The psychological status and anxiety in normal and high risk pregnancies

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Objective: This study was conducted with the aim of determining the level of anxiety and problems experienced by pregnant women in their last trimester who came to the prenatal clinic for check-up and pregnant women who are hospitalized because of a risk factor related to pregnancy
Method: The research was conducted as a descriptive and comparative study. 100 women having a high risk pregnancy and 100 women experiencing a healthy pregnancy participated in the research. Women's anxiety was measured using Spielberger's State and Trait Anxiety Inventory.
Results: In this study both the healthy (X=50.59) and the at-risk pregnant women (X=50.43) had trait anxiety score means clearly higher than normal. In addition, although not as high as the trait anxiety score means, both the at-risk (X=42.17) and the healthy pregnant women (X=43.17) had higher than normal state anxiety score means. The hospitalized pregnant women's highest rate of anxiety was that their current risk factor would hurt their infant and were bothered by and worried of being hospitalized. Furthermore, increase in the period of hospitalization as well as livings in rural areas as compared to urban areas were found to be factors leading to higher anxiety.
Conclusions: Nurses and midwives need to exert more effort in recognizing the emotional problems experienced by women and their families during pregnancy to ensure that holistic care is provided which will support pregnant women emotionally and psychologically to decrease the negative effects caused by stress.

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Continuous FHR scoring-procedures: A new approach

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Background: Hypoxia and acidosis influence both the fetal heart-rate (FHR) and all acid-base variables of the fetus. We aimed at a clinically valid pH-prognosis by electronic evaluation of FHR-patterns.
Methods: The FHR-signal during the last 30 min. of delivery of 471 fetuses was stored and further processed electronically (MATLAB). Oscillationamplitude (OA), microfluctuation (MICRO) and the mean frequency (FRQ) were computed for every min. After adjustment of each parameter according to empirical weighting a new index was designed:
WAS-index =MICRO * FRQ / OA. The mean of 30 subsequent WAS-indices was named WAS-score. This score was correlated (r, Rho) with pH, BEoxy., pCO2 and sO2 measured (RADIOMETER) in umbilical artery blood immediatley after birth. Using linear regression analysis each WAS-score was used for pH-determination. Moreover the WAS-index (computed for one min.) could be determined every second which leads to 60 pH-values / min.(using again regression analysis) which now serve for continuous control of fetal well-being.
Results: Correlation-analysis of the WAS-score with pH, BEoxy., pCO2 and sO2 leads to the following coefficients: r =0.644, 0.570, -0.500 and 0.254 respectively. P all <<0.0001. The behavior of the index is demonstrated by video in two fetuses with terminal acidosis. The adjustment procedures are demonstrated as well.
Conclusions: Fetal acidaemia can be predicted with the WAS-score in clinically reasonable limits using only OA, MICRO and FRQ after adequate adjustment of each variable. Computation of the WAS-index every sec. Thus leads to continuous control of fetal well-being which seems to be quite similar to a continuous pH-evaluation. The original CTG remains untouched.

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Spectral power of fetal heart rate variability can be used to predict fetal scalp blood pH

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Introduction: Spectral analysis of fetal heart rate variability is related to fetal condition. Previous studies found that an increased normalized low frequency (LFn) power is associated with fetal acidosis. In addition to fetal monitoring by cardiotocogram, fetal scalp blood sampling and STAN® are used to reduce the number of unnecessary interventions for presumed fetal distress. The objective was to study if normalized low frequency spectral power can predict fetal scalp blood pH.
Methods: Ten-minute continuous STAN® segments, preceding the scalp blood measurement, were used to determine fetal beat-to-beat heart rate. Spectral analysis was performed using a Fourier transform. Spectral power in the low frequency band (0.04-0.15Hz) was calculated. In addition, normalized values were determined by dividing low frequency power by total power (0.04-1.5Hz). Fetal scalp blood pH values were predicted from LFn power. Some of the women included underwent more than one fetal scalp blood sample. Therefore, linear regression models were estimated on the basis of the method of generalized estimating equations.
Results: In total 39 fetal blood samples from 30 patients were studied. We found that LFn power could significantly predict fetal scalp blood pH. The estimated ß of LFn was -0.4 (95% confidence interval (CI) -0.7 to -0.1) and the odds ratio was 0.69 (95% CI 0.51-0.94).
Conclusion: LFn power can significantly predict fetal scalp blood pH. Spectral values might be incorporated into STAN® to decrease false negative Results. However, prospective studies should be performed in advance.

