

## Foetal Anaesthesia during In-Womb Surgery

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Received: July 01, 2019; Published: July 29, 2019

Prenatal surgery is a challenging field for the paediatric surgeon [1]; since foetal pain in the second half of pregnancy is now a well established fact, the role of the anaesthetist in foetal surgery has to be implemented as well. Foetuses who do not receive the due analgesic treatment during surgery can be accidentally hurt because of their own sudden antalgic movements. Early pain has to be prevented because of its long-term detrimental effects [2]. This urges us to increase our concern about this field. Data were recently published [3] to assess whether any foetal analgesia was administered during invasive prenatal procedures. In one-third of the cases foetuses received direct anaesthesia, while in two-thirds anaesthesia was administered only to the mother. In most cases, foetal direct analgesia was obtained using i.m. opioids, and muscle relaxants with episodic minor drawbacks on either foetuses or mothers due to foetal analgesia [3].

Several ways of administering analgesics to the foetus are available: transplacentally (after parenteral administration to the mother) or directly to the foetus, using the intravenous, intramuscular or intra-amniotic approach; even the maternal administration of sedatives should be taken into account when evaluating the exact dose to give directly to the fetus. The best routes of administration for these drugs to the foetus are the injection into the umbilical cord and the intramuscular injection. Foetal immobilization is possible using maternally administered sedative drugs such as diazepam, or in vein infusion of remifentanyl. Strumper, *et al.* showed that intra-amniotic sufentanyl was easily absorbed by the sheep foetus and suggested that the intra-amniotic administration of analgesics might provide a simple and effective means of reassuring good and prolonged foetal analgesia [4]. Marc van der Velde reported a useful review of the different approaches possible for either maternal or foetal anaesthesia during foetal surgery [5]. It is utterly important to understand that maternal anaesthesia is not sufficient to anaesthetize both mother and the foetus: after a caesarean sections much foetuses are born awake or slightly sedated, even though their mothers received a general anaesthesia.

While foetal possibility of feeling pain if hurt is supported by a strong group of evidences, the objections to foetal pain like the incomplete development of foetal cortex or the presence of neuroinhibitors in foetal blood seem now obsolete. In fact, foetal cortex development is generally assumed as sufficient to feel pain in the third trimester of pregnancy, and the main hub for mammal pain sentience, the thalamus, is already set around the middle of the gestation. Neuroinhibitors such as adenosine, prostaglandins and pregnanolone are present in foetal blood at higher concentrations than in mothers' blood, but foetal values overlap those of their mothers in several cases, in particular during maternal hyperemesis gravidarum or during eclampsia, and mothers are not anaesthetized for the presence of these levels in their blood [6]. Moreover, these neuroinhibitors do not provide anaesthesia or analgesia, but at most some sedation [7]. Recently a pain scale to assess the level of pain during foetal surgery has been proposed by a Brazilian group of study, evaluating in real time with 3D US scans face movements, according to the NFCS (Neonatal Facial Scoring System), which is validated to detect pain behaviours and suffering healthy and preterm newborns, but never before used during the intrauterine life during acute pain conditions [8].

More research is needed to assess or to rule out the long-term drawbacks of prenatal analgesia, as well as the actual consequences of pain during surgery.

Something more may be done: one single anaesthetist takes care for the mother and the foetus during foetal surgery; maybe foetal anaesthesia should be performed by a specifically trained paediatric team including a dedicated neonatologist and anaesthetist, as it happens for foetal surgery that is performed by specialized paediatric surgeons. This is a challenging field where pioneers are reporting the first successes: a dedicated team for the foetus may be a good step forward.

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**Volume 5 Issue 9 September 2019**

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