



*Regional anesthesia in the
high-risk cardiac parturient*

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The high-risk parturient

*Maternal disease : sometimes worse or better
effect of pain & labor & bearing down :*

CO $\uparrow\downarrow$, PAP-SVR-PVR \uparrow

postdelivery autotransfusion : PCWP \uparrow

Delivery may help to solve problem

- bleeding , preeclampsia / HELLP*
- CPR, some cardiac diseases*

High risk parturient

- *understand disease involved*
- *disease* ↔ *pregnancy*
- *disease* ↔ *labor*
- *disease* ↔ *fetus*
- *impact of anesthesia*
- *impact of perinatal drugs*

Mortality risk

- *<1%*
 - *Valvular regurgitation / prolaps /mild PS*
 - *Repaired, ASD, VSD*
- *1-15%*
 - *Stenotic lesions, severe PS, previous AMI*
 - *Metalic valves*
- *>25%*
 - *NYHA III/IV, severe AoS, Marfan, PHT*
 - *LV dysfunction, arrhythmias, cyanosis*

Cardiac disorders

- **Valvular disease**
- *Ischemic disease*
- **Septal defects**
- **Cardiomyopathy**
- **Primary *Pulm. Hypertension***
- **Others :**
 - *Marfan*, ToF, Eisenmenger's complex

Valvular : in general

- *Life threatening risks*
 - *Endocarditis (new guidelines ?)*
 - *Oxytocin (never in bolus)*
 - *Embolism*
 - *Pulmonary hypertension / edema*
 - *Arrhythmias*
 - *Bloodloss*

Pulmonary

■ *Pulmonary edema*

- *Congestive heart failure*
- *Fluid retention / return (preload) after birth*
- *Excessive fluids (prehydration + drugs)*
- *Autotransfusion & return (preload) after birth*
- *Proceed with epidural , furosemide ??*
- *Colloids ?*

■ *Acute pulmonary hypertension*

- *Stress, hypertension, pain, SVR, HR, drugs*

Arrhythmias

- *More with mitral valve disease*
- *Reduced cardiac filling (time)*
 - *Effect on coronary perfusion*
- *Accentuated by*
 - *Oxytocin*
 - *Ephedrine*

Blood loss

■ *May be enhanced by*

- *Avoidance of oxytocics*
- *Anticoagulants (more TE risk)*
- *Operative delivery*

■ *Specific problems*

- *Less capacity to compensate*
- *β -blocker use*

Maternal and fetal outcome

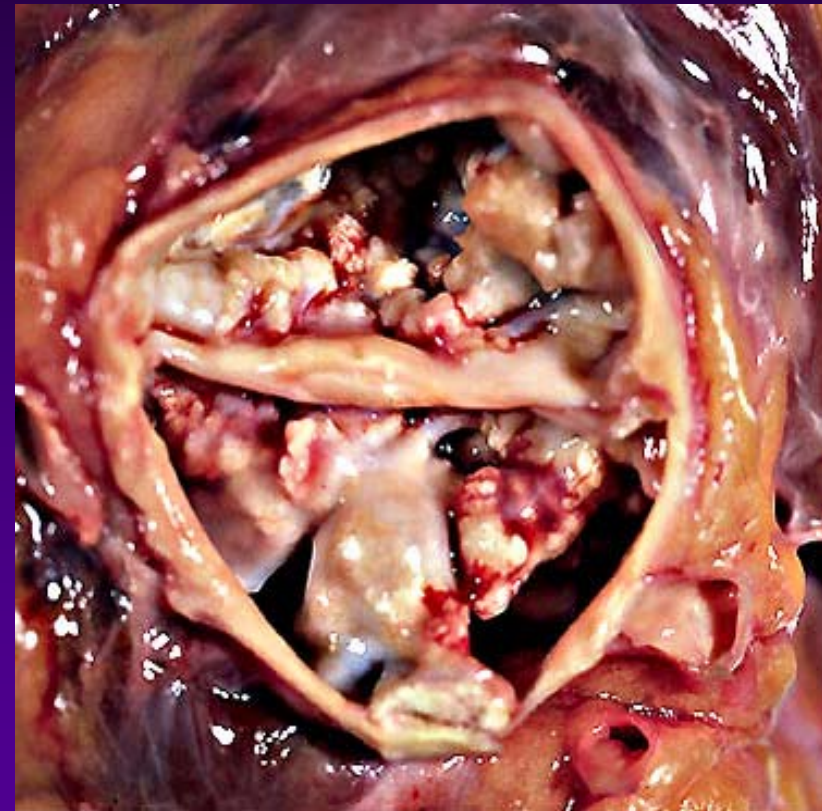
n=312 valvular vs 321 healthy parturients

