CLASMATOSIS AS A MEANS OF EXTRACELLULAR MATRIX COMPONENTS SECRETION IN RELIANCE ON SMOOTH MUSCLE CELLS IN RAT CERVIX

Y. Grigoryeva[1], G. Suvorova[1], S. Chemidronov[2], T. Shishkina[3], O. Kulakova[1], S. Bovtunova[1]

[1] *Department of Histology and Embryology of the Samara State Medical University, Samara, Russia;*
[2] *Department of Human Anatomy of the Samara State Medical University, Samara, Russia;*
[3] *Department of Histology and Embryology of the Astrakhan State Medical University, Astrakhan, Russia*

Correspondence address:
histology@bk.ru

ABSTRACT — A number of morphological changes in rat cervix uteri at childbirth provide apropos disclosure of the cervix channel facilitating unobstructed fetus expulsion. The research in cervix disclosure morphogenesis is important for the development of effective methods of the birth process management.
The objective: to conduct an ultrastructural level study of the morphological clasmatosis manifestations in laboratory rats cervix myocytes at childbirth, at the fetus expulsion stage; and specify its functional role for a cell in the given section of the organ.
The research has shown that clasmatosis is a variation of the smooth muscle cell definitive form functioning, implemented at the high functional pressure. This process in labor leads to the increase in a fraction volume of extracellular matrix due to the urgent protein synthesis and, as a result, to the change in its quality.

KEYWORDS — clasmatosis, smooth muscle cells, cervix uteri.

INTRODUCTION

The uterus of mammals is an internal organ adapted to considerable morphofunctional changes due to the myometrium myocytes activity. Despite rather extensive literary data on the structure and changes in uterus myocytes a number of unsolved issues remains [1,2,5]. For example, knowing the cervix tissues morphogenesis in labor is important for development of effective methods of management of labor process to provide cervix channel disclosure for fetus expulsion without injury to the organ sides [1,8].

Examining the structure of cervix myometrium smooth muscle cell in laboratory rats at childbirth, we observed the clasmatosis phenomenon which functional role is not clear.

The objective of the research: to study morphological clasmatosis manifestations in laboratory rats cervix myocytes at the ultrastructural level and specify its functional role for a cell in the given section of the organ.

MATERIALS AND METHODS

The research has been carried out in accordance with the laboratory practice rules of the Russian Federation: the order of the Ministry of Health of the USSR N 755 of 12.08.1977; the order of the Ministry of Health of the Russian Federation N 267 of 19.06.2003; the law "On Protection of Animals against Ill Treatment" ch. V, art. 104679-GD of 01.12.1999. The research has been granted a permission of the SamSMU Committee on Bioethics (the protocol N 176 of 03.08.2016).

The object of the research were pregnant white not purebred laboratory rats at the age of 6–7 months, in number of 5 individuals. The animals with the dated term of pregnancy were obtained with the standard technique described earlier by E. Zussman (1977) [3]. The material for the research was cervix uteri. Material sampling was carried out during the childbirth, after the birth of 1–2 infant rats, and after killing the animals with a lethal dose of aether anesthesia.

Electronic transmission microscopy (ETM) was applied in the research. The material was fixed in glutaric aldehyde (BASF, Germany), poured in an epon-araldit mix and contrasted with uranil acetate and lead citrate (EMS, USA). Precisely executed cuts were observed with an electronic microscope (JEOL JEM-1400 PLUS, Japan).

RESULTS OF THE RESEARCH

The research has shown that there are ultrastructural transformations characteristic of clazmatosis in cervix myocytes of laboratory rats at childbirth. In some myocytes changes affect the membrane contours, cytoplasmic protrusions of different volume are formed. The latter then detach from the cell and fill intercellular spaces. It leads to separation of myocytes and destruction of intercellular contacts.

