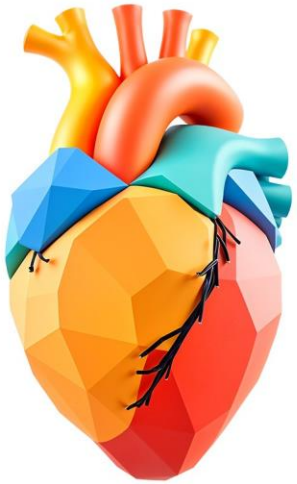

Critical Cardiovascular Care

دانشگاه علوم پزشکی و خدمات بهداشتی درمانی تهران

مرکز قلب تهران

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12th Annual Tehran Heart Center Congress

7th CRITICAL CARDIOVASCULAR CARE

دوازدهمین کنگره سالیانه مرکز قلب تهران

2025

۲۵ و ۲۶ بهمن ماه ۱۴۰۳

13 & 14 February

Tehran Heart Center

Tehran, Iran

Mechanical complication of MI

Dr. H. Ahmadi. THC TUMS

Cardiovascular & thoracic surg

Complications of MI

Rupture = **VSR, free wall rupture, PM rupture**

Unruptured:

- Profound LV failure
- RV infarct
- **LV aneurysm**
- Ischemic MR
- LVOT obstruction
- LV mural thrombosis
- Pericarditis and effusion

Dynamic LVOTO

Anterior wall infraction → hyperdynamic contraction base of LV

Reduction LVOT cross section area

Reduction of co

SAM

Treatment:

- LV fluid + cessation or reduction of inotrope
- cautious use of B blocker

Post MI VSD

Historical perspective

First recognition = Lathan 1945 in autopsy

First surgery = cooly 1956

Incidence

0.2% of MI

Time 24 hr to 2-4 days after MI

Risk factors: advance age , male gender LAD infact

Ideal time for post MI VSD repair

Immediate surgery

Delay surgery if possible

(reversible renal dysfunction is in favor of delayed surgery)

Indication of delayed repair

High degree of certainty that hemodynamic may remain stable

1) Adequate CO
2) Absence of symptom of PVHTN
3) Easy control of symptoms
4) Absence of fluid retention or easy control with diuretics
5) Adequate renal function and normal BUN CR (such circumstances is uncommon)

Delay surgery

Allow advantages

a) **Scar formation of VSD**

1) may benefit from device

2) reduces risk of surgery

b) Optimization of hemodynamic

Disadvantages

Prolong MT is risky

Expansion of VSD

Hemodynamic deterioration

Post MI VSD
In favor of percutaneous device closure

Patients deemed **inoperable** or not amenable to surgical repair

Anatomy is suitable

Recurrent or residual shunt after surgical repair

Defect < 1.5cm

Contraindication >35mm

Sub acute stage

Provide the time for maturation of VSD (bridge to definite management)

Post MI VSD
In favor of percutaneous device closure

Improvement of hemodynamic

Allow myocardium to heal and scar formation to facilitate surgery

Disadvantages

Degeneration of rim and device **dislodgment**

It is **better than VAD** (economical – less invasive)

Post MI VSD with reversible shock or organ damage

Optimizing with ECMO and IABP

Then repair or percutaneous device

Residual or recurrent VSD need intervention

QP/QS > 2

Persistent symptom

Allowing the patient have his or her natural history

Profound cardiogenic shock

Neurologic unresponsiveness

Limb ischemia or bowel

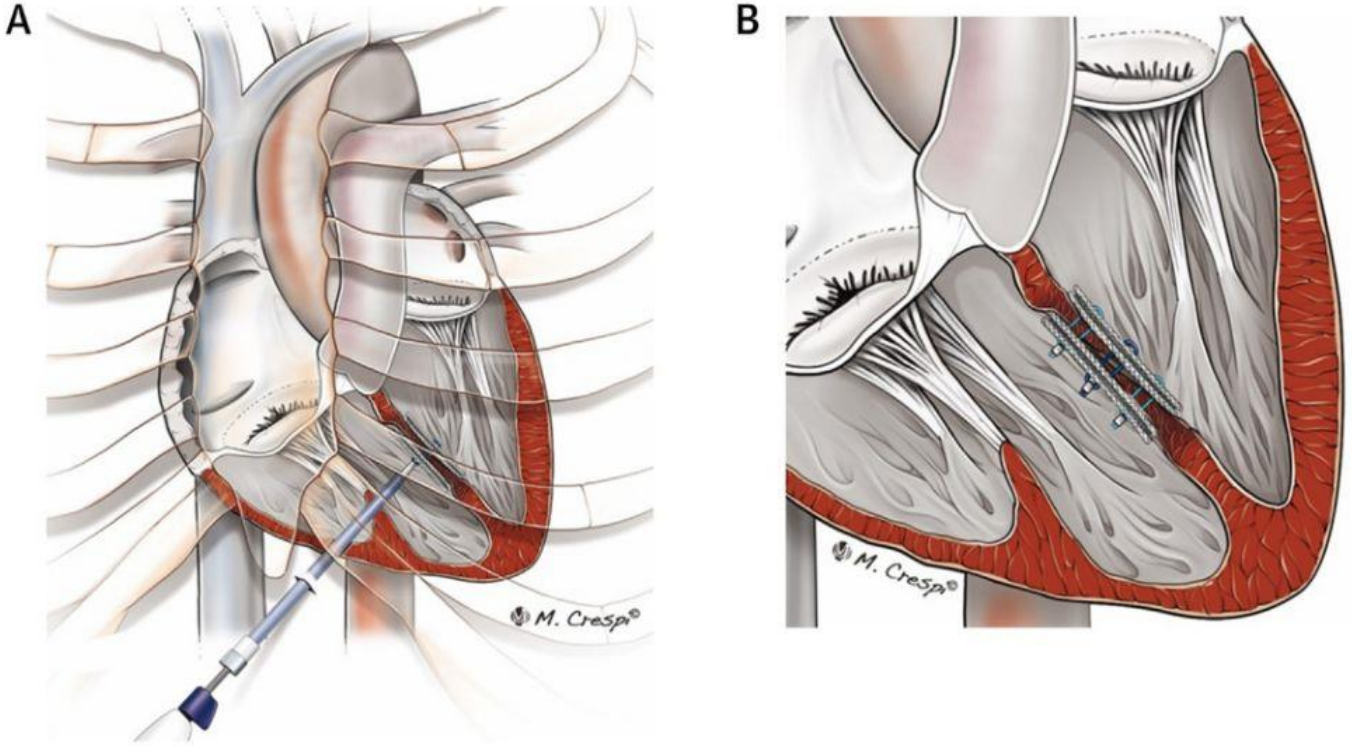
Severe renal dysfunction

Surgical repair of post MI VSD

1) infarctectomy and patch repair
2) Infarct exclusion
3) Apical amputation

"Doble patch is preffered"

FIGURE 6 Hybrid Transcatheter-Periventricular Approach



(A) Following percutaneous or surgical exposure (via small surgical window), a catheter is advanced through the right ventricular free wall and across the ventricular septal defect. (B) The Amplatzer Septal Occluder is deployed and released to close the septal defect. Reproduced with permission from M. Crespi.

