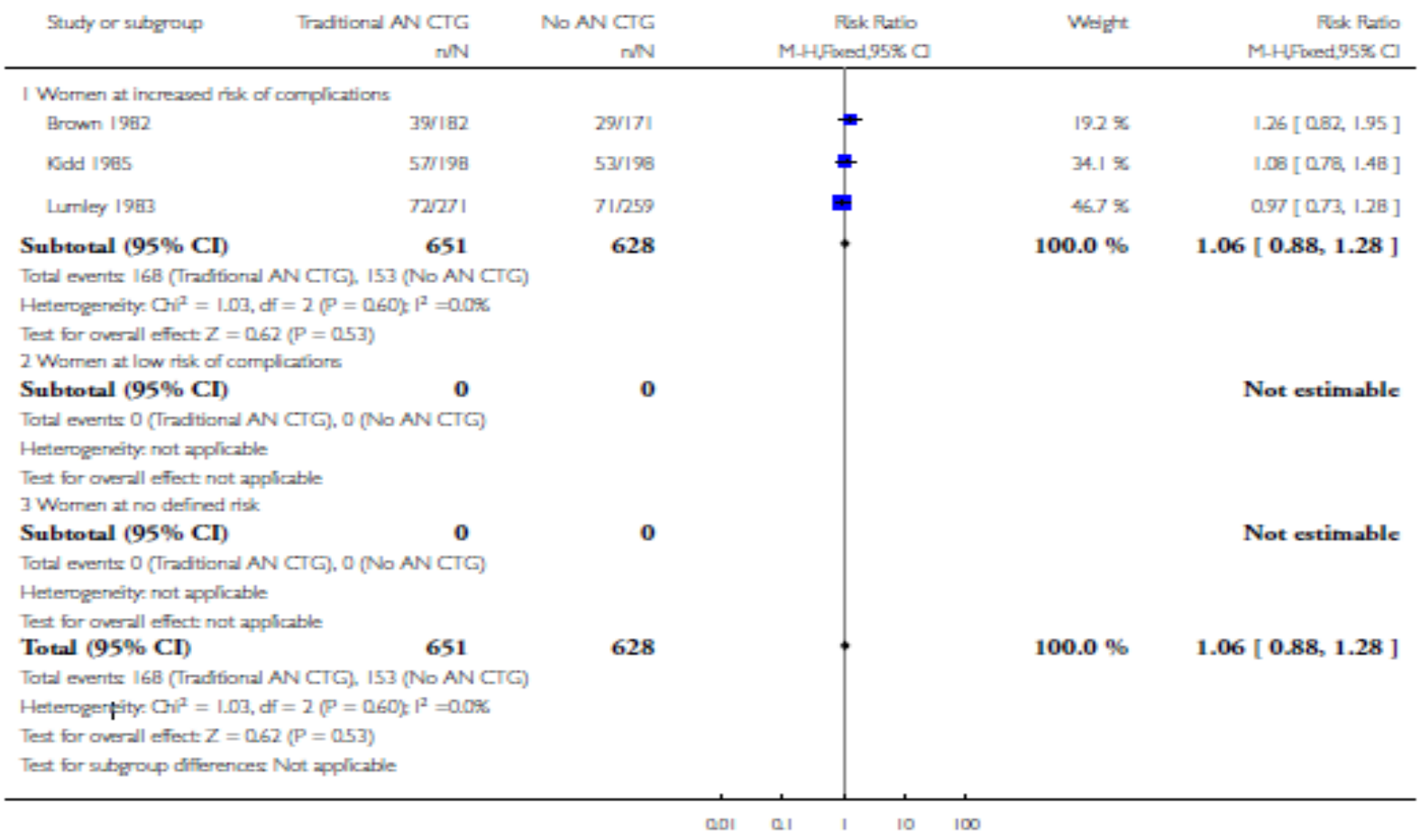
Traditional Antenatal CTG vs No Antenatal CTG Perinatal Mortality.



Perinatal mortalite risk fark yok

RR 2.05, 95% CI 0.95 to 4.42, 2.3% vs 1.1%

Traditional antenatal CTG vs no antenatal CTG CS



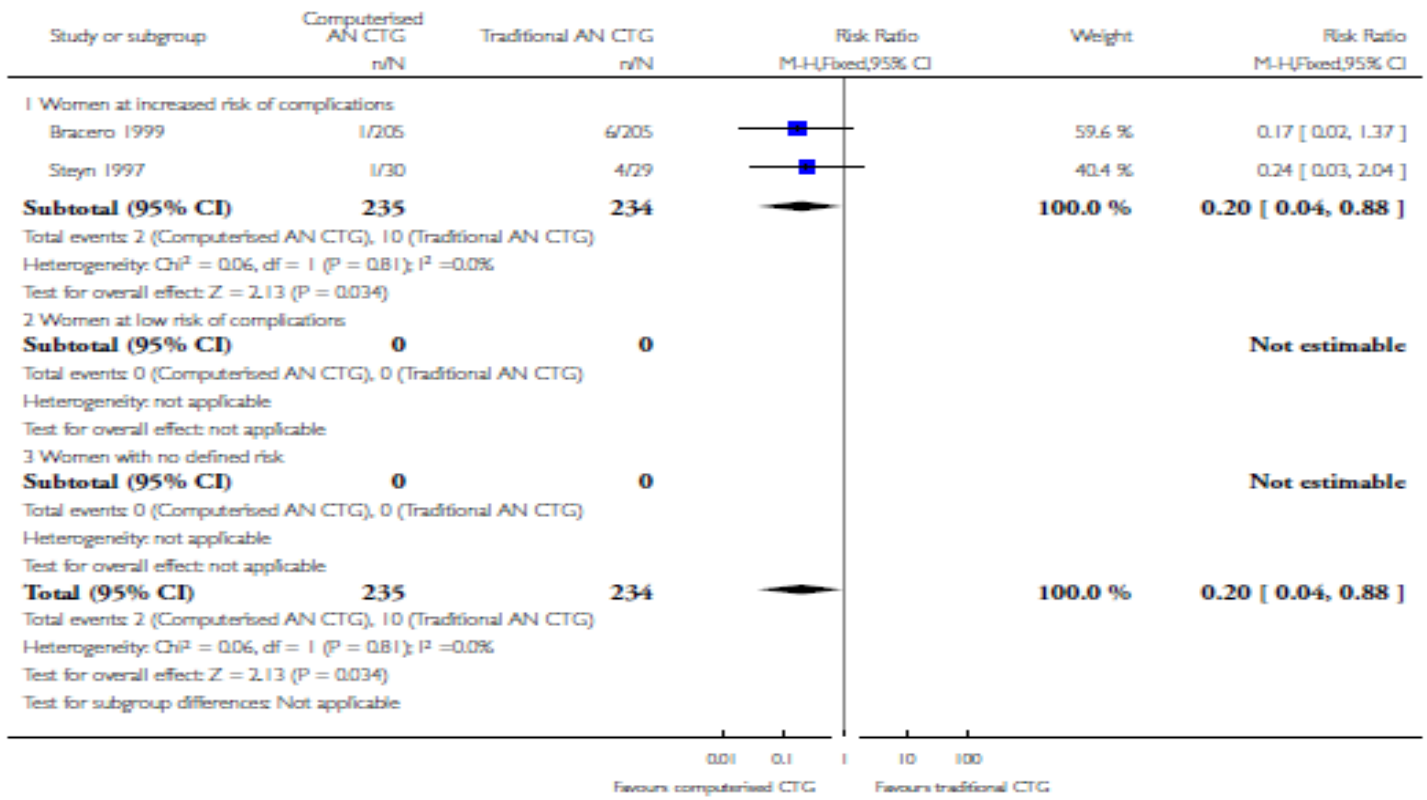
CS fark yok RR 1.06, 95% CI 0.88 to 1.28, 19.7% vs 18.5%

Sekonder Sonuçlar

- Potansiyel önlenebilir perinatal mortalite, (RR 2.46, 95% CI 0.96 to 6.30)
- 5. dk Apgar skor < 7, (RR 0.83, 95% CI 0.37 to 1.88)
- NICU süre, (RR 1.08, 95% CI 0.84 to 1.39)
- Doğum haftası, mean difference (MD) 0.00, 95% CI -0.33 to 0.33)
- Neonatal seizures, (RR 0.54, 95% CI 0.05 to 5.91)

