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The Effect of Detomidine Hydrochloride on the Electrical Activity of Uterus in Pregnant Mares

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Jedruch, J., Z. Gajewski and J. Kuussaari: The effect of detomidine hydrochloride on the electrical activity of uterus in pregnant mares. Acta vet. scand. 1989, 30, 307–311. – The effect of detomidine on the electrical activity of the uterus was studied during the last trimester of pregnancy in 6 mares.
The effect was observed in 3–5 min after the i.m. injection and it lasted for 50–70 min. 20 and 40 μg/kg b.w. doses of detomidine decreased the myometrial electrical activity, whereas 60 μg/kg dose did not have any effect on the activity.
The results suggested that 20, 40 and 60 μg/kg b.w. doses of detomidine can be administered to mares during the last trimester of pregnancy without the risk of abortion induced by increased uterine electrical activity.

α-agonist; equine sedation; myometrial contractions.

Introduction

Detomidine is a sedative and analgetic compound which has been successfully used in veterinary practice in horses and cattle for a few years now (*Alitalo* 1986, *Jedruch & Gajewski* 1986, *Jöchle & Hamm* 1986, *Szeligowski et al.* 1986). It activates α_2-receptors of the adrenergic system (*Savola* 1986, *Salonen* 1986, *Virtanen* 1986). Previous information indicates that the α-receptor agonist xylazine and phenylephrine induce uterine contractions in cows and ewes (*Le Blac et al.* 1984, *Prudhomme* 1986). Thus the use of α-agonists during pregnancy can create the risk of abortion. Although no abortions were observed in pregnant animals after detomidine administration (*Jedruch & Gajewski* 1986) the risk still exists. It depends on the dose of the drug and the time of its administration (*Jedruch & Gajewski* 1986).
The aim of the present research was to study the effect of different doses of detomidine on the electrical activity of the uterus in pregnant mares.

Material and methods

The experiment was carried out on 6 standardbred mares of 450–500 kg body weight, being in their last trimester of pregnancy. The mares had 3 bipolar electrodes implanted in both uterus horns, 20–30 cm from their ends, and in the corpus of uterus (Fig 1). The electrodes were of 2 types (Fig. 2):

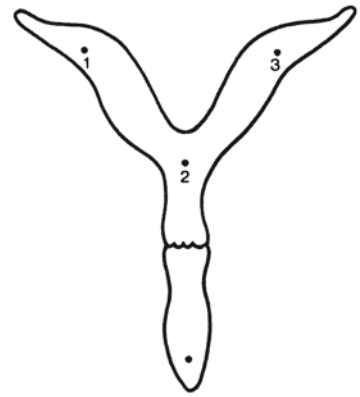

Figure 1. The electrode implantation sites on the uterus.

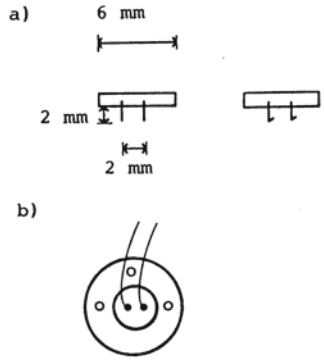

Figure 2. Schematic illustration of the electrodes used a) horizontally b) vertically.

straight (4 mares) and harpoon-shaped (2 mares). The straight electrodes were implanted after making the incision along the white line under general anaesthesia. The harpoon-shaped electrodes were implanted through the incision in the left flank in sedated animals under local anaesthesia.

The electrical activity was recorded using a 6 channel recorder (Recorder Medipan) with the amplifier of biological signals (Biological Amplifier WSB-4). The speed of the tape was 0,4 mm/s. Electrical activities were recorded starting from the 10th day after the surgery. The activity was counted in 10 min intervals and expressed as the activity time in s per 10 min (Fig. 3–5).

Detomidine (Domosedan®, Farmos Group Ltd. Turku, Finland) was administered intramuscularly at 3 different doses: 20, 40 and 60 µg/kg b.w. Each dose was given to 2 different mares. The doses 20 and 40 µg/kg were repeated 4 times and the dose 60 µg/kg 3 times in each mare. The recording started 60 min before the injection and continued for 70 min after the injection.

Figure 3. The effect of 20 µg/kg dose of detomidine on the electrical activity of the pregnant mare uterus. Each graph represents the mean of altogether 8 recordings in 2 different mares.

