

How to Deliver an Effective Anesthesia for the Delivery of a Cardiac Patient?

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Cardiovascular Conditions That May Complicate Pregnancy

Table 2. Cardiovascular Conditions That May Complicate Pregnancy.

Antecedent cardiovascular conditions with unacceptable adverse event rates for the mother and fetus

Severe, idiopathic pulmonary-artery hypertension

Eisenmenger's syndrome

Other cyanotic congenital heart disease

Severe aortic stenosis (or other left-sided obstructive lesions), with or without symptoms

Severe, symptomatic aortic regurgitation, especially with left ventricular systolic dysfunction (ejection fraction, <0.40)

Severe, symptomatic mitral stenosis, especially with pulmonary-artery systolic pressure $\geq 75\%$ of systemic arterial systolic pressure

Severe, symptomatic mitral regurgitation, especially with left ventricular systolic dysfunction (ejection fraction, <0.40)

Severe, symptomatic pulmonic stenosis

Dilated cardiomyopathy (ejection fraction, <0.40) with New York Heart Association class III or class IV symptoms

Marfan's syndrome with dilated aortic root (>4.0 cm)

Mechanical heart valve with obligate need for anticoagulation

Cardiovascular complications of pregnancy

Hypertension; preeclampsia; eclampsia; and hemolysis, elevated liver-enzyme levels, and low platelet count (HELLP syndrome)

Venous thromboembolic disease

Aortic dissection

Coronary-artery dissection

Peripartum cardiomyopathy

Key points

- Not all cardiac diseases are the same
- Not all terms of pregnancy are the same
- Not all stages of the disease are the same
- Not every hour in a day-night is the same

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A 31-year-old woman with **primary pulmonary hypertension** presented for an elective cesarean section at the 34-week gestation. After monitoring pulmonary artery, systemic artery blood pressures and an electrocardiogram, continuous lumbar epidural anesthesia was performed. Uneventful delivery was followed by a sudden decrease in systemic pressure and loss of consciousness. Her trachea was intubated and administration of epinephrine was started. Nitroprusside and milrinone were infused to decrease pulmonary artery pressure and to maintain systemic arterial pressure. However, she died after 16 hours due to an impairment of right ventricular function. Although the patient with PFH had been managed successfully using continuous epidural analgesia until delivery, sudden hemodynamic alterations following delivery could not be controlled by pharmacological interventions.

Confidential Enquiry into Maternal and Child Health

>2,000,000 maternities
2003-2005

- Cardiac disease was the most common cause of *Indirect* deaths as well as of maternal deaths overall. In the main this reflects the growing incidence of acquired heart disease in younger women related to less healthy diets, smoking, alcohol and the growing epidemic of obesity.

Table 8.1

Direct deaths attributed to anaesthesia and rate per 100,000 maternities, United Kingdom: 1985-2005

Triennium	Direct deaths attributable to anaesthesia n (%)	Total number of Direct deaths	Rate per 100,000 maternities	95 per cent CI	
1985-87	6 (4.3)	139	0.26	0.12	0.58
1988-90	4 (2.8)	145	0.17	0.07	0.44
1991-93	8 (6.3)	128	0.35	0.18	0.68
1994-96	1 (0.7)	134	0.05	0.01	0.26
1997-99	3 (2.8)	106	0.14	0.05	0.42
2000-02	6 (5.7)	106	0.30	0.14	0.66
2003-05	6 (4.5)	132	0.28	0.13	0.62

Table 9.2

Causes of maternal death from cardiac disease: United Kingdom: 2003-2005.

Type and cause of death	Indirect	Late*
Acquired		
Aortic dissection	9	0
Myocardial infarction	12	4
Ischaemic heart disease	4	0
Sudden Adult Death Syndrome (SADS)	3	9
Peripartum cardiomyopathy	0	12
Cardiomyopathy	1	4
Myocarditis or myocardial fibrosis	5	0
Mitral stenosis or valve disease	3	0
Infectious endocarditis	2	2
Right or left ventricular hypertrophy or hypertensive heart failure	2	1
Congenital		
Pulmonary hypertension	3	0
Congenital heart disease	3	2
Total	47	34

Maternal outcome correlates with NYHA criteria

- Class I: pts not limited in their physical activity
- Class II: slight limitation in physical activity
- Class III: marked limitation in physical activity
- Class IV: symptoms at rest/ inability to carry physical activity

Maternal mortality

<1%

5-15%

Maternal outcome correlates with
NYHA criteria, but...

Exceptions:

- Pulmonary hypertension
- Significant LV dysfunction
- Severe Marfan syndrome

Perinatal loss correlates with NYHA criteria

Class III-IV:

perinatal mortality rate

20-30%

Anesthesiologist's armamentarium

- *Anesthesia*
 - General anesthesia vs.
 - Regional anesthesia
 - Spinal
 - Epidural: ultra-low concentrated local anesthetic
- *Ventilatory support*
 - Hyperoxia
 - + Hypocapnia
 - + Hypercapnia
- *Hemodynamic support*
 - Fluids
 - Vasopressors (phenylephrine)
 - Inotropes (milrinone)

Monitoring

- Standard
 - ECG
 - IBP (incl. vaginal delivery)
 - Pulse oximetry
 - Capnography
- Uncommon
 - CVP vs. PAC

Awareness during anesthetic induction for C.S.