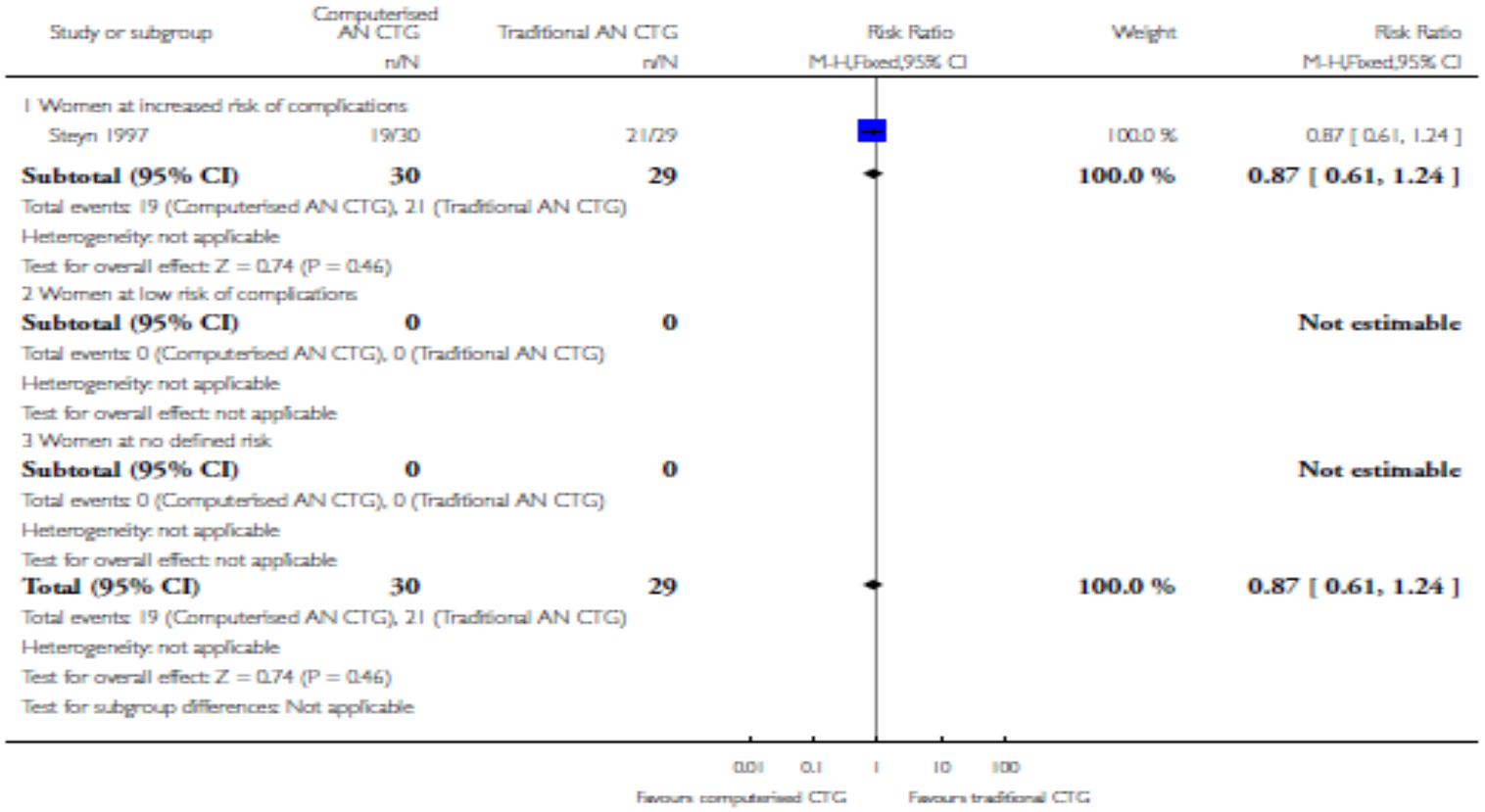
Fark yok

Komputerize Antenatal CTG vs Geleneksel Antenatal CTG, Perinatal Mortalite
2 Çalışma , 469 Hasta



Azalmış PNM (RR 0.20, 95%CI 0.04 to 0.88, 0.9% vs 4.2%

Komputerize Antenatal CTG vs. Antenatal CTG CS



CS fark yok (RR 0.87, 95% CI 0.61 to 1.24, 63% vs 72%

Komputerize Antenatal CTG vs Geleneksel Antenatal CTG Sekonder Sonuçlar

- Potansiyel önlenebilir PNM (RR 0.23, 95% CI 0.04 to 1.29)
- 5. dk Apgar <7 (RR 1.31, 95% CI 0.30 to 5.74)
- NICU süre (MD -0.40, 95% CI -0.99 to 0.19)
- Doğum hafta (MD -0.10, 95% CI -0.43 to 0.23).

Fark yok

Sonuçların Güncel Pratikte Uygulanmasındaki Sorunlar??

- 4 çalışma 80 li yıllarda
  - Maternal fetal hastalık yönetimi günümüzden farklı ??
  - Doppler kullanımını hastalık yönetimlerini değiştirdi
  - Prematur bebeklerde survi ve morbidite iyileşme
  - Çalışmaların PNM değerlendirmede power zayıf

Traditional antenatal CTG compared with no antenatal CTG (women at increased risk of complication) for fetal assessment

Patient or population: Pregnant women with/ without complications
Settings: Different countries
Intervention: Traditional antenatal CTG
Comparison: No antenatal CTG (women at increased risk of complication)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	No antenatal CTG (Women at increased risk of complication)	Traditional antenatal CTG				
Perinatal mortality	Study population		RR 2.05 (0.95 to 4.42)	1627 (4 RCTs)	⊕⊕◯◯ LOW [1,2]	
	11 per 1000	23 per 1000 (11 to 49)				
	Moderate					
	12 per 1000	25 per 1000 (11 to 53)				
Caesarean section	Study population		RR 1.06 (0.88 to 1.28)	1279 (3 RCTs)	⊕⊕◯◯ LOW [1,2]	
	244 per 1000	258 per 1000 (214 to 312)				
	Moderate					
	268 per 1000	284 per 1000				
Apgar less than 7 at 5 minutes	Study population		RR 0.83 (0.37 to 1.88)	396 (1 RCT)	⊕◯◯◯ VERY LOW [2,3]	
	61 per 1000	50 per 1000 (22 to 114)				
Admission to neonatal special care unit or intensive care unit	Study population		RR 1.08 (0.84 to 1.39)	883 (2 RCTs)	⊕⊕◯◯ LOW [1,2]	
	205 per 1000	221 per 1000 (172 to 284)				
	Moderate					
	189 per 1000	204 per 1000 (159 to 262)				

Cochrane Library

Cochrane Database of Systematic Reviews

Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing (Review)

Devane D, Lalor JG, Daly S, McGuire W, Smith V

Devane D, Lalor JG, Daly S, McGuire W, Smith V.
Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing.
Cochrane Database of Systematic Reviews 2012, Issue 2. Art. No.: CD005122.
DOI: 10.1002/14651858.CD005122.pub4.

www.cochranelibrary.com

Admission CTG

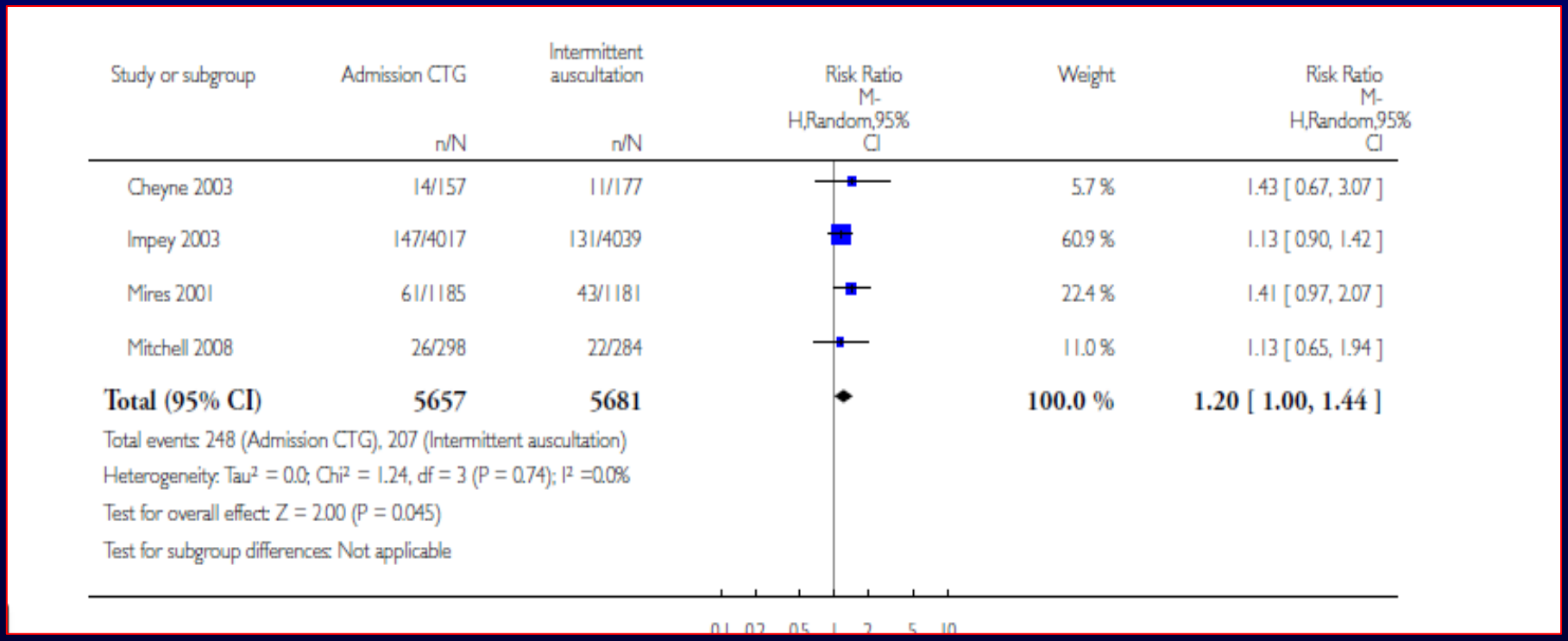
Maternal birimlerin

- 2001 UK 79%
- 2004 İrlanda 96%
- 1998 Kanada 76%
- 2008 İsveç 100%

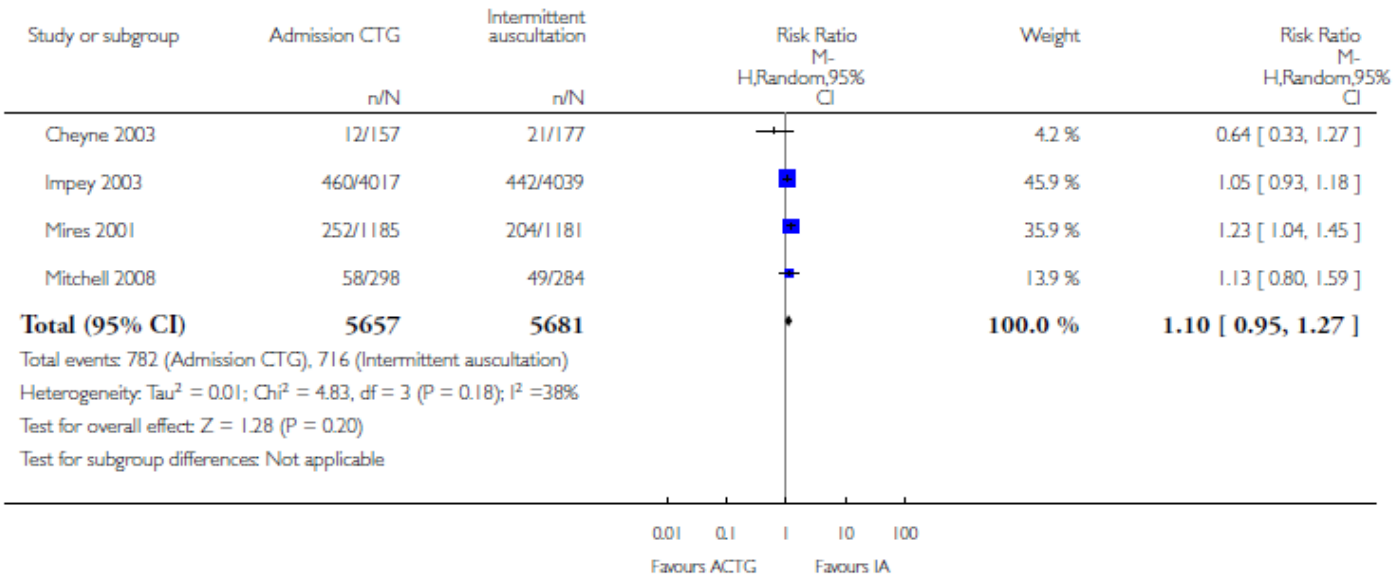
Amaç: İntrapartum hipoksi açısından riskli fetus saptama ve yakın takip/müdahale gerektirecek fetus saptama (düşük riskli hastalar)