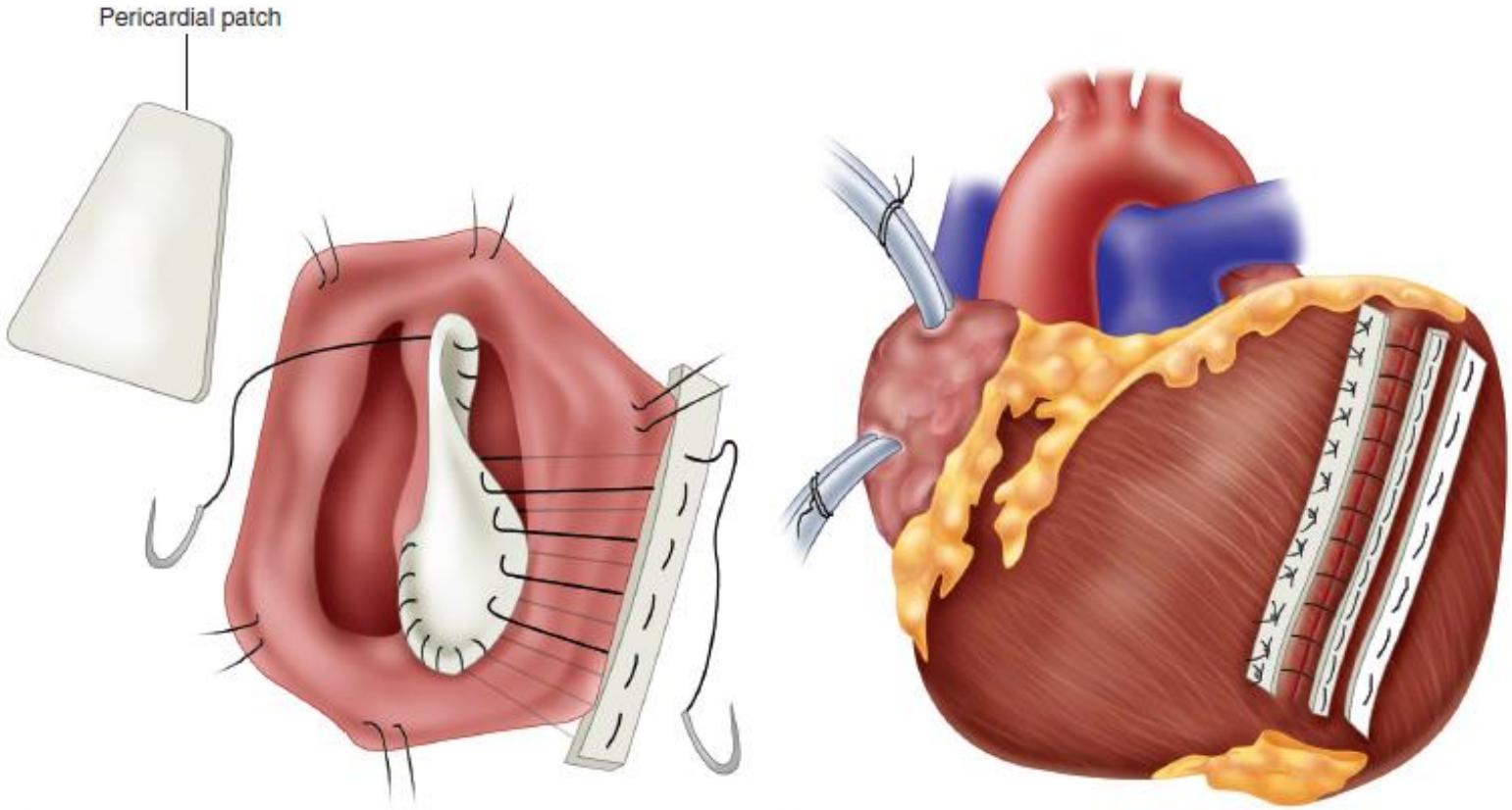


Figure 8.9

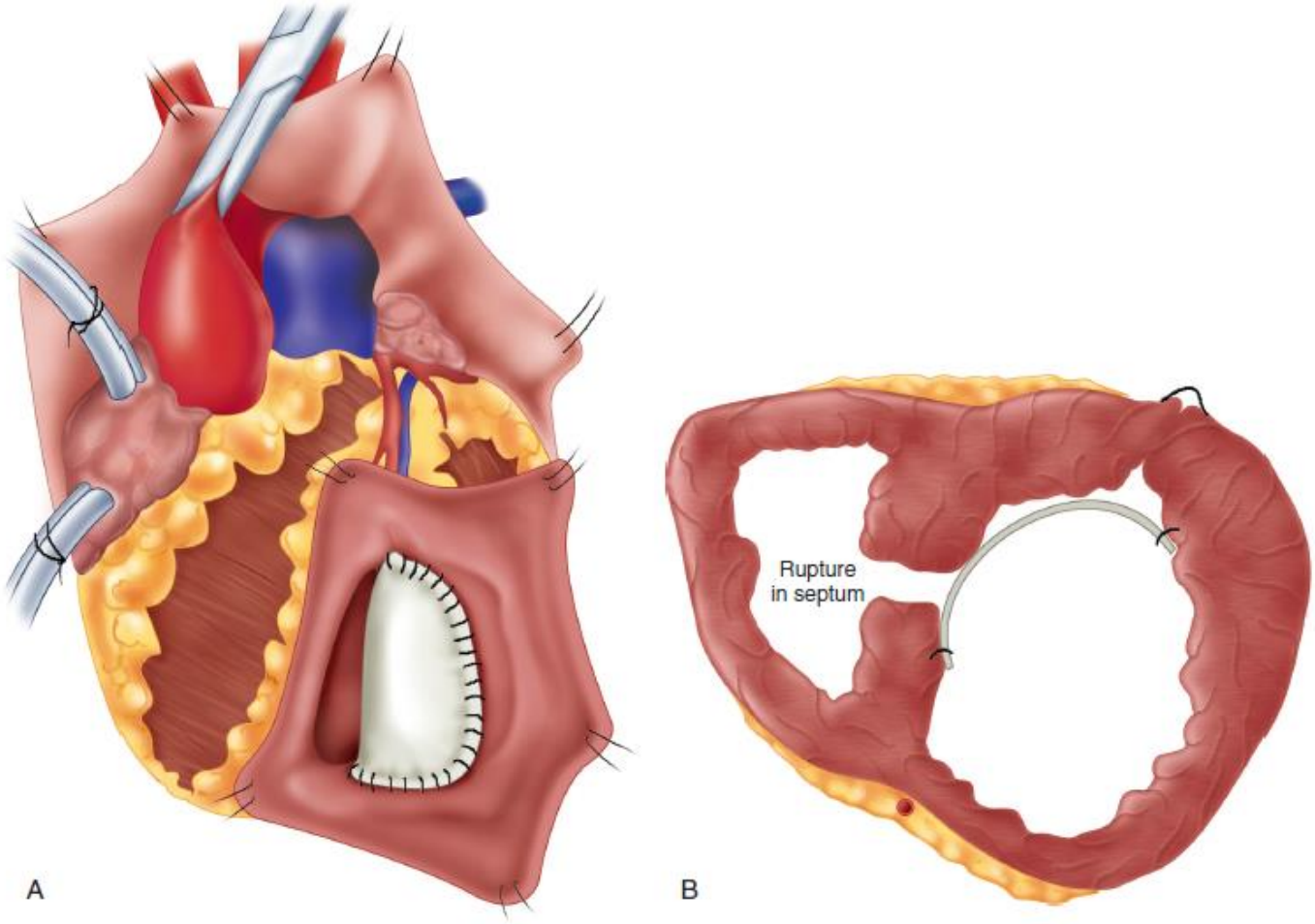


Figure 8.10

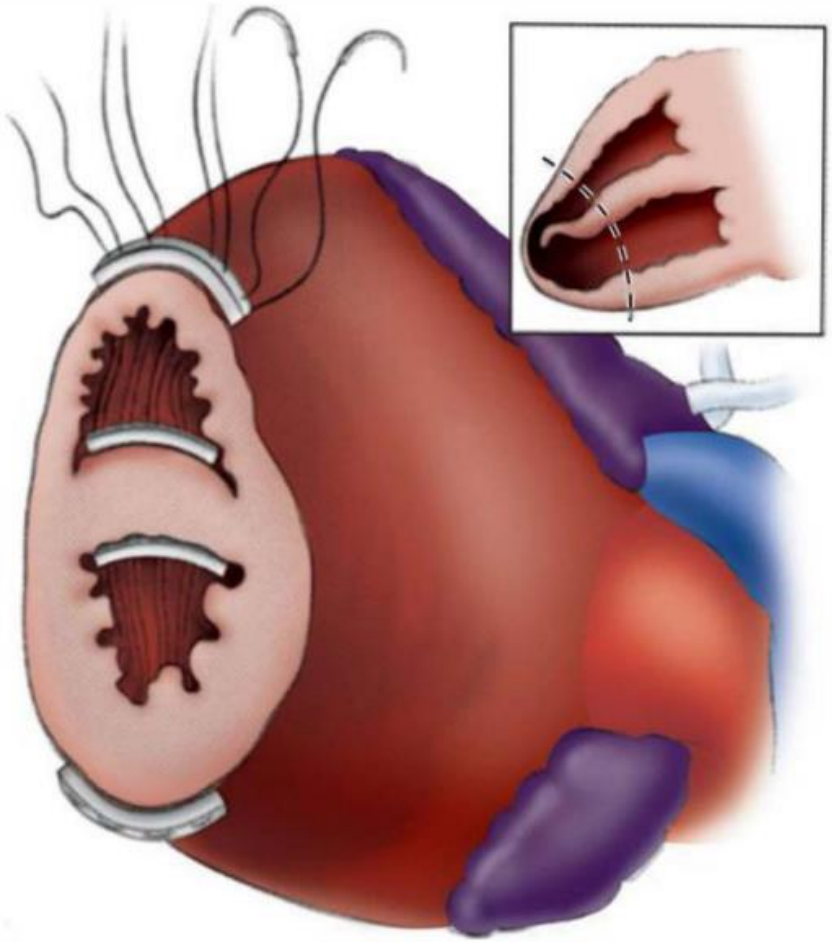


FIGURE 31-19 Amputation of an apical septal rupture with biventricular closure using pledgeted sutures. (Adapted from Fig. 22.11 in Buxton BF, Frazier OH, Westaby S (eds). *Ischemic Heart Disease Surgical Management*. Philadelphia: Mosby, 1999.)