- *Maternal (0.6-2%) & fetal mortality*
- *Preterm delivery, lower BW*
- *IUGR and Apgar<8*
- *Instrumental delivery (less stressful)*
 - *but identical C-section rate*

Malhotra et al, 2004

Valvular defects

- *Regurgitation*
 - *mitral insufficiency*
 - *mitral valve prolaps*
 - *aortic insufficiency*
- *Stenotic conditions*
 - *mitral stenosis*
 - *aortic stenosis*
 - *pulmonic stenosis*
- *Mixed disease*
- *Corrected problems*



Regurgitation : avoid....

■ *Bradycardia - Dysrhythmia*

- *Increases LV filling time, more regurgitation*
- *Ephedrine better than phenylephrine*

■ *Preload & afterload increase*

- *LRA desirable (fluid preloading !)*
- *Afterload decrease : AVR benefits more than MVR*

■ *Myocardial depression : LVF!*

- *LV enlargement : earlier in AVR*

Beneficial effect of pregnancy (BV, SVR, HR)

Mitral valve stenosis

- *frequent, severe if area $<1\text{cm}^2$*
- *diastolic pressure gradient & duration*
- *LA dilated /thrombus /arrhythmia(AF)*
 - *maternal mortality significantly increased*
- *if tachycardia or AF*
 - *reduced LVF and atrial enlargement*
- *balloon valvuloplasty possible*
- *CHF, PE, second PHT, RVF, TricI*

Aortic valve stenosis

- *Ischemia (O₂ supply, workload, LV wall)*
- *NYHA*
 - *May be severe but symptomless*
- *Echocardiography*
 - *LV hypertrophy, gradient, valvular area*
 - *<1cm² : severe, <0.6cm² : critical*
- *Betablocker : LVEF ??*
 - *more filling time and coronary flow*

Stenotic defects : avoid....

- *SVR increase and tachycardia*
 - *ketamine , atropine , ephedrine*
- *severe bradycardia : phenylephrine ?*
- *marked afterload reduction*
 - *LRA : OK if moderate AL decrease*
- *hypovolemia : normo-volemic expansion*
- *myocardial depression, dysrhythmias*
- *epinephrine in local anesthetics*

Other valvular problems

- *Mitral valve prolaps*
 - *Avoid tachycardia, AL reduction,....*
- *‘Operated’ patients*
 - *HF, PHT and arrhythmia may persist*
 - *Anticoagulation : heparin better ?*
 - **Protamine, LMWH bleeding risk <12h?**
 - **Warfarin : PPSB or FFP**
 - **Bleeding or thromboembolism ?**
- *Mixed problems : predominant ?*

Coronary artery disease

- *Increased risk when*
 - *in third trimester , delivery <2weeks*
 - *C-section*
 - *age <30yrs , diabetes , hypertension*
- *labor : epidural*
- *C-section : epidural > spinal*
- *phenylephrine > ephedrine*
- *LV failure : GA+ low-dose EA ?*

Septum defects

■ *Left to Right shunt :*

avoid

- *SVR increases*
- *severe SVR decrease (ASD)*
- *volume overload , tachycardia (VSD)*

■ *Right to Left shunt (PHT)*

- *Fallot's Tetralogy, Eisenmenger's complex*
- *Avoid pre- and afterload reduction*

Cardiomyopathy

- *Perinatal/Paripartum Dilated CM*
 - *LRA beneficial : afterload reduction*
- *Hypertrophic Obstructive CM*
 - *strictly normovolemia, avoid tachycardia*
 - *no inotropics or afterload reduction*
 - *MVR frequently present*
 - *preferably vaginal delivery*
 - *RA : 'low-LA dose' technique*
 - *if C-section : general anesthesia*

Pulmonary HT

- *Causes (functional and structural)*
 - *Primary*
 - *Secondary : CHD, HIV, SLE, TED, COPD...*
- *Treatment*
 - *Nitric oxide*
 - *Prostacyclin (VD, PLT, Anti-Infl, ...)*
 - *Endothelin receptor antagonists*
 - *Phosphodiesterase inhibitors*
 - *Viagra, Vasopressin*

Pulmonary HT : avoid....

