CONSORCI
HOSPITAL GENERAL
UNIVERSITARI
VALÈNCIA

CASO CLÍNICO.

Cirugía de Revascularización Coronaria con Circulación Extracorporea

Sesiones de Formación Continuada
6 de Noviembre de 2007

Dra.Merche Murcia, Dr. Alejandro Ripoll
Servicio de Anestesiología, Reanimación Y Tratamiento del Dolor
Consorcio Hospital General Universitario de Valencia

- Paciente de 78 años de edad sometido a cirugia de revascularizacion coronaria realizandose 5 puentes, por cardiopatía isquémica en tratamiento previo con coropres, seguril, AAS, y clopridogel, estos últimos suspendido dos días antes de la cirugía.
- Intraoperatorio sin incidencias. A la salida de CEC muestra hipocinesia global y dilatacion de ventriculo derecho y elevacion del segmento ST. La revision quirurgica demuestra los puentes permeables.

- En el postoperatorio inmediato presenta hipotensión progresiva, con disminución del índice cardiaco, sin elevación significativa de la presión venosa central, sin respuesta a volumen intravascular, ni a la administración de fármacos inotrópicos

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ACC/AHA PRACTICE GUIDELINES—FULL TEXT

ACC/AHA 2004 Guideline Update for Coronary Artery Bypass Graft Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery)

Developed in Collaboration With the American Association for Thoracic Surgery and the Society of Thoracic Surgeons

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Class I

Aspirin is the drug of choice for prophylaxis against early saphenous vein graft closure. It is the standard of care (Table 13) and should be continued indefinitely given its benefit in preventing subsequent clinical events. ***(Level of Evidence: A)***

Class I

Preoperative or early postoperative administration of beta-blockers in patients without contraindications should be used as the standard therapy to reduce the incidence and/or clinical sequelae of atrial fibrillation after CABG. ***(Level of Evidence: B)***

Class I

If clinical circumstances permit, clopidogrel should be withheld for 5 days before performance of CABG surgery. ***(Level of Evidence: B)***

- Existe un riesgo real de sangrado?

Clopidogrel does not increase bleeding and allogenic blood transfusion in coronary artery surgery

Hasan Karabulut[a,*], Fevzi Toraman[a], Serdar Evrenkaya[a], Onur Goksel[b], Sumer Tarcan[a], Cem Alhan[a]

European Journal of Cardio-thoracic Surgery 25 (2004) 419–423

Estudio prospectivo, observacional, 1628 pacientes consecutivos

In conclusion, we suggest that use of clopidogrel prior to CABG does not the increase the amount of postoperative bleeding, rates of reoperation due to postoperative bleeding and the use of blood/blood products regardless of the priority of the operation.

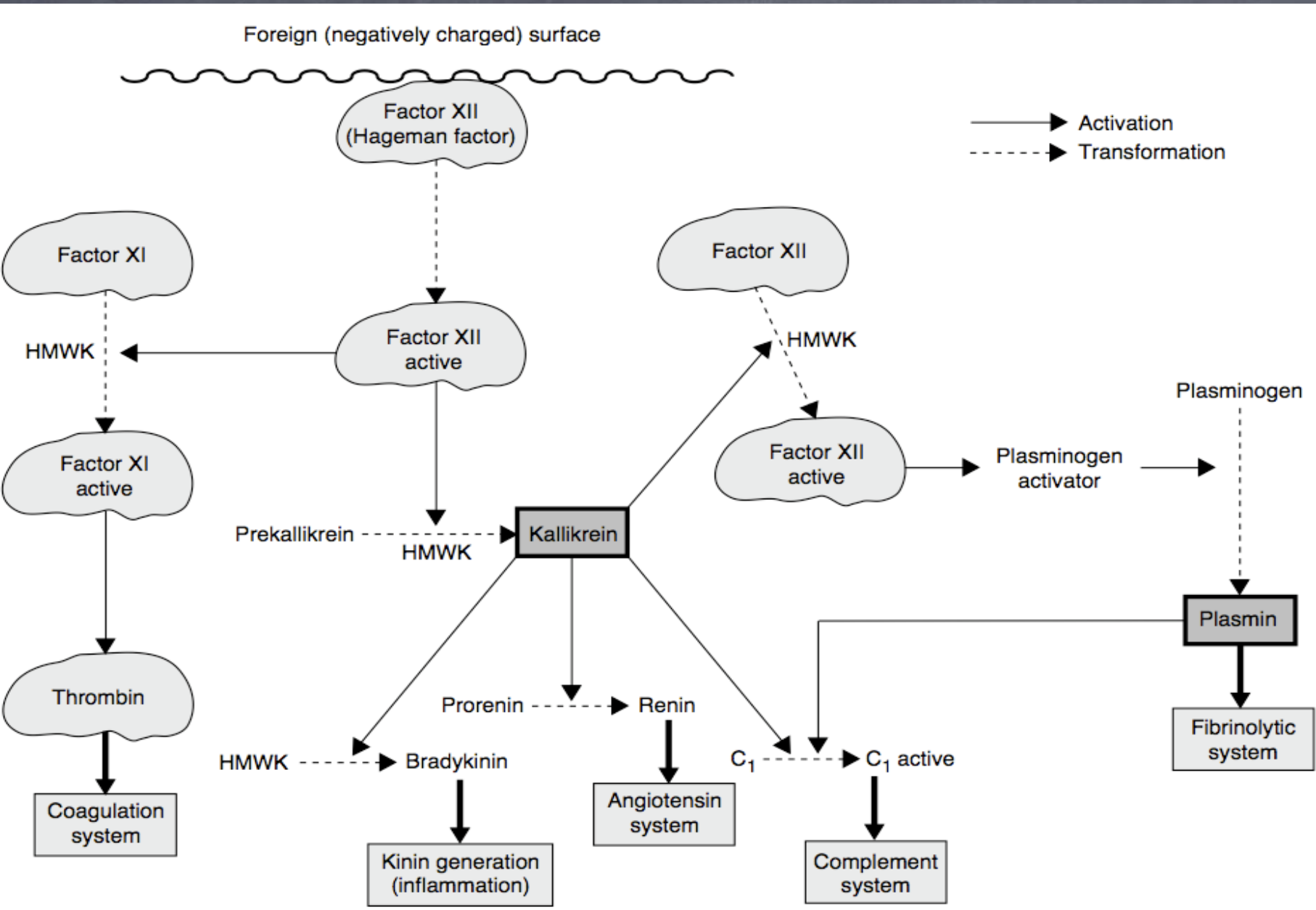
- existe alguna medida para minimizar ese sangrado?