Free wall rupture

Occurring 10% – 30% of MI

Second cause of death due to MI

Occurs median of 4 days after MI

Operative techniques

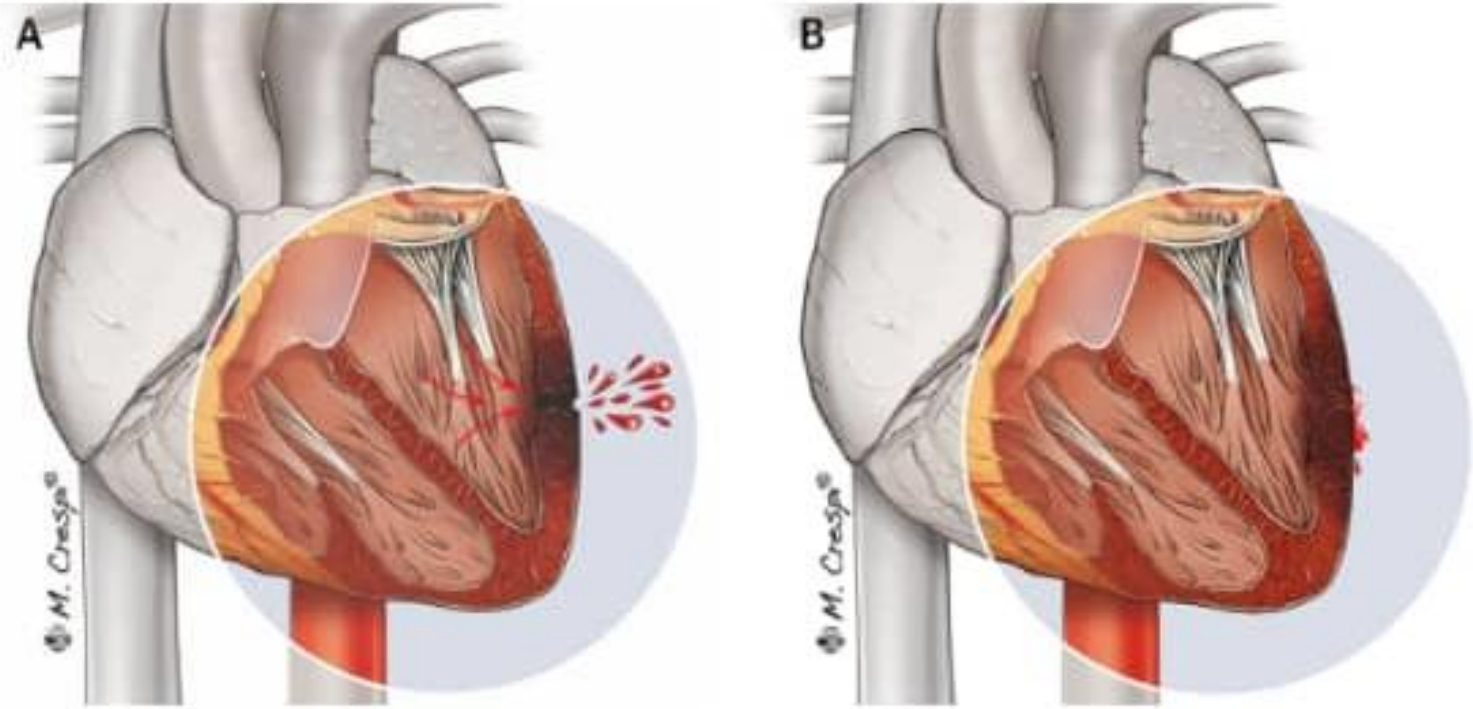
Infarctectomy patch plasty ± glue

Biological patch attach with glue ± sutures

Type of free wall rupture

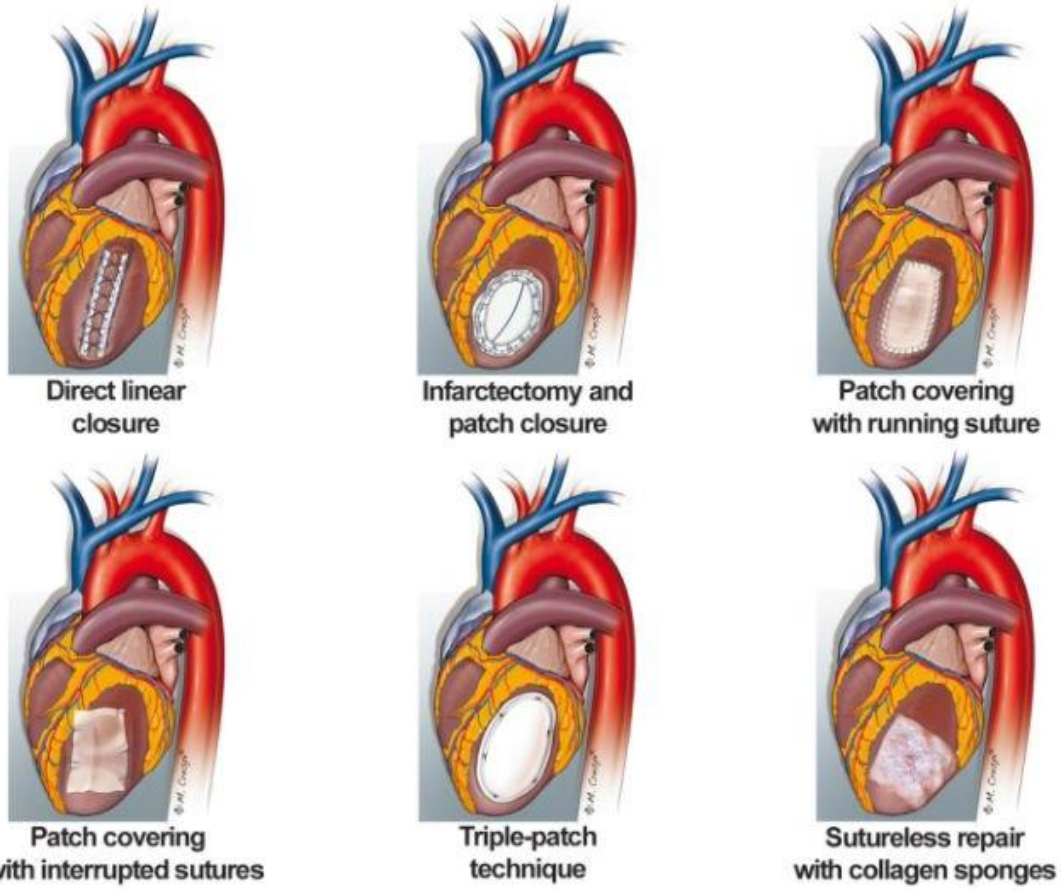
1) Slit like (most common, SVD)
2) Localized necrosis (sub acute)
3) Myocardial thinning with central rupture
4) Walled off and false aneurysm

FIGURE 1 Types of VFWR



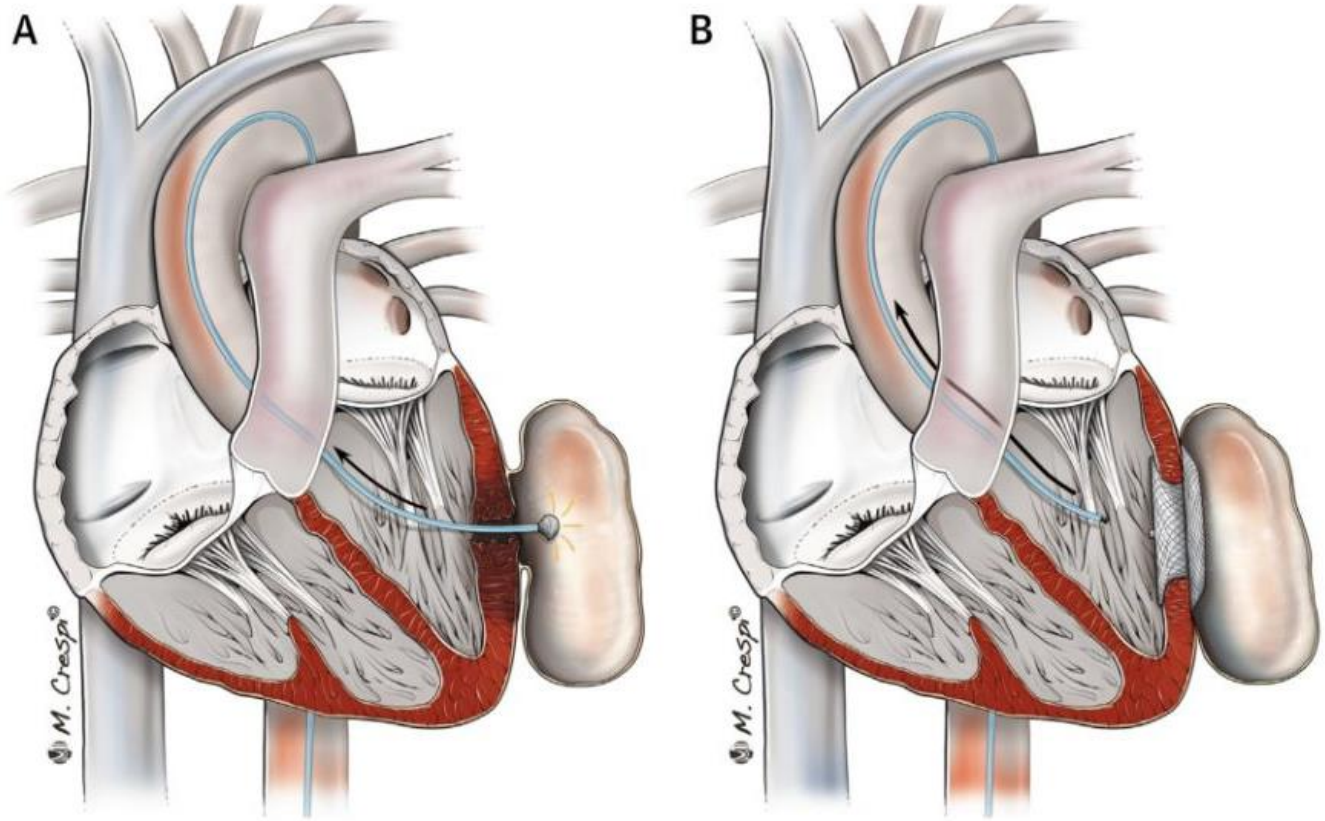
(A) Blowout free-wall rupture with direct communication between the internal ventricular chamber and the pericardium (red arrows) usually generating large and hemodynamically impacting hemopericardium. (B) Oozing free-wall rupture, with myocardial hematoma, and possible extravasation usually leading to limited hemopericardium into the pericardial sac or no communication either due to confined intramural myocardial hematoma or epicardial thrombi with no hemopericardium. Reproduced with permission from M. Crespi. VFWR = ventricular free-wall rupture.

