

In pregnant bitches, is elective caesarean section more effective than vaginal delivery at improving puppy survival?

A Knowledge Summary by

Mullika Borisoot RVN^{1*}

¹ University of Bristol, Senate House, Tyndall Ave, Bristol BS8 1TH

* Corresponding Author (mb15544@bristol.ac.uk)

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Patrick Arlt (Dipl ECAR)

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PICO question

In pregnant bitches due to whelp, is elective caesarean section more effective than vaginal delivery to improve puppy survival?

Clinical bottom line

Category of research question

The category of the research question is regarding the incidence of puppy mortalities as a result of vaginal delivery, emergency caesarean section and elective caesarean section.

The number and type of study designs reviewed

Two retrospective articles were reviewed and critically appraised; one retrospective study with high single canine breed bias and one study on different canine breeds but limited support in directly answering the PICO question.

Strength of evidence

The studies selected both had strong uses of experimental designs but together provided weak evidence to determine a definitive answer to the PICO question.

Outcomes reported

The outcomes from both retrospective studies suggests that the mortality rates of newborn puppies can be reduced if pregnant bitches are scheduled ahead for elective caesareans, in comparison to undergoing an emergency caesarean section when complications develop, particularly in breeds with higher risks of dystocia. Therefore, there is some evidence to support that it may be advantageous to consider the breed, age and overall health of the bitch during pregnancy to determine whether elective caesarean sections, for the safe delivery of puppies, should be considered.

Conclusion

There are currently insufficient studies, literatures and evidence in veterinary medicine for caesarean sections to become a routine procedure in first opinion practices. Future prospective studies should be conducted and include the optimum anaesthetic protocols with the lowest associated risks for the pregnant bitch and puppies.

[How to apply this evidence in practice](#)

The application of evidence into practice should take into account multiple factors, not limited to: individual clinical expertise, patient's circumstances and owners' values, country, location or clinic where you work, the individual case in front of you, the availability of therapies and resources.

Knowledge Summaries are a resource to help reinforce or inform decision making. They do not override the responsibility or judgement of the practitioner to do what is best for the animal in their care.

Clinical Scenario

Following a radiographic examination of a French Bulldog within a few days from her due date in a first opinion veterinary practice, the veterinary surgeon has concerns regarding the abnormally large sizes of the puppies' heads in relation to the relatively narrow pelvic opening. With fear of dystocia due to foetopelvic disproportion, in addition to other complications associated with the nature of the brachycephalic breeds. If left without any intervention, the pregnant bitch may experience dystocia due to obstruction of the birth canal, endangering herself and her puppies. In this scenario, an emergency caesarean section may be necessary to resolve dystocia, which may increase surgical and anaesthetic risks, and possibly result in puppy loss. The veterinary surgeon discussed the advantages of an elective caesarean section with the owner, to reduce the likelihood of mortality of the puppies. However, the owner has strong beliefs in natural vaginal deliveries of newborns, with homeopathic or herbal remedies if necessary to facilitate labour and delivery. The veterinary surgeon researched for existing literature for evidence to support the recommendation to consider elective caesarean sections especially in situations and breeds with predispositions to dystocia, to maximise survival of the puppies.

The evidence

The literature research via various databases presented two articles that could be used in this Knowledge Summary (Proctor-Brown et al., 2019; and Alonge & Melandri, 2019), each with differing values of relevance to the PICO question, which were reviewed and evaluated by the author of this Knowledge Summary. Although the article written by Alonge & Melandri (2019) directly addresses the PICO question, with the evidence producing a clear conclusion, the authors only discussed a single breed, the Great Danes. Therefore, these results cannot be used to exclusively represent the entire canine species. The other article by Proctor-Brown et al. (2019) included multiple breeds but with more limitations with regards to the PICO question. Both articles have evidence which support that the mortality rates of puppies can be reduced with the pregnant bitch undergoing elective caesarean sections, in comparison to vaginal delivery and emergency caesarean sections.