Admission CTG vs Intermittent auscultation (IA) (düşük risk hasta) C/S

- 4 çalışma 13296 dogum eylemindeki hasta
- 20% artmış CS riski

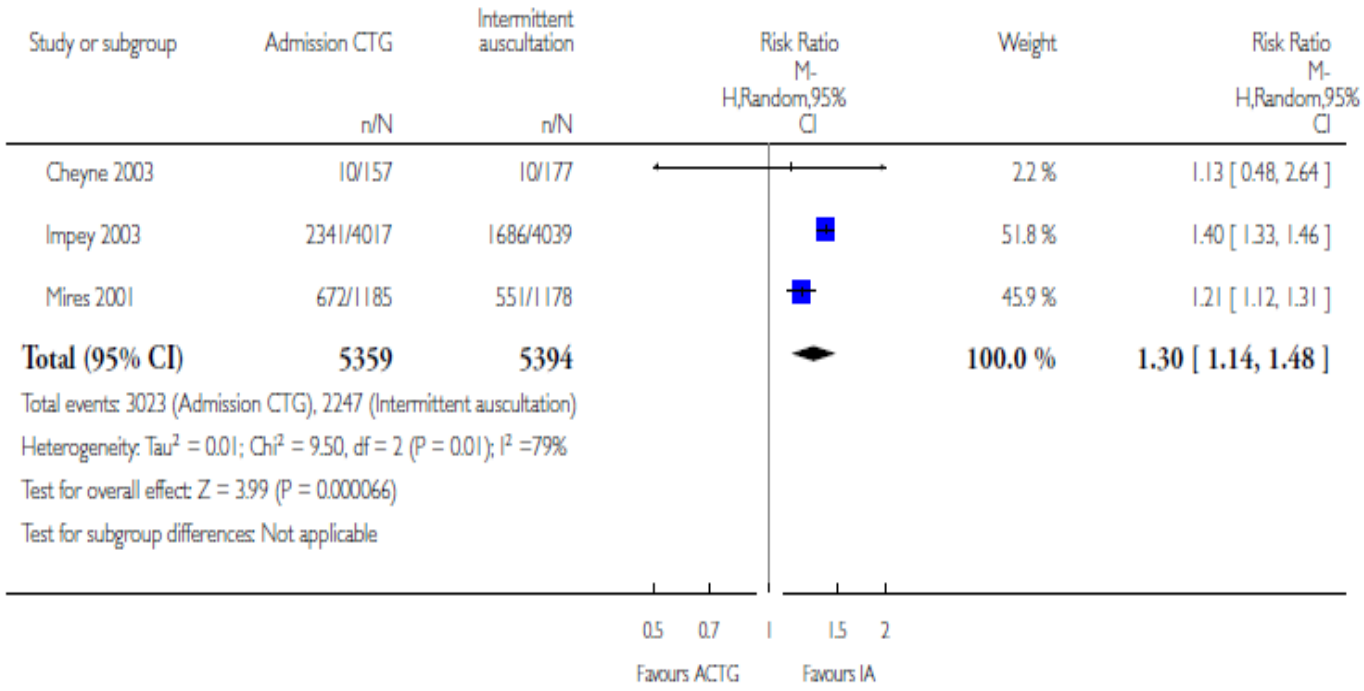


Admission CTG vs IA (düşük-risk)
Operatif vajinal doğum



Operatif vajinal doğum, FARK YOK

Admission CTG vs IA (düşük-risk hasta)
Doğum süresince devamlı EFM



Doğum eyleminde artmış devamlı EFM (RR 1.30, 95% CI 1.14 to 1.48)

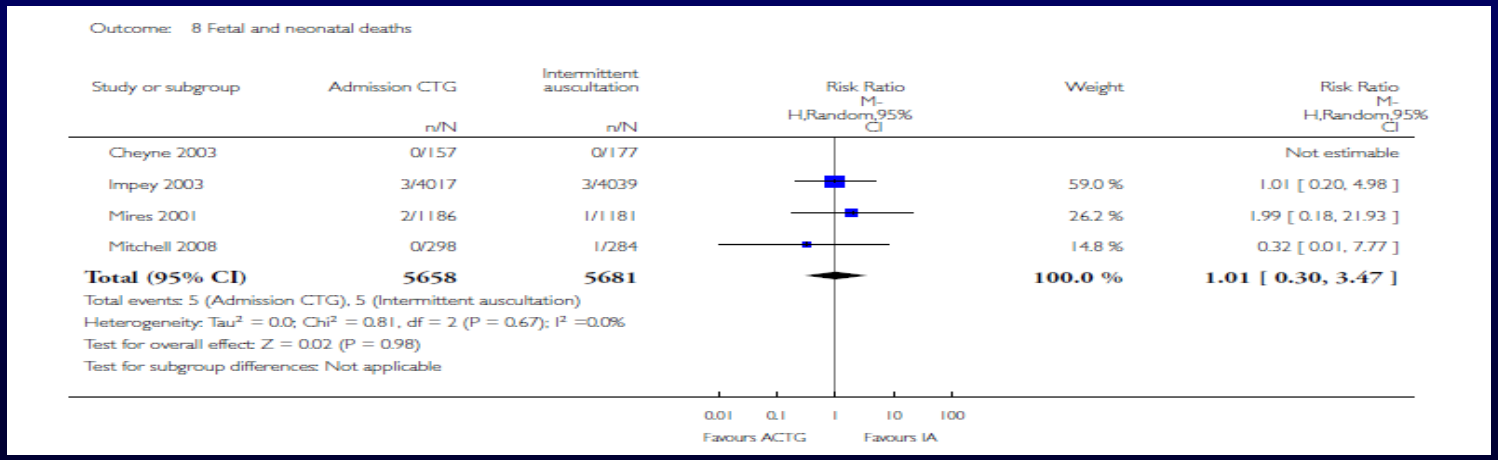
Sekonder Sonuçlar

- Amniyotomi (RR 1.04, 95% CI 0.97 to 1.12)
- Doğum augmentasyonu için oksitosin (RR 1.05, 95% CI 0.95 to 1.17)
- Epidural (RR 1.11, 95% CI 0.87 to 1.4)
- 5.dk Apgar skor <7 (RR 1.00, 95% CI 0.54 to 1.85)
- HİE (RR 1.19, 95% CI 0.37 to 3.90)
- NICU (RR 1.03, 95% CI 0.86 to 1.24)

FARK YOK

Sonuç

- Admission CTG düşük riskli grupta fayda sağlamamakta, artmış CS ile birlikte
- Perinatal mortalite FARK YOK !! (istatiksel fark saptamada power zayıf)
  - PNM 20% azalmayı gösterebilmek için yaklaşık 100.000 hasta gerekli mi ??? Pek olası değil



İntrapartum Fetal Monitorizasyon

- İntermitant monitorizasyon
  - Fetal steteskop (Pinard)
  - El doppleri
- Devamlı monitorizasyon
  - CTG
    - Eksternal
    - İnternal
      - Pulse oksimetri
      - Fetal EKG
      - ST analiz vs

Cochrane Library

Cochrane Database of Systematic Reviews

Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour (Review)

Alfirevic Z, Devane D, Gyte GML

Alfirevic Z, Devane D, Gyte GML.
Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour.
Cochrane Database of Systematic Reviews 2013, Issue 5. Art. No.: CD006066.
DOI: 10.1002/14651858.CD006066.pub2.

www.cochranelibrary.com

- 13 çalışma 37715 hasta
- Surekli CTG monitorizasyon(+/- fetal kan örneklemesi) vs
  - Monitorizasyon yok
  - İntermitant oskultasyon veya el Doppler
  - İntermitant CTG