FIGURE 7 Surgical Techniques for VFWR

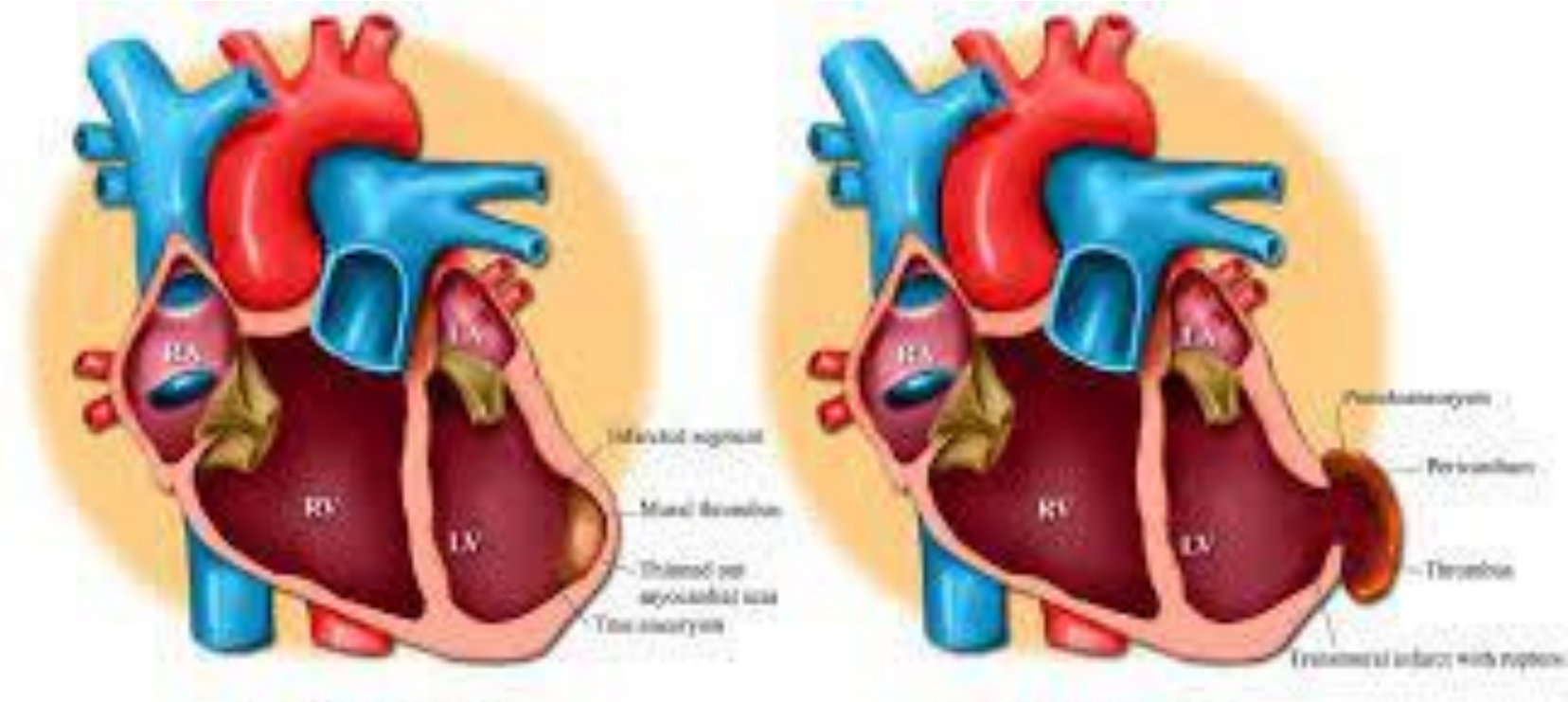


The surgical procedures may be differentiated as "sutured" or "sutureless" according to the presence or absence of surgical sutures, either to approximate the infartectomy edges, or suture the applied patch onto the cardiac edges, or just to maintain the applied epicardial patch in place with no myocardial excision. The sutureless technique, instead, accounts only for the application of patches of various type (biological, prosthetic, or collagen sponge) usually with the adjunct of glue between the epicardium and the overlaying patch to better secure the contact between the two. Reproduced with permission from M. Crespi. Modified from Matteucci et al.[29] VFWR = ventricular free-wall rupture.

FIGURE 9 Percutaneous Transcatheter Closure of Ventricular Pseudoaneurysm



(A) Retrograde transaortic guidewire positioning in the left ventricular pseudoaneurysm for a percutaneous transcatheter closure. (B) Deployment of the Amplatzer device across the pseudoaneurysm entry site for the percutaneous transcatheter closure. Reproduced with permission from M. Crespi.



True Aneurysm

Pseudoaneurysm

Pathophysiology of MI

Early expansion: 2 day – 2 weeks

Cell necrosis

Inflammatory cells accumulation

Activation of complement cytokins free radical

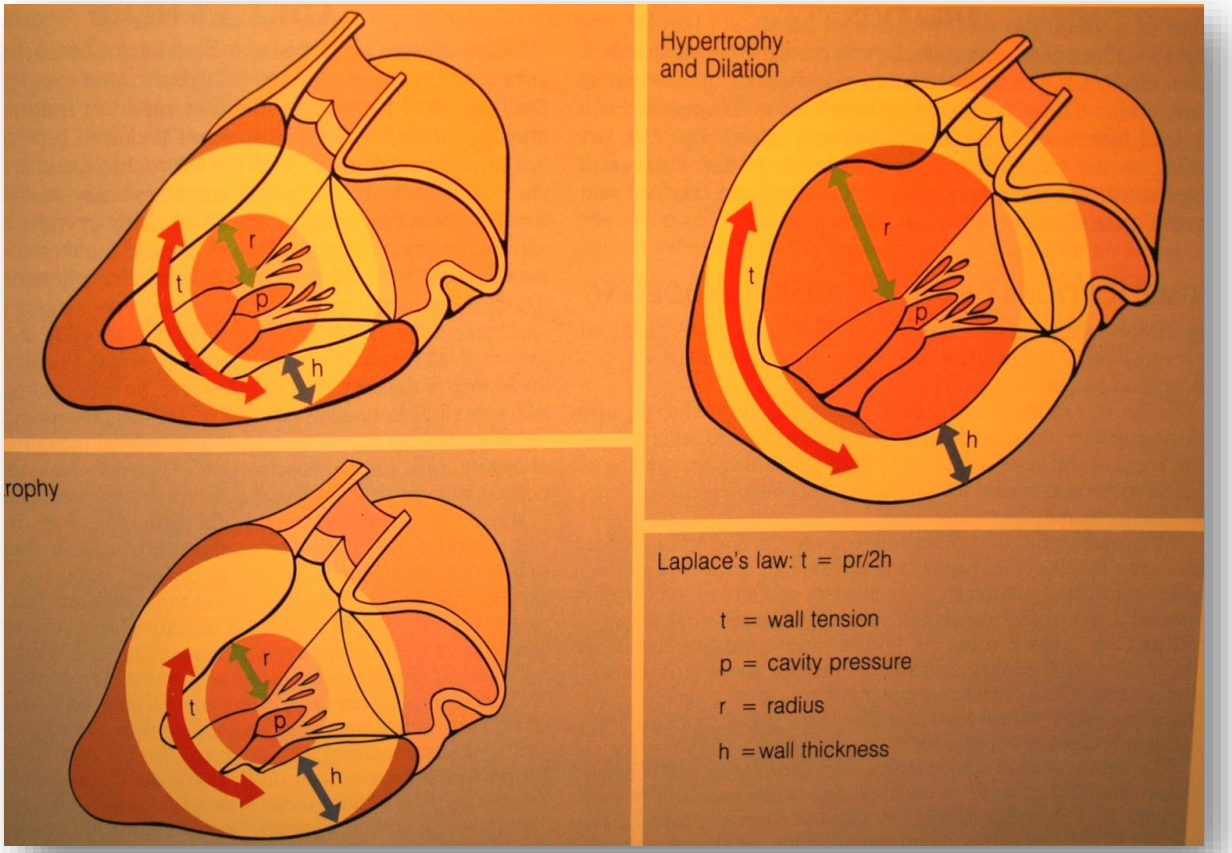
Proteolytic enzymes, collagen degeneration expansion