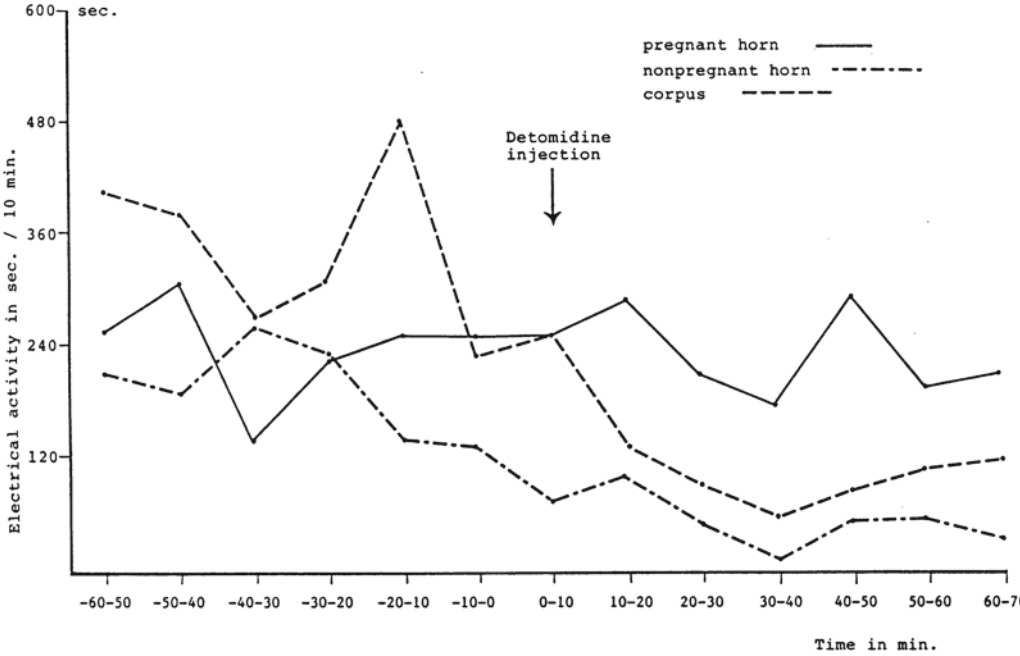

Figure 4. The effect of 40 µg/kg dose of detomidine on the electrical activity of the pregnant mare uterus. Each graph represents the mean of 8 recordings in 2 different mares.

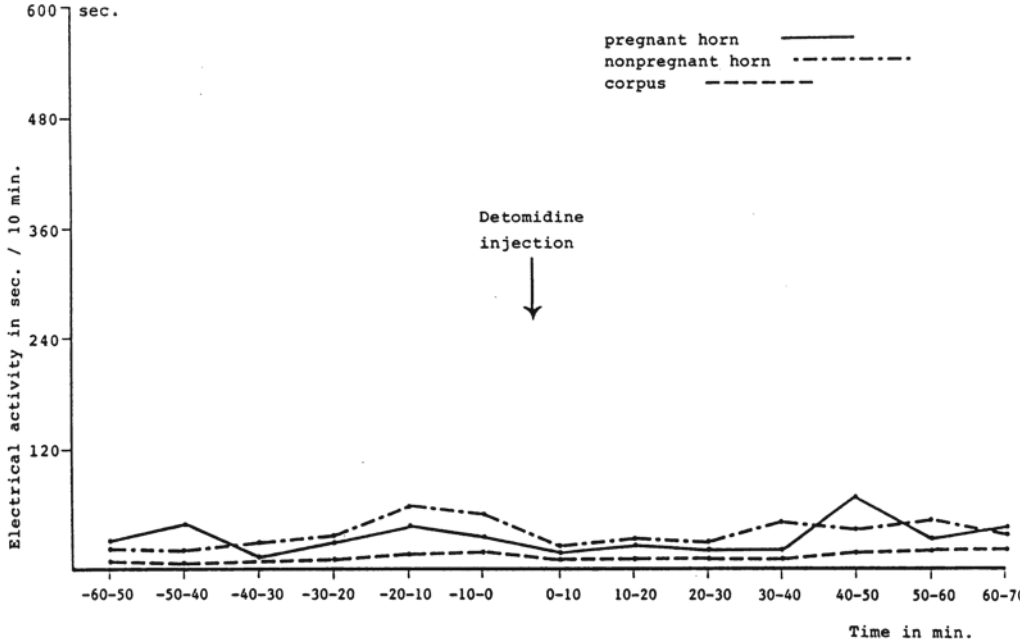

Figure 5. The effect of 60 µg/kg dose of detomidine on the electrical activity of the pregnant mare uterus. Each graph represents the mean of 6 recordings in 2 different mares.

