HEART DISEASE & PREGNANCY

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CARDIOVASCULAR CHANGES DURING PREGNANCY

A number of physiologic changes take place over the course of a normal pregnancy. The main cardiovascular changes include a decrease in systemic vascular resistance, an increase blood volume by 25%, and an increase in cardiac output by approximately 50%. These changes are associated with a significant increase in blood flow to the kidneys, uterus, and skin.

Drop in systemic vascular resistance

The initial change during pregnancy is a fall in systemic and pulmonary vascular resistance to about 70% of pre-pregnancy levels by 8 weeks of gestation (1). This fall is felt to be related to increased levels of circulating estrogens, nitric oxide, and other vasodilatory peptides (2). The decrease in systemic vascular resistance is associated with a drop in blood pressure (systolic and diastolic) by about 10 mmHg reaching its lowest point at 20 weeks of gestation and returning to pre-pregnancy levels by full term (1,3). The fall in blood pressure may be attributed to a relatively under-filled vascular state created by arterial and venous dilation (4).

Increase in Plasma Volume and Cardiac Output

There is also an increase in plasma volume and thus the preload that occurs by activation of the renin-angiotensin-aldosterone system which is thought to be a response to the relative vascular underfill. The heart rate increases by 10-20 beats per minute for the entire duration of the pregnancy (1). The increases in end-diastolic volume, stroke volume, heart rate, and contractility all cumulate to increase cardiac output, which peaks at 140% of pre-pregnancy levels by 20-28 weeks of gestation (5). During labour, without analgesia, cardiac output increases by approximately 30% with contractions due to an increase in stroke volume (6). This acute increase in cardiac output may be alleviated with effective regional analgesia (7). Increases in cardiac output may also be reduced by the supine position rather and the decubitus position, as the former reduces venous return to the heart (8). There is a significant increase in cardiac output after delivery that is related to placental autotransfusion. All of these changes put pregnant women, especially those with heart disease, at an increased risk of volume overload and pulmonary edema. Cardiac output may take up to 6 months to return to pre-pregnancy levels (9).

Structural Changes to the Heart and Blood Vessels

A number of structural and functional changes to the heart occur during pregnancy (10). Pregnancy is associated with increases in ventricular chamber dimensions, left ventricular mass, ejection fraction and fiber shortening. All of these changes regress after delivery. Valvular orifice areas and diameters have all been shown to increase during pregnancy accounting for a higher incidence and increase in severity of valvular regurgitation.

There is an increased risk of aortic dissection during pregnancy that has been attributed to changes in the extracellular matrix of the aortic media and increase in cardiac output.

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