Aprotinin

An Update of its Pharmacology and Therapeutic Use in Open Heart Surgery and Coronary Artery Bypass Surgery

Dene C. Peters and *Stuart Noble*

Drugs 1999 Feb; 57 (2): 233-260


Foreign (negatively charged) surface
Factor XII
(Hageman factor)
Activation
Transformation
Factor XI
HMWK
Factor XII
active
Factor XII
HMWK
Plasminogen
Factor XI
active
Factor XII
active
Plasminogen
activator
Prekallikrein
HMWK
Kallikrein
Plasmin
Thrombin
Prorenin
Renin
HMWK
Bradykinin
C_1
C_1 active
Fibrinolytic
system
Coagulation
system
Angiotensin
system
Kinin generation
(inflammation)
Complement
system

- existe alguna medida para minimizar ese sangrado?

Aprotinin Reduces Bleeding and Blood Product Use in Patients Treated With Clopidogrel Before Coronary Artery Bypass Grafting

Gabriella Lindvall, MD, Ulrik Sartipy, MD, and Jan van der Linden, MD, PhD

Department of Cardiothoracic Surgery and Anesthesiology, Karolinska Institute, Karolinska University Hospital, Stockholm, Sweden

(Ann Thorac Surg 2005;80:922–7)

Aprotinin Decreases Postoperative Bleeding and Number of Transfusions in Patients on Clopidogrel Undergoing Coronary Artery Bypass Graft Surgery

A Double-Blind, Placebo-Controlled, Randomized Clinical Trial

Jan van der Linden, MD, PhD; Gabriella Lindvall, MD; Ulrik Sartipy, MD

(*Circulation*. 2005;112[suppl I]:I-276–I-280.)

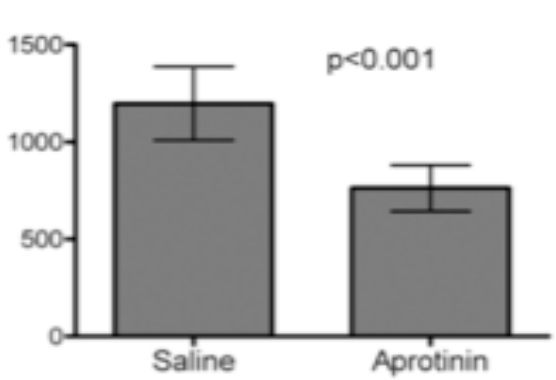


Figure 1. The mean (95% CI) postoperative bleeding (mL) in patients undergoing coronary bypass surgery and randomized to treatment with aprotinin or saline.

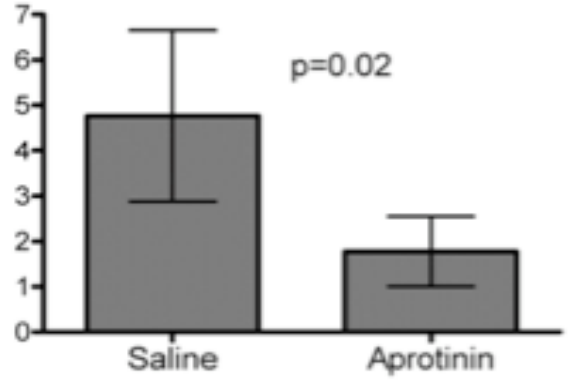


Figure 2. The mean (95% CI) number of transfusions during the total hospital stay in patients undergoing coronary bypass surgery and randomized to treatment with aprotinin or saline.

- existe alguna medida para minimizar ese sangrado?

Mortality Associated With Aprotinin During 5 Years Following Coronary Artery Bypass Graft Surgery

Dennis T. Mangano, PhD, MD

JAMA, February 7, 2007—Vol 297, No. 5 **471**

ORIGINAL ARTICLE

The Risk Associated with Aprotinin in Cardiac Surgery

Dennis T. Mangano, Ph.D., M.D., Iulia C. Tudor, Ph.D., and Cynthia Dietzel, M.D.,
for the Multicenter Study of Perioperative Ischemia Research Group
and the Ischemia Research and Education Foundation*

N Engl J Med 2006;354:353-65.

- existe alguna medida para minimizar ese sangrado?

Effect of aprotinin on clinical outcomes in coronary artery bypass graft surgery: A systematic review and meta-analysis of randomized clinical trials

Artyom Sedrakyan, MD, PhD[a,b,d]
Tom Treasure, MD, FRCS[b,c]
John A. Elefteriades, MD, FACS[a]

J Thorac Cardiovasc Surg 2004;128:442-8

Conclusions

Aprotinin substantially decreases transfusion requirements in patients undergoing CABG. The concern that aprotinin therapy is associated with increased risk of mortality, MI, or renal failure is not supported by data from published, randomized, placebo-controlled clinical trials. For stroke, evidence of a reduced risk associated with aprotinin therapy was shown. A tendency toward reduction in atrial fibrillation occurrence associated with aprotinin use was observed. The balance of effects is positive with aprotinin use.

- existe alguna medida para minimizar ese sangrado?

FDA

Information for Healthcare Professionals

Aprotinin Injection
(marketed as Trasylol)

The issues described in this communication have been addressed in product labeling.

FDA ALERT [02/2006, Updated 09/2006 and 12/2006]: This Alert highlights important revisions to the full prescribing information for Trasylol. The new labeling for Trasylol (December 2006) has a more focused indication for use, a new Warning about renal dysfunction, a revised Warning about anaphylactic reactions, and a new Contraindication. Trasylol is now indicated only for prophylactic use to reduce peri-operative blood loss and the need for blood transfusion in patients who are at *an increased risk for blood loss and blood transfusion* undergoing cardiopulmonary bypass in the course of coronary artery bypass grafting (CABG) surgery. Trasylol should be administered only in the operative setting where cardiopulmonary bypass can be started quickly. Trasylol should not be administered to any patient with a known or suspected exposure to aprotinin within the past 12 months.

FDA is evaluating additional recently submitted epidemiological safety study data (discussed below), in the context of all other safety and efficacy information available on aprotinin. This review may result in other actions, including additional changes to the full prescribing information (product labeling).

This information reflects FDA's current analysis of data available to FDA concerning this drug. FDA intends to update this sheet when additional information or analyses become available.

- existe alguna medida para minimizar ese sangrado?