Late remodeling 2-4 weeks

Akinesia provoke remodeling

Aneurysm formation

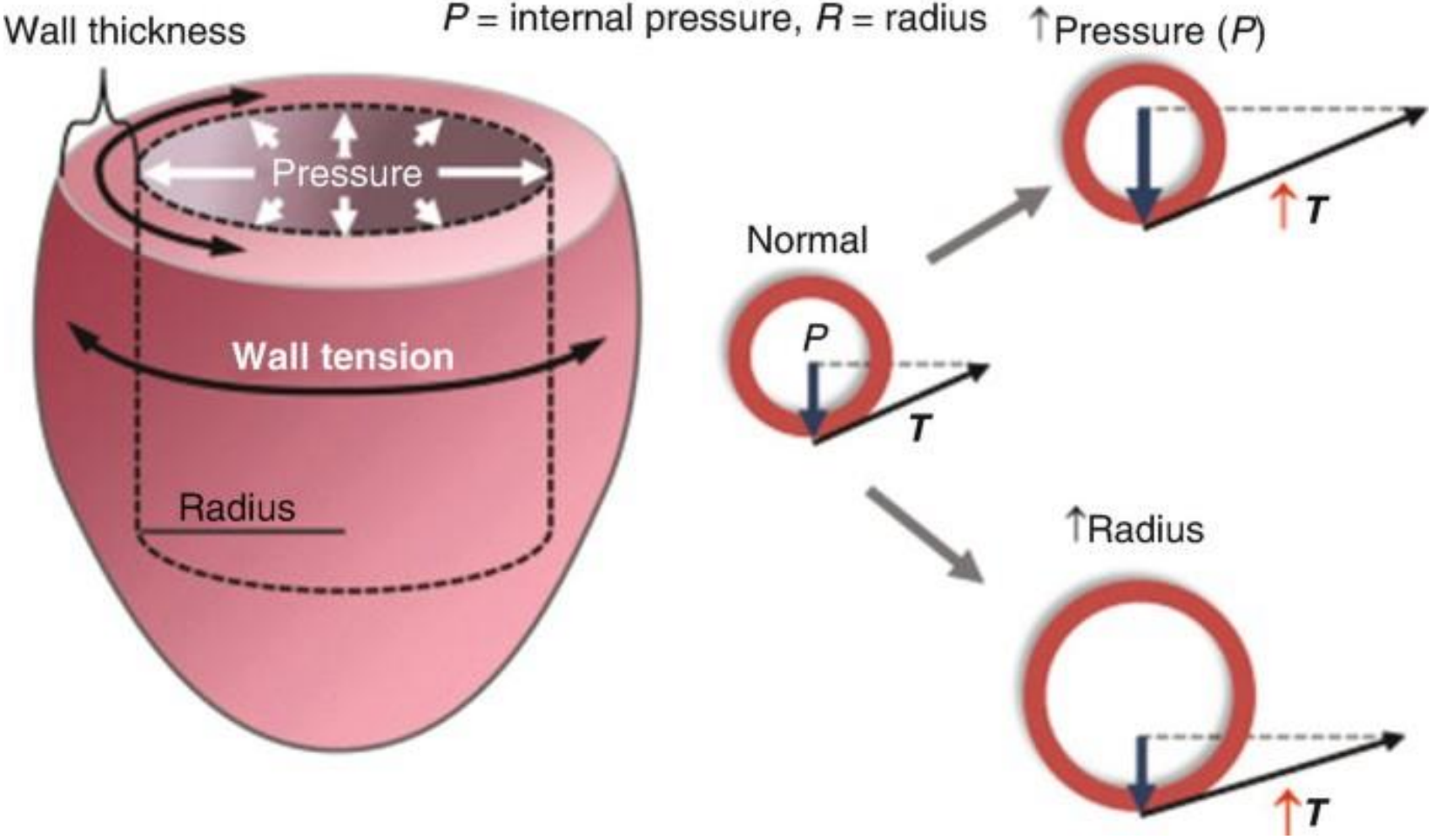
Laplace's Law
Wt=P.R/2H



LaPlace's law

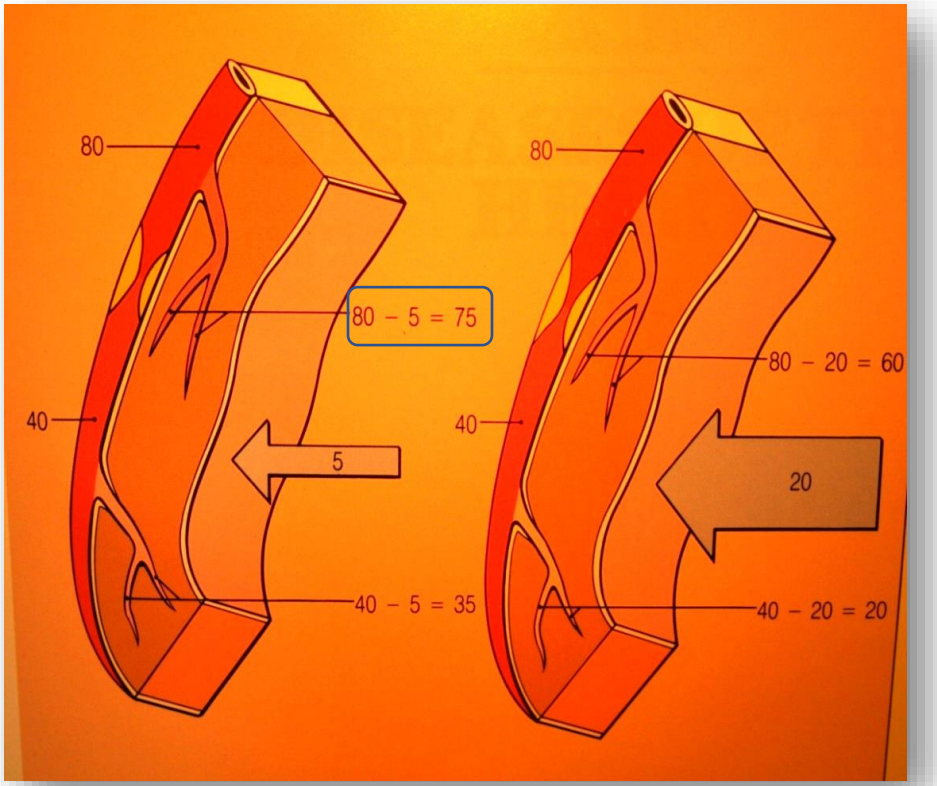
Wall tension (T) = P x R

P = internal pressure, R = radius



Deleterious effect of high wall stress

- Increases O_2 demand
- Reduces contractility
- Increases Apoptosis
- Sub endocardial ischemia



