Alternative method of sampling placentas for the assessment of uteroplacental vasculature

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Abstract

A new method for the taking and embedding of placental blocks to obtain maximum information regarding the uteroplacental vasculature was developed. This method involves taking *en face* blocks of the basal plate of the placenta. Results show that normal and abnormal maternal vessels are clearly delineated.

In addition to conventional full thickness blocks, which provide information about the chorionic plate such as inflammation and meconium pigment uptake, and about the parenchyma in the other zones remote from the basal plate of the placenta, it is recommended that *en face* blocks be taken for histological assessment of the placenta.

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During normal pregnancy, extravillous trophoblast invading maternal decidua and myometrium transform the normally narrow calibre spiral arteries into distended uteroplacental arteries. These changes constitute the physiological vascular changes of pregnancy and effect an increased blood flow to the placenta and fetus.^{1,2} It is now evident that an assessment of the maternal uteroplacental vasculature is an important and necessary component of the examination of the placenta in numerous pregnancy disorders, including pre-eclampsia, intrauterine fetal growth retardation, miscarriage and maternal connective tissue disease.¹⁻⁶ Definitive evidence of abnormal placentation includes absence of physiological vascular changes, acute atherosclerosis, and, in the third trimester, intraluminal endovascular trophoblast.

Histological assessment of the maternal blood supply to the placenta can be made either by a study of placental bed biopsy specimens or of the basal plate of the placenta.³ The former is usually attainable only at caesarean section or else not available in every obstetric centre. Thus it is necessary to maximise the information available from the examination of the placental basal plate. The current recommendation for histological examination is that sampling consist of full thickness blocks of the placenta extending from the fetal to the maternal surface, including both amnion and decidua.^{7,8} However, these sections do not always contain maternal vessels for assessment. It occurred to one of us (TYK) that an alternative method for examining these utero-

placental arteries would be to take *en face* blocks of the placental basal plate which would comprise a larger surface area and, accordingly, have a greater chance of including a spiral artery for assessment. This paper reports the preliminary results of this alternative method of taking and embedding placental blocks and a comparative quantitative assessment between conventional and alternative block taking.

Methods

All placentas submitted to the Department of Pathology, Queen Victoria Hospital in a 14 week period (April to July 1991) were entered into the study. Conventional blocks were taken to include the full thickness of the parenchyma from the amniotic surface through to the basal plate. A random *en face* block of the basal plate was also taken from each placenta (or corresponding half of a fused twin placenta) by shaving the basal plate and embedding the block on its face. All sections were examined and the number of uteroplacental arteries in the conventional blocks and alternative *en face* blocks were compared. Specifically, the presence or absence of physiological changes^{2,3} and the presence of the vasculopathy, acute atherosclerosis,⁹⁻¹¹ in these uteroplacental arteries were documented in each case.

Results

A total of 136 placentas were submitted for histopathological examination. There were 33 twin and two triplet placentas. In three twin placentas an *en face* block was taken from only one half of the placenta; therefore, 170 sets of placentas were available for comparison. Fifty five pregnancies were complicated by conditions thought to be associated with maternal vascular abnormalities (intrauterine growth retardation (n = 20), pre-eclampsia (n = 19), intrauterine growth retardation and pre-eclampsia (n = 4), systemic lupus erythematosus or mixed connective tissue disease (n = 3) and placental abruption (n = 9).

The other 81 placentas were sent for various reasons: preterm delivery (n = 41), ascertainment of zygosity in multiple pregnancy (n = 20), unusual gross lesions in the placenta (n = 3), fetal distress or fetal anomaly (n = 11) and other maternal or obstetrical reasons, such as hepatitis, diabetes mellitus, placenta praevia and polyhydramnios (n = 6).

When blocks were taken *en face* to the basal

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Figure 1 Section showing a leash of uteroplacental arteries in an *en face* block of placental basal plate. Note the distended lumina.