MINISTERIO DE SANIDAD Y CONSUMO

agencia española de medicamentos y productos sanitarios

25 OCT 2007

33474

SUBDIRECCIÓN GENERAL DE MEDICAMENTOS DE USO HUMANO

COMUNICACIÓN SOBRE RIESGOS DE MEDICAMENTOS PARA PROFESIONALES SANITARIOS

Ref: 2007/14

25 de octubre de 2007

NOTA INFORMATIVA

RIESGOS ASOCIADOS AL USO DE APROTININA EN CIRUGÍA EXTRACORPOREA: NUEVOS DATOS DE SEGURIDAD Y MEDIDAS ADOPTADAS

- ***Restricción de la indicación a cirugía de derivación aorto-coronaria en pacientes con al riesgo de hemorragia.***
- ***Advertencia sobre riesgo de disfunciones renales, sobre todo en pacientes con alteracion previas de la función renal.***
- ***Se describe como una de las reacciones adversas la posibilidad de fallo renal con aprotinina.***

- Que se hace habitualmente?

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ISSN 0735-1097/06/$32.00
doi:10.1016/j.jacc.2006.04.029

Acute Coronary Syndromes

Acute Clopidogrel Use and Outcomes in Patients With Non–ST-Segment Elevation Acute Coronary Syndromes Undergoing Coronary Artery Bypass Surgery

Rajendra H. Mehta, MD, MS, FACC,* Matthew T. Roe, MD, MHS, FACC,* Jyotsna Mulgund, MS,* E. Magnus Ohman, MD, FACC,† Christopher P. Cannon, MD, FACC,‡ W. Brian Gibler, MD,§ Charles V. Pollack, Jr, MD, MA,‖ Sidney C. Smith, Jr, MD, FACC,† T. Bruce Ferguson, MD,¶ Eric D. Peterson, MD, MPH, FACC*

Durham and Chapel Hill, North Carolina; Boston, Massachusetts; Cincinnati, Ohio; Philadelphia, Pennsylvania; and New Orleans, Louisiana

Conclusions. When CABG is required, the majority (87%) of patients treated with acute clopidogrel did not have their surgery delayed for the recommended 5-day interval, contrary to current ACC/AHA guidelines. These patients demonstrated an increase in bleeding complications compared with patients who did not receive clopidogrel and underwent early CABG. However, these bleeding risks must be weighed against the benefits of clopidogrel use demonstrated in randomized clinical trials, as well as against the economic impact of delaying CABG surgery.

- Que se hace habitualmente?

Hemostasia cuidadosa.
Aprotinina.
Transfusión postoperatoria de plaquetas.
Uso de pruebas específicas de función plaquetaria

- Intraoperatorio sin incidencias. A la salida de CEC muestra hipocinesia global y dilatación de ventrículo derecho y elevación del segmento ST. La revisión quirúrgica demuestra los puentes permeables.

Métodos de monitorización y diagnóstico de la isquemia

Causas de isquemia post Derivación CardioPulmonar

Métodos de Monitorización y diagnóstico de la isquemia

- Monitorización del ECG.
- Monitorización de presiones intracardiacas.
- Ecocardiografía Transesofágica.

Métodos de Monitorización y diagnóstico de la isquemia

ECG

- Metodo estándar
- Detecta hasta el 90 % de las alteraciones squémicas
- Económico
- Sencillo
- Pre, intra y postperatorio

Métodos de Monitorización y diagnóstico de la isquemia

Monitorización de la arteria pulmonar

- Administración de infusiones
- Temperatura sanguinea
- Precarga ventricular
- Gasto Cardiaco
- Resistencia Vascular
- Isquemia miocárdica

Métodos de Monitorización y diagnóstico de la isquemia

nesthesiology 2003; 99:988–1014

Practice Guidelines for Pulmonary Artery Catheterization

An Updated Report by the American Society of Anesthesiologists Task Force on Pulmonary Artery Catheterization

- *"La cateterización rutinaria de la arteria pulmonar, con algunas excepciones, es generalmente inapropiada para pacientes de bajo y moderado riesgo".*

PACIENTE

CIRUGÍA

ESCENARIO

nesthesiology 2003; 99:988–1014

Practice Guidelines for Pulmonary Artery Catheterization

An Updated Report by the American Society of Anesthesiologists Task Force on Pulmonary Artery Catheterization

Terms	Definition
Patient	
Low-risk	ASA 1 or 2, hemodynamic disturbances unlikely to cause organ dysfunction
Moderate-risk	ASA 3, hemodynamic disturbances that occasionally cause organ dysfunction
High-risk	ASA 4 or 5, hemodynamic disturbances with a great chance of causing organ dysfunction or death
Surgery	
Low-risk	Small probability of fluid changes or hemodynamic disturbances, low perioperative morbidity or mortality
Moderate-risk	Moderate chance of fluid changes, hemodynamic disturbances, or infection that could cause morbidity or mortality
High-risk	Large chance of fluid changes or hemodynamic disturbances or other factors with high risk of morbidity and mortality
Practice setting	
Low-risk	Good catheter-use skills and technical support, training and experience of nursing staff in the recovery room and ICU, technical support for ancillary services, and availability of specialists and equipment to manage complications
Moderate-risk	Moderate catheter-use skills and technical support, training and experience of nursing staff in the recovery room and ICU, technical support for ancillary services, and availability of specialists and equipment to manage complications
High-risk	Poor catheter-use skills and technical support, training and experience of nursing staff in the recovery room and ICU,

27 SITUACIONES

Anesthesiology 2003; 99:988–1014

Practice Guidelines for Pulmonary Artery Catheterization

An Updated Report by the American Society of Anesthesiologists Task Force on Pulmonary Artery Catheterization

1	2	3	4	5	6	7	8	9
innecesario			posiblemente apropiado			apropiado (no obligatorio)		

Clinical Scenario	Median Vote
Low-risk practice setting Low-risk patient Low-risk surgery	1
Low-risk patient Moderate-risk surgery	1
Low-risk patient High-risk surgery	5
Moderate-risk patient Low-risk surgery	1
Moderate-risk patient Moderate-risk surgery	6
Moderate-risk patient High-risk surgery	8
High-risk patient Low-risk surgery	5
High-risk patient Moderate-risk surgery	8
High-risk patient	9

