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Histological features of placenta in domestic cat (*Felis catus*)

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Abstract
The placenta was a complex structure formed by apposition of extra embryonic membrane and maternal tissue which was involved in the exchange of nutrients and gases to the embryo. The placenta of catwas zonary and endotheliochorial type and it consisted of three layers histologically. The lamellar zone contained numerous lamellae which was composed of cytotrophoblast, syncytiotrophoblast, foetal capillaries, maternal capillaries and giant cells. Junctional zone was the transitional region between lamellar and glandular zone. The glandular zone consisted of remnants of uterine endometrial glands which were invaded by trophoblast cells. The present study was carried out to explain the histological features of cat placenta.

Keywords: placenta, cat, histology

1. Introduction
Placenta is a complex structure formed by close apposition of extra embryonic membranes to the maternal tissue. It is involved in the exchange of nutrients and gases, elimination of waste products, gives mechanical protection to the embryo, produces hormones and transport immunoglobulins to confer immunity. During the development of foetus, the blastocyst reaches the uterus and initially nourished by uterine secretions. The formation of placenta takes place at 20th day of pregnancy in case of cats, afterwards the foetus gets the nutrients through placental attachment [1]. The placenta of mammals can be classified depending on the morphology, histological features, type of materno-foetal interdigitation and mode of materno-foetal blood flow [2]. The domestic cat (*Felis catus*) has been reported to be a useful model for studying comparative biology of felines and development of assisted reproductive techniques for conservation of endangered feline species [3].
The placenta of carnivores is classified as zonary and endotheliochorial type. It is a chorioallantoic placenta, formed by intimate interdigitating contact zone or girdle around the chorionic sac [4]. The relationship between the maternal and foetal tissue is lamellar as the foetal projections and maternal septae complexly folded and interdigitating with each other and the materno-foetal blood flow is achieved through simple cross current mechanism [5]. The development of foetal membranes and histology of placenta was extensively studied in dogs. The present study on histological features of placenta was conducted to elaborate the placental structure in domestic cats.

2. Materials and Methods
The placenta was collected from a 1 year old domestic short hair queen, which had undergone caesarean section. The collected tissues were washed in normal saline, mopped with blotting paper and fixed in 10 per cent neutral buffered formalin. After 24 hours of fixation, the tissues were processed dehydrating in ascending grades of isopropyl alcohol (starting from
50 per cent), cleared in three changes of xylene, impregnated and embedded in paraffin wax (melting point 58-60˚C) to prepare paraffin tissue blocks. Afterwards 3-5 µm thickness tissue sections were prepared by using Leica rotary microtome. The tissue sections were subjected to routine haematoxylin and eosin staining and the observations were obtained by Leica trinocular microscope with image analyzer [6].

3. Results and Discussion
In the placentation of domestic cat, the uterine epithelium and connective tissue were removed and the direct contact of chorionic epithelium with endothelium of endometrial capillaries

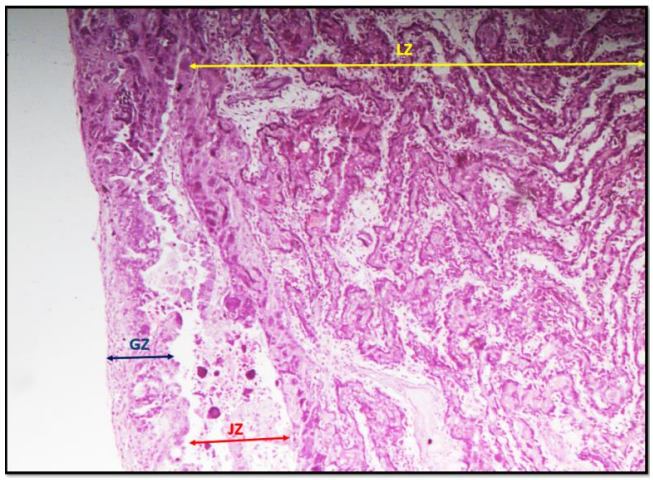
Histologically, the placenta of cat was composed of three zones *viz.*, lamellar or labyrinth or placental zone, junctional zone, glandular zone (Fig.1) and the same was reported by [2] in the placenta of domestic dogs.