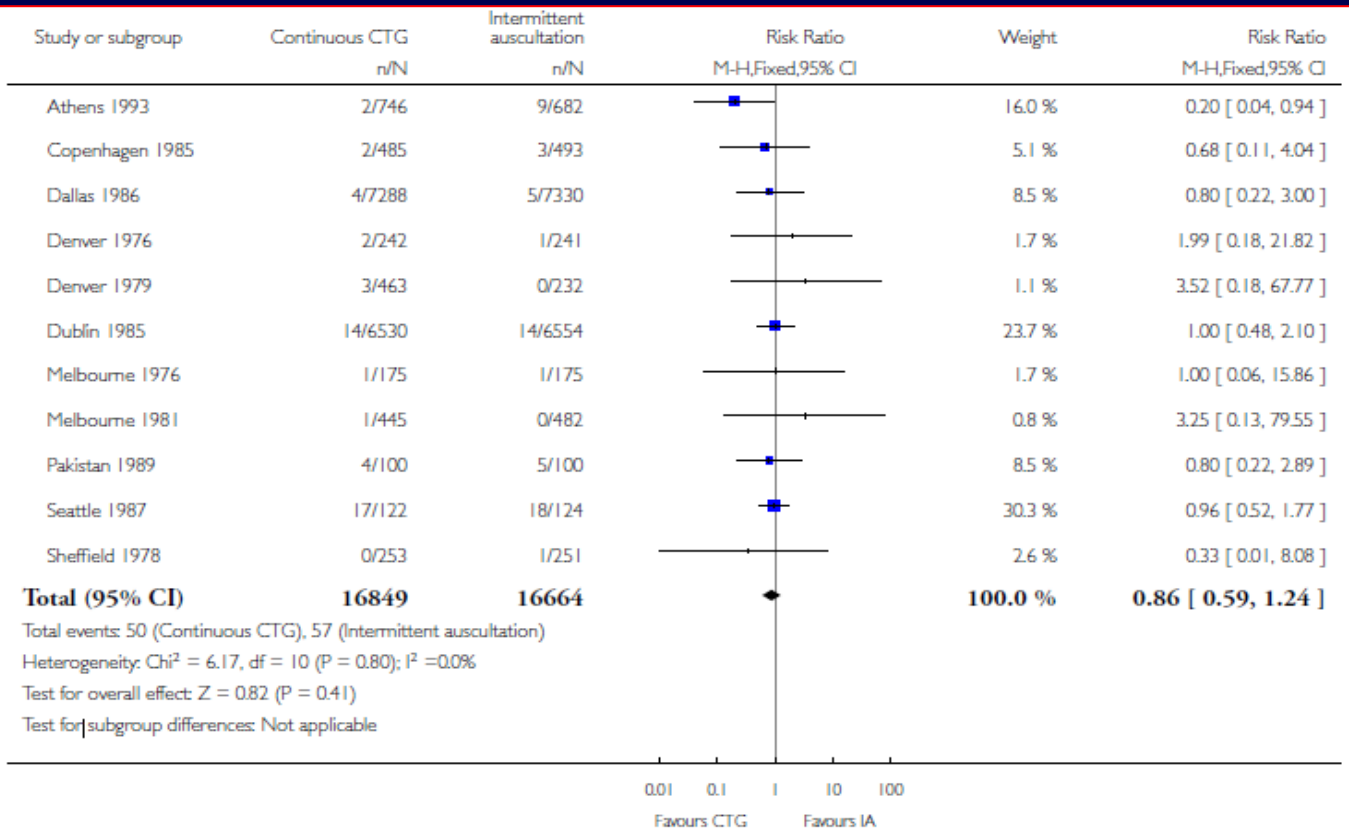
Primary outcomes

1. Perinatal mortality;
2. seizures in the neonatal period, either apparent clinically or detected by electro-encephalographic recordings;
3. cerebral palsy;
4. caesarean section;
5. instrumental vaginal birth;
6. cord blood acidosis (low pH/low base excess as defined by trialists; where report included a range of pH values we have used cord pH less than 7.10 as a cut off for acidosis);
7. use of all forms of pharmacological analgesia during labour and birth (including epidural but excluding anaesthesia for caesarean section).

Secondary outcomes

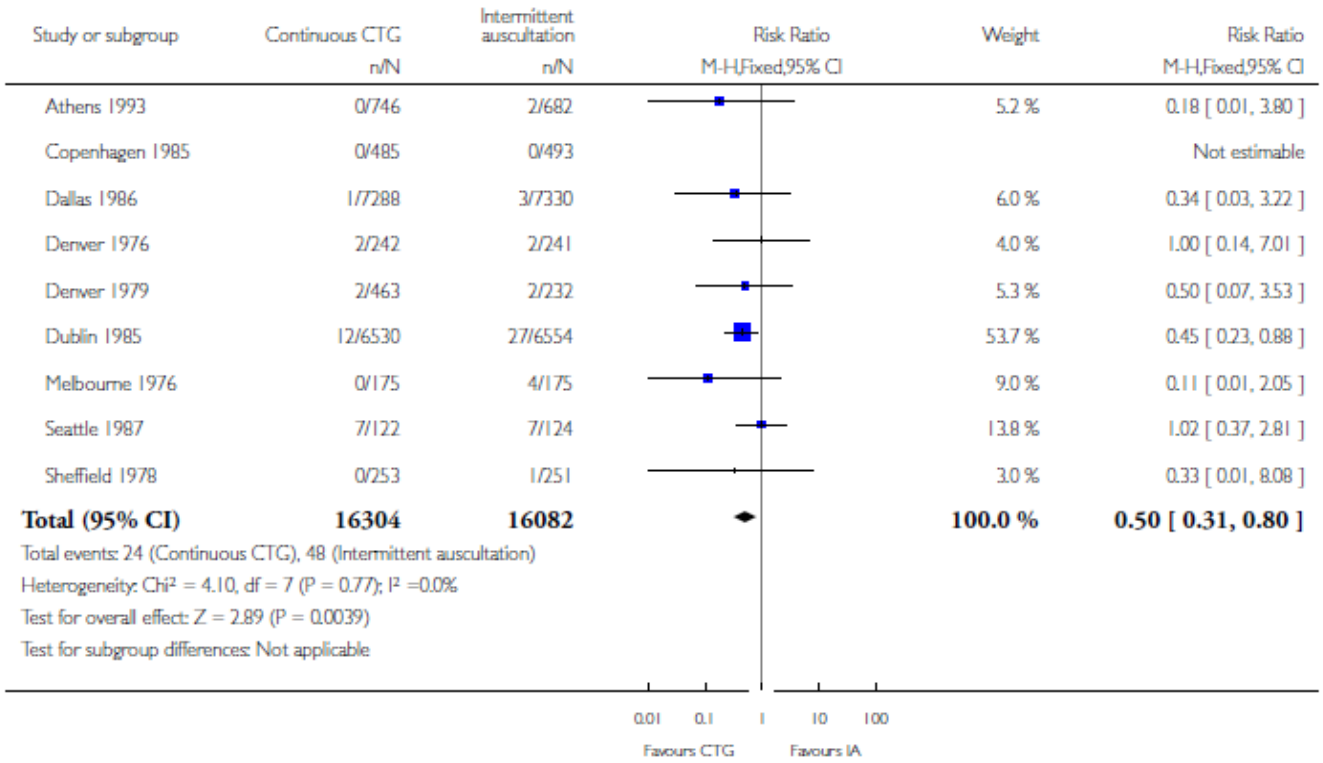
1. Hypoxic ischaemic encephalopathy (as defined by trialists);
2. neurodevelopmental disability assessed at 12 months of age or more. Neurodevelopmental disability, defined as any one or combination of the following: non-ambulant cerebral palsy, developmental delay, auditory and visual impairment. Development should have been assessed by means of a previously validated tool, such as Bayley Scales of Infant Development (Psychomotor Developmental Index and Mental Developmental Index (Bayley 1993);
3. Apgar less than seven at five minutes;
4. Apgar less than four at five minutes;
5. admission to neonatal special care and/or intensive care unit;
6. fetal blood sampling;
7. damage/infection to baby's head from scalp electrode or fetal blood sampling;
8. caesarean section for abnormal fetal heart rate pattern and/or fetal acidosis;
9. instrumental vaginal birth for abnormal fetal heart rate pattern and/or fetal acidosis;
10. spontaneous vaginal birth not achieved;
11. epidural analgesia;
12. use of non pharmacological methods of coping with labour, e.g. transcutaneous electrical nerve stimulation, hydrotherapy;
13. amniotomy (artificial rupture of membranes);
14. oxytocin during labour;
15. perineal trauma requiring repair (including episiotomy);
16. inability to adopt preferred position during labour;
17. dissatisfaction with labour and/or perceived loss of control during labour;
18. postpartum depression;
19. exclusively breastfeeding at discharge from hospital;
20. length of stay in neonatal special care and/or intensive care unit.