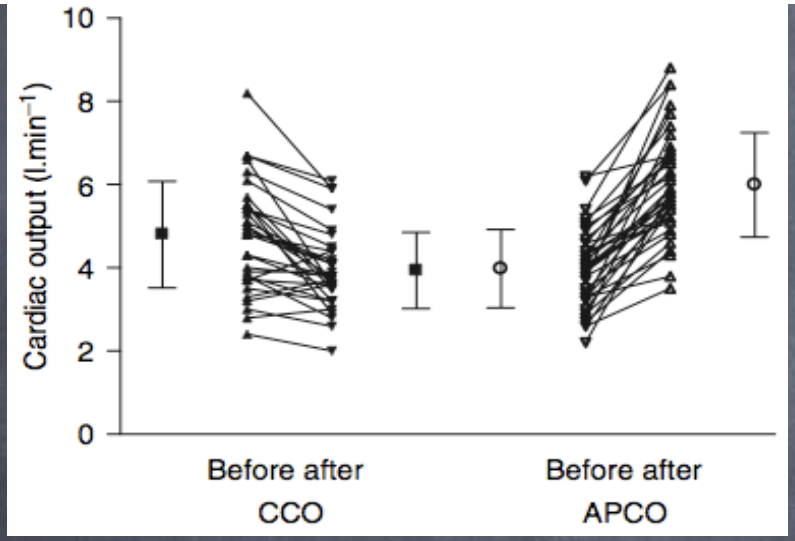
Clinical Scenario	Median Vote
Moderate-risk practice setting Low-risk patient Low-risk surgery	1
Low-risk patient Moderate-risk surgery	1
Low-risk patient High-risk surgery	3
Moderate-risk patient Low-risk surgery	1
Moderate-risk patient Moderate-risk surgery	3
Moderate-risk patient High-risk surgery	6
High-risk patient Low-risk surgery	3
High-risk patient Moderate-risk surgery	7
High-risk patient High-risk surgery	8

Clinical Scenario	Median Vote
High-risk practice setting Low-risk patient Low-risk surgery	1
Low-risk patient Moderate-risk surgery	1
Low-risk patient High-risk surgery	1
Moderate-risk patient Low-risk surgery	1
Moderate-risk patient Moderate-risk surgery	1
Moderate-risk patient High-risk surgery	2
High-risk patient Low-risk surgery	2
High-risk patient Moderate-risk surgery	3
High-risk patient High-risk surgery	4

Continuous cardiac output measurement: arterial pressure analysis versus thermodilution technique during cardiac surgery with cardiopulmonary bypass

S. Lorsomradee,[1] S. R. Lorsomradee,[1] S. Cromheecke[2] and S. G. De Hert[3]

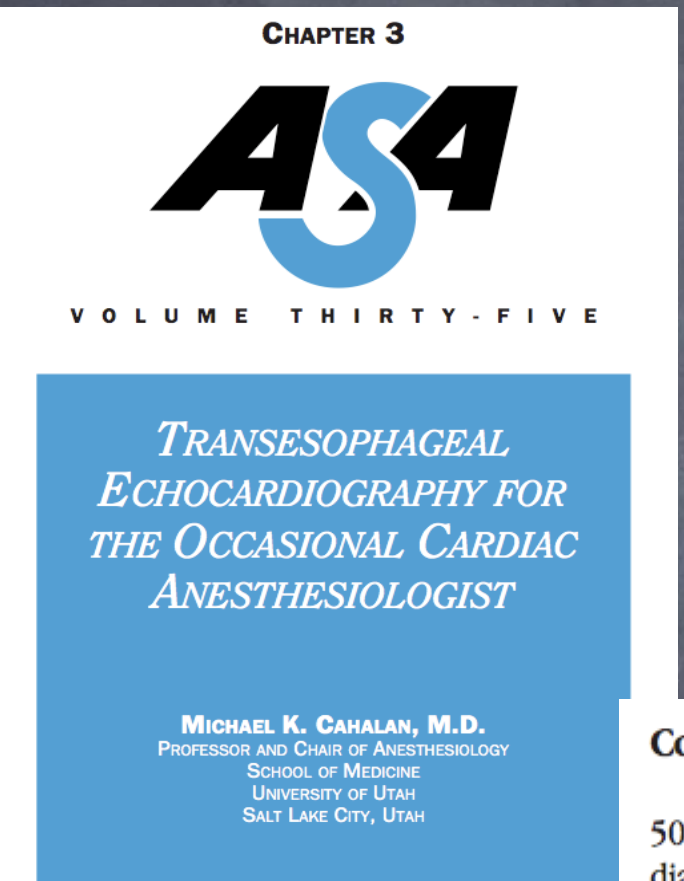
Anaesthesia, 2007, **62**, pages 979–983



In conclusion, the results of this study show that continuous cardiac output measurement with an arterial pressure-based method using the Vigileo system and a thermodilution-based method give comparable results for cardiac output measurement during cardiac surgery with CPB. However, during periods of vasoconstriction, APCO may become less reliable.

ECOGRAFÍA TRANSESOFÁGICA

- **Evaluación de la precarga y la contractilidad**
- **Evaluación de la zona de canulación aórtica.**
- **Patolgía valvular.**
- **Facilitar la colocación del BCIA**
- **Diagnóstico de complicaciones.**
- **Detección de las ARMP inducidas por la isque**



Coronary Artery Bypass Surgery

TEE can have a major impact during coronary artery surgery. In one study 50 patients, TEE identified two patients in whom new SWMA provided the only imm diate sign of unsuspected graft occlusion and prompted graft thrombectomies.[23] another study of 82 high-risk patients, Savage *et al.* used staged blindings of the cardi surgeons and anesthesiologists at critical points during surgery. After these clinicia documented their planned management at each stage, the TEE results were reveale and led to at least one significant change in anesthetic management in 51% of patien and surgical management in 33% of patients, including additional unplanned or revise grafts (15%) and unplanned valve procedures (20%).[24] These high-risk patients had po operative infarction and mortality rates below predicted (1% versus 3% predicted, d ference not statistically significant).

CAUSAS DE ISQUEMIA POSTDERIVACIÓN CARDIOPULMONAR

Espasmo coronario

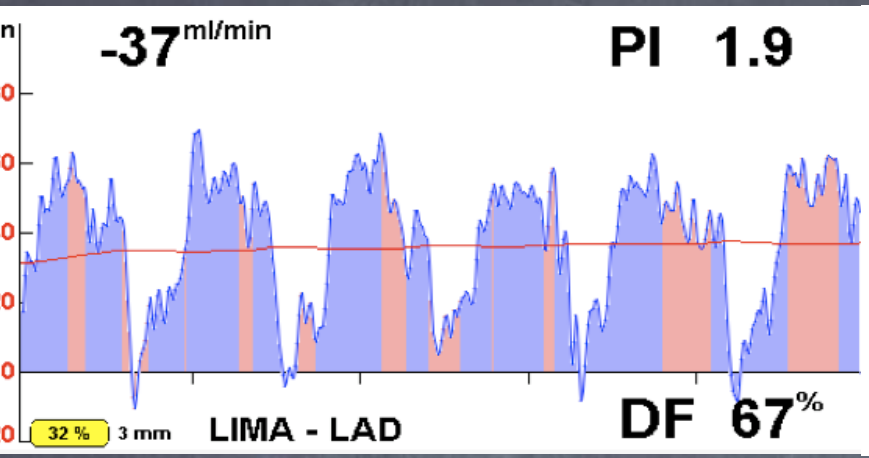
Factores mecánicos
- Longitud inadecuada del injerto
- Oclusion flujo AMI 2ª a VM