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The use of PR interval - fetal heart rate correlation analysis in intrapartum fetal monitoring: A systematic review of the literature

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Background: Since the introduction of continuous electronic monitoring has not benefited neonatal outcome and led to increased intervention rates, new methods for fetal surveillance have been investigated. Research into fetal electrocardiogram waveform changes has focused on morphologic features (T/QRS complex) and time interval (PR interval) changes. Time interval changes are robust measurements thought to be especially useful when the fetal electrocardiogram is obtained from electrodes on the maternal abdomen. We aimed to assess the diagnostic properties of the PR interval – fetal heart rate correlation analysis.
Methods: A systematic search was performed in the electronic databases CENTRAL (Cochrane Library), EMBASE and MEDLINE up to March 2009. Articles that described PR interval – fetal heart rate correlation analysis and compared conduction index or ratio index with any measure of fetal outcome, such as umbilical blood-gas values, were included.
Results: Six studies met the inclusion criteria, assessing the outcome of 2413 fetuses. In 2202 cases sufficient data was obtained for analysis. The Results of included studies will be pooled to define diagnostic properties of the test.
Discussion: While the Results of four observational trials and one randomized controlled trial were promising, a large multi-centre randomized controlled trial did not show a significant benefit from using PR-interval – fetal heart rate correlation analysis. There are indications this could be due to non-adherence to the protocol.
Conclusion: The Results of studies regarding the use of PR interval – fetal heart rate correlation analysis in conjunction with cardiotocography in fetal monitoring are inconclusive.

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Complex fetal assessment during labor

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The common cause of fetal morbidity and mortality is perinatal asphyxia – medical, ethical and forensic problem. We evaluated correlations and validity of different methods and their combinations for fetal distress diagnosis.
Simultaneous continuous intrapartum monitoring with cardiotocography (CTG), fetal pulse oxymetry (FPO) and the analysis of ST segment of fetal ECG (STAN) was performed in 67 term deliveries. Fetal metabolic status was verified by examination of acid-base parameters, umbilical concentrations of lactate, erythropoietin (EPO), and protein S100B. The criterion for metabolic acidosis (MAC) was pH<7.15, resp. BD>12mmol/l.
Significant differences have been found among non-acidotic (n=36) and acidotic (n=31) fetuses in the CTG, FPO, acid-base parameters, and lactate and EPO concentrations. The most valid biophysical approach in fetal distress diagnosis was combination of simultaneous continuous monitoring with CTG, FPO and STAN (Spearman test: $p<0.05$, Kendall test: $p<0.0005$). Effective monitoring time decreased subsequently: CTG–STAN–FPO. Our Results confirmed an excellent correlation between acid-base parameters, lactate and EPO levels. The best validity for MAC prediction had lactate concentration. The highest sensitivity had lactate and EPO concentrations, and the highest specificity had simultaneous continuous monitoring (CTG, FPO and STAN) and lactate levels.
The most objective diagnostic approach of fetal distress is a simultaneous continuous monitoring with CTG, FPO and STAN with complex postpartum verification of fetal metabolic status with acid-base parameters, umbilical lactate, and EPO levels.

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External FHR-monitoring: Do we really trace the fetus?

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Introduction: Signal ambiguity can Result in unexpected outcome with external fetal heart rate (FHR) monitoring (1). This is due to difficulties to differentiate between fetal and maternal heart rate signals visually and by the autocorrelation technique. Therefore the question arises whether external FHR monitoring systems always trace the fetus reliably.
Patients and Methods: In 7 patients, both maternal and fetal heart rate were siltmultaneously traced on separate tracks during labor and delivery. External FHF monitoring systems for twins were used, with the FHR on the first, and the maternal heart rate on the second track. Occasionally the FHR was traced directly by an internal fetal scalp electrode.
Results: In only 2 patients fetal and maternal heart rate could be clearly differentiated visually over the complete monitoring period. The other 5 patients showed repetitive periods during which maternal and fetal heart rate interfered with each other. In one case a pattern of repetitive FHR decelerations appeared simultaneously with maternal accelerations. Without the double tracing in this case the maternal accelerations might have been misinterpreted as fetal well-being leading to a seemingly unexplainable adverse fetal outcome.
Conclusion: Our study shows that it might often be necessary to either use direct internal FHR registration or double tracing of maternal and fetal heart rate signals in order to identify the fetus clearly at any time during labor and delivery. Visual identification of external FHR patterns, generated by the autocorrelation technique, may be misleading.

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Does access to computerized cardiotocogram analysis affect the clinical prediction of newborn umbilical ph and apgar scores?

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Objective: To evaluate whether access to computerized CTG (cCTG) analysis affects clinicians' reproducibility and validity in prediction of newborn umbilical artery blood pH (UAB) and Apgar scores (As).
Methods: Intrapartum CTG tracings of singleton term-pregnancies monitored internally until a maximum of 5 or 20 minutes before vaginal or caesarean delivery, respectively (n=204) were randomly assigned to computer analysis by Omniview-SisPorto 3.5® (n=104) or no analysis (n=100). Three obstetricians were asked to evaluate tracings independently and to predict the newborn's UAB and As. Inter-observer agreement and precision on prediction of these values were assessed using the Intraclass Correlation Coefficient (ICC), percentage of correct predictions within 0.10 of real pH values and a margin of 1 for As, and the Limits of Agreement (LA), all with 95% confidence intervals (95%CI).
Results: Interoberver agreement on UAB estimation was significantly higher in the cCTG group [ICC=0.70 (95%CI=0.61-0.77) versus ICC=0.43 (95%CI=0.21-0.60)], and this group also showed non-significant trends towards higher agreement on estimation of 1 and 5-minute As. In the cCTG group observers predicted UAB correctly in 70% of cases (95%CI=0.61-0.79), while in the control group this occurred in 46% (95%CI=0.35-0.56). LA for observer-outcome agreement in UAB estimation were -0.16; +0.11 in the cCTG arm and -0.21; +0.14 in the control group. Non-significant trends were seen towards a better prediction of As with access to cCTG.
Conclusions: Access to computerised analysis of CTGs significantly improves interobserver agreement between clinicians and their precision in prediction of newborn UAB.