Sürekli CTG vs IA
Perinatal Mortalite



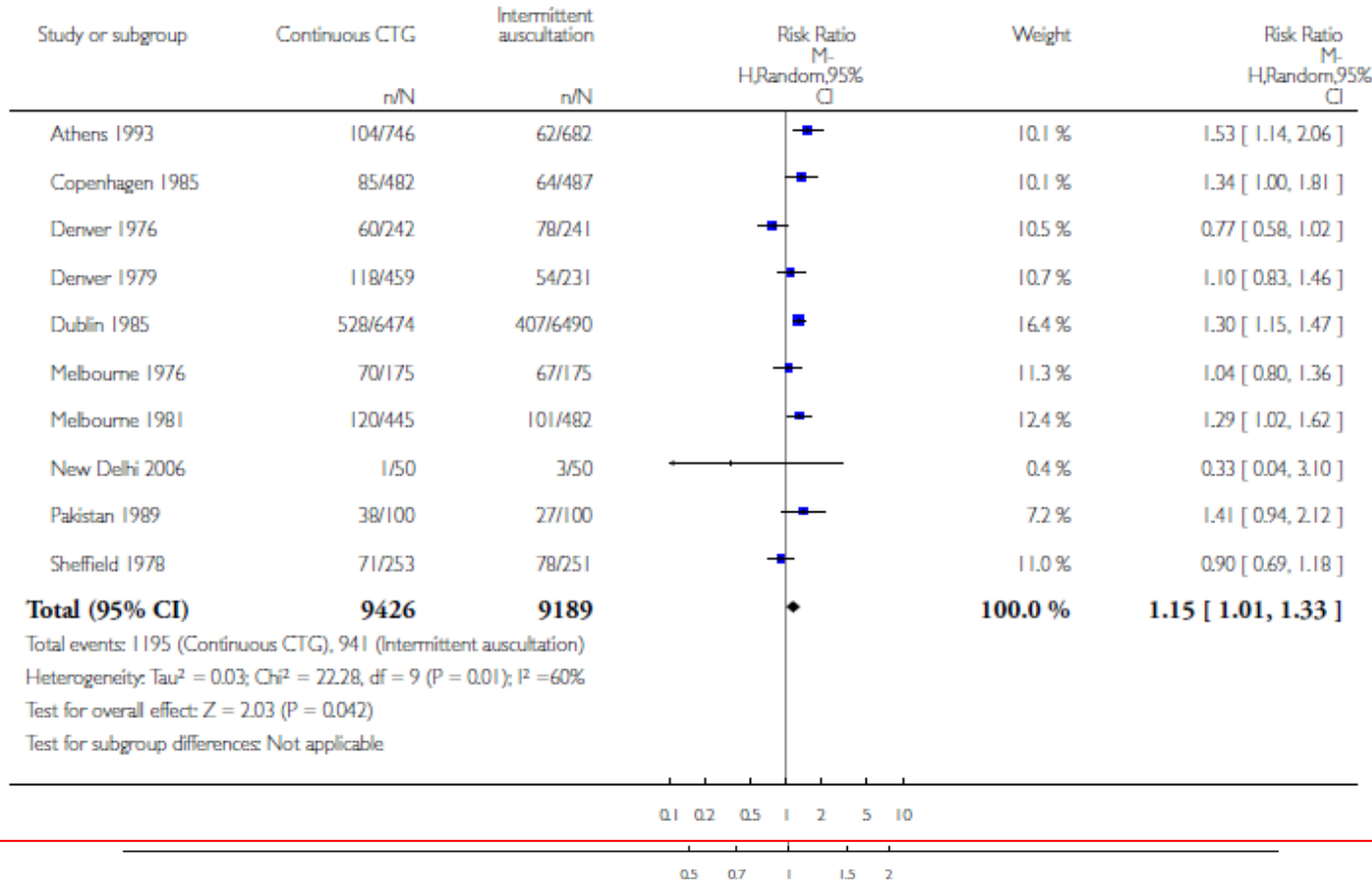
FARK YOK

Sürekli CTG Vs IA
Neonatal Konvulziyon



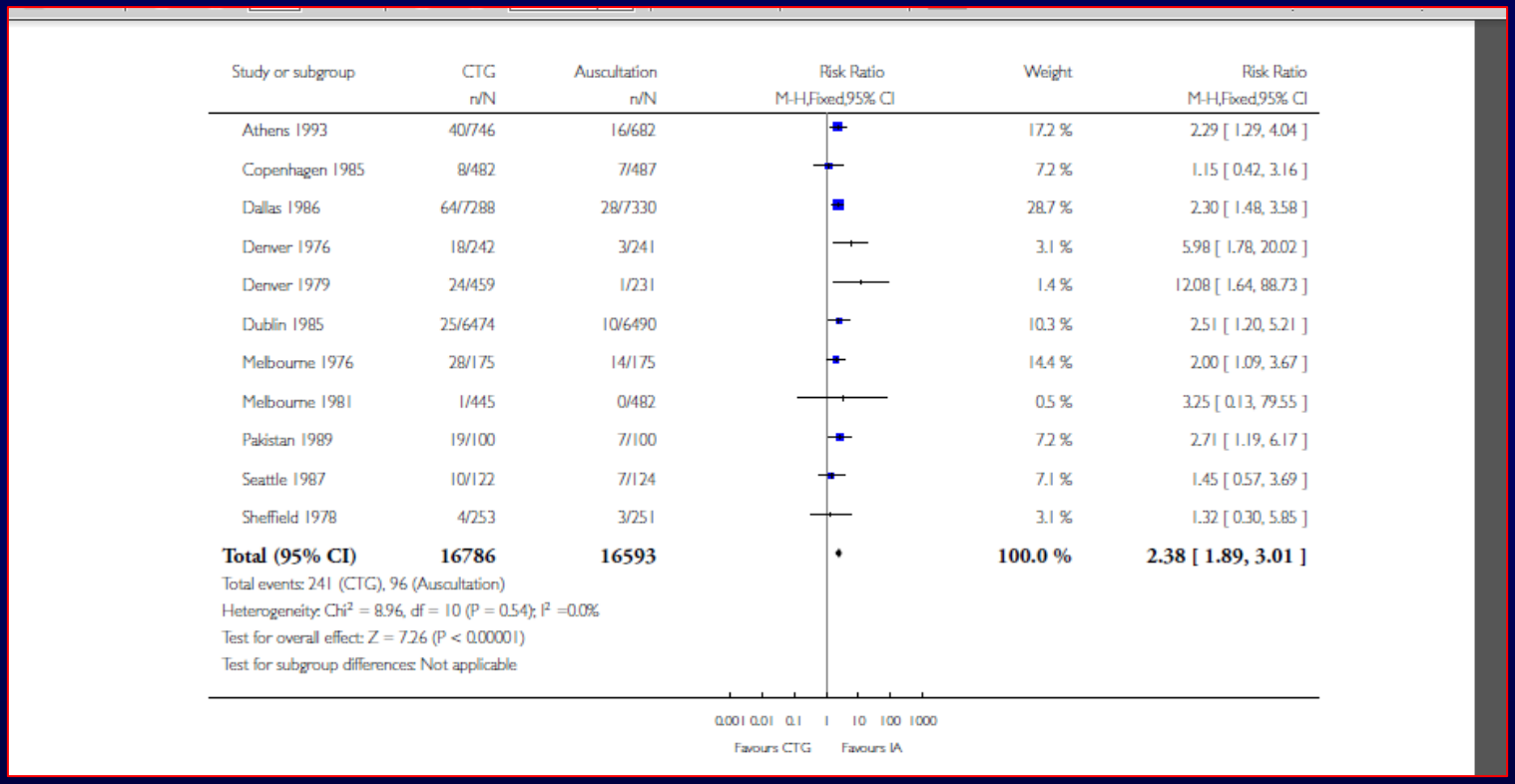
Devamlı CTG Neonatal konvulziyon 50% azalma

Sürekli CTG vs IA
CS



Devamlı CTG ile CS artış (RR 1.35, 95% CI 1.01 to 1.33)

Sürekli CTG vs IA
Anormal Fetal Kalp Trase ve/veya Asidoz Nedenli CS



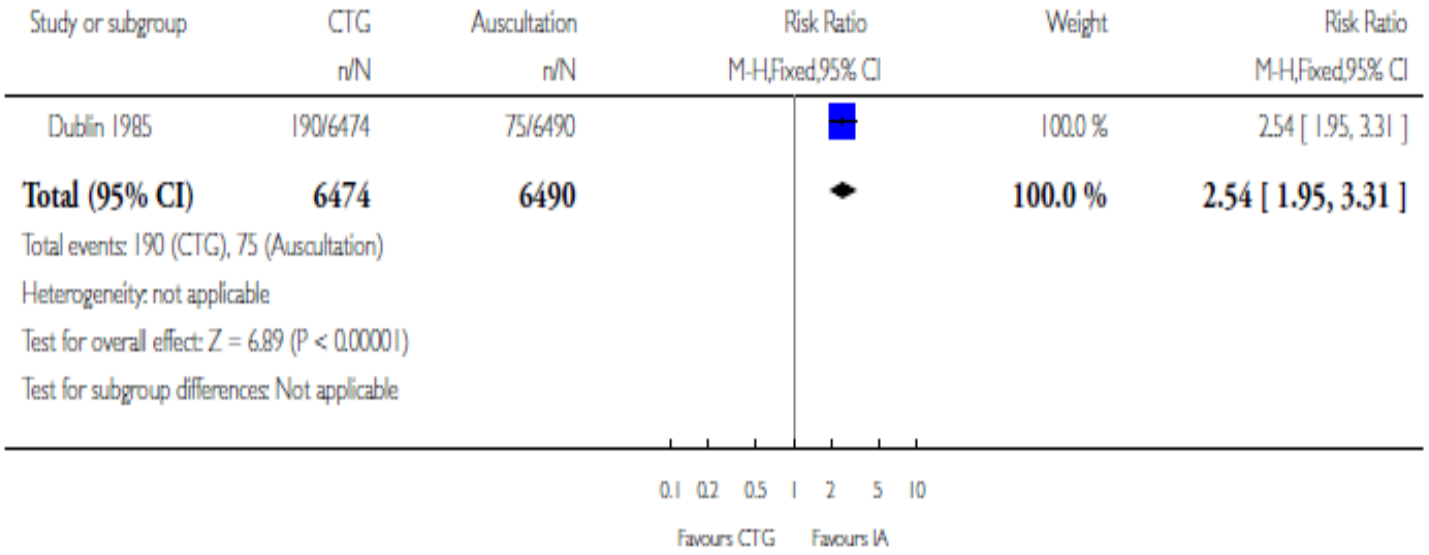
Study or subgroup	CTG n/N	Auscultation n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Athens 1993	40/746	16/682		17.2 %	2.29 [1.29, 4.04]
Copenhagen 1985	8/482	7/487		7.2 %	1.15 [0.42, 3.16]
Dallas 1986	64/7288	28/7330		28.7 %	2.30 [1.48, 3.58]
Denver 1976	18/242	3/241		3.1 %	5.98 [1.78, 20.02]
Denver 1979	24/459	1/231		1.4 %	12.08 [1.64, 88.73]
Dublin 1985	25/6474	10/6490		10.3 %	2.51 [1.20, 5.21]
Melbourne 1976	28/175	14/175		14.4 %	2.00 [1.09, 3.67]
Melbourne 1981	1/445	0/482		0.5 %	3.25 [0.13, 79.55]
Pakistan 1989	19/100	7/100		7.2 %	2.71 [1.19, 6.17]
Seattle 1987	10/122	7/124		7.1 %	1.45 [0.57, 3.69]
Sheffield 1978	4/253	3/251		3.1 %	1.32 [0.30, 5.85]
Total (95% CI)	**16786**	**16593**		**100.0 %**	**2.38 [1.89, 3.01]**

Total events: 241 (CTG), 96 (Auscultation)
Heterogeneity: $Chi^2 = 8.96$, df = 10 (P = 0.54); $I^2 = 0.0\%$
Test for overall effect: Z = 7.26 (P < 0.00001)
Test for subgroup differences: Not applicable

0.001 0.01 0.1 1 10 100 1000
Favours CTG Favours IA

Anormal FKH veya asidozis nedeniyle CS artmış RR 2.38 [1.89, 3.01]

Sürekli CTG vs IA
Anormal CTG veya Fetal Asidozis Nedeniyle Operatif Vajinal Doğum



Anormal CTG veya fetal asidozis nedeniyle operatif vajinal doğum RR 2.54 [1.95, 3.31]

Sürekli CTG vs IA (Subgroup: pregnancy risk status - high/low/unclear or both

- **12 çalışma**
  - 6 çalışma: yüksek riskli hastalar
  - 3 çalışma : düşük riskli hasta
  - 3 çalışma: risk belirtilmemiş

Düşük risk, yüksek risk, preterm grupta benzer sonuçlar.

Comparison 2. Continuous CTG versus IA (pregnancy risk status - high/low)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Perinatal mortality	11	33513	Risk Ratio (M-H, Fixed, 95% CI)	0.86 [0.59, 1.24]
1.1 High risk	5	1974	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.62, 1.74]
1.2 Low risk	3	16049	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.29, 2.58]
1.3 Risk status - mixed or not specified	3	15490	Risk Ratio (M-H, Fixed, 95% CI)	0.68 [0.38, 1.24]
2 Neonatal seizures	9	32386	Risk Ratio (M-H, Fixed, 95% CI)	0.50 [0.31, 0.80]
2.1 High risk	5	4805	Risk Ratio (M-H, Fixed, 95% CI)	0.67 [0.36, 1.24]
2.2 Low risk	3	25175	Risk Ratio (M-H, Fixed, 95% CI)	0.36 [0.16, 0.79]
2.3 Risk status - mixed or not specified	2	2406	Risk Ratio (M-H, Fixed, 95% CI)	0.18 [0.01, 3.80]
3 Cerebral palsy	2	13252	Risk Ratio (M-H, Fixed, 95% CI)	1.74 [0.97, 3.11]
3.1 High risk	1	173	Risk Ratio (M-H, Fixed, 95% CI)	2.54 [1.10, 5.86]
3.2 Low risk	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Risk status - mixed or not specified	1	13079	Risk Ratio (M-H, Fixed, 95% CI)	1.20 [0.52, 2.79]
4 Caesarean section	11	18861	Risk Ratio (M-H, Random, 95% CI)	1.63 [1.29, 2.07]
4.1 High risk	6	2069	Risk Ratio (M-H, Random, 95% CI)	1.91 [1.39, 2.61]
4.2 Low risk	2	1431	Risk Ratio (M-H, Random, 95% CI)	2.06 [1.24, 3.45]
4.3 Risk status - mixed or not specified	3	15361	Risk Ratio (M-H, Random, 95% CI)	1.14 [0.95, 1.36]
5 Instrumental vaginal birth	10	18615	Risk Ratio (M-H, Random, 95% CI)	1.15 [1.01, 1.33]
5.1 High risk	5	1823	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.82, 1.27]
5.2 Low risk	2	1431	Risk Ratio (M-H, Random, 95% CI)	1.09 [0.77, 1.54]
5.3 Risk status - mixed or not specified	3	15361	Risk Ratio (M-H, Random, 95% CI)	1.33 [1.20, 1.49]
6 Cord blood acidosis	2	2494	Risk Ratio (M-H, Fixed, 95% CI)	1.16 [0.72, 1.89]
6.1 High risk	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.2 Low risk	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.3 Risk status - mixed or not specified	2	2494	Risk Ratio (M-H, Fixed, 95% CI)	1.16 [0.72, 1.89]
7 Any pharmacological analgesia	3	1677	Risk Ratio (M-H, Fixed, 95% CI)	0.99 [0.93, 1.04]
7.1 High risk	2	1173	Risk Ratio (M-H, Fixed, 95% CI)	1.01 [0.96, 1.06]
7.2 Low risk	1	504	Risk Ratio (M-H, Fixed, 95% CI)	0.92 [0.79, 1.07]
7.3 Risk status - mixed or not specified	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Sürekli CTG vs aralıklı CTG