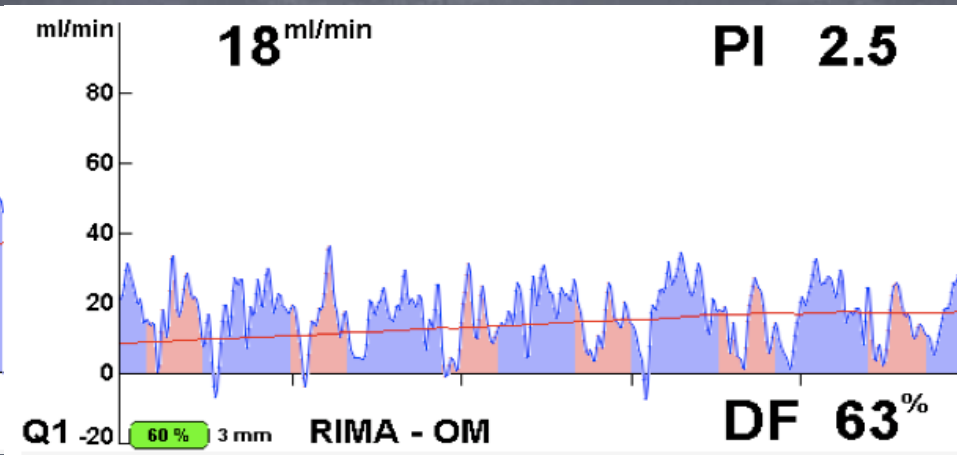
Complicaciones quirúrgicas y técnicas.

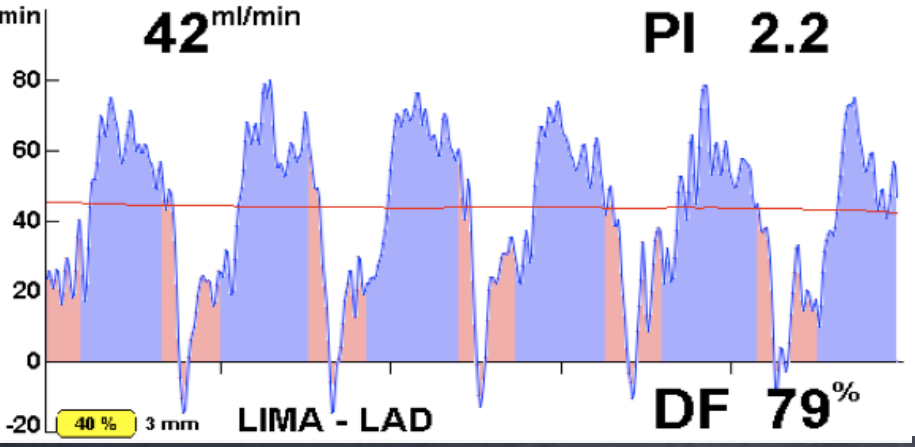
Inotrópicos.
- Anastomosis de mala calidad
- Manipulación inadecuad del injerto.
- Rotación de injertos.

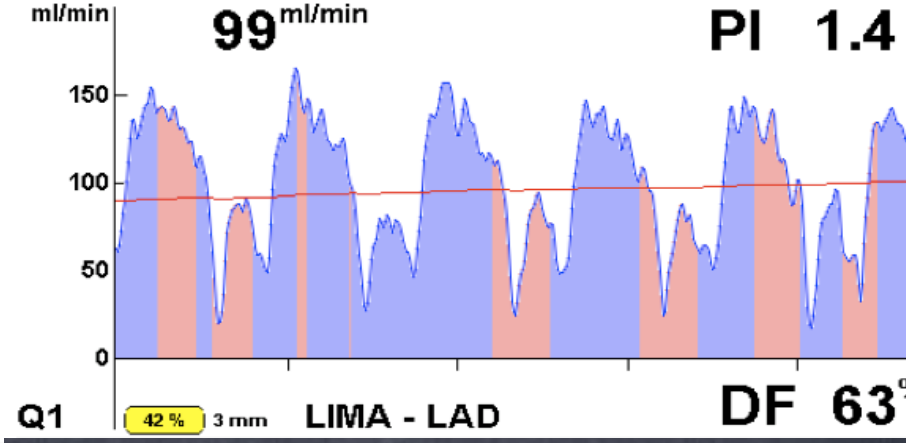
Formación de trombo
- Anastómosis del injerto en vena coronaria

Revascularización incompleta
- Vasos no susceptibles de injerto
- Enfermedad distal difusa y diabetes


-37 ml/min
PI 1.9
32 %
3 mm
LIMA - LAD
DF 67%


ml/min
18 ml/min
PI 2.5
80
60
40
20
0
Q1
-20
60 %
3 mm
RIMA - OM
DF 63%


42 ml/min
PI 2.2
80
60
40
20
0
-20
40 %
3 mm
LIMA - LAD
DF 79%

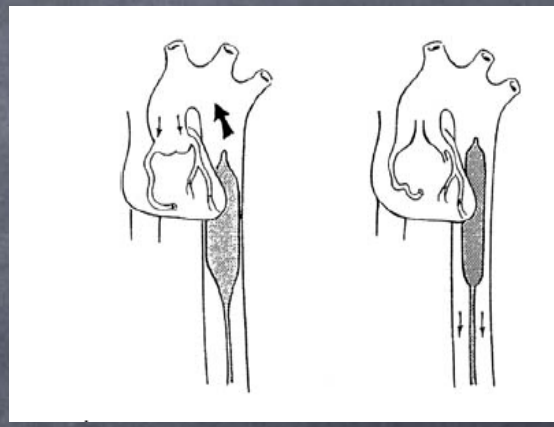

ml/min
99 ml/min
PI 1.4
150
100
50
0
Q1
42 %
3 mm
LIMA - LAD
DF 63

Revascularización incompleta

- **Tratamiento farmacológico específico**
  - **nitroglicerina.**
  - **betabloqueantes.**
  - **Calcioantagonistas.**
  - **Inotrópicos????**
- **Soporte mecánico.- BCIA**

BALON DE CONTRAPULSACION INTRAAÓRTICO

- **Isquemia perioperatoria.**
- **Soporte para el shock cardiogénico o las complicaciones mecánicas del IAM.**
- **Síndrome de bajo gasto perioperatorio refractario al tratamiento farmacológico.**
- **Deterioro agudo de la función miocárdica**