Labyrinth zone

In the labyrinth zone, the placental labyrinth consisted of numerous lamellae which were running almost in parallel manner. The foetal lamellae was surrounded by mesenchymal tissue and consisted of syncytiotrophoblast cells with dark nuclei and very few cytotrophoblast cells with pale nuclei. The lamellae were separated by lightly stained foetal connective tissue, which contained the foetal blood vessels lined by endothelial cells. The maternal blood vessels which were lined by endothelial cells were noticed within the cores of darkly stained lamellae.

The labyrinth of carnivore placenta consisted of darkly stained lamellae which runs more or less parallel and were separated by light coloured bands of foetal connective tissue in which the fetal blood vessels were located [7] (Fig. 2).

Within the cores of lamellae, pale staining larger giant cells were also observed along the maternal capillaries. The maternal blood vessels and pale staining giant cells or granulated decidual cells were surrounded by foetal trophoblast cells. In carnivore placenta, in the long axis of lamellae, surrounded by trophoblast cells, the tortuous sinusoidal maternal capillaries were lodged and were lined by thick endothelium [8]. The maternal blood vessels were interspersed by giant cells known as granulated decidual cells [5]. These foetal trophoblast cells constituted the chorionic epithelium in cat [7]. Thus, the maternal blood vessels and foetal capillaries were separated by trophoblast cells.



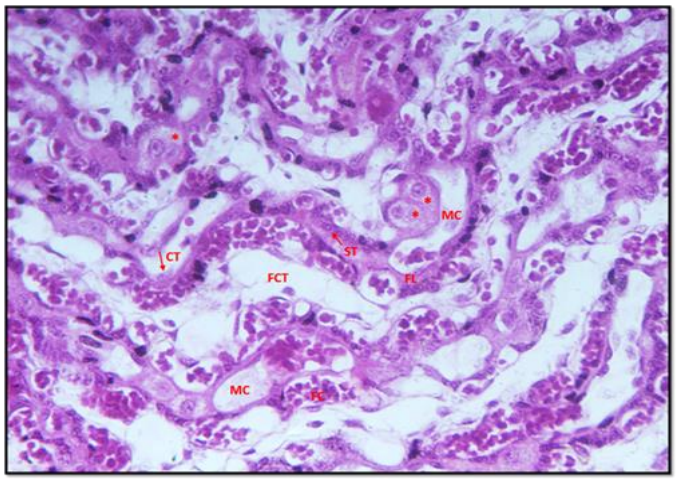


Fig 1: Three different zones in the placenta of cat (H&E, 10X).
LZ – Lamellar Zone,
JZ – Junctional Zone,
GZ – Glandular Zone.

Fig 2: Lamellar zone of cat placenta (H&E, 40X). FL- Foetal Lamellae,
FCT- Foetal connective tissue,
FC- Foetal capillary,
ST- Syncytiotrophoblast,
CT- cytotrophoblast,
MC- Maternal capillary,
*- Granulaed decidual cells

Junctional zone

The junctional zone was observed as an area of transition between labyrinth zone and glandular zone, and it was composed of columnar cells which invaded the endometrial glandular region. The wide intercellular spaces were observed in this zone which gave a spongy appearance. The front of the lamellar region was designated as junctional zone, which obviously joins and penetrates the glandular region of the placenta in carnivores [5].

Glandular zone

Glandular zone was in close apposition with endometrium of the uterus and it contained remnants of short endometrial glands. The glands were distended by retained secretions and invaded by trophoblast in the placenta of dogs [2]. At the time of parturition, the after birth break off between the spongy and solid parts of the glandular zone, and only shell-like remnants of the solid gland fundi left in the endometrium. The epithelial cells persisting in the remnants were responsible for the reepithelialization of whole endometrium during the puerperium [5].

4. Conclusion

The placenta was a complex structure formed by apposition of extra embryonic membrane and maternal tissue. The placenta of cat was zonary and endotheliochorial type and it consisted of three layers. The lamellar zone contained numerous lamellae composed of cytotrophoblast, syncytiotrophoblast, foetal capillaries, maternal capillaries and giant cells. Junctional zone was the transitional region between lamellar and glandular zone. The glandular zone consisted of remnants of uterine endometrial glands. The present study was carried out to investigate the histological features of placenta of domestic cat.

5. References

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