- CS RR 1.29 [0.84, 1.97]
- Operatif vajinal dogum RR 1.16 [0.92, 1.46]
- Kord kan asidoz RR 1.43 [0.95, 2.14]
- 5.dk Apgar <7 RR 2.65 [0.70, 9.97]
- NICU RR 1.34 [0.91, 1.98]
- Anormal FKH veya asidozis nedeniyle CS RR 1.19 [0.66, 2.15]
- Spontan vajinal doğum RR 0.98 [0.96, 1.00]
- Epidural analjezi RR 1.06 [0.92, 1.21]

Lung 1994 4044 yüksek riskli hasta
FARK YOK

SONUÇ

- Devamlı CTG takip fetal sonuçlarda iyileşme olmadan yaklaşık 35% artmıs CS (50% azalmış neonatal konvulziyon uzun dönem önemi???)

- Neonatal konvulziyonları yarı yarıya azaltır
  - NK riski 3/1000
  - 1 NS önlemek için 667 hastanın devamlı takibi yapılmalı

- Perinatal ölüm riskinde anIamlı azalma sağlamaz ???
  - Kanıt kalitesi ‘orta’
  - 1 ölümü önlediğini göstermek için 50,000 vaka gerekli
  - Çalışmalar daha çok morbidite odaklı

- İntrapartum hipoksiye sekonder CP çok nadir
  - İntrapartum CTG için gerekli power sağlayacak RCT olası değil

Continuous CTG versus intermittent auscultation for fetal assessment during labour

Patient or population: Women undergoing fetal assessment during labour
Settings:
Intervention: Continuous CTG versus intermittent auscultation

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control	Continuous CTG versus intermittent auscultation				
Perinatal mortality (primary outcome)	Study population		RR 0.86 (0.59 to 1.24)	33513 (11 studies)	⊕⊕◯◯ low[1,2]	
	3 per 1000	3 per 1000 (2 to 4)				
	Moderate					
	4 per 1000	3 per 1000 (2 to 5)				
Neonatal seizures (primary outcome)	Study population		RR 0.5 (0.31 to 0.8)	32386 (9 studies)	⊕⊕⊕◯ moderate[3]	
	3 per 1000	1 per 1000 (1 to 2)				
	Moderate					
	4 per 1000	2 per 1000 (1 to 3)				
Cerebral palsy (primary outcome)	Study population		RR 1.75 (0.84 to 3.63)	13252 (2 studies)	⊕⊕◯◯ low[4,5]	
	3 per 1000	4 per 1000 (2 to 9)				
	Moderate					
	39 per 1000	68 per 1000 (33 to 142)				
Caesarean section (primary outcome)	Study population		RR 1.63 (1.29 to 2.07)	18861 (11 studies)	⊕⊕◯◯ low[6,7]	
	36 per 1000	59 per 1000 (47 to 75)				
	Moderate					
	66 per 1000	108 per 1000 (85 to 137)				
Instrumental vaginal birth (primary outcome)	Study population		RR 1.15 (1.01 to 1.33)	18615 (10 studies)	⊕⊕◯◯ low[8,9]	
	102 per 1000	118 per 1000 (103 to 136)				
	Moderate					
	222 per 1000	255 per 1000 (224 to 295)				

ACOG PRACTICE BULLETIN

CLINICAL MANAGEMENT GUIDELINES FOR OBSTETRICIAN–GYNECOLOGISTS

NUMBER 106, JULY 2009

Replaces Practice Bulletin Number 70, December 2005

Intrapartum Fetal Heart Rate Monitoring: Nomenclature, Interpretation, and General Management Principles

The following recommendations are based on expert opinion (Level C):

- A three-tiered system for the categorization of FHR patterns is recommended.
- The labor of women with high-risk conditions should be monitored with continuous FHR monitoring.
- The terms hyperstimulation and hypercontractility should be abandoned.

JOGC

Journal of Obstetrics and Gynaecology Canada
The official voice of reproductive health care in Canada
Le porte-parole officiel des soins génésiques au Canada
Journal d'obstétrique et gynécologie du Canada

Volume 29, Number 9 • volume 29, numéro 9 September • septembre 2007 Supplement 4 • supplément 4

Fetal Health Surveillance: Antepartum and Intrapartum Consensus Guideline

Recommendation 11: Intrapartum Fetal Surveillance for Women with Risk Factors for Adverse Perinatal Outcome

1. Electronic fetal monitoring is recommended for pregnancies at risk of adverse perinatal outcome. (II-A)

Intrapartum care for healthy women and babies

NICE National Institute for Health and Care Excellence

Clinical guideline

Published: 3 December 2014

nice.org.uk/guidance/cg190

1.4.10 Do not perform cardiotocography on admission for low-risk women in suspected or established labour in any birth setting as part of the initial assessment. [new 2014]

1.4.11 Offer continuous cardiotocography if any of the risk factors listed in recommendation 1.4.3 are identified on initial assessment, and explain to the woman why this is necessary. (See also section 1.10 on fetal monitoring.) [new 2014]

Düşük Riskli Hasta-İa Sıklığı

Table 10. Recommended frequency of auscultation

	First stage–latent phase	First stage–active phase	Active second stage
	For the latent phase of labour, there are very limited data on which to base a recommendation for IA. Optimally, most women will be in their own home environment with family support during this period but may be in hospital because of geographic /weather considerations.		
SOCG*	**Recommended at the time of assessment, approximately q1h**	**q 15–30 minutes**	**q 5 minutes**
ACOG†		q 15 minutes	q 5 minutes
AWHONN‡		q 15–30 minutes	q 5–15 minutes
RCOG§		q 15 minutes	q 5 minutes

*Society of Obstetricians and Gynecologists of Canada, 2007

†American College of Obstetricians and Gynecologists, 2005

‡Association of Women's Health, Obstetric and Neonatal Nurses ; Feinstein, Sprague, & Trepanier, 2000[166]

§ Royal College of Obstetricians and Gynaecologists, 2001[7]

- CTG yaklaşık 40 yıldır klinik kullanımda
- Bu süreçte CP sıklığı değişmezken CS oranı artmıştır

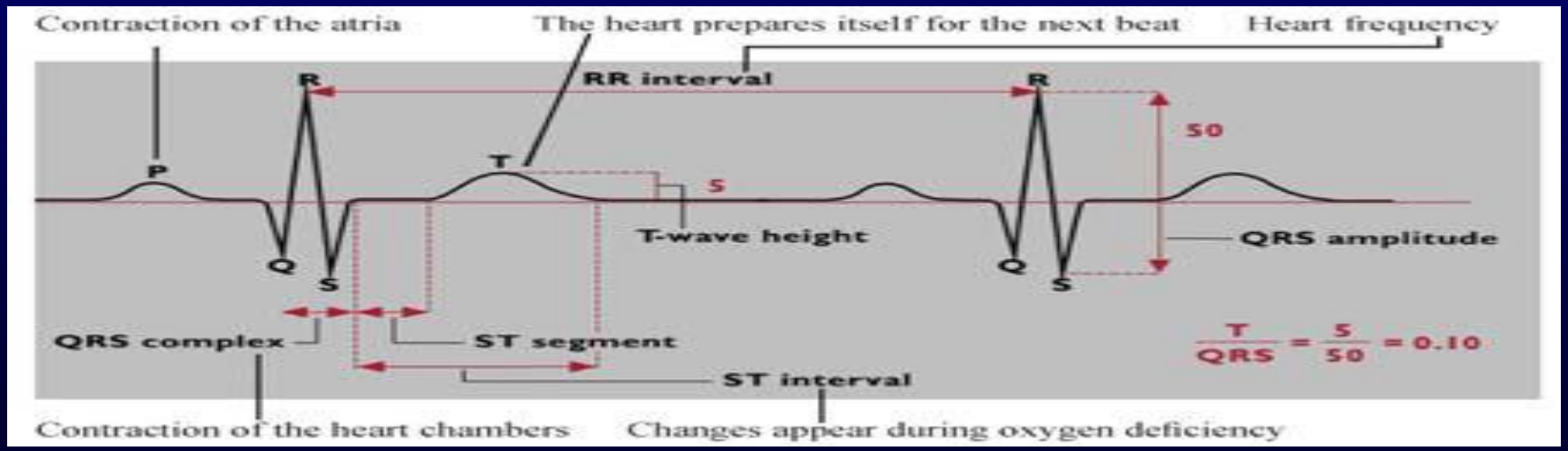
- Metabolik asidozu saptamada FPR yüksek olup anormal CTG nedeniye operatif doğum yapılan hastaların 40-60% nın kan gazı normal olacaktır.

- Perinatal sonuçlar iyileşmeden CS oranları artmaya devam edecektir

- **PPV arttırmak ve FPR düşürmek** amaçlı ek yöntemler
  - Fetal scalp blood sampling(FBS)
  - Fetal scalp lactate
  - Fetal pulse oximetry
  - Fetal ECG (STAN or ST-analyser).

