

ADVANTAGES AND DISADVANTAGES OF OXYTOCIN DURING LABOUR

J. de Haan

I. INTRODUCTION

The history of oxytocin in obstetrics varies from a very liberated use without almost any fear for danger or disadvantages to an almost complete condemnation of the use of this drug. Oxytocin was especially discredited by the intramuscular route of administration. On the other hand caused the intravenous administration by infusion pump a very liberated use of this drug finally resulting in the so called day-light obstetrics. Despite this, again certain doubts arise concerning the safety and possible risks of the use of oxytocine in obstetrics.

II. PHYSIOLOGICAL PROCESS OR PHARMACOLOGICAL PROCEDURE

The chemical structure of the synthetically produced oxytocin is identical to the structure of the substance produced by the posterior pituitary gland. This fact has led to the assumption that continuous administration of oxytocin mimics a physiological process i.e. that spontaneous labour at term results from increasing levels of oxytocin.

The main question now is whether the administration of oxytocin, in order to initiate or to accelerate labour, is a physiological process or a pharmacological procedure.

The initiation of labour is one of the complex physiological processes which is up to now poorly understood. A multiplicity of factors are involved which vary probably from species to species but what is the role of oxytocin in this particular process ?

In man no increase of oxytocin release before the onset of labour could be demonstrated. Also during labour no continuous increase of oxytocin could be proven but only a low level spurt release of oxytocin. The frequency of these spurts increased during the course of labour reaching its maximum at the time of the actual delivery of the child (4).

The work of Liggins (11) in sheep proved almost that the fetus initiates its own delivery. Fetal hypophysectomy results in prolonged delivery whilst administration of corticotrophin (ACTH) or corticosteroids results in premature delivery. The production of fetal corticosteroids leads to a decrease in progesterone synthesis, an increase in estrogens, and an increase in myometrical prostaglandins.

It is not clear whether this mechanism is of importance in man. In anencephalics prolonged pregnancy as well prematurity can be found as could be demonstrated in man (10) as well as in hypophysectomized rhesus monkeys (13). This suggests that the mechanism of the onset of labour is completely out of order.

The human fetal pituitary however produces probably no authentic ACTH until term, but releases fragments of this molecule. The switch in production from fragments to the intact ACTH molecule might be of importance in the role of the human fetus in the onset of labour (17).

The posterior fetal pituitary gland is probably also one of the factors in the initiation and maintenance of labour. Fetal oxytocin crosses the placenta and stimulates the uterus. The arteriovenous difference of oxytocin concentration over the umbilical circulation increases progressively to reach a maximum around delivery. It is however not clear whether the fetal

oxytocin release precedes labour or is simply an effect of uterine contractions (5).

These data shortly summarized from literature strongly suggest that continuous administration of oxytocin is a pure pharmacological procedure and mimics by no means the physiological process of onset of labour as many textbooks in obstetrics suggest. This answer to our question means that in addition to the advantages of the drug, possible unwanted or side effects has to be considered.

III. ADVANTAGES

The main sites of action of oxytocin are the uterus, the mammary gland, the kidneys and the cardiovascular system.

The important advantage of oxytocin is the possibility to induce labour if the fetal risks inside the uterus exceed the risks as a newborn. This procedure is only successful in case of a ripe cervix and an engaged fetal presenting part.

The side effects and risks of oxytocin administration are greatly dependent to the route and way of administration, the dosage and the maternal condition. Intramuscular administration has by no way place in modern obstetrics. The consensus is that intra venous administration by infusion-pump offers the best control of dosage. Most patients will react on a dosage less than 10 mU/min. The individual sensitivity of the uterus varies however greatly, especially in cases of toxæmia and meconium stained amniotic fluid.

IV. MATERNAL RISKS

A consequence of intravenous administration of oxytocin is that the mother is more or less confined to bed. Several papers draw attention to the fact that the maternal position during labour determines the intensity, the frequency and coordination of uterine activity. The course of labour in regard to the presentation also is influenced negatively when the patient is immobilized (3, 12, 7).

Synthetically produced oxytocin still shows a slight ADH effect. Although the use of infusion pumps can prevent this complication completely, cases of water intoxication are still reported (1).

