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Oxytocin and dystocia as risk factors for adverse birth outcomes: A cohort of low-risk nulliparous women

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ABSTRACT

Objectives: augmented and not augmented women without dystocia were compared to investigate associations between oxytocin and adverse birth outcomes. Augmented women with and without dystocia were compared, to investigate associations between dystocia and adverse birth outcomes.
Design: a cohort of low-risk nulliparous women originally included in a randomised controlled trial.
Setting: the Department of Obstetrics and Gynaecology, Østfold Hospital Trust, Norway.
Participants: the study population consists of 747 well defined low-risk women.
Measurements: incidence of oxytocin augmentation, and associations between dystocia and augmentation, and mode of delivery, transfer of newborns to the intensive care unit, episiotomy and postpartum haemorrhage.
Findings: of all participants 327 (43.8%) were augmented with oxytocin of which 139 (42.5%) did not fulfil the criteria for dystocia. Analyses adjusted for possible confounders found that women without dystocia had an increased risk of instrumental vaginal birth (OR 3.73, CI 1.93–7.21) and episiotomy (OR 2.47, CI 1.38–4.39) if augmented with oxytocin. Augmented women had longer active phase if vaginally delivered and longer labours if delivered by caesarean section if having dystocia. Among women without dystocia, those augmented had higher body mass index, gave birth to heavier babies, had longer labours if vaginally delivered and had epidural analgesia more often compared to women not augmented.
Key conclusion: in low-risk nulliparous without dystocia, we found an association between the use of oxytocin and an increased risk of instrumental vaginal birth and episiotomy.
Implications for practice: careful attention should be paid to criteria for labour progression and guidelines for oxytocin augmentation to avoid unnecessary use.

Introduction

Oxytocin is often used to treat dystocia, which is characterised by abnormal slow progress of labour, and is among the most common challenges in birth care, especially for primiparous women (American College of Obstetricians and Gynecologists Committee on Practice Bulletins—Obstetrics, 2003; Kjærgaard et al., 2008; Bugg et al., 2011).

An expected progression of 1 cm/hour in the active phase of the labour for nulliparous women is widely referred to, but it is also suggested that this expected progression could be overrated and contribute to an unnecessary high intervention rate (Neal et al., 2010a, 2010b). More recently a rate below 0.5 cm/hour is taken as the threshold for treatment (Bugg et al., 2011). The lack of consensus on how to define dystocia (Kjærgaard et al., 2008; Selin et al., 2008) may lead to an over diagnosing of dystocia, and this is of great concern because dystocia is among the most common indications for caesarean sections (Neal et al., 2010b).

Causes of dystocia can be cephalopelvic disproportion, deflection attitude, occiput-posterior position and inefficient uterine contractions of which the latter is the most frequent (O'Driscoll et al., 2003). Other aspects may also be taken into consideration when discussing causes of dystocia, e.g. psychological factors, high age, high body mass index

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(BMI), infertility, epidurals and stress during labour (Nerum et al., 2010; National Medical Indications, 2011).

The consequences of augmentation of labour with oxytocin, both positive and negative, are subject to investigation and attention worldwide (Oscarsson et al., 2006; Berglund et al., 2008; Reuwer et al., 2009; Clark et al., 2009; Bugg et al., 2011; Wei et al., 2012). Even though the results should be interpreted with caution, observational studies have found associations between the use of oxytocin and adverse outcomes for newborns (Oscarsson et al., 2006; Kjærgaard et al., 2009), and increased operative birth rates (Bugg et al., 2006; Oscarsson et al., 2006; Kjærgaard et al., 2009). The use of oxytocin is associated with a reduction in time to delivery, which might be considered as a positive consequence to some women (Bugg et al., 2006).

It is still a major challenge to predict if adverse maternal and neonatal birth outcomes are related to the cause of augmenting or to oxytocin itself (Kjærgaard et al., 2009). A study from Sweden reveals that severe asphyxia considered to be a result of malpractice, in 71% of the cases was due to incautious use of oxytocin (Berglund et al., 2008). This strengthens the role of oxytocin as a potent drug that should be administered with care (Clark et al., 2009). A Cochrane review from 2011 concluded that the use of oxytocin is associated with a reduction in duration of labour, but showed no significant differences in caesarean section rate or other adverse outcomes for the mother or the baby (Bugg et al., 2011).

The aims of this study were: To describe the use of oxytocin augmentation in nulliparous women who were assessed to be low-risk at onset of spontaneous labour, and to study associations between dystocia and adverse birth outcomes, and associations between oxytocin augmentation and adverse birth outcomes.