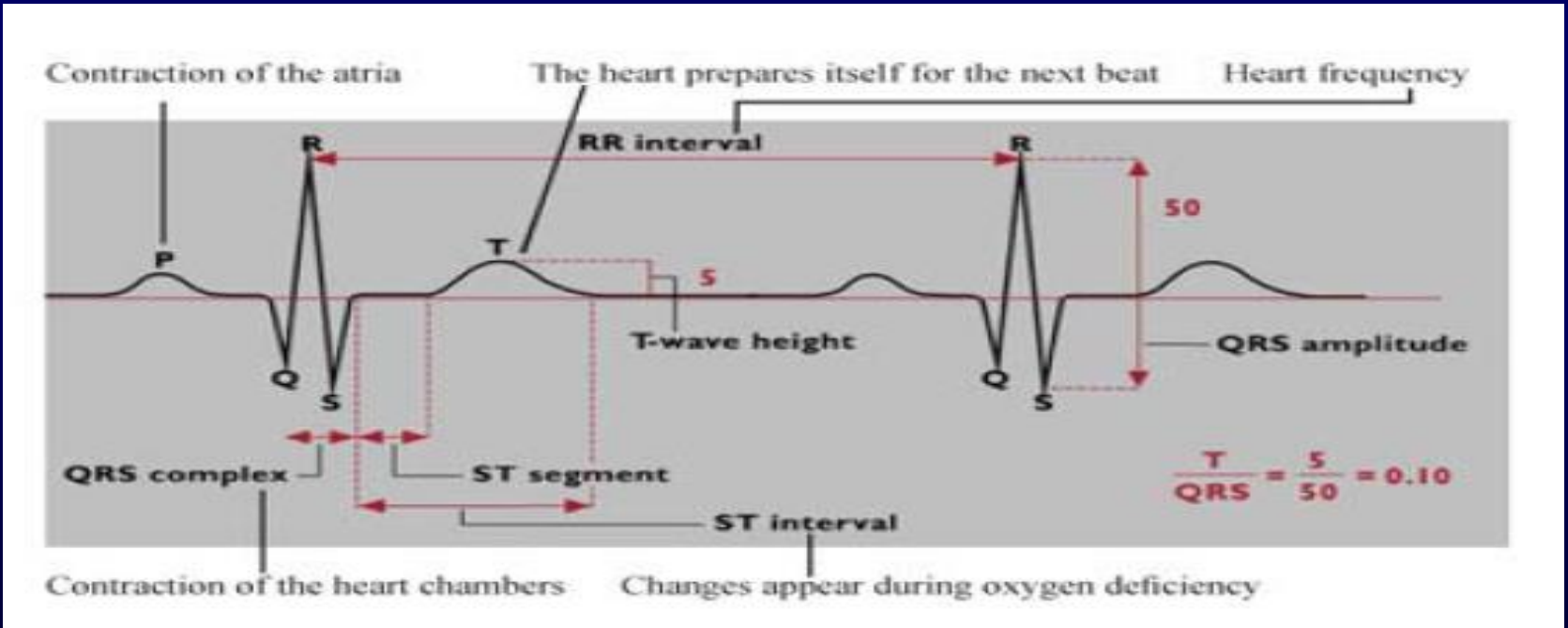
STAN (ST-Analyser)

- Fetal EKG: myocard hücrelerin elektrik aktivitesinin grafik kaydı
- Hipoksinin son döneminine dek korunan santral organ (kalp,beyin) oksijenizasyonunu yansıtır
- STAN myokard hipoksisine sekonder EKG değişikliklerini saptar



STAN(ST-Analyser)

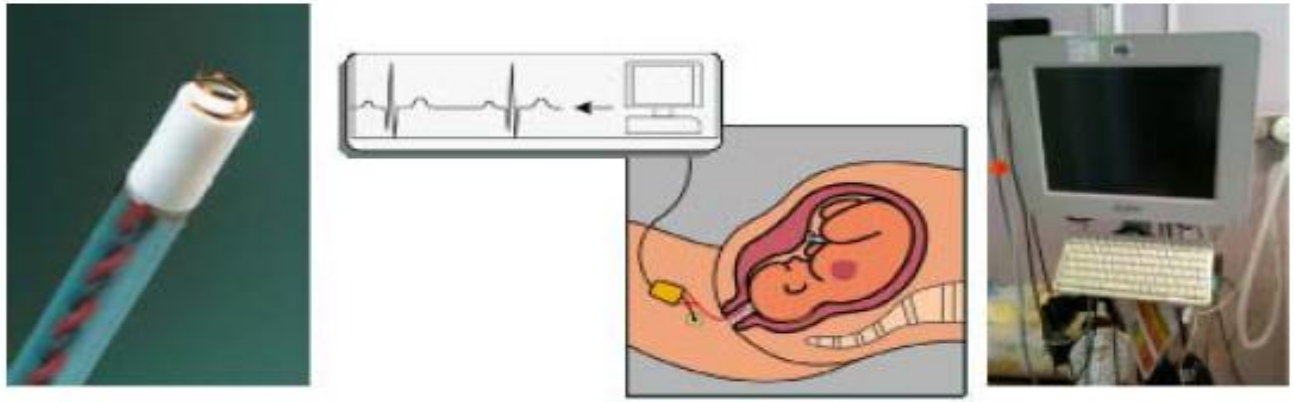
- STAN myokard hipoksisine sekonder EKG değişiklikleri;
  - ST segment, T dalga, T/QRS Ratio



STAN(ST-Analyser)

- Fetal skalp: FBS, fetal pulse oksimetry, and fetal skalp lactate →periferik doku oksijenizasyonu, devamlı izlem şansı yok
- ST-Analyser (STAN): →santral oksijenizasyon, devamlı izlem şansı

Figure 2. Scalp electrode (a), connection to skin electrode on the maternal thigh (b) and STAN Machine (c)



- Fetal EKG komplekslerinden T/QRS oranlarını hesaplar ve normal **baseline** hesaplar
- Her 30 EKG kompleksi baseline değerle kıyaslayıp ekrana ‘X’ olarak yansıtır
- 150 atım / dk FKH’da yaklaşık 5 X dk

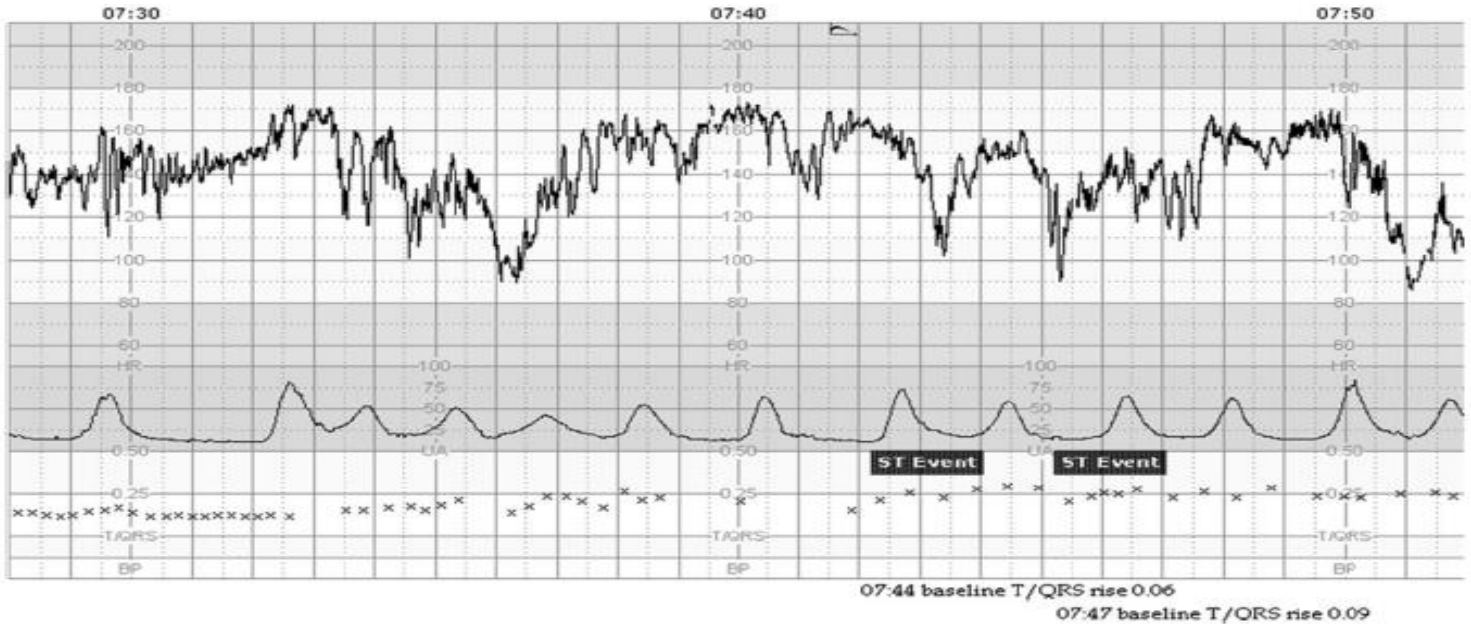
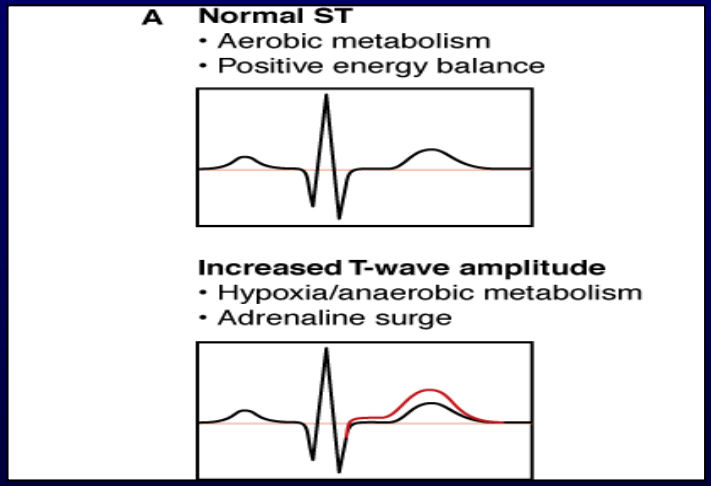


Fig. 1. Example STAN-recording, showing an abnormal CTG pattern with two significant ST events, baseline T/QRS rise 0.06 and 0.09, respectively (paper speed 1 cm/min).

