Placenta 42 (2016) 37–43

Contents lists available at ScienceDirect

Placenta

journal homepage: www.elsevier.com/locate/placenta

Revisiting decidual vasculopathy

Jonathan L. Hecht [a, *], Zsuzsanna K. Zsengeller [b], Melissa Spiel [c], S. Ananth Karumanchi [c, b], Seymour Rosen [a]

[a] Department of Pathology, Beth Israel Deaconess Medical Center (BIDMC), 330 Brookline Ave, Boston, MA 02215, USA
[b] Department of Medicine, Beth Israel Deaconess Medical Center (BIDMC), 330 Brookline Ave, Boston, MA 02215, USA
[c] Department of Obstetrics and Gynecology, Beth Israel Deaconess Medical Center (BIDMC), 330 Brookline Ave, Boston, MA 02215, USA

ARTICLE INFO

Article history:
Received 11 January 2016
Received in revised form
1 April 2016
Accepted 6 April 2016

Keywords:
Preeclampsia
Decidual vasculopathy
Decidual angiopathy
CD31
CD34

ABSTRACT

Introduction: In the setting of preeclampsia (PE), decidual vasculopathy (DV) can be seen along the free membranes.
Methods: We describe DV using stains for CD31, CD34, Cd42b, CD68, desmin, fibrin and Masson's trichrome in patients with preeclampsia and fetal growth restriction.
Results: We first examined the "membrane roll" sections from the placentas of six patients with preeclampsia. Affected vessels showed endothelial proliferation with detachment. Remodeling of the media was characterized by smooth muscle loss with variable degrees of fibrin deposition. CD31 and CD34 highlighted the prominent endothelium and showed striking particulate staining throughout the media. All of these findings infer a sequence of endothelial injury, fragmentation and repair with incorporation of endothelial components into the vascular wall. We evaluated the frequency of DV by clinical presentation; in cases with PE with and without small for gestational age (SGA) (N = 15), and SGA with and without Doppler flow abnormalities (N = 15). All groups except the SGA without Doppler abnormalities showed DV. Among placentas with DV, the most severely affected group was PE with SGA; the least affected was PE without SGA.
Discussion: The association with SGA suggests that the DV is a subacute process of vascular injury that accelerates in the setting of PE. The majority of DV cases were not initially recognized suggesting a role for endothelial markers for DV detection. We also propose that the rampant endothelial injury seems to be a prominent finding in the decidual vessels of subjects with PE complicated by SGA and a similar process in the systemic vasculature may be responsible for the circulating endothelial microparticles reported in such patients.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

In the setting of preeclampsia (PE), vascular changes termed decidual vasculopathy (DV) occur in the decidua along the free membranes away from any trophoblast invasion [1]. Two patterns of DV are recognized. One showing fibrinoid necrosis within the vessel wall and occasional foam cells termed acute atherosis. The other form shows medial hypertrophy, often with perivascular lymphocytes, so-called hypertrophic DV [2]. The relationship between these two forms is unclear, but it is often assumed that the hypertrophic form evolves into atherosis [3].

Our goal was to provide a detailed description of DV using stains for CD31, CD34, desmin and Masson's trichrome to characterize the changes in the intima and media of the decidual vessels in cases of placental insufficiency such as in preterm preeclampsia and idiopathic fetal growth restriction. We also used stains to evaluate functional damage to endothelium including detection of extravasated fibrin and accumulation of nitrotyrosine. We then reviewed additional placentas from other forms of impaired placentation to assess the frequency of DV by clinical presentation. The clinical groups studied were: 1) Small for gestational age (SGA), with normal Dopplers of the umbilical vessels and without PE; 2) SGA, with abnormal Dopplers of the umbilical vessels and without PE; 3)

Abbreviations: PE, Preeclampsia; DV, decidual vasculopathy; SGA, Small for gestational age.

* Corresponding author. Present address: Department of Pathology, Beth Israel Deaconess Medical Center (BIDMC), 330 Brookline Ave, Boston, MA 02215, USA.
E-mail addresses: JLHecht@bidmc.harvard.edu (J.L. Hecht), zzsengel@bidmc.harvard.edu (Z.K. Zsengeller), mspiel@bidmc.harvard.edu (M. Spiel), sananth@bidmc.harvard.edu (S.A. Karumanchi), srosen@bidmc.harvard.edu (S. Rosen).

http://dx.doi.org/10.1016/j.placenta.2016.04.006
0143-4004/© 2016 Elsevier Ltd. All rights reserved.

PE with SGA; 4) PE without SGA.

2. Material and methods

2.1. Case selection

For the morphometric study, the 'membrane roll' sections from six, de-identified, term and preterm placentas with clinically reported decidual vasculopathy in the setting of PE were reviewed. In our practice, hypertrophic DV is reported when prominent (mean wall diameter is about 30% of overall vessel diameter; similar to that seen in first trimester spiral arterioles). Cases showing more than one focus of well preserved histologic features of atherosis-like or hypertrophic DV were selected for immunostaining. Four elective terminations without anomaly, at less than 16 weeks gestational age, were selected to define normal vascular development and for comparison with hypertrophic DV. Such muscular spiral arterioles are rarely seen in the decidua of the membrane rolls away from the disc near term, so the early gestations were included as examples of intact muscular arterioles unaffected by DV.

