Mast cells in human adrenal gland during fetal development

ABSTRACT

We previously found that mast cells are expressed in human adult adrenal gland with a possible role in aldosterone secretion in adrenocortical neoplasms responsible for primary adrenal hyperplasiasis.

To investigate human developing adrenal gland for the presence of mast cells, immunohistochemistry studies were performed on paraffin-embedded adrenal glands from 16 weeks to the term.

RESULTS (1)

We aimed to search for mast cells in human fetal adrenal gland to analyze their localization and kinetic of expression to provide arguments in favor of mast cells involvement in fetal adrenal development.

Material and methods

Human tissue collection

Human fetal tissue (n=30) from 16 to 40 GW (gestational weeks) were collected from medical and surgical terminations of pregnancy and/or from premature infants died during the first days of life.

Immunohistochemistry

Immunochemistry studies were performed using the following antibodies according to our local protocols.

Antibodies Specificity of immunostaining

<table>
<thead>
<tr>
<th>Antibody</th>
<th>Specificity</th>
</tr>
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<tbody>
<tr>
<td>Tryptase</td>
<td>Mast cells</td>
</tr>
<tr>
<td>CD34</td>
<td>Vascular basement</td>
</tr>
<tr>
<td>CD31</td>
<td>C-46 proto-oncogene</td>
</tr>
<tr>
<td>3βHSD</td>
<td>Definitive and transitional zones</td>
</tr>
<tr>
<td>17-OH</td>
<td>Fetal and transitional zones</td>
</tr>
<tr>
<td>CYP11B2</td>
<td>Aldosterone synthesis</td>
</tr>
<tr>
<td>K67</td>
<td>Proliferation cells</td>
</tr>
<tr>
<td>Shh</td>
<td>Progenitor cells</td>
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</tbody>
</table>

Hypothesis

The fetal adrenal cortex consist of a small outer definitive zone, and a larger inner fetal zone; a transitional zone between those 2 zones exist and produces cortisol towards the end of the fetal development.

Type of the adrenocortical hormone secreted in each zone is depending of the localization of the enzyme expression.

RESULTS (2)

We recently found that mast cells are much more prominent in adrenocortical aldosterone-producing adenomas and that they may play a role in aldosterone secretion through the serotonin signaling.

Similarities exist between normal fetal adrenal cortex and adrenal cancers, which probably occur through process of dysregulation and dedifferenciation.

We thus hypothesized that mast cells could appear early during fetal adrenal gland development and might play a role in fetal aldosterone secretion.

Steroidogenic enzymes expression during human fetal adrenal gland

Kinetic of mast cells and K67 expression during adrenal gland development

Expression of progenitors cells and proliferative markers during fetal adrenal development

CONCLUSION

The present study constitutes the first demonstration of the presence of mast cells in human fetal adrenal gland from the second trimester of pregnancy in the subcapsular zone of the cortex.

Double immunostaining did not allow us to found evidence for relationship with the 3βHSD or 170HP enzymes and/or stem cells kinetic expression. However CYP11B2 (or aldosterone synthase) expression is detected from the 24 weeks of gestation that could suggest a role of mast cells in aldosterone synthesis. Moreover, proliferative markers decreased from the 22th week of gestation, concurrently to mast cells that could suggest a role in that process.

Therefore mast cells could be as a new mechanism involved in adrenal development. However, further studies specially in animal model need to be performed to better understand the role of mast cells in adrenal development.

References

- Duparc, C. et al. Regulation of aldosterone secretion by intratubular mast cells: potential role in the pathophysiology of aldosterone-producing adenoma (2011)