Summary of the evidence

Proctor-Brown et al. (2019)	
Population:	Litters of puppies from 53 different breeds from one referral hospital
Sample size:	836 puppies
Intervention details:	<ul style="list-style-type: none">• 150 bitches who underwent caesarean sections between June 2007 and March 2017 were divided into emergency (104) and elective (46) groups.• 53 breeds were included in this study, most commonly the English/American Bulldog and Labrador Retriever.• 59/150 (40%) of the total number of participants were brachycephalic breeds and out of those, 23/59 (39%) underwent elective caesareans.
Study design:	Retrospective study
Outcome studied:	<ul style="list-style-type: none">• Variables included signalment of the pregnant bitch, information regarding whelping and timing, regarding anaesthesia and surgery.• The dependent variable is perinatal death identified as a result of a caesarean section.

Main findings: (relevant to PICO question):	<ul style="list-style-type: none"> • The percentages of neonatal death from emergency compared to elective caesarean sections decreases from 45/104 (43%) to 7/46 (15%). • Only 6/16 (38%) of vaginal deliveries in emergency cases were successful. • There is a 6.67 odds ratio of a minimum of one deceased puppy delivered via caesarean section should the anaesthetic time increase over 120 minutes.
Limitations:	<ul style="list-style-type: none"> • Selection bias. • Inability to control variables. • The study's authors concluded that there is a correlation between duration of surgery and mortality rates but anaesthetic protocols were not evaluated as part of the study.

Alonge & Melandri (2019)	
Population:	Great Dane litters from eight different kennels
Sample size:	46 different Great Dane litters, including a total of 303 puppies
Intervention details:	Three categories were evaluated; vaginal deliveries, elective caesarean sections and emergency caesarean sections.
Study design:	Retrospective study
Outcome studied:	<ul style="list-style-type: none"> • Mortality risks were calculated, including early neonatal and perinatal forms. • Risks of stillbirths were calculated. • Data were analysed using the ANOVA and Chi-squared test with a significant value of less than 0.05.
Main findings: (relevant to PICO question):	<ul style="list-style-type: none"> • The number of stillbirth and neonatal mortalities were statistically significantly reduced in elective caesarean sections in comparison to vaginal deliveries and emergency caesarean sections, thus highlighting the effects of adverse obstetrical conditions on newborn litters. • Neonatal mortalities <ul style="list-style-type: none"> ○ 2% in elective caesarean section ○ 10% in emergency caesarean section ○ 19% in vaginal delivery • Stillborn <ul style="list-style-type: none"> ○ 4% in elective caesarean section ○ 18% in emergency caesarean section ○ 22% vaginal delivery • The study's authors suggested that some of the main factors resulting in neonatal death includes dystocia and prolonged labour. • Difficulty in parturition can affect the neonate's intake of immunoglobulin antibody through the bitch's colostrum. • Natural delivery of puppies can lead to a 20% risk of perinatal

	<p>mortality, which could be reduced down to 2% with elective caesarean section.</p> <ul style="list-style-type: none"> • Accurate time of parturition estimation should be performed, along with appropriate choice of anaesthetic techniques, to avoid risk factors which could have adverse effects on the survival rates of puppies.
Limitations:	<ul style="list-style-type: none"> • The study was limited to one breed and therefore not representative of the canine species. • Selection bias. • Inability to control variables.

Appraisal, application and reflection

Although anaesthetic protocols for canine caesarean sections were not reflected as part of the PICO question, it is important to acknowledge that the mortality or survival statistics of puppies in existing literatures alone should not solely determine if a patient should be scheduled for elective caesarean sections. Anaesthetic protocols and other factors such as size of the litter, the breed and age of the pregnant bitch should also be considered (Cornelius et al., 2019) and the risks should be compared to the benefits. There is also query regarding owner's or breeder's knowledge and experience with pregnancy and labour of canines. Future investigations could explore the detection of labour, symptoms of dystocia and timing of decisions made regarding surgery.

Despite the article by Proctor-Brown et al. (2019) including 150 litters who underwent caesarean sections in the study, the article's main objective was to investigate the impact of the decision to delivery interval on foetal death. No direct comparisons were investigated in the differences between vaginal delivery, elective and emergency caesarean sections. Abdominal ultrasounds were performed in only 55% of all cases in order to assess foetal distress, making it unclear whether the puppies included in the data were already dead *in utero* and therefore these puppies would have not been in association with caesarean sections. Furthermore, the ratio between the weight of the bitch and weight of the heaviest puppy may be a factor on the probability on the necessity of a caesarean section (Dold et al., 2018). The article also explored the correlation between surgical time and rate of foetal death, another essential factor to take into consideration for conducting caesarean sections. The article uses evidence based medicine and relevant literatures to support their cases.

