

PULMONARY FUNCTION IN THE NEWBORN PUPPY

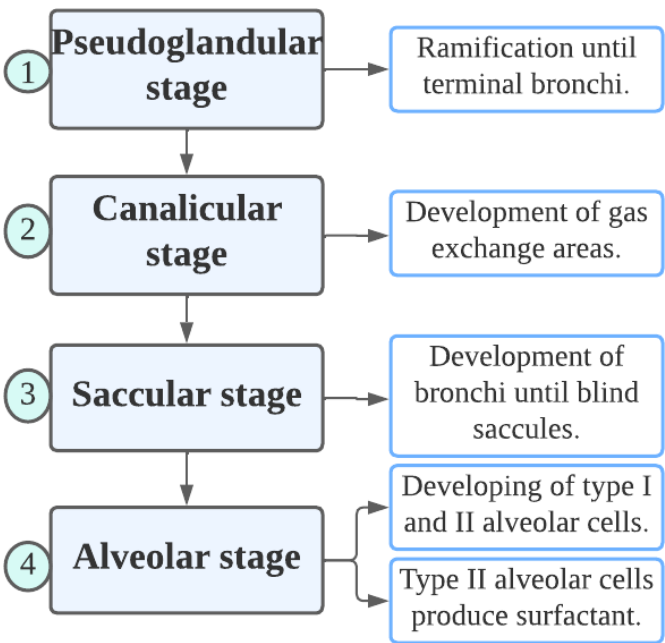
Objectives

The aim of this project was to gain proper understanding of a newborn's pulmonary function, the factors that affect it from prenatal lung development until the neonatal stage and the actions that can be taken to manage neonatal respiratory alterations.

Prenatal stage

Lung development

4 stages:



Lung of a 25 to 27 day-old embryo, Lg: lung, Pb: primary bronchi (Martins et al. 2016).



Dorsal view of lungs, 1:left cranial lobe, 2: right cranial lobe, 3:left caudal lobe, 4: right caudal lobe (Martins et al. 2016).

Surfactant is a tensoactive phospholipid substance that spreads thin on the lungs allowing gas exchange.

At day 57 of pregnancy, foetal lungs ready to adapt to extra-uterine life.



Approximately 46 day-old foetus development (Martins et al. 2016).

Antenatal Corticosteroid therapy

A single dose of betamethasone promotes higher PvO₂, SvO₂ and oximetry values in preterm puppies, higher respiratory rates and more advanced saccular formation and septation. However, it almost does not promote surfactant production.

Delivery

Eutocia, dystocia, caesarean section.

Delivery method can have a tremendous impact on a neonate's pulmonary function at birth, as seen below.

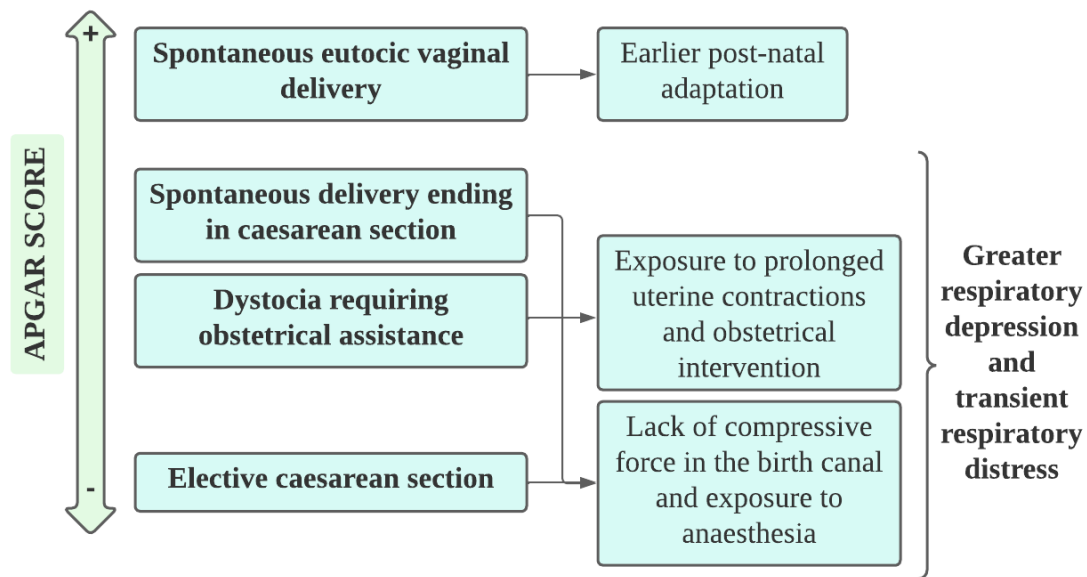


Diagram representing different delivery methods in regards of their Apgar scores, with an emphasis in neonatal pulmonary function and respiratory depression.

The anaesthetic protocol for a C-section must be as safe as possible for mother and puppies, causing as little depression possible.

