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CASE SERIES AND REVIEW

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Peripartum anesthetic management of patients with aortic valve stenosis: a retrospective study and literature review

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ABSTRACT
Background: Anesthetic management of parturients with aortic stenosis is controversial. Early studies suggest maternal mortality was related to cardiac condition and anesthetic care. In this report, management of parturients with moderate or severe aortic stenosis in two institutions is compared, and published cases are reviewed.
Methods: Peripartum anesthetic management of all parturients with moderate or severe aortic stenosis who gave birth between 1990 and 2005 at our institutions, is described. Patients with mild or non-valvular aortic stenosis were excluded.
Results: There were 12 parturients, six with moderate and six with severe aortic stenosis. Two patients with moderate aortic stenosis were New York Heart Association (NYHA) classification II, the others were asymptomatic. Five patients with severe aortic stenosis were symptomatic (NYHA classification II or III). Two patients with moderate and three with severe aortic stenosis underwent cesarean delivery; epidural anesthesia was used for two. Two patients with moderate and all with serious aortic stenosis were observed postpartum for 24 to 48 h in a high-dependency unit. There were no severe maternal or neonatal complications.
Conclusions: Carefully titrated regional analgesia is usually well tolerated in patients undergoing vaginal or cesarean delivery even in the presence of severe aortic stenosis. Standard monitoring is usually adequate for vaginal delivery, but invasive monitoring may facilitate management in some patients. An arterial line allows close monitoring of systemic blood pressure. Facilities for close 24-48-h post-partum observation should be available. A multidisciplinary approach is needed.

Keywords: Pregnancy; Aortic stenosis; Anesthesia; Peripartum

Introduction

Aortic stenosis (AS) in young women is usually the result of a stenotic bicuspid aortic valve. Bicuspid aortic valves are among the most common congenital cardiac anomalies, occurring in 1-2% of the population.[1] Severe AS carries a high risk of maternal morbidity and mortality and therefore requires advanced planning and a comprehensive team approach.[2] Anesthetic management of the parturient with AS has been discussed in several case reports.[3–17] In our report, the peripartum anesthetic management of patients with moderate and severe AS, is discussed in context with a systematic review of previously reported cases.

Methods

The peripartum records of parturients with the diagnosis of AS who delivered between January 1990 and October 2005 were reviewed in two university hospitals (Shaare Zedek Medical Center, Jerusalem, Israel and Mount Sinai Hospital, Toronto, Canada) with approximately 17 000 deliveries annually. The hospital databases and records of parturients with the diagnosis of 'aortic stenosis and pregnancy' meeting these criteria were reviewed. The severity of AS: moderate (peak pressure gradient 36-63 mmHg) or severe (peak pressure gradient >63 mmHg), was determined by echocardiography.[3] Patients with non-valvular AS (subvalvular or hypertrophic obstructive cardiomypathy), corrected AS (valvuloplasty or valve replacement without obstruction) or mild AS (peak pressure gradient <36 mmHg) were excluded.

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Table 1 Patient demographic and obstetrical data

Pt #	Age	Gravity/parity Gestation age	Additional medical problems	Severity			Mode of delivery	Peripartum monitoring
				AVA (cm^2)	Peak gradient (mmHg)	NYHA		
Moderate aortic stenosis								
1	16	G1P0, 38 wks	None	0.9	35	I	Vacuum	Standard
2	33	G2P1, 40 wks	None	0.9	50	I	NVD	Standard (without ECG)
3	22	G2P1, 40 wks	Heavy smoker	0.9	60	II	Emergency CS	Standard
4	25	G3P2, 39 wks	Heavy smoker	0.9	62	II	NVD	Standard + IBP
5	27	G1P0, 39 wks	AV balloon dilatation	1.0	44	I	Forceps	Standard
6	37	G9P3, 37wks	Aortic root diameter 4.2 cm	1.0	48	I	Elective CS	Standard +IBP
Severe aortic stenosis								
7	36	G2P1, 38wks	Moderate AI	0.8	67	II	Vacuum	Standard
8	26	G5P1, 38 wks	Asthma, CHF, aortic coarctation	0.8	70	III	Vacuum	Standard +IBP
9	34	G2P1, 38 wks	Previous CS	0.8	64	II	Elective CS	Standard +SpO2
10	32	G1P0, 39 wks	MVS, CVA	0.7	80	I	Forceps	Standard +IBP
11	36	G13P6, 37 wks	Aortic root diameter 4.8 cm	0.5	130	II	Elective CS	Standard +IBP+TEE
12	31	G1P0, 36 wks	MVR	0.5	130	III	Elective CS	Standard +IBP

Standard monitoring: non-invasive blood pressure cuff, continuous electrocardiogram, and pulse oximetry. AI: aortic insufficiency; AV: aortic valve; MVS: mitral valve stenosis; CVA: cerebrovascular accident; MVR: mitral valve regurgitation; AVA: aortic valve area; NVD: normal vaginal delivery; CS: cesarean section; IBP: invasive blood pressure; TEE: transesophageal echocardiography; ECG: electrocargigarm. Early labor, fetal distress.

Patients were assessed in the third trimester of pregnancy, within three weeks of delivery but before the onset of labor. At that time, the New York Heart Association (NYHA) functional class and the aortic valve area and gradients were determined. These data and the demographics, mode of delivery, anesthetic management, peripartum monitoring, intrapartum fluids and complications were summarized and entered into a database.

Guidelines written by the American College of Cardiology and the American Heart Association defined moderate AS as a valve area of 1.0-1.5 cm^2 or a peak pressure gradient between 36 and 63 mmHg. Severe AS was defined as a valve area of $\leqslant$1.0 cm^2 or a peak pressure gradient >63 mmHg.[18] Patients in our report were classified as *severe* only if the gradient was >63 mmHg; this was done to include only those parturients with significant hemodynamic compromise. Using these pressure gradient criteria, all of our patients with a valve area of 0.8 cm^2 or less were classified as *severe*.

Previously reported cases were identified by searches conducted on MEDLINE (1966 to December 2005) and EMBASE (1980 to December 2005) using the following key words: anesthesia/anaesthesia; aortic stenosis; pregnancy. There were no restrictions on language or publication type. Case reports of hypertrophic obstructive cardiomyopathy or sub- and supra-valvular aortic stenosis were excluded. All cases were classified using the criteria above and available demographic, peripartum and anesthetic information were summarized and entered into the database.

Results

In our series, six patients had moderate AS and six had severe AS. A description of the population, including maternal age, gestational age at the time of delivery, gravity, parity, severity of AS and concomitant medical conditions is shown in Table 1. Two cases were managed in Israel (#10 and #11), with the remainder in Canada. The etiology of AS in 11 patients was a congenital bicuspid aortic valve and one patient (#10) had rheumatic heart disease. In patients with moderate AS, four were asymptomatic (NYHA I) and two had mild symptoms (NYHA II). In this group, patients with symptoms had higher peak gradients. In contrast, all but one patient with severe AS (#10) had cardiac symptoms. Two patients (#6 and #11) had aortic root dilatation.

All patients had non-invasive blood pressure and electrocardiogram monitoring but only one patient, with dilatation of the aortic root (#6), had continuous blood pressure monitoring using an arterial line (Table 1). In patients with moderate AS, four delivered vaginally and two had cesarean deliveries. Epidural or combined spinal-epidural (CSE) analgesia was used for pain relief