BALON DE CONTRAPULSACION INTRAAÓRTICO

Aumenta	Disminuye
PAo Diastólica	PAo Sistólica
Flujo Transmitral	LVEDP
Fracción de eyección	Consumo miocárdico de O2 MIOCÁRDICO DE O2
Perfusión renal y cerebral	Producción de Lactato
Aporte de O2 miocárdico	Postcarga
Flujo diastólico coronario	

A Multicenter Comparison of Intraaortic Balloon Pump Utilization in Isolated Coronary Artery Bypass Graft Surgery

(Ann Thorac Surg 2003;76:1988–92)

Roger J. F. Baskett, MD, Gerald T. O'Connor, PhD, Gregory M. Hirsch, MD, William A. Ghali, MD, Kathy Sabadosa, MPH, Jeremy R. Morton, MD, Cathy S. Ross, MS, Felix Hernandez, MD, William C. Nugent, Jr, MD, Stephen J. Lahey, MD, Donato A. Sisto, MD, Lawrence J. Dacey, MD, John D. Klemperer, MD, Robert E. Helm, Jr, MD, and Andrew Maitland, MB, for the Northern New England Cardiovascular Disease Study Group

The Intraaortic Balloon Pump in Cardiac Surgery

Roger J. F. Baskett, MD, William A. Ghali, MD, Andrew Maitland, MB, and Gregory M. Hirsch, MD

[Ann Thorac Surg 2002;74:1276–87]

The Maritime Heart Centre, Dalhousie University, Halifax, Nova Scotia, and Departments of Medicine and Surgery, University of Calgary, Calgary, Alberta, Canada

Trends in Intraaortic Balloon Counterpulsation Complications and Outcomes in Cardiac Surgery

Jan T. Christenson, MD, Marc Cohen, MD, James J. Ferguson III, MD, Robert J. Freedman, MD, Michael F. Miller, PhD, E. Magnus Ohman, MD, Ramachandra C. Reddy, MD, Gregg W. Stone, MD, and Philip M. Urban, MD

(Ann Thorac Surg 2002;74:1086–91)

BALON DE CONTRAPULSACION INTRAAÓRTICO

Despite more than 30 years of clinical use and the large body of literature on IABPs, several critical questions remain to be answered. Appropriate and optimal use of the IABP, particularly preoperatively, remains to be clarified. The provocative results of a small but limited randomized controlled trial showing a survival benefit with the use of preoperative balloon support in high-risk cases needs to be validated, perhaps with a large series of observational data, and multi-institution comparisons. The role of the IABP for intraoperative and postoperative support relative to the use of ventricular assist devices needs to be defined, probably in the setting of a multicentered trial.

- En el postoperatorio inmediato presenta hipotensión progresiva, con disminución del índice cardiaco, sin elevación significativa de la presión venosa central, sin respuesta a volumen intravascular, ni a la administración de fármacos inotrópicos

Common complications after cardiac surgery in the adult: Anecdotes, biases… and some evidence

Carole L. Foot, John F. Fraser, Daniel V. Mullany*

Common complications after cardiac surgery in the adult: Anecdotes, biases… and some evidence

Carole L. Foot, John F. Fraser, Daniel V. Mullany*

Table 1 Complications of cardiac surgery.

Cardiovascular
Bleeding
Impaired vasomotor tone and capillary leak
Pericardial Tamponade
Dysrhythmia
- Tachy or bradydysrhythmia
- Loss of atrial kick or atrioventricular synchrony

Ventricular dysfunction
- Incomplete or delayed revascularisation
- Incomplete myocardial protection
- Coronary artery spasm or embolism (air, atheroma)
- Prolonged systemic hypotension
- Pre-existing dysfunction
- Severe acute anaemia

Hypertension
Intracardiac right to left shunt with hypoxia
Specific surgical sequelae (e.g. prosthetic valve complications)

Respiratory
Acute lung injury/ARDS
Atelectasis
Cardiogenic alveolar oedema
Abnormal chest wall mechanics
Post sternotomy or thoracotomy pain
Phrenic nerve injury
Sedation related hypoventilation
Pulmonary thromboembolism
Bronchospasm
Tension pneumothorax
Pleural effusion

Renal
Acute renal failure

Gastrointestinal
- Post operative nausea and vomiting
- Paralytic ileus
- Peptic ulcer disease
- Pancreatitis
- Mesenteric ischaemia/infarction
- Ischaemia hepatitis
- Acalculous cholecystitis

Endocrine/metabolic
Hypo/hyperkalaemia
Hypomagnesaemia
Hyperglycaemia
Hypo/hyperthermia