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Maternal body-mass-index has a relevant impact on the signal quality of fetal heart rate traces and on academia at birth

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Objective: Is there a relation between maternal weight (BMI kg/m2), the signal processing of the fetal heart rate monitor, the quality of the displayed fetal heart rate traces and the acidemia after birth?
Methods: In a prospective randomized observational study 354 deliveries very surveilled with the most recent fetal heart rate monitores from HME (Sonicaid FM 800) und Philips (Avalon FM 30+50). During the study Philips developed a new algorithm which was applied in 101 deliveries while the classic software was used in 136 cases. The HME technology was applied to 117 fetuses. The three groups did not differ concerning maternal age, parity, BMI in early pregnancy and at term. Each heart rate trace was analyzed in steps of one second in the last hour of stage I and the last 30' of stage II.
Results: The time of signalloss increased with BMI. In stage I the median time without detected fetal heart rate rose from 2' and 20'' (BMI<30) to 4' (BMI>30) and in stage II from 3'30'' (BMI<30) to 4'30'' (BMI>30). Acidemia in the umbilical artery after birth was more often with overweight (BMI<30.0: 19.5%, BMI<30.0: 26.5%), p =0.046. The rate fetal scalp blood samples during delivery rose with maternal overweight.
Conclusion: The most recent fetal monitoring technology provides an almost 95% exploitation of reliable heart rate signals. However maternal overweight is a relevant risk for fetal surveillance and leads to increased academia.

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Homemonitoring of high risk pregnancies by midwives of the Academic Medical Centre, Amsterdam

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During the nineties of last century in the Academic Medical Centre in Amsterdam a successful investigation runs, entitled: “Fetal monitoring at home in high-risk pregnancy”, an integrated clinical and economic evaluation.
The study shows no contraindications for the implementation of domiciliary maternal and fetal monitoring. It shows that obstetrical and neonatal outcomes were not affected as ante-natal monitoring in the hospital would be replaced by monitoring at home. This homemonitoring (HM) is just as safe as monitoring in the hospital. Included for HM are still women with high risk pregnancies, indicated for daily fetal and maternal surveillance, who have restricted mobility.
Suitable portable equipment for fetal surveillance at home, even as capable professionals, the secondary care midwives of the AMC, stand for quality and continuity of care. This hospital care at home requires strict protocols for patient and caregiver concerning ability, responsibility and communication skills. Important patient conditions are the distance to hospital and an appropriate daily care by family and friends in a suitable home.
The daily surveillance include: CTG, blood pressure, blood research, urine tests and observation of the patient. HM is a challenge for professionals to work outside the hospital with other responsibilities. Autonomy and a more in balance family life are huge advantages for women.
At present 20 hospitals in The Netherlands are offering HM to their patients.

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Objective and non-invasive detection of fetal movement

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Reduced fetal motility is associated with fetal death. Since maternal perception is liable to significant inter-patient variability, clinical actions based on fetal movement counting by the mother do not necessarily improve fetal outcome. If it were possible to assess fetal movement in an objective way, however, this would resolve issues on maternal impartiality and hence could become of significant value in supporting cardiotocography for ante partum fetal monitoring.
Building on a method to extract the fetal electrocardiogram (fECG) from electrophysiological recordings on the maternal abdomen, we conceived a method for non-invasive and objective monitoring of fetal movement. By describing the spatial fECG unambiguously through the fetal vectorcardiogram (fVCG), variations in the fECG are related to movement of the fetal thorax. Moreover, visualization of the evolution of the fVCG over time provides a direct indication of fetal movement and has been validated by comparing it to simultaneously performed ultrasound analysis.
This comparison suggests that automated analysis of the fVCG across successive heartbeats should permit physicians to monitor fetal movements quantitatively and objectively for long periods of time, thus providing vital information on fetal motility and sleep/activity patterns. Moreover, as the method does not expose the fetus to ultrasound, it can be applied 24 hours per day.
This approach may pave the way to a non-invasive, automated, reliable, and objective method to monitor fetal movements during all states of pregnancy, 24 hours per day. With future research it might be supplemented with fECG analysis, further enhancing its diagnostic value.

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