Figure 3 *En face* basal plate block: intraluminal endovascular trophoblast (arrow) in a pregnancy complicated by intrauterine growth retardation.

plate, occasionally the morphological picture was that of islands of villi with basal plate or superficial decidua very much like the hillocks and valleys seen in a topographical map. Uteroplacental arteries were defined as those arteries with fibrinoid matrix in the walls in which were embedded endovascular trophoblast (fig 1). Absence of physiological vascular changes could be seen in the form of unconverted spiral arteries that retained their mus-

cular and elastic tissue within the walls (fig 2); this was observed only in pregnancies complicated by pre-eclampsia, or intrauterine growth retardation, or both. A further abnormal finding was the presence of endovascular trophoblast either free in the lumen or attached to the intima in the abnormal pregnancies (fig 3). Acute atherosclerosis could be identified in the *en face* blocks (fig 4).

Uteroplacental arteries—spiral arteries

Figure 2 *En face* basal plate block: spiral arteries show no evidence of physiological changes with retention of muscular and elastic tissue within their walls and narrow calibre lumen.

Figure 4 *En face* basal plate block: acute atherosclerosis in a pregnancy complicated by fulminating pre-eclampsia and intrauterine growth retardation.

showing physiological changes, were seen in 91 *en face* blocks and in 38 full thickness blocks, while spiral arteries devoid of physiological changes were seen in two *en face* and two full thickness blocks of the same two cases. Thus more vessels could be seen in the *en face* basal plate blocks more often than could be obtained in the full thickness blocks (93 or 54.7% v 40 or 23.5%). For the detection of uteroplacental arteries *en face* blocks were superior to full thickness blocks in 80 cases (in 69 corresponding full thickness blocks no spiral arteries were detected), inferior in 16 cases (no arteries were detected in 16 *en face* blocks) and no different in 72 cases (no arteries were detected in 61 *en face* or full thickness blocks). Features of abnormal placentation were seen more often also in *en face* blocks: intraluminal endovascular was seen in five *en face* but not in any full thickness blocks while acute atherosclerosis was seen in one case in only one *en face* block. Villitis of unknown aetiology was clearly seen in the *en face* blocks in seven cases.

Discussion

More maternal spiral arteries could be identified by embedding an *en face* block of the basal plate than by conventional full thickness blocks. This confirms previous observations¹⁰ that the basal plates from full thickness blocks often do not include maternal vessels. Utilising full thickness blocks taken at every 20 mm along the maximum diameter of the placenta and thus yielding six to eight blocks per placenta, Khong found spiral arteries in only 73% of placentas,¹⁰ an expensively low yield, considering the number of blocks. The pick-up rate of 54.7% from one *en face* block in the present study compares very favourably.

The finding of uteroplacental arteries showing physiological changes in the basal plate is not a reliable indicator of normality because deeper decidual and myometrial segments may not show such changes.³ The more diagnostically useful feature is the finding of spiral arteries without physiological changes and, in this respect, these were seen equally frequently in *en face* and full thickness blocks. It could therefore be argued that *en face* blocks offer no advantage over full thickness blocks. However, we used only one *en face* block in this evaluation and we could detect more maternal arteries more frequently in *en face* than full thickness blocks, allowing a theoretically

increased likelihood of detecting unconverted arteries. Furthermore, *en face* blocks proved superior in detecting other parameters of abnormal placentation, such as acute atherosclerosis^{9,11} or intraluminal endovascular trophoblasts.³

En face blocks also proved useful in detecting villitis of unknown aetiology as these lesions are often distributed among anchoring villi in some cases.¹² No valid comment can be made regarding its comparison with full thickness blocks because these lesions are often focal.

A potential pitfall of this method of sampling for assessing uteroplacental arteries was the possible confusion between the unconverted spiral arteries and the thicker muscular arteries of the mainstem villi. However, the presence of an investing layer of syncytial trophoblast in these mainstem villi, surrounding fetal mesenchyme and the absence of surrounding decidua or trophoblast easily distinguished fetal and maternal arteries.

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