Haematological
Anaemia
Thrombocytopaenia

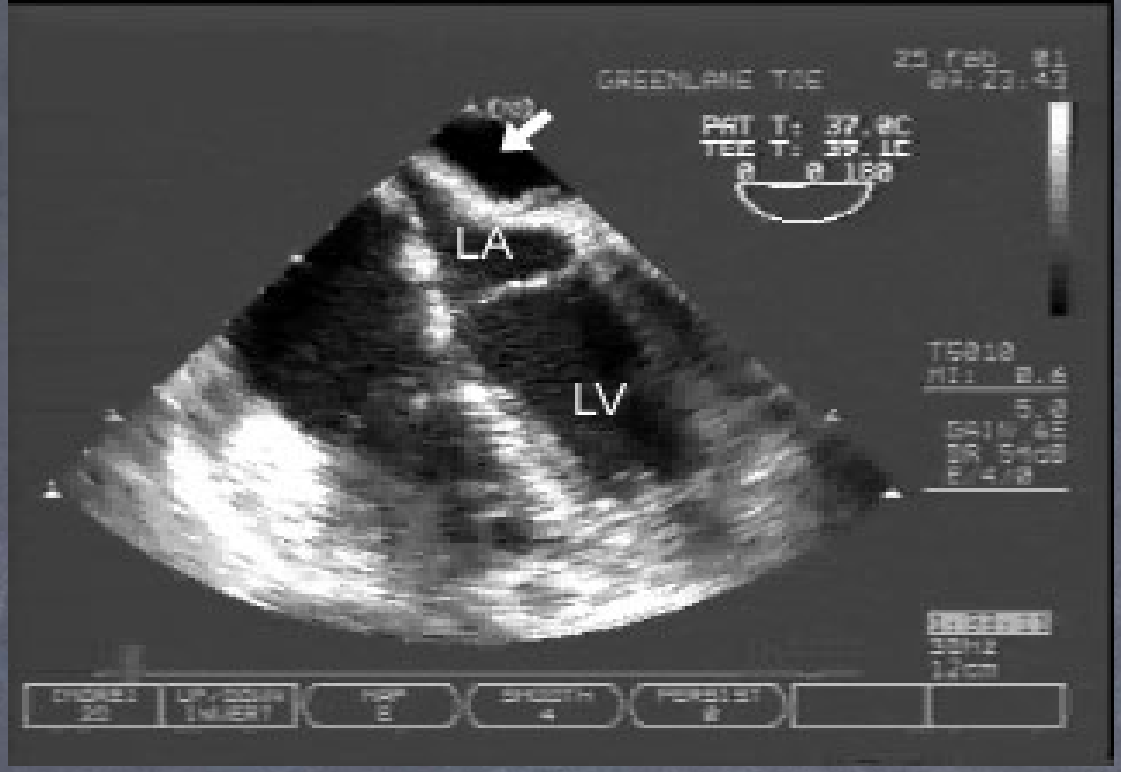
Neurological
Encephalopathy
TIA/CVA

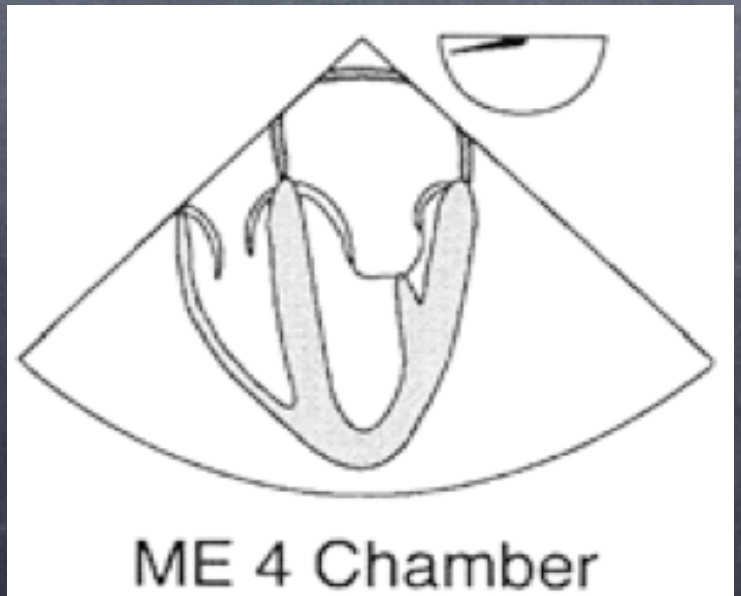
Infection
Wounds (e.g. sternal, vein graft harvest sites)
Pneumonia
Urinary tract infection
Invasive line sepsis

Common complications after cardiac surgery in the adult: Anecdotes, biases… and some evidence

Carole L. Foot, John F. Fraser, Daniel V. Mullany*

Cardiovascular
Bleeding
Impaired vasomotor tone and capillary leak
Pericardial Tamponade
Dysrhythmia
  Tachy or bradydysrhythmia
  Loss of atrial kick or atrioventricular synchrony
Ventricular dysfunction
  Incomplete or delayed revascularisation
  Incomplete myocardial protection
  Coronary artery spasm or embolism (air, atheroma)
  Prolonged systemic hypotension
  Pre-existing dysfunction
  Severe acute anaemia
Hypertension
Intracardiac right to left shunt with hypoxia
Specific surgical sequelae (e.g. prosthetic valve complications)





ME 4 Chamber

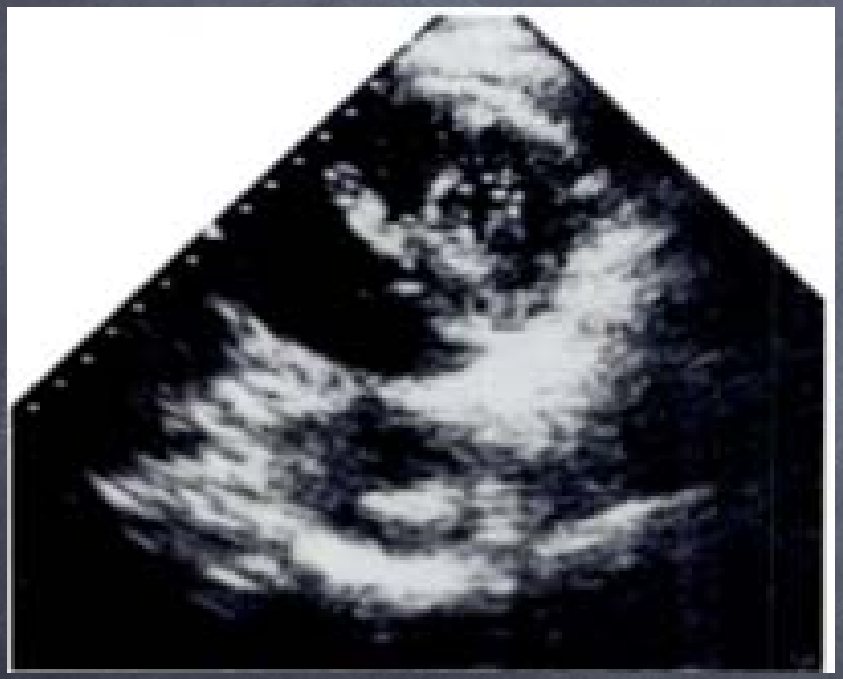
CHEST

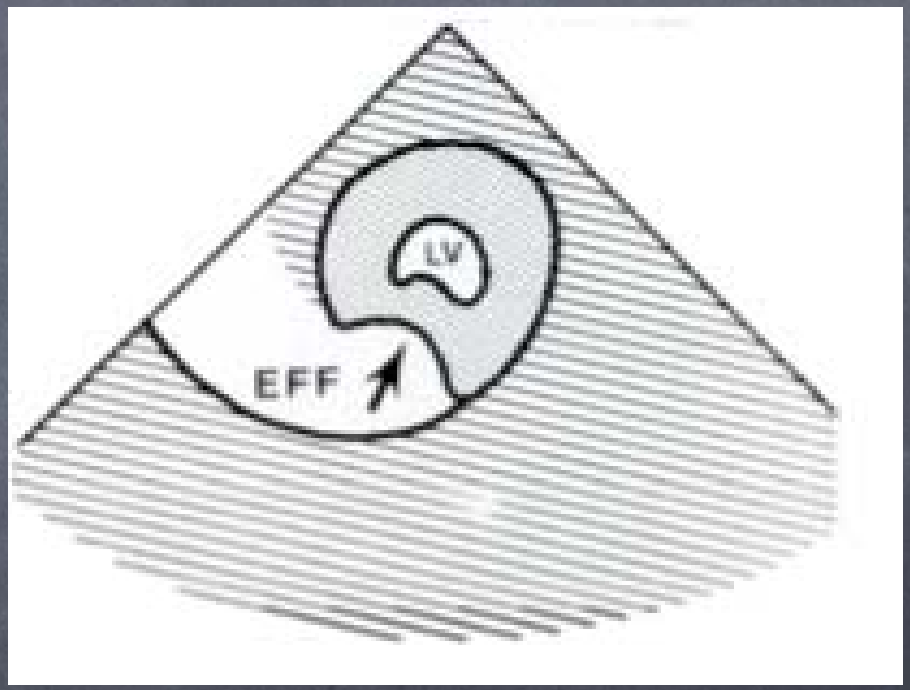
Official publication of the American College of Chest Physicians

