CHANGES IN THE MYOMETRIUM DURING THE PUERPERIUM

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Involutional changes in the uterus during the puerperium have been studied in the past. References on the subject are, however, only few. The present investigation was taken up with a view to study the sequence of histological changes occurring in the different structural components of the myometrium on different days of the puerperium.

Material and Methods

Wedge biopsies from the anterior aspect of the fundus of 24 puerperal uteri, 4 non-puerperal but parous uteri and 4 nulliparous uteri were obtained for study. Those in the puerperium were operated on for ligation of the tubes,—the operations being so spaced as to get materials from the first day to the tenth day of the puerperium. The non-puerperal parous specimens were collected from women subjected to the same operation long after their last childbirth. The nulliparous women were explored for removal of ovarian cysts.

The tissues were fixed in 10% formal-saline and processed for paraffin embedding. Sections were cut at 5μ and stained with haematoxylin—eosin, van Gieson—Weigert's elastic tissue stain.

Results

The sections were studied for changes occurring in the muscles, blood vessels, connective tissues and elastic tissues.

The histological changes along with the relevant obstetric history are presented as follows:—

First day puerperium

Only one case was available. The patient was a tenth para with uneventful previous pregnancies.

Conspicuous changes were observed in many muscle bundles with oedema and coagulative necrosis. They looked smudgy, the cytoplasm was basophilic, nuclear chromatin was darkly stained with blurring of the chromatin pattern.

Presence of a few short, wavy elastic fibres were noted mainly in the connective tissues between muscle

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bundles. The connective tissue was oedematous and showed an overall increase of its amount.

Numerous small blood vessels were present in the stromal connective tissue.

A moderate number of mononuclear cells was present in the perivascular connective tissue.

Second day puerperium

A total of five cases were examined. Parity distribution was as follows: eighth para 3, fifth para 1, and fourth para 1.

Degenerative changes in the muscles were prominent, smudginess and basophilia being much pronounced. Many of the muscle fibres appeared more or less homogenous and their outlines were indistinct. Nuclear chromatin appeared fragmented.

Elastic tissues were plentiful in the wall of big blood vessels and also in between muscle bundles. Slight fragmentation of elastic fibres was noted in two cases. Oedematous connective tissue, both around the blood vessels and in between muscle bundles, was conspicuous.

Big vessels in three cases showed hyaline changes of their walls. Four cases showed presence of organised thrombi. Thin walled vessels were also present, some with swelling of the lining endothelium.

Mononuclear cell infiltrates were more prominent in the connective tissues and in the region of the necrosed muscles. In two cases, plasma cells and neutrophils were present in addition.

Third day puerperium

Tissues from two women, 4th and 5th para respectively, were available for study.

Changes in the muscles were still more marked. Pyknosis and karyorrhexis of nuclear chromatin and a melting away of the cytoplasm characterised the picture (Fig. 1).

Elastic tissues were inconspicuous in both cases, while connective tissues in between muscle bundles appeared to have increased in amount.

Big blood vessels were mostly narrowed. Large number of small blood vessels were present in the connective tissue stroma. Endothelial cell proliferation was evident in many of the vessels. A few arteries in one case showed evidence of panarteritis.

Mononuclear cells were found inside the muscle bundles in the form of histiocytes. Focal collections of eosinophils were particularly noted around blood vessels and in the area of necrosis.

Fourth day puerperium

Two specimens, one from a 4th para and the other from a 6th para, were studied.

Changes in the muscles were characterised by intense basophilia and smudging of the cytoplasm. Nuclei were mostly pyknotic.

Elastic tissues were prominent in the area of necrosis. In places there were heaped up masses of fragmented elastic fibres.

Connective tissues were oedematous and particularly prominent around blood vessels.

Few blood vessels showed narrowing of their lumen and in some organised thrombus was present. New capillary formation was visible.

Mononuclear infiltrates especially in the region of necrosis were present.

Fifth day puerperium

Only one case, a fifth para, was studied.

Muscle changes were identical with those on the fourth day.

Small amount of elastic fibres were present in the area of necrosis and also in the wall of the big vessels. Connective tissues appeared to be somewhat increased.

New capillary formations were noted specially in the area of necrosis.

Mononuclear cells and eosinophils were present in the stroma in large numbers.

Sixth day puerperium

Three cases were available. The parity was 6, 7 and 9 respectively.

Changes in the muscles were much less marked. However, the homogeneous and, in places, an eaten-away appearance of the muscles were still there.

Elastic fibres, mostly fragmented, were abundant, especially around the blood vessels. Connective tissues appeared increased in amount, often replacing the necrosed muscle tissue. (Fig. 2).

Organised thrombus was present in one case. Young blood vessels were plentiful.

Mononuclear and plasma cells were present in moderate number.

Seventh day puerperium

Tissue from a 5th para was studied.

Muscle bundles were no longer smudgy. Individual fibres appeared shorter, widely separated from one another and the nuclei pale and plump.

Elastic tissues were scanty. Young connective tissues were seen in the region of muscle necrosis.

The big vessels showed thickening and hyalinisation of their walls. No thrombus was noticed.

Mononuclear infiltrates were prominent especially around the blood vessels.

Eighth day puerperium

Three cases were available for study. Two were fifth para and one a 6th para.

Degenerative changes in muscles, although much less marked, were still observable.

Heaped up masses of fragmented elastic tissue were noted, especially around the blood vessels. Connective tissues showed an apparent increase.

Many young capillaries could be seen (Fig. 3). No evidence of thrombosis was detected.

There were marked mononuclear and plasma cell infiltrates all through the tissue.

Ninth day puerperium

Two cases, a fifth para and an 8th para, were studied.