Methods

At the Department of Obstetrics and Gynaecology, Østfold Hospital Trust with approximately 3200 births per year, a randomised controlled trial (RCT) was carried out during the period 2006–2010 including 1111 low-risk women of which 747 were nulliparous. The RCT compared birth outcomes in three birth care units placed on separate floors: The midwife-led unit, organised for low-risk women who want as little intervention as possible, the normal unit for women with expected normal births, and the special unit for women who are in need of extended surveillance.

To participate in the RCT every woman had to fulfil inclusion criteria similar to those of the midwife-led unit; healthy, low-risk women without any disease known to influence the pregnancy and spontaneous onset of labour with gestational age between week 36+1 and 41+6. All participants gave a written consent and none of the participants expressed a preference of birth care unit. The outcomes of the RCT were: mode of delivery, oxytocin augmentation, pain relief, postpartum haemorrhage, sphincter injury and outcomes of the newborns. The results of this RCT, recently published, revealed that participants randomised to the midwife-led unit were more likely to deliver without oxytocin augmentation compared to the normal unit and the special unit (Bernitz et al., 2011). It was also found that low-risk nulliparous women were augmented with oxytocin in an unexpected amount at all three units, and that oxytocin, to some extent, was given without apparent indication. Consequently the use of oxytocin augmentation in low-risk nulliparous women was investigated further using secondary data from the RCT.

At Østfold Hospital trust there is a clear definition of active labour and labour dystocia. Active labour is defined from the point when regular progressive contractions are established at least every five minutes and the cervix is dilated at least 3–4 cm, until the cervix is fully dilated. When in active phase, an alert-line is drawn on the electronic partogram expecting a cervical dilatation of 1 cm/hour. Parallel to the alert line two hours to the right, an action line is drawn, and dystocia in the first stage is diagnosed if the action line is crossed. The second stage is defined from the point where the cervix is fully dilated until the baby is born. The second stage is divided into the latent phase, and the expulsion phase. Dystocia in the second stage is diagnosed for nulliparous women if lasting longer than two hours, three hours for women with epidural analgesia, or if the expulsion phase lasts longer than 60 minutes.

If the action line is crossed, an intervention is considered. If the membranes are intact, an amniotomy is conducted. If this procedure does not affect the progression and there is a normal fetal heart rate pattern and no malpresentation, oxytocin infusion is administered by a midwife following the department's guidelines. If dystocia occurs in the second stage, an obstetrician is to be consulted before initiating oxytocin infusion. Prescribed dose of oxytocin infusion is 10 IU (10,000 mU) in 1000 ml physiological saline with an initial dose of 5 mU/minute. The dose is increased by 5 mU every 30 minutes until five contractions in 15 minutes are reached. Maximum dosage is 30 mU/minute. At the Østfold Hospital Trust a two-hour action line is used. This is common in Norwegian obstetric departments although a four-hour action line is recommended internationally if an action line is included in the partogram (Technical Working Group WHO, 1997; National Institute for Health and Clinical Excellence, 2007).

Statistical methods

All women in this study received intravenous oxytocin when augmented. Augmented and not augmented women without dystocia were compared to investigate associations between oxytocin and adverse birth outcomes. Augmented women with and without dystocia were compared to investigate associations between dystocia and adverse birth outcomes.

Dependent variables were mode of delivery, presented as caesarean section, instrumental vaginal birth and spontaneous birth, haemorrhage >500 ml, episiotomy, anal sphincter injury, transfer to the neonatal intensive care unit (NICU) and Apgar score <7 at five minutes. Independent variables were oxytocin augmentation (no versus yes) and dystocia (no versus yes). The statistical tests conducted on data reported in Tables 1–3 are as follows: When the data from a variable are presented as mean (SD), an independent samples *t*-test is used. When the data from a variable are presented as *n* (%), a χ^2 or Fishers Exact test is used as appropriate.

Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated. Adjusting variables were birth weight, birth care unit, epidural analgesia, gestational age, cervical dilatation upon admission and duration of labour. The adjusting variables were selected based on factors known to affect the outcomes, for example the effect of epidural on caesarean section (Eriksen et al., 2011), and also based on clinical experience. Duration was estimated from the onset of the active phase of the first stage or from admission to the labour ward if already reached this phase. All statistical analyses adopted the significance level of 5%. Univariate logistic regression analyses were performed to estimate associations between the covariates and the outcomes, and multivariate analyses were performed to adjust for confounders. Colinearity between the variables was measured by the variation inflation factor (VIF) statistic which is a colinearity diagnostic tool in regression analysis in the SPSS. None of the variables had a VIF >5; hence all independent variables were included. In each multivariate analysis, the numbers of adjusting variables were kept below 10% of the number of events. A one-way Anova was used to compare means. For outcomes with few cases (Apgar score <7 at five minutes (9 cases) and anal sphincter