A constant intravenous infusion range not exceeding approximately 20 mU/min. has almost no effects upon the arterial blood pressure. Higher continuous infusion dosages cause a slight elevation of blood pressure. This effect is intensified in case of toxæmia and already at lower levels of oxytocin. Rapid single intravenous administered doses cause a serious dramatic decrease in arterial blood pressure. This side effect is of special importance in case of maternal heart disease and or hypovolaemia post partum in cases of uterine haemorrhage. Certain anesthetic procedures even intensify this effect dramatically (9, 18).

Initiation of uterine activity by oxytocin causes in a higher frequency abnormal uterine activity in regard to hypertonia, incoordinated (double shaped) activity and hyperactivity compared to spontaneous labour. Abnormal uterine activity is either defined statistically or related to abnormal reactions in the fetal heart rate pattern. In case of oxytocin induced labour the frequency of uterine hyperactivity seems to be twice as high compared to spontaneous and apparently uncomplicated labour. The same holds for the basal intra-uterine pressure (16,8)

Another remarkable effect concerns the shape of the uterine contraction. The oxytocin induced contraction is almost completely symmetrical, whereas the spontaneous contraction is asymmetrical and skewed to the relaxation phase of the contraction.

Uterine rupture has been reported incidently and may be caused either by an overdosage and or a high individual sensitivity for oxytocin.

V. FETAL RISKS

Numerous papers try to prove the safety or the danger for the fetus in oxytocin induced uterine activity. Novy et. al. (14) showed in the rhesus monkey that each uterine contraction diminishes the blood flow to the placenta remarkably. So abnormal uterine activity might influence the fetal condition even more negatively. Clinical studies concerning this subject show different results either due to not comparable patient groups or to the fact that the results were found retrospectively. It is clear however that possible fetal risk factors greatly depend on the indication of the induction and on the route and way of administration and last but not least on the supervision of the patient. Rapid correction of pathological uterine activity will prevent serious fetal complications (fig. 1, a,b).

Incidently intrauterine transplacental hyponatraemia due to oxytocin has been reported causing neonatal convulsions and respiratory depression (15). Intravenous pump infusion will prevent this complication almost for sure.

VI. NEONATAL RISKS

A part of the fetal problems already listed are also present during the direct neonatal period such as distress and hyponatraemia.

In case of oxytocin induced labour neonatal hyperbilirubinaemia occurs more frequently than in case of spontaneous labour. Beazly and Alderman (2) found an high correlation between the total amount of oxytocin administered and the incidence of neonatal hyperbilirubinaemia.

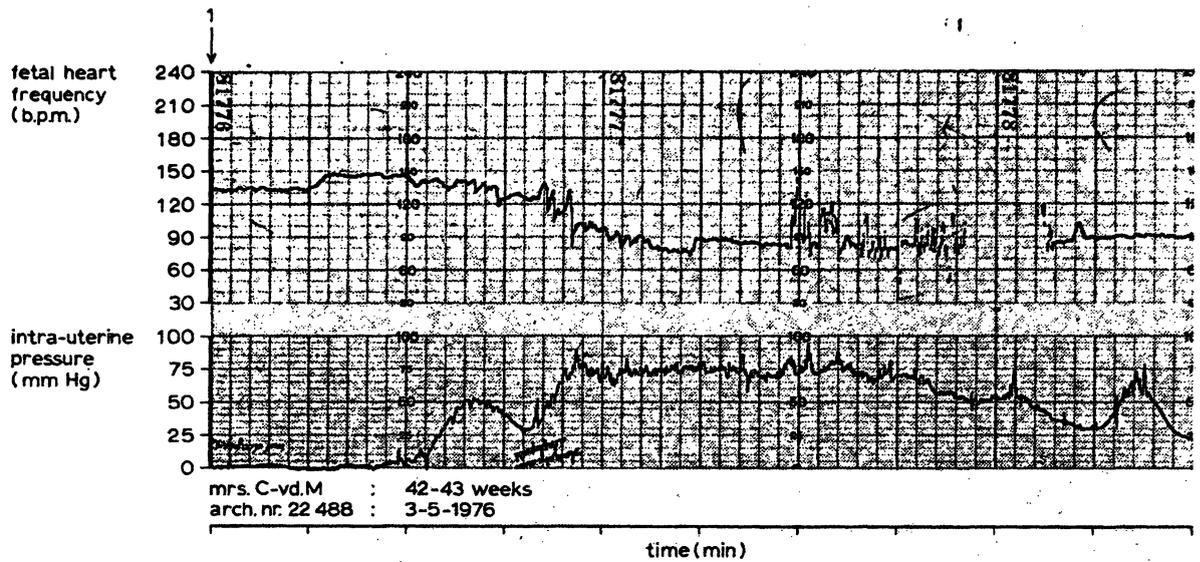
An indirect but serious complication of the liberated use of oxytocin is respiratory distress due to iatrogenic prematurity. This risk is approximately between 1 and 2 percent, but Flaksman et. al. (6) found an incidence of over 3 % in 1000 newborn infants following elective induction of uncomplicated and apparently term pregnancies. Although ultra sonic techniques and or determination of fosfolipids can decrease this figure it never can be prevented completely.