Results

After the administration of detomidine in the dose of 20 μg/kg b.w. the electrical activity of uterus in pregnant mares decreased (Fig. 3). This change was observed in the pregnant horn, corpus and non-pregnant horn. The effect lasted for the whole period of observation.

The dose of 20 μg/kg b.w. of detomidine caused a decrease of electrical potentials and their amplitudes. These changes increased up to 60 min and then the situation returned to that observed before the injection of the drug.

The administration of detomidine in the dose of 40 μg/kg b.w. resulted in a decreased electrical activity of uterus mainly in the corpus and the non-pregnant horn (Fig. 4). In the pregnant horn the electrical activity after the injection of detomidine did not change significantly as compared to that before the injection.

The dose of 40 μg/kg b.w. caused a decrease in the number of electrical potentials and their amplitudes in the corpus and the non-pregnant horn. In the pregnant horn no significant changes in the frequency of potentials were observed and only a slight decrease of their amplitude.

The detomidine dose of 60 μg/kg b.w. did not have any effect on the electrical activity either in the pregnant horn, corpus or the non-pregnant horn of the uterus (Fig. 5). No significant changes were observed either in the frequency of potentials or in their amplitude with this dose.

The results were analyzed statistically using Student's t-test. With the dose of 20 and 40 μg/kg detomidine induced a significant ($p < 0.01$) decrease in the electrical activity of the non-pregnant horn and the corpus of the uterus, while the change in the pregnant horn was not statistically significant. The dose of 60 μg/kg did not induce any significant changes in any of the 3 electrode sites of myometrium.

Discussion

A characteristic of smooth muscle and especially the uterus is its spontaneous contractibility. The uterus contracts also during pregnancy but the contractions are uncoordinated and local, causing only a slight increase of the pressure in the uterus (*Figueroa et al.* 1985, *Harding et al.* 1982, *Hanzen* 1982).

According to *Csapo* (1969), there is an increase of the rest potential during pregnancy resulting from the hyperpolarization of the cell membranes. It hinders the process of cell depolarization to the level producing the action potential.

It is caused by a high local level of progesterone in uterus and predominance of the action of α-receptors of adrenergic system (*Csapo* 1969).

The excessive activation of α-receptors of the adrenergic system can destroy this balance (homeostasis) and increase the contractibility of uterus (*Prudhomme* 1986). Such an action is observed after the administration of xylazin (Le Blac et al. 1984). *Jedruch & Gajewski* (1986) proved that the detomidine dose of 20 μg/kg b.w. decreased electrical activity of uterus in pregnant cows. Higher doses (40 and 60 μg/kg) increased the electrical activity and amplitude of potential but did not lead to abortion. Similar dose-dependent effects of detomidine on the blood pressure in the rat have been observed by *Salonen* (1986). In the present study a decrease of the activity was observed after the administration of the dose of 20 or 40 μg/kg while the dose of 60 μg/kg did not have any effect on the electrical activity of uterus. This finding suggests that normal clinical doses (20–60 μg/kg) of detomidine do not induce contractions in the mare uterus during the last trimester of pregnancy

and hence the risk of abortion due to increased myometrial electrical activity is not increased. However, since α-receptor agonist have well known central and peripheral cardiovascular effects, also these effects must be encountered when evaluating the risks of using these compounds in pregnant animals.

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Sammandrag

Effekten av detomidin hydroklorid på den elektriska aktiviteten i livmodern hos dräktiga ston.

Effekten av detomidin på den elektriska aktiviteten i livmodern undersöktes under den sista trimestern hos 6 dräktiga ston.

Effekten observerades 3–5 min efter i.m. injektion, och den kvarstod i 50–70 min. Doser av 20 och 40 µg/kg kroppsvikt minskade den elektriska aktiviteten i myometriet, medan en dos av 60 µg/kg inte hade någon effekt på aktiviteten.

På basen av dessa resultat kan man utgå ifrån att doser av 20, 40 och 60 µg/kg detomidin /kg kroppsvikt kan ges åt ston under den sista dräktighetstrimestern utan risk för abort inducerad av en ökad elektrisk aktivitet i livmodern.

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