The article by Alonge & Melandri (2019) included 303 puppies in total. There was only one breed and it is not specifically for breeds predisposed to dystocia evaluated. The article directly addresses the PICO question, making clear and concise comparisons between vaginal delivery, elective and emergency caesarean sections. The results demonstrate a definitive outcome regarding the maximisation of successful neonatal delivery. Alonge & Melandri (2019) also made comparisons with human and cattle literature, which supports that dystocia has a negative effect on the offspring's survival and their vitality. Other considerations regarding a caesarean section were discussed within this article, including indications for the best time to perform surgery, anaesthetic protocol and diet of the pregnant bitch, making this article more relevant to the PICO question than the article by Proctor-Brown et al. (2019). However, being retrospective studies, these articles are expected to be associated with limitations such as selection bias and the inability to control variables.

Despite the current evidence suggesting that an elective caesarean section reduces the rate of puppy mortalities, there is still resistance from breeders and first opinion veterinary practices to perform routine elective caesarean sections. However, it is also important to consider the possibility that an elective caesarean section should not be considered as a first line intervention as there are anaesthetic and surgical risks associated and the bitch may be able to whelp the puppies with only assistance and not surgical interventions. It can be argued that puppies may benefit from a vaginal delivery rather than a caesarean section due to

greater vitality (Oliva et al., 2018). Equally, the ethics of elective caesarean sections should be recognised in future prospective studies; would the bitch experience more pain and complications associated with surgery than vaginal delivery, and should we, as veterinary practices, be supporting the breeding of canine breeds predisposed to dystocia and that do not have the capability to reproduce naturally without veterinary assistance?

Methodology Section

Search Strategy	
Databases searched and dates covered:	CAB Abstracts 1992 – 2019 Medline 1966 – 2019 Science Direct 1986 – 2019
Search terms:	<p>CAB Abstracts:</p> <ol style="list-style-type: none"> (dog or dogs or bitch or bitches or puppy or puppies).mp. [mp=abstract, title, original title, broad terms, heading words, identifier, cabicodes] (caesarean section or caesarean sections or cesarean section or cesarean sections).mp. [mp=abstract, title, original title, broad terms, heading words, identifier, cabicodes] (mortality or mortalities or mortality rate or mortality rates).mp. [mp=abstract, title, original title, broad terms, heading words, identifier, cabicodes] 1 and 2 and 3 <p>Medline:</p> <ol style="list-style-type: none"> (dog or dogs or bitch or bitches or puppy or puppies) (caesarean section or caesarean sections or cesarean section or cesarean sections) (mortality or mortalities or mortality rate or mortality rates) 1 and 2 and 3 <p>Science Direct: (dog or dogs or bitch or bitches or puppy or puppies) AND (caesarean section or caesarean sections or cesarean section or cesarean sections) AND (mortality or mortalities or mortality rate or mortality rates)</p>
Dates searches performed:	CAB Abstracts 27 th September 2019 Medline 10 th October 2019 Science Direct 25 th October 2019

Exclusion / Inclusion Criteria	
Exclusion:	Irrelevant to PICO question, articles that do not discuss both emergency and elective caesarean sections, articles not written in the English language, conference abstract, duplicates, chapters or sections from a textbook, articles without full access, feline caesarean sections.
Inclusion:	Relevant to PICO question, retrospective studies, review articles, observational studies, interventional studies, articles published in the English language.

Search Outcome						
Database	Number of results	Excluded – [did not answer PICO question]	Excluded – [not written in the English language]	Excluded – [conference abstract only]	Excluded – [duplicates]	Total relevant papers
CAB Abstract	39	25	13	0	0	1
Medline	21	18	2	0	1	0
Science Direct	56	49	0	5	1	1
Total relevant papers						2

CONFLICT OF INTEREST

The author declares no conflict of interest.

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