VII. CONCLUSIONS

The immense value of oxytocin in induction and acceleration of labour is beyond question. It is important however to realize continuously that the administration of oxytocin is a pharmacological procedure which does not mimic the physiological process of the initiation of labour.

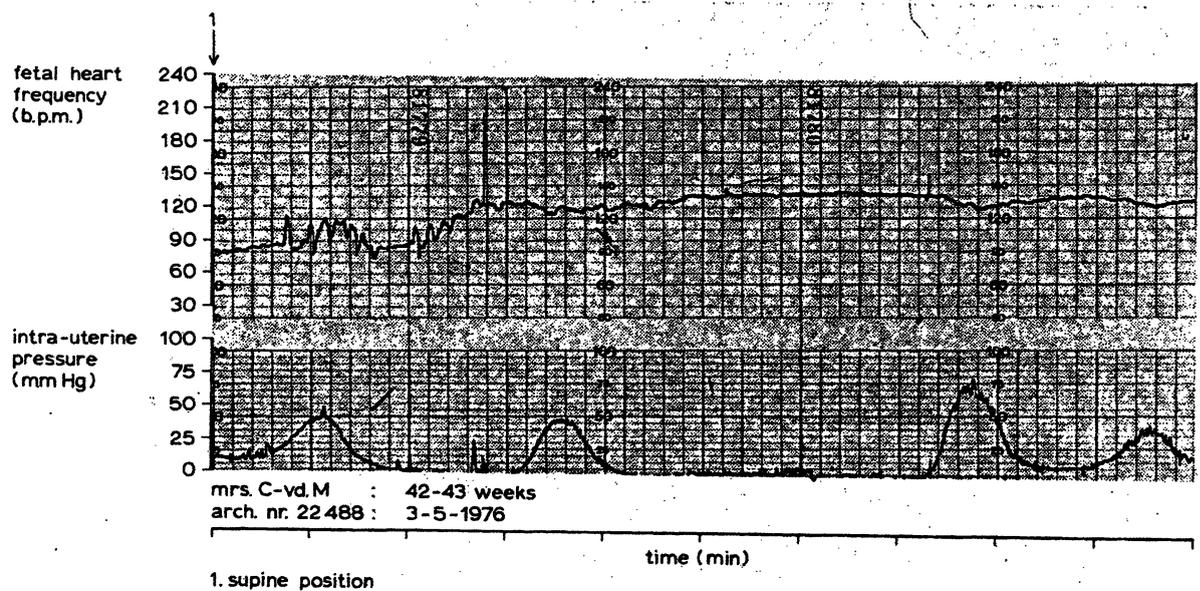
The only correct procedure is the intravenous pump infusion, whereas mother and fetus has to be supervised properly by a qualified staff in a well equiped obstetrical ward.

My personal opinion is that reviewing the possible number of disadvantages due to oxytocin induced labour, initiation of labour in uncomplicated term pregnancies, is not justified.



oxytocin 200 mU / min i.v.

1. supine position



1. supine position

Fig. 1a, b : The effects of oxytocin overdose on uterine activity and fetal heart rate pattern, and its correction. Note the initial increase in fetal heart frequency as first reaction. The overdose was due to miscalculation.

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J. DE HAAN
DEPARTMENT OF OBSTETRICS AND GYNECOLOGY
ZIEKENHUIS ST. ANNADAL
STATE UNIVERSITY LIMBURG
MAASTRICHT
HOLLAND.