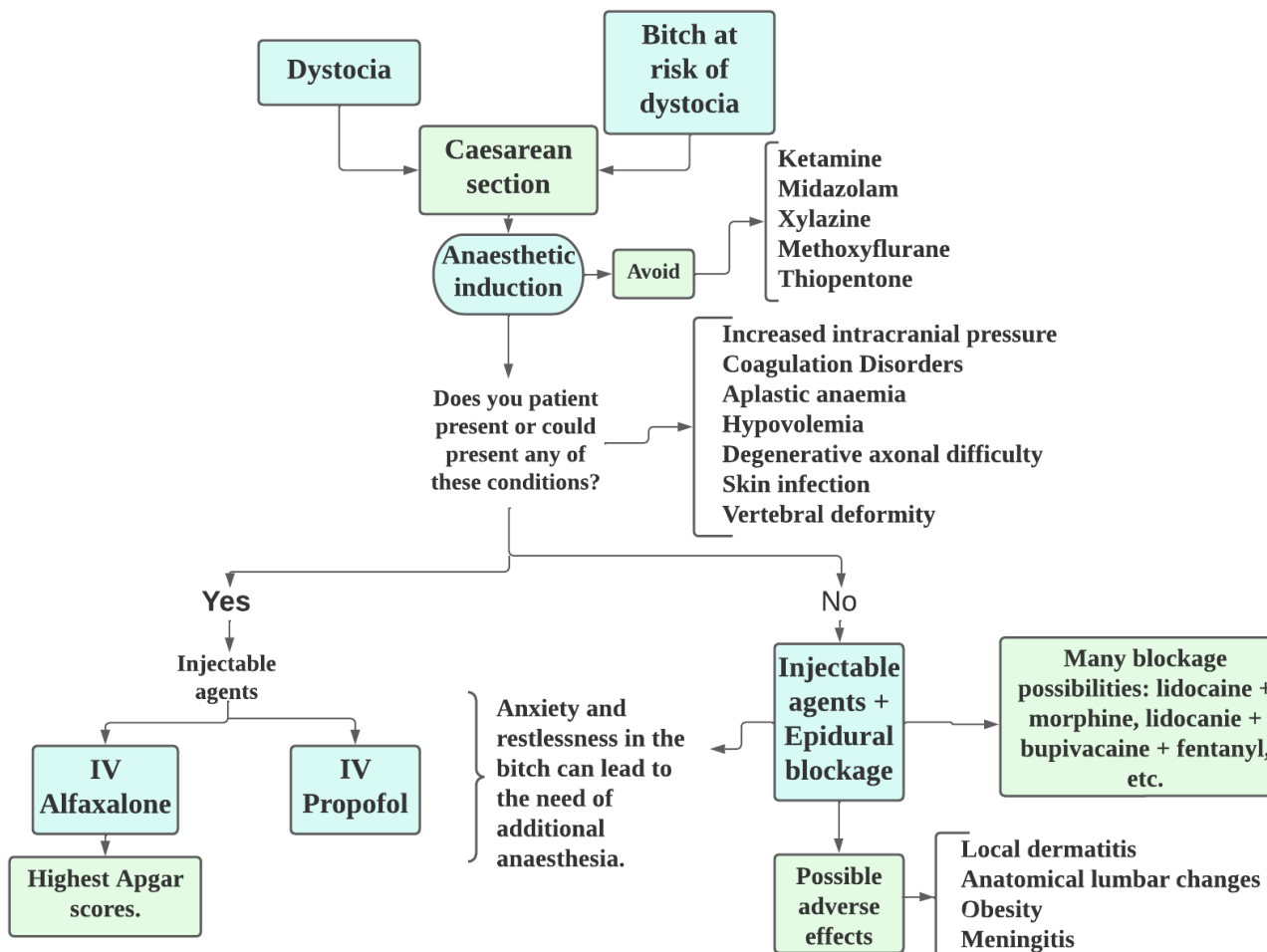
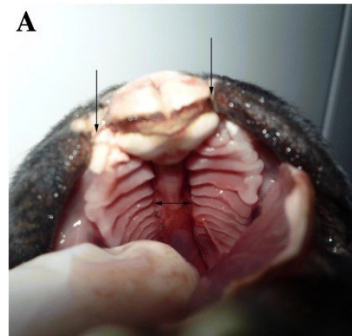


Diagram representing a possible decision-making process regarding anaesthetic protocol for a caesarean section.

Neonatal stage

Neonatal conditions

- Non infectious** - Respiratory Distress Syndrome: caused by inadequate surfactant production, but also prolonged deliveries resulting in hypoxia.
- Malformations** - Palatoschisis (cleft-palate): connection of oral and nasal cavities. Predisposes the puppy to aspiration pneumonia and other infections and prevents it from suckling to lactate.
- Infectious** - Sepsis: bacterial blood infection that results in dyspnoea, bradypnea, agonal breathing, reduction of peripheral oxygen saturation and cyanosis, among other signs.



Cleft-palate in a neonate (Pankowsky et al. 2018).



Cyanotic limb in a septic animal (Nobre Pacifico Pereira et al. 2022).

Neonatal pulmonary function evaluation

Pulmonary auscultation, respiratory rate and complementary tests (blood gas evaluation). The clinical approach of a hypoxic neonate starts emptying upper airways and stomach of foetal fluid, followed by oxygen supplementation.

Apgar Score:	Score:	Parameter	0	1	2
Developed by Victoria Apgar to assess human neonates, adapted by Veronesi (2016) to evaluate veterinary medicine neonate patients.		Mucous colour	Cyanotic	Pale	Pink
		Heart rate	<180	180-220	>220
		Reflex irritability	Absent	Grimace	Vigorous
		Motility	Flaccid	Some flexions	Active motion
		Respiratory efforts (vocalizations and RR)	No crying/<6	Mild crying/6-15	Clear crying/>15

Pulmonary function in newborns is one of the most compromised parameters during the neonate stage and any alteration during that period can have severe consequences. It is advised that a veterinarian ensures proper pulmonary function during development, delivery and/or after birth to guarantee good neonatal vitality and oxygenation.

Bibliography

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