Fetal distressle ilişkili fetal EKG değişiklileri

- T dalga ampl artış
- T/QRS oran artış
- Bifazik ST segment



Classification of Cardiotocographic Patterns According To FIGO Guidelines 2015 / ST Changes

Classification of cardiotocographic patterns according to FIGO guidelines [19]

Cardiotocographic classification	Baseline heart frequency	Variability Reactivity	Decelerations
Normal	110–150 beats/min	5–25 beats/min Accelerations	Early decelerations Uncomplicated variable decelerations with a duration of <60 s and a beat loss of <60 beats/min
Intermediary[a]	100–110 beats/min	>25 beats/min without accelerations	Uncomplicated variable decelerations with a duration
	150–170 beats/min Short bradycardia episode	<5 beats/min for >40 min	of <60 s and a beat loss of >60 beats/min
Abnormal	150–170 beats/min and reduced variability	<5 beats/min for >60 min	Repeated late decelerations
	>170 beats/min	Sinusoidal pattern	Complicated variable decelerations with a duration of >60 s
Preterminal	Total lack of variability and reactivity with or without decelerations or bradycardia		

ST-changes that prompt clinical intervention such as delivery or solving a cause of fetal distress

	Intermediary CTG	Abnormal CTG
Episodic T/QRS rise (duration < 10 min)	Increase >0.15 from baseline	Increase >0.10 from baseline
Baseline T/QRS rise (duration ≥ 10 min)	Increase >0.10 from baseline	Increase >0.05 from baseline
Biphasic ST (a component of the ST-segment below the baseline)	Continuous >5 min or >2 episodes of coupled biphasic ST type 2 or 3	Continuous >2 min or >1 episode of coupled biphasic ST type 2 or 3

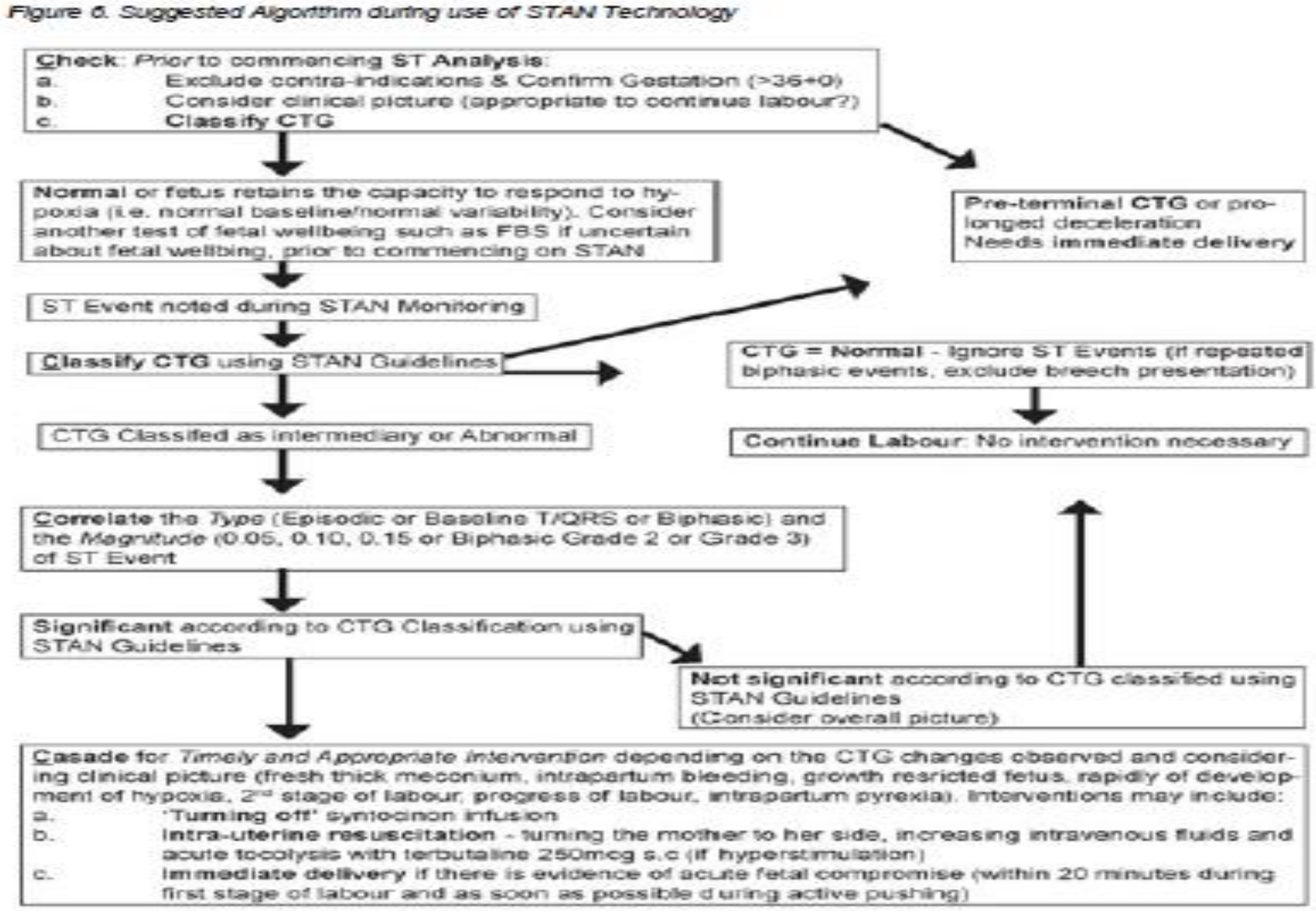
The ST log requires 20 min of recording for automatic ST-analysis to start. A decrease in signal quality with insufficient number of T/QRS measurements requires manual data analysis.

[a] Combination of several intermediary observations will result in an abnormal CTG.

STAN®

- STAN® CTG ve ST değişikliklerinini kombine değerlendirmesini sağlar
- CTG FİGO 2015
  - Normal → ST gerek yok
  - İntermediary(or suspicious)→
  - Abnormal(or pathological) →Dogum, FBS yada diğer nedenlerin düzeltilme kararı ST değişiklerine göre
  - (Pre)terminal →Doğum

STAN® algoritma



Cochrane Library

Cochrane Database of Systematic Reviews

Fetal electrocardiogram (ECG) for fetal monitoring during labour (Review)

Neilson JP

Neilson JP.
Fetal electrocardiogram (ECG) for fetal monitoring during labour.
Cochrane Database of Systematic Reviews 2015, Issue 12. Art. No.: CD000116.
DOI: 10.1002/14651858.CD000116.pub5.

www.cochranelibrary.com

Fetal ECG plus CTG vs CTG

7 çalışma

- 27403 hasta
  - Amer-Wahlin 2001
  - Belfort 2015
  - Ojala 2006
  - Strachan 2000
  - Vayssiere 2007
  - Westerhuis 2010
  - Westgate 1993

- Primer sonuçlar
  - Maternal
    - CS
  - Fetal
    - Metabolik asidoz
    - Neonatal ensefalopati
- Seconder sonuçlar
  - Maternal
    - Fetal kan örneklemesi
    - Operatif vajinal doğum
  - Fetal
    - 5. Apgar skor <7
    - Neonatal entubasyom
    - NICU
    - Perinatal ölüm
    - Serebral palsy

Neilson JP. Fetal electrocardiogram(ECG) for fetalmonitoring during labour. Cochrane Database of Systematic Reviews 2015

Primer Sonuçlar

- CS (RR 1.02, 95%CI 0.96 to 1.08)
- Metabolik asidosis (RR 0.72, 95% CI 0.43 to 1.20)
- Neonatal ensefalopati (RR 0.61, 95% CI 0.30 to 1.22)

FARK YOK

Sekonder Sonuçlar

- **FBS (RR 0.61, 95% CI 0.41 to 0.91)**
- **Operatif vajinal doğum (RR 0.92, 95% CI 0.86 to 0.99)**
- 5. Apgar skor <7 (RR 0.95, 95% CI 0.73 to 1.24)
- Neonatal entubasyon (RR 1.37, 95% CI 0.89 to 2.11)
- NICU (RR 0.96, 95% CI 0.89 to 1.04)
- Perinatal ölüm (RR 1.71, 95% CI 0.67 to 4.33)

CTG + ST analiz ile vajinal operatif doğumda 10% ve fetal kan örneklemede 40% azalma, metabolik asidoz ve diger fetal sonuçlar fark yok

STAN® Limitasyonlar

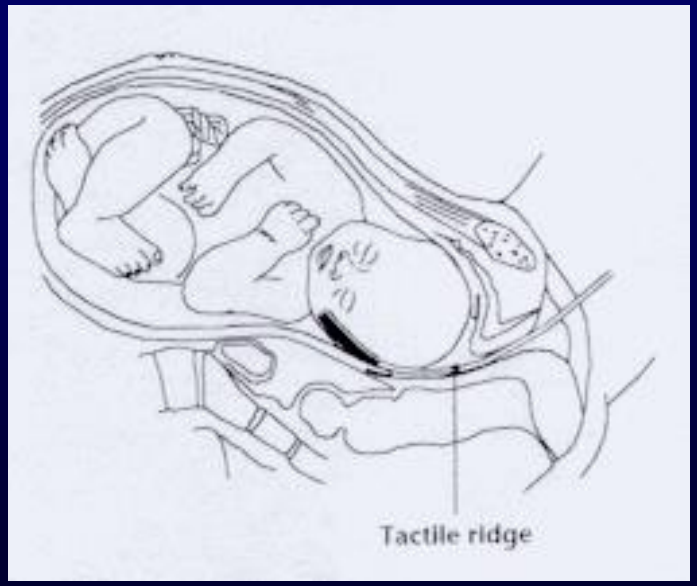
- Sadece 36 hafta üzeri kullanım
- Bazı yapısal kalp hastalıklı fetuslarda kullanım
- Internal monitorizasyon gerekliliği
- Aşırı fetal saç varlığında düzgün elektrik sinyal sağlama
- Maternal diabet , ateş kullanım?
- Doğumun 2. evresinde kullanımı(baseline ve ST değişiklerini saptamak için yetersiz zaman)

Sonuç

- ST analiz çalışmaları devamlı CTG esnasında ST analizi kullanımını kuvvetle destekleyecek belirgin klinik fayda göstermemiş olup operatif doğum ve fetal kan örneklemede azalma göstermiştir
- Eksternal monitorizasyon kolay, non invazif cogu zaman tatmin edici traseler saglar
- ST analiz güven vermeyen trase varlığında kullanılabilir

Fetal Pulse Oksimetri

- Yaygın kullanım yok.
- >30% üzeri normal kabul edilmekte.
- Meta-analizde fayda yok (COCHRANE 2014)



ÖZET