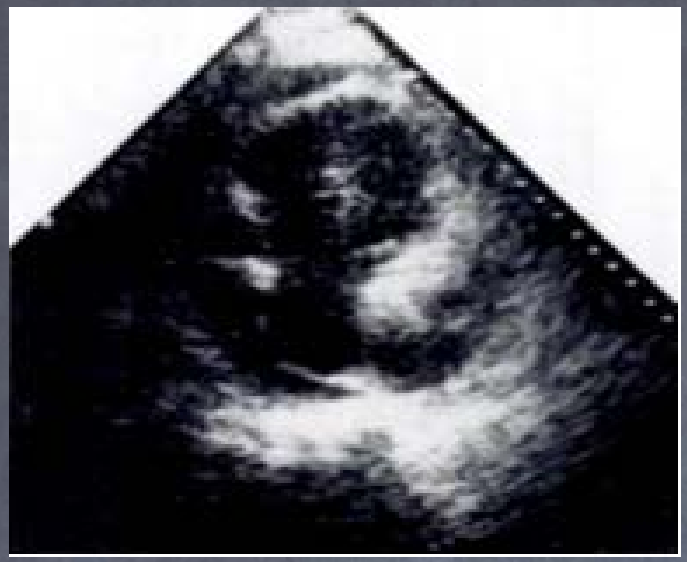
Atypical presentations and echocardiographic findings in patients with cardiac tamponade occurring early and late after cardiac surgery

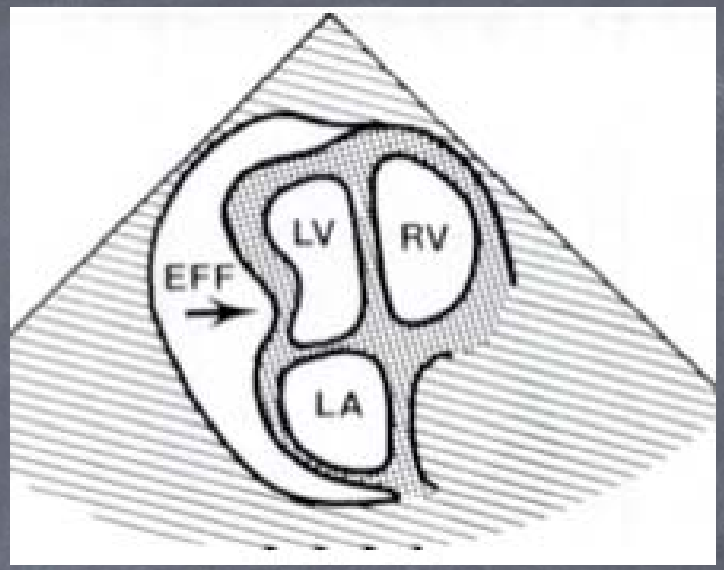
AM Russo, WH O'Connor and HL Waxman

Chest 1993;104;71-78




LV
EFF




EFF
LV
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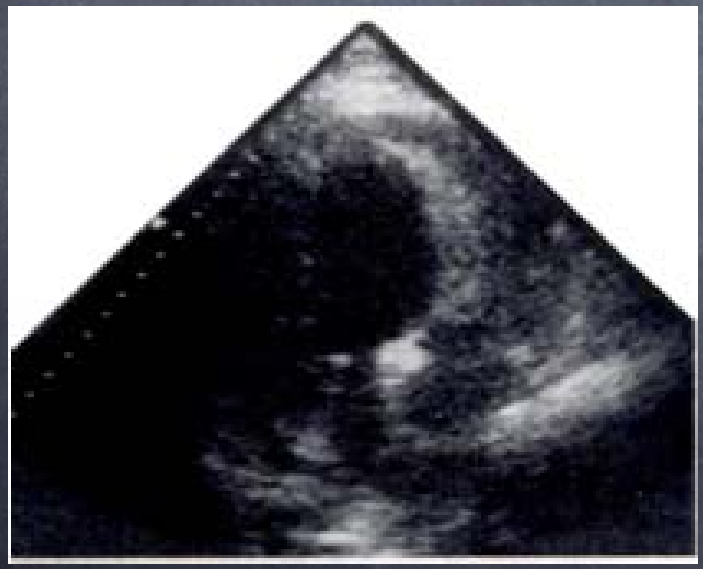

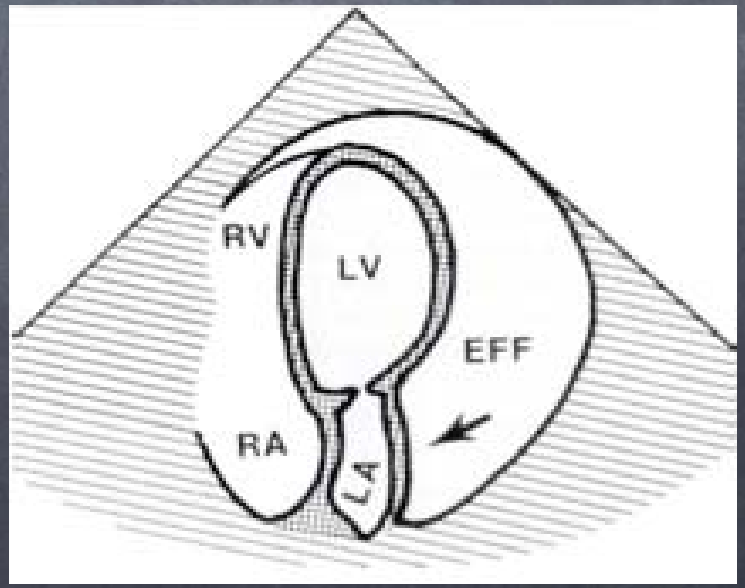
RV
LV
EFF
RA
LA