Smudgy appearance of only a few muscles with often vacuolated cytoplasm was noticed.

Fragmented elastic tissues were present, especially around the blood vessels. In one case, elastic fibres from perivascular connective tissue were found to extend into the wall of a big vessel (Fig. 4).

The big blood vessels showed degenerative changes in their walls. Many small vascular spaces were noticed.

Mononuclear cells and eosinophils were present in moderate number.

Tenth day puerperium

Four cases, two 4th para and two 5th para, were studied. Minor degenerative changes of the muscles were still noticed. Elastic tissues were plentiful and were mostly fragmented. Connective tissues showed a myxomatous change in one case. Newly formed small blood vessels were present. In one case, a thrombus was noted inside a big vessel. Mononuclear cell infiltrates were still present.

Control cases
Parous, but non-puerperal

Two cases, one an 8th para, the other a 5th para, were available for study.

Changes were confined to the elastic tissues and blood vessels. Elastic tissues were plentiful, especially around blood vessels and were also seen insinuating into the muscle bundles. Presence of connective tissue was not conspicuous. The blood vessels were mostly thick walled with sometimes hyalinisation of the subendothelial connective tissue. There was an old organised thrombus in one case.

Nulliparous

Two cases, aged 40 and 41 years respectively, were studied.

Elastic fibres were limited to the wall of the big vessels only. No relevant change could be found in either of the two specimens.

Discussion

The uterine muscles have been observed to undergo autolytic changes during the puerperium (Brews, 1963). With pregnancy there occurs not only a hypertrophy but also hyperplasia of the existing muscle fibres (Ham, 1965). In the present series of puerperal uteri, it would appear that the autolytic changes of the muscle fibres are more profound in the early days of the puerperium. The muscle fibres of the first day of puerperal uterus appear smudgy and oedematous, and in a day or two the fibres become more homogenous and some appear to be melting away. The muscle changes, however, are much less descriptive from the 6th day onward, and by the 9th and 10th day the muscles show only occasional fatty changes with rarely any necrosis.

Although a quantitative analysis of the myometrial connective tissue could not be done in the present investigation, it appears that the amount of connective tissue, both around the blood vessels and in the process of replacing the necrosed muscles, steadily increase from the first day of the puerperium throughout the period of 10 days of observation. Dilts and Greene (1964), however, observed that there was no increase in the relative amount of myometrial fibrous tissue with parity or age.

Elastic tissues in the uterus have been observed to increase with parity (Goodall, 1909; Baker, 1933; Schwarz, 1951; Maher, 1959). Several hypotheses have been put forward to explain the overall increase of elastic tissue. It is possible that

the elastic limit being exceeded during pregnancy, the individual fibres fail to contract to its original length during involution. They coil or clump, with again uncoiling and stretching during the successive pregnancies. When the stretch limit is exceeded, the fibres may also break and the loose ends would then snap back toward their original position and cause coiling. Since the materials in the present investigation were derived from women whose parity ranged from 4 to 10, it is but natural that the amount of elastic tissues would be excessive. Curiously, the only single case on the first day puerperium was a 10th para and the amount of elastic tissue in this instance was only insignificant. Similarly, a 5th para on the seventh day puerperium showed only scanty elastic tissue. The nulliparous uterus, as expected, also contained scanty elastic tissue.

The remaining cases, however, revealed excessive amounts of elastic tissue, while in one instance on the 9th day puerperium there was definite evidence of elastic tissue proliferation, the fibres extending between the perivascular connective tissue and the walls of the blood vessels.

Goodall observed that uterine vessels in the puerperium undergo thrombosis before they disintegrate and finally disappear. This observation could not always be substantiated in the present materials, although collapse of the big vessels, thickening and hyalinisation of their walls and endothelial cell proliferation were commonly encountered. Numerous new vessels in a matrix of loose, sometimes oedematous, connective tissue could be seen in each specimen. Yet, Goodall's observation that the small vessels are formed to replace the disintegrating and thrombosed vessels could not be corroborated.

Presence of mononuclear cells, frequently admixed with a number of plasma cells and/or eosinophils was noted in all the instances. The cells were especially conspicuous in the region of necrosis and around the vessels. Significance of these inflammatory cells in the puerperal uteri is little known. Necrosis per se may be responsible for such cellular infiltration.

The present work is, however, limited by the insufficiency of the materials and further study of a good number of cases are essential to come to any conclusion. It appears from the present study that the process of involution is by itself responsible for the vascular changes and not vice versa. Elastic recoil of the muscle fibres leads to mechanical pressure on the vessels. The connective and elastic tissues found in excess around the blood vessels appear to serve as a mechanical guard against this process. Fragmentation of elastic fibres possibly occurs as a result of their failure to recoil completely. Thrombosis is probably a secondary phenomenon not seen in all the vessels or specimens and when present is most likely the result of narrowing of the vascular lumen, stagnation of blood and associated endothelial injury. Increased platelet count after childbirth may also contribute to the process of thrombosis.

Summary

Histological changes occurring in the uterus during the first 10 days of puerperium were studied.

A total of 24 puerperal uteri, 4 non-puerperal but parous uteri and 4 nulliparous uteri were available for study.

The puerperal uteri showed extensive degeneration and necrosis of the uterine muscles, most marked during the earlier days and gradually recovering in the course of 10 days.

Amount of connective tissues showed an apparent increase. The elastic fibres, scanty in nulliparous, were plenty in most cases of parous uteri, puerperal or not.

Thrombosis of the big vessels was not a constant finding in the puerperal uteri.

Numerous new vessel formation was noticed in all the instances of puerperal uteri.

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