Definitation of large aneurysm

Involvement of 35% of LV

LVESVI >80

LVEDVI> 120

Dor, fractional shortening 15% in:

eleptical LV → 60% EF

Spheroid LV → 30% EF

LV aneurysm

CABG need:

large aneurysm = resection repair

moderate = resection repair

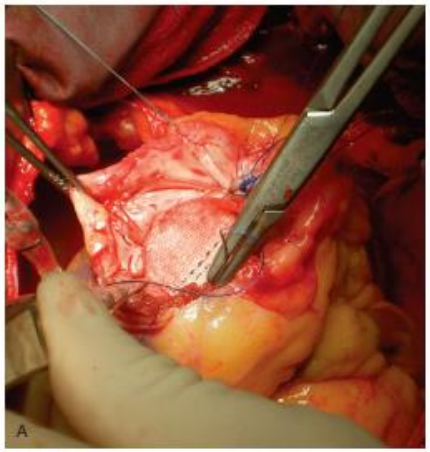
CABG not needed

Surgical indication:

FC III- IV

Falal arrhythmias

recurrent thromboembolic



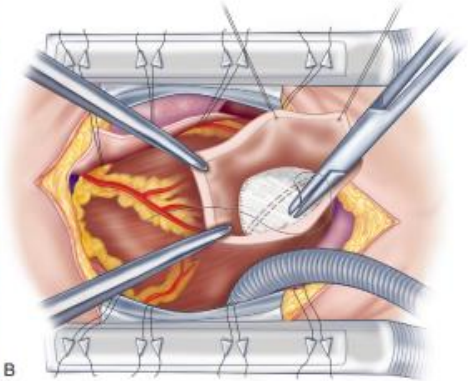


Figure 30.13

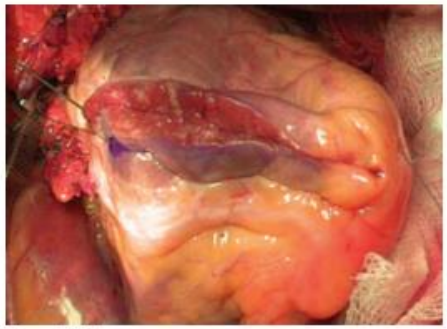


Figure 30.14

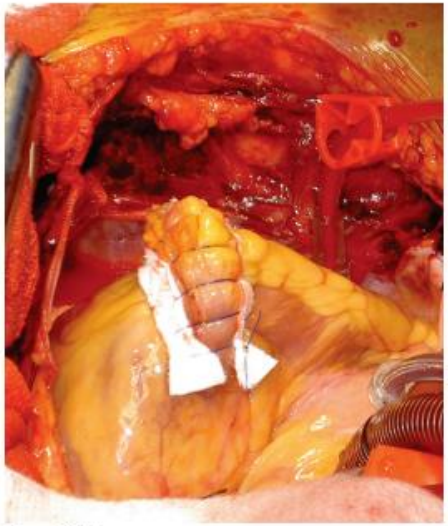
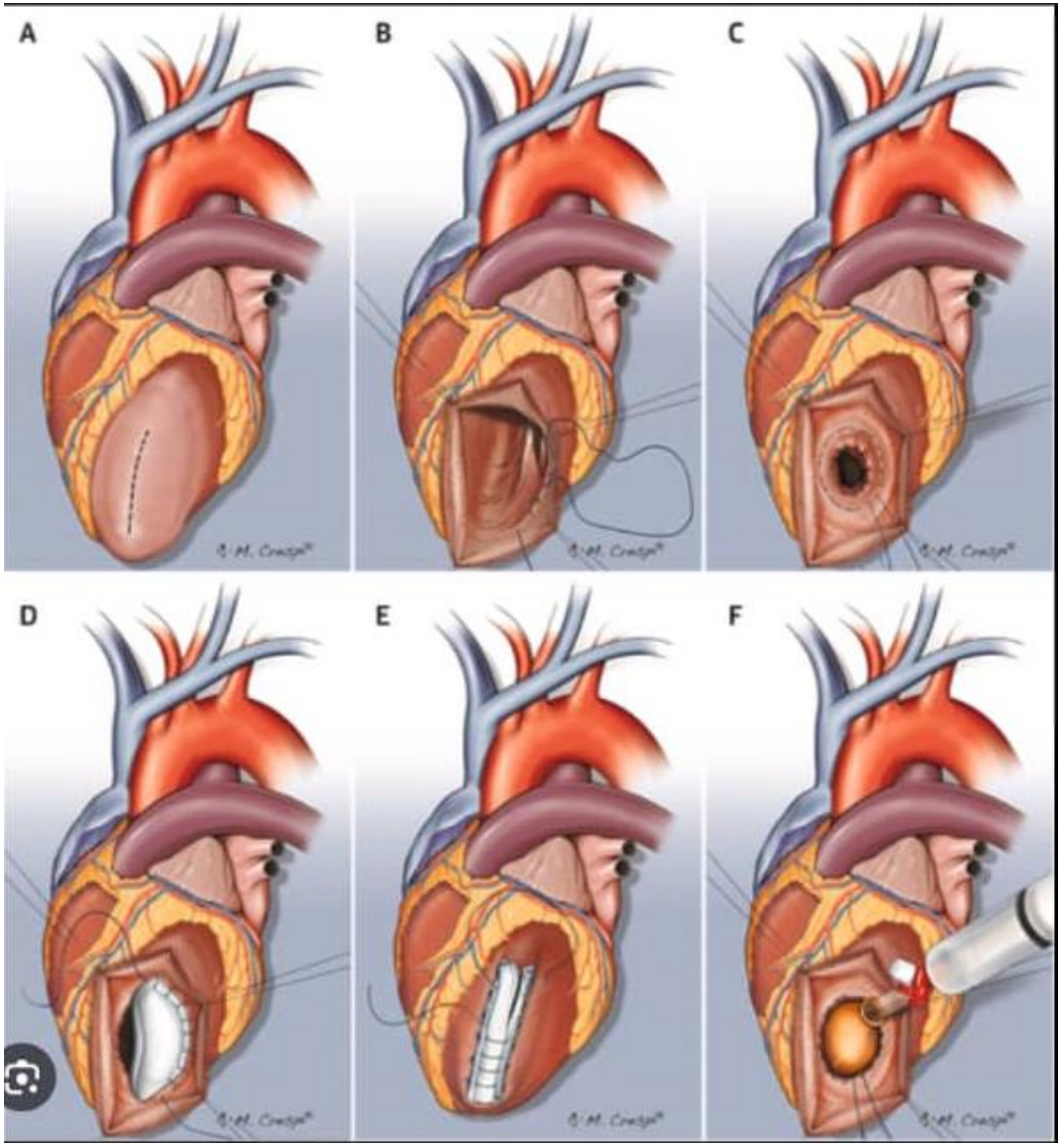