To determine the frequency of DV by clinical presentation, an additional 30 cases were selected from a preexisting tissue database based on the availability of residual tissue sections (Tables 1 and 2). Endothelial stains were reviewed. The number of vessel profiles involved by DV were counted in membrane roll sections and expressed as a proportion of all vessels of size between 40 and 150 μm and further quantitated as abnormal vessels/100 analyzed for purpose of comparison.

The definitions used for PE, SGA and Doppler abnormalities were previously described [4–6]. Preeclampsia was diagnosed based on the "ACOG Task Force on Hypertension in Pregnancy 2013" criteria [4]. Normotensive women who developed a blood pressure ≥140 mm Hg systolic or ≥90 mm Hg diastolic on 2 occasions at least 4 h apart after the 20th week GA and proteinuria ≥300 mg/24 h urine collection or protein/creatinine ratio ≥0.3. Additionally, preeclampsia was diagnosed in the absence of proteinuria based on hypertension with additional new-onset laboratory abnormalities: elevated liver transaminases (twice the normal range), renal insufficiency (creatinine level > 1.1 mg/dl), thrombocytopenia (platelet count <100,000/microliter), or with additional new-onset symptoms: pulmonary edema and/or cerebral or visual disturbances. Placentas of women diagnosed with preeclampsia are routinely sent for pathologic examination, and these placentas were identified retrospectively and prospectively reanalyzed for this study.

Infants were classified as growth restricted when they were less than 10th percentile for estimated fetal weight by antenatal ultrasonographic growth curves. The birth weights of these infants were plotted on Fenton growth curves incorporating gestational age, gender, and also classified as SGA [7]. Antenatal umbilical Doppler velocimetry were retrospectively reviewed for infants that met criteria for SGA. Doppler studies were performed as part of clinical practice using a 5–8 MHz curvilinear transabdominal probe and a General Electric Voluson E8 machine (GE Medical Systems). Criteria for abnormal umbilical artery Doppler velocimetry were based on the clinical guideline published by the Society of Maternal Fetal Medicine in 2012 and include: progressive decrease in end-diastolic flow until the waveform was absent and then with reverse flow during diastole [6]. We also studied placentas from 10 preterm labor patients delivered less than 37 weeks that served as additional controls to exclude gestational age related changes in the decidual vessels.

Table 1
Frequency of decidual vasculopathy by case.

Case ID	# Vessels with DV	Vessels counted	DV per 100 vessels counted
SGA, normal Doppler, No PE			
MS2	0	50	0
MS3	0	138	0
MS6	0	383	0
MS10	0	189	0
MS14	0	57	0
SGA, abnormal Doppler, No PE			
MS35	40	133	30
MS36	0	120	0
MS37	60	280	21
MS38	7	144	5
MS41	0	310	0
MS44	0	153	0
MS46	0	71	0
MS47	0	110	0
MS49	0	180	0
MS50	26	26	100
SGA with PE			
MS81	54	171	32
MS82	3	131	2
MS83	0	70	0
MS84	50	340	15
MS86	40	230	17
MS89	0	140	0
PE without SGA			
MS124	3	203	1
MS125	0	78	0
MS140	0	31	0
MS162	0	98	0
MS151	12	112	11
MS126	0	147	0
MS148	0	40	0
MS176	0	120	0
MS175	0	45	0

2.2. Immunohistochemistry

Immunohistochemical stains were performed on four micron sections from formalin-fixed, paraffin-embedded tissue using epitope retrieval, and a two step polymer method conjugated to peroxidase (Envision Plus-DAKO). DAB Plus (Dako) was the chromogen. An automated stainer was used (Dako Autostainer). Primary antibodies (source; clone; dilution) were CD31 (Dako, Santa Barbara, CA USA; JC70A; prediluted), CD34 (Dako; QBEnd 10; prediluted), desmin (Dako; D33; prediluted), CD68 (Dako; KP1; prediluted), CD45 (Dako; 2B11 + PD7/26; prediluted), carbonic anhydrase IX (CA-9) rabbit anti-human polyclonal (Novus Biologicals, Littleton, CO USA; catalog# NB100-417; 1:3000), CD42B (Leica, Buffalo Grove, IL USA; MM2/174; 1:100). Nitrotyrosine stain was performed manually using heat retrieval (Antigen Unmasking Solution, Citric Acid Based pH6, Vector Laboratories, Burlingame, CA, USA), with incubation for 40 min at room temperature using rabbit anti-nitrotyrosine antibody (Millipore/Fisher #AB5411 1 mg/ml) using a 1:750 dilution, and detection by Vector ImmPRESS™ HRP Anti-Rabbit IgG (Peroxidase) kit (Vector Laboratories, Burlingame, CA, USA). Fibrin stain was performed manually with pronase pretreatment (Roche, Indianapolis, Indiana). Primary fluorescein isothiocyanate (*FITC*) conjugated antibody (Catalog#55169, MP biomedicals, LLC Solon, Ohio) was applied at a dilution 1:16 in phosphate buffered saline for an incubation time of 30 min. Slides were read by direct immunofluorescence.

2.3. Statistical methods

Chi-squared statistics were calculated for contingency tables comparing clinical subsets to the control group (SGA with normal Doppler and no preeclampsia). In addition, we compared the total

Download English Version:

https://daneshyari.com/en/article/5894330

Download Persian Version:

https://daneshyari.com/article/5894330

Daneshyari.com