Not all cardiac diseases are the same:

SVR

High

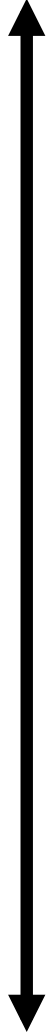
AS

Eisenmenger

PH

Low

MR



Not all cardiac diseases are the same:

HR

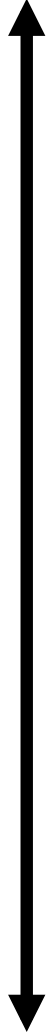
High

PH

AS

Low

MS



- MS
 - betha-blockers
 - prevention & aggressive treatment of AF
- PH
 - Milrinone

Not all cardiac diseases are the same: Intravascular Volume

High

Eisenmenger

PH

MS

MR

Low

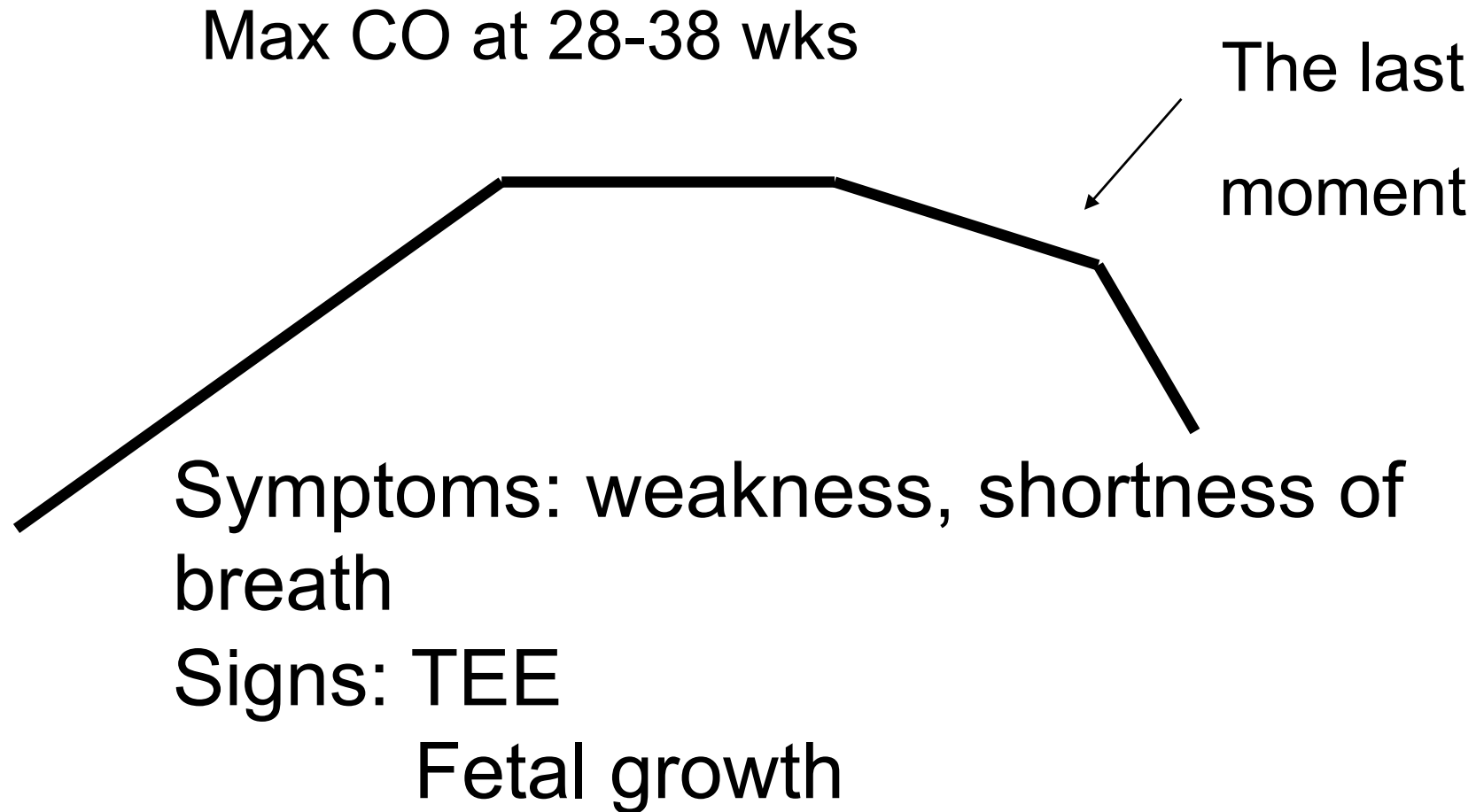


Not all terms of pregnancy are the same

✓ Feasibility of vaginal delivery

Not all stages of the disease are the same

NYHA I-II \neq III-IV



Not every hour in a day-night is the same: Planned C.S. is preferred

- Surgical cases that start after routine hours may face an elevated risk of complications

Kelz et al. Ann Surg 2008;247:544

- Peak anesthetic adverse events in cases began at 4 p.m.

Wright et al. Qual Saf Health Care 2006;15:258

- Increased risk of inadvertent dural puncture between midnight and 8 a.m.

Aya et al. Can J Anaesth 1999;46:665

Anesthesiologist's dilemma:
general vs. regional anesthesia

How to do

is always more important than

What to do

Anesthesiologist's dilemma:
general vs. regional anesthesia

What is common in cardiac patients?

The limited ability for adaptation to rapid changes

Anesthesiologist's dilemma: *general vs. regional anesthesia*

The limited ability for adaptation to rapid changes

Spinal anesthesia is controversial

Epidural anesthesia is feasible

Anesthesiologist's dilemma: *general vs. regional anesthesia*

The limited ability for adaptation to rapid changes

Advantages of general anesthesia:

Control on airway

Control on hemodynamics

Better conditions for Rx in emergency

TEE

PAC

How to do

is always more important than

What to do

Thank you