Figure 30.15


A
B
C
D
E
F

Acute Ischemic MR

Papillary muscle rupture

90% occurs in posteromedial due to **SBS and multiple heads**

10% occurs anterolateral due to **DBS and single head**

Complete transection of PM is fatal

Individual head of PM survive the patient

Grade of murmur does not correlate with degree of MR due to equalization between LV & LA pressure

Large V wave in PCWP tracing

Occurs usually one week after MI

Treatment

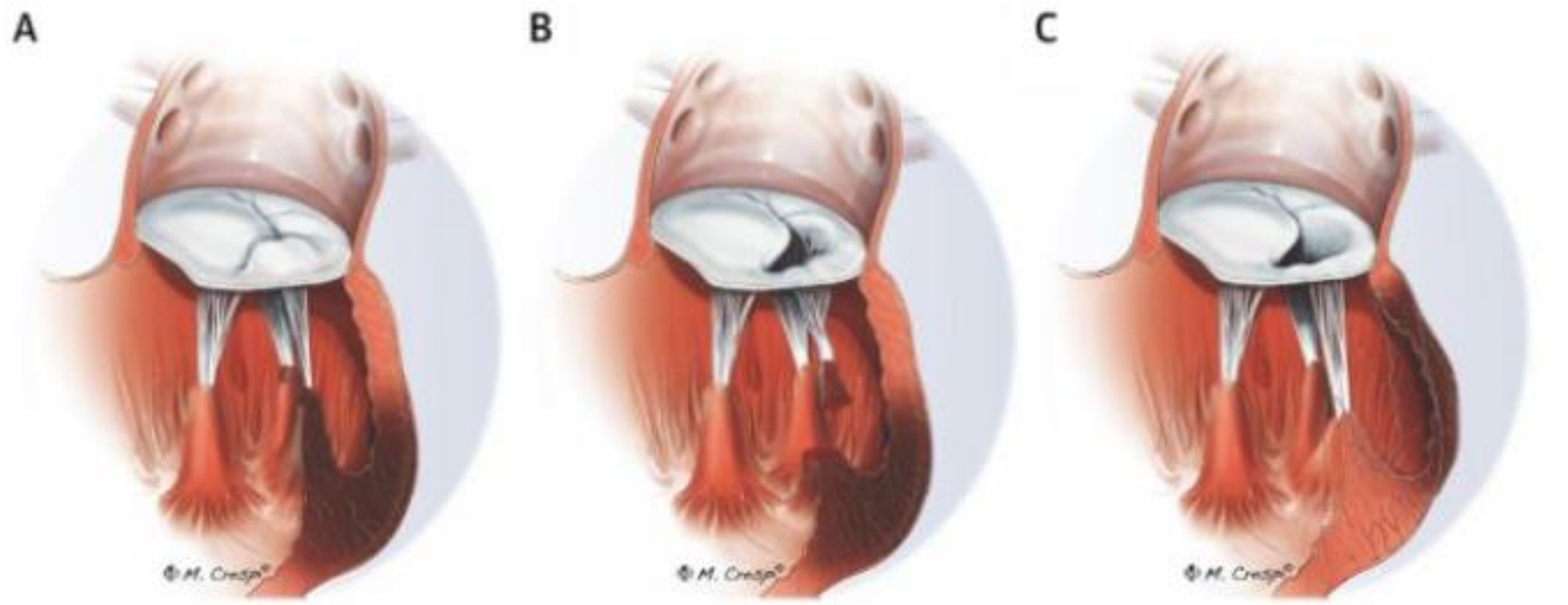
Afterload reduction + IABP

Emergency surgery (mortality 25%)

Often MVR is necessary

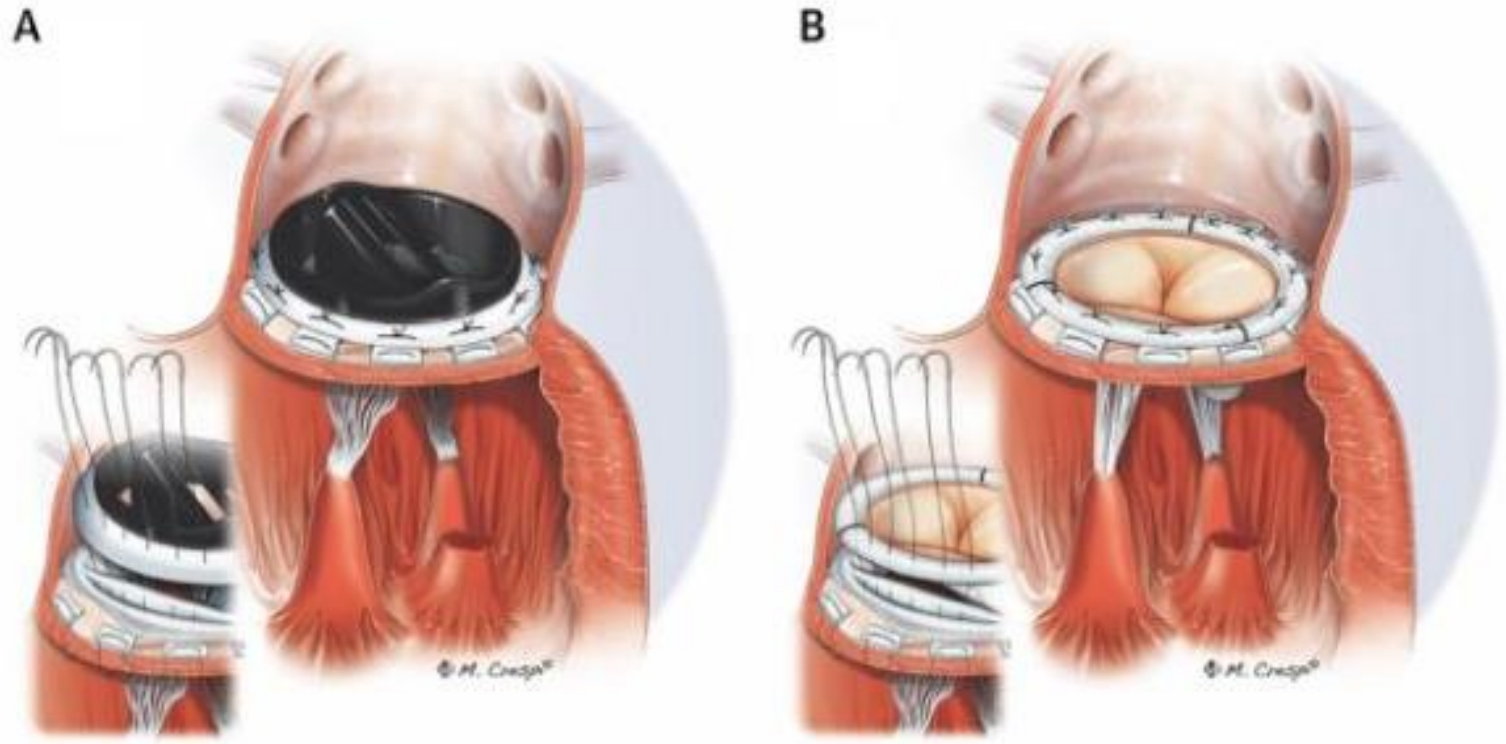
Usually occurs with small MI and SVD

FIGURE 5 Illustration Showing Mechanisms of Acute Mitral Regurgitation