- *Hypoxia , hypercapnia , stress*
- *ketamine , N₂O*
- *PG , oxytocin , ergometrine*
- *Myocardial depression*
- *Bradycardia*
- *Afterload reduction*
- *Preload reduction*



*What about clinical
practice and
experience ?*

Labor analgesia

- *Low dose epidural mostly well tolerated*
- *Stress response ↓ : mitigates Valsalva effects by decreasing the pushing reflex*
- *More stable hemodynamics during contractions and expulsion (forceps)*
- *AL decrease : benefit in regurgitation*
- *CSE / Epidural : no local anesthetics ?*
 - *opioid, neostigmine, clonidine, adrenaline...*
- *CSA ?*

Labor CSA : Advantages

- *Adjustable, titratable*
- *Opioid alone : F 15-25 μ g, S 5-7.5 μ g*
- *Labor : rapid conversion to CS*
- *Lower doses (?)*
 - *not in most reports (leakage ?)*
- *Better hemodynamic stability*
 - *Robson et al, BJA 1993; 70: 634-8*
hypotension 2/20 pts
- *Headache less important than benefits*

Labor analgsia : stenosis

■ *Epidural*

- *Hemmings 1987, Shin 1993*
- *Suntharalingam 2001*
- *After MVR : Nakao 2005*

■ *Spinal*

- *Kee , n=3, CSE , start opioids alone*
- *Vanhelder 1998, CSE : mixed Ao/M, also I*
- *Ransom 1995, CSA : sufentanil*
- *Vd Velde 2003, CSA : sufentanil 2x (+ ropi)*
- *Pan & D'Angelo 2004, CSE : bupi + F + M*

C-section : regurgitation

■ *Epidural*

- *Mitral Valve Prolaps*

 - *Tanaka 1994*

 - *Ruiz Castro 1996*

 - *Alcontara 1987*

- *Ao regurgitation*

 - *Alderson 1987 (+ preeclampsia : death)*

 - *Zangrillo 2005*

- *Between MV replacement & reoperation*

 - *Nakao 2005*

C-section : stenosis

■ *Epidural*

- *Ao Stenosis*

- *Brian 1993, Tamura 1997*

- *Colclough 1990 /'95, Peng 1997, Xia 2006*

- *Pulmonic stenosis*

- *Conway 1994, Campbell 2003 (+ AoI)*

- *Mitral stenosis*

- *Ziskind 1990, Afrangui & Malinow 1998*

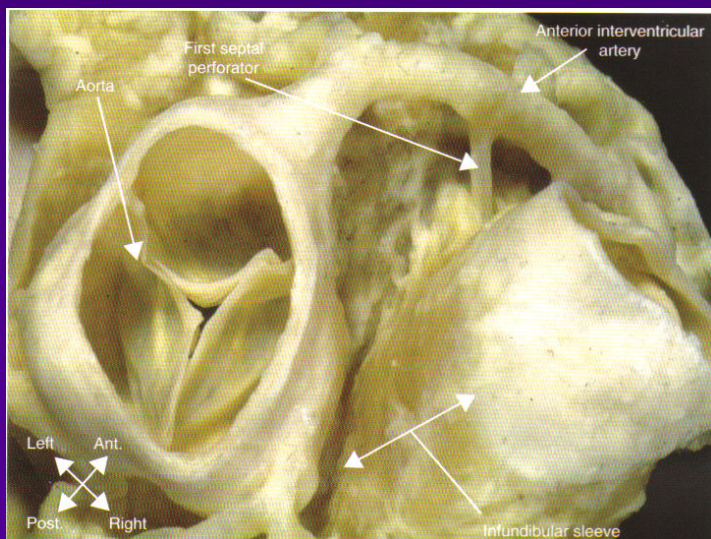
- *Kubota 2003 (n=7), Pan & D'Angelo 2004*

C-section : stenosis

■ *Spinal*

- *SDS* : *Mostafa 1984 (MS)*
- *CSE* : *Boso 2008 (AS)*
- *CSA* : *Pittard & Vucevic 1998 (AS)*

+ 2 editorials



SDS to be avoided !!!

Low dose CSE + EVE ?

Lew et al, A & A 2004; 98: 810-4

- BH 5mg + EVE (6ml NaCl 0.9%)
 - BH 8mg
- vs*
- both + Fentanyl 10µg)
 - quality / spread : identical
 - faster MB recovery
 - **hypotension : no difference**

Sitting or lateral ?