Formation of cytoplasmatic protrusions is followed by loosening and destruction of contractile ap-

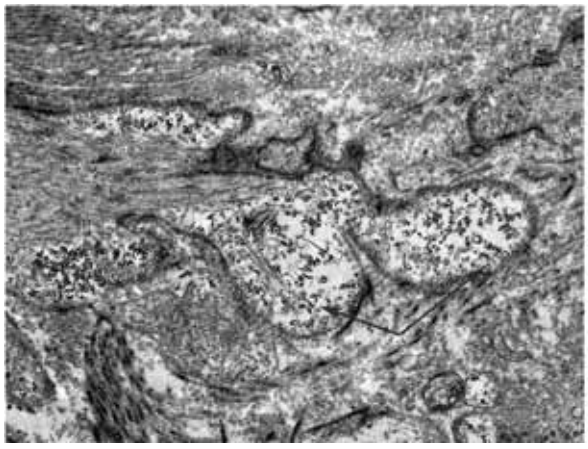

Fig. 1. The myocyte site with cytoplasmatic protrusions containing ribosomes, vesicles, contractile components (specified by the arrow). ETM. 20000 ×

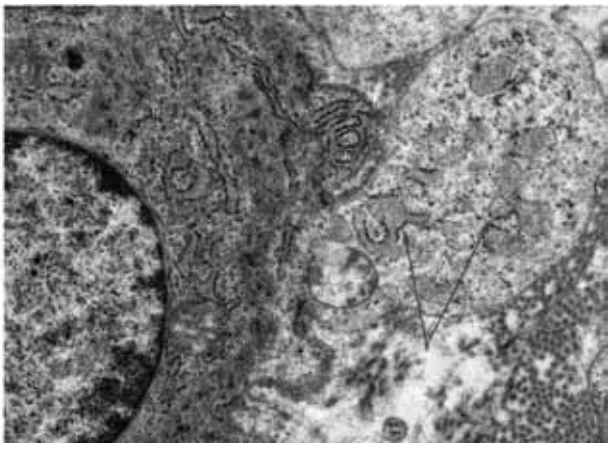

Fig. 2. The myocyte site with cytoplasmatic protrusions. Contents of protrusions is presented by ribosomes and rough endoplasmic reticulum cistern (specified by the arrow). ETM. 20000 ×

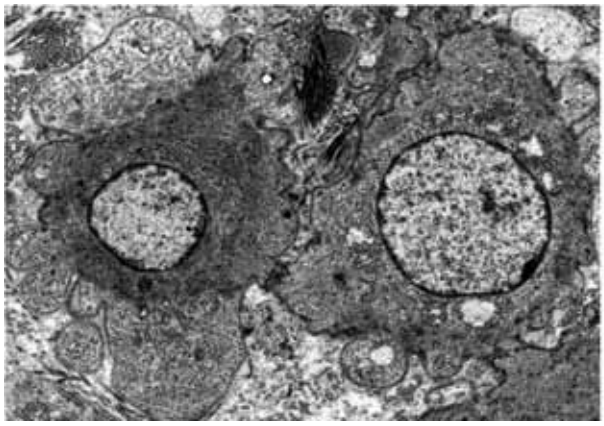

Fig. 3. Dark and light myocytes of the inner layer in cervix myometrium with clasmatosis at childbirth. ETM. 4000 ×

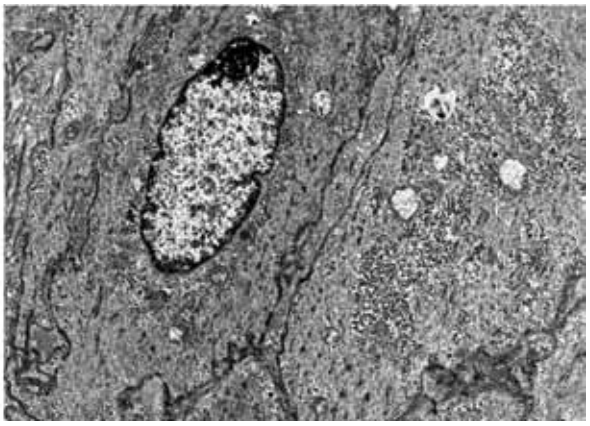

Fig. 4. External myometrium layer smooth muscle cells at childbirth. ETM. 4000 ×

paratus components in the peripheral part of myocytes sarcoplasm. In certain cases, contents of protrusions are presented by myofilament, mitochondrions and pinocytosis vesicles (fig. 1). But in most cases, rough endoplasmic reticulum development with accumulation of ribosomes and polisomes in myocytes sarcoplasm was observed. These ultrastructures present the main contents of the sections separated from cells (fig. 2).

The light and dark myocytes which are characterized by various levels of cytoplasm density were equally involved in this process (fig. 3).

However, some difference in participation of smooth muscle cell in this process depending on their localization in myometrium layers was noted. Marked clasmatosis is observed in all perimeters of a cell in myocyte of vascular and internal myometrium layers (fig. 3). The external layer myocytes at childbirth keep the structure as a part of functional layer with no clasmatosis present (fig. 4). It indicates various functional roles of smooth muscle cells as a part of myometrium layers.

DISCUSSION

Analysis of the literary sources has shown that clasmatosis is considered as pathology of cellular membranes [6]. Clasmatosis is considered characteristic of cells with phagocytic activity, and promotes antigene information transfer [7]. In uterus myocytes the clasmatosis phenomenon is described during postnatal involution, and is considered as one of elimination mechanisms in hypertrophied myometrium structures

providing reduction of its weight without the loss in the number of smooth muscle cells and threat of inflammation development [2]. Some authors associate clasmatosis with substances transport, for example, regarding it as one of the means of collagen secretion in actively synthesizing fibroblast [4]. The data obtained in our research prove that clasmatosis is a way of secretion which is implemented in emergency synthesis conditions, when synthesized material from rough endoplasmic reticulum cisterns, bypassing a lamellar complex via transport vacuoles, arrives in intercellular space . Thus, clasmatosis is suggested to be considered as physiological process which occurs in cells during emergency secretion.

CONCLUSIONS

Basing on the research and literature analysis conclusion has been made that clasmatosis in cervix myometrium myocytes at labor is one of functioning options in definitive cell form which is implemented under high functional pressure. This process in childbirth leads to an increase in a volume fraction of extracellular matrix due to synthesis of proteins and their emergency evacuation.

Authors report about no conflict of interests.

REFERENCES

1. **Bakhmach V.O., Chekhonatskaya M. L., Yannayeva N. E. et al.** Changes in uterus and a cervix during pregnancy and before childbirth (review). Saratov scientific and medical journal 2011; 2(7): 396–400. (In Russian)
2. **Dolgikh O.V., Agafonov Y. V., Zashikhin A. L.** Adaptive myometrium transformation of rats at pregnancy and after delivery. Morphology. 2012; 142(5): 59–63. (In Russian)
3. **Zussman E.** Development biology; English M.: MIR; 1977: 301. (In Russian)
4. **Serov V.V., Shekhter A. B.** Connective tissue (functional morphology and general pathology). M.: Medicine; 1981: 312. (In Russian)
5. **Sozykin A. A.** Morphological aspects of normal hystogenesis and reactive changes of myometrium smooth muscular tissue of rats [thesis]: Volgograd; 2004: 107. (In Russian)
6. **Strukov A. I., Serov V. V.** Pathological anatomy. B: Strukov A. I., Serov V. V. General pathological anatomy. Damage. 5th prod. Moscow: Litterra; 2010: 5–37. (In Russian)
7. **Bier O.G., Götze D., Mota I., Dias da Silva W.** Experimentelle und klinische Immunologie. Springer-Verlag; 2013:370.
8. **Oxlund B.S., Ørtoft G., Brüel A. et al.** Cervical collagen and biomechanical strength in non-pregnant women with a history of cervical insufficiency. Reprod. Biol. Endocrinol. 2010; 8: 92.