Inglis et al, Anaesthesia 1995 (SDS)

Bembridge, Anaesthesia 1986 (SDS)

Patel et al, Can J Anesth 1993 (CSE)

Kohler et al, A A Scand 2002 (SDS 3')

Coppejans et al, Anesth Analg 2006 (CSE)

Sitting injection of hyperbaric B

- **Slower / less rostral spread**
- **Less (later) hypotension**
- **More epidural supplementation**

RA for non-valvular disease

- *HOCM, PPCM, single ventricle*
- *Ao dissection, coronary (CAD)*
- *several case reports: CSE / CSA*

Honig et al, Anästhetist 1998 (CAD)

Ishiyama et al, A&A 2003 (HOCM)

Ben Letaifa, Ann Fr An Rean 2002 (Marfan, PuEd, MVI)

Okutomi et al, Acta Anaesth Scand 2002 (HOCM, labor)

Dubois et al, Ann Fr Anesth Reanim 2003 (single ventr n=2)

Velichovic & Leicht, IJOA 2004 (PPCM, n=3)

Landau et al, Acta Anaesth Scand 2004 (double outlet RV)

Smith et al, IJOA 2008 (CAD, CS n=3, labor n=1)

RA for non-valvular disease

■ *Eisenmenger's complex ??*

Atanasoff, Acta Anaesthesiol Scand 1990

Cole et al, BJA 2001

Sakuraba et al, J Anesth 2004

MARTIN et al, RAPM 2002; 27: 509-13 (review)

-103 anesthetics + 21 labor analgesia

- mortality : overall 14%, RA 5%, GA 18% (NS)

major surgery : 24%, minor 5% ($p < 0.05$)

labor RA : 24% !!

RA for non-valvular disease

■ *Severe pulmonary hypertension ??*

BONNIN et al, Anesthesiology 2005; 102: 1113-7

-N=14, 15 pregnancies

-Vaginal : n=4 (RA) (1 died, 1 worse)

-CS under GA : n=4 (1 died, 2 worse)

-CS under CSE : n=5 (1 died, 4 stable)

- mortality : n=2 before delivery

overall 36%

a place for low dose CSE ??

Perioperative monitoring











- *ECG , pulse oxymetry*
- *US (EF?) or TEE (awake ?)*
- *Blood pressure : radial artery*
 - *Anticipated blood loss, pre-eclampsia*
 - *CO measurement ?*
- *Central venous line ?*

What will it learn ? Risk of arrhythmias
- *Pulmonary artery catheter ?*
 - *NYHA III/IV, sheath only ? Vasc trauma ?*

Conclusions

- *Multidisciplinary approach (at 24wks ?)*
- *Low-dose epidural is mostly OK for labor*
- *Single-dose spinal mostly not the best idea*
- *Problems not solved after birth or surgery*
- *Invasive monitoring ?*
- *C-section : not always best choice*
- *All RA techniques are not the same*
 - **Outweigh PRO's and CONs**
 - **Individual judgement**

Summary : avoid...

	<i>HR</i>	<i>PL/AL</i>	<i>Contr</i>	<i>C-section</i>
<i>Ao-I</i>				<i>RA</i>
<i>Mi-I</i>				<i>RA</i>
<i>Mi-S</i>				<i>RA</i>
<i>CAD</i>				<i>RA>GA</i>

Summary : avoid...

	<i>HR</i>	<i>PL/AL</i>	<i>Contr</i>	<i>C-section</i>
<i>Ao-S</i>	↑ • •	↓		<i>GA > RA</i>
<i>PS/PHT</i>		↓		<i>GA</i>
<i>L to R</i>		↑ • •		<i>GA/RA</i>
<i>R to L</i>		↓		<i>GA</i>
<i>Eisenm</i>		↓		<i>GA</i>
<i>PPCM</i>	↓	↑ •	↓	<i>RA</i>
<i>HOCM</i>	↑	↓	↑ • •	<i>GA</i>

Conclusions

- *Contraindications for RA (& pregnancy ?)*
 - **Fallot's tetralogy unless repaired**
 - *Gelson et al 2008, RA 67% (16pt / 26del)*
 - **Eisenmenger's complex**
 - **Anticoagulation**
 - **Hypertrophic subaortic stenosis, HOCM**
 - **Primary pulmonary hypertension**
 - **Severe Ao/pulm stenosis ($<0.6-0.9\text{cm}^2$)**
- *Avoid 'heroism'*

*The most important part of 'patient care'
is 'caring for the patient'*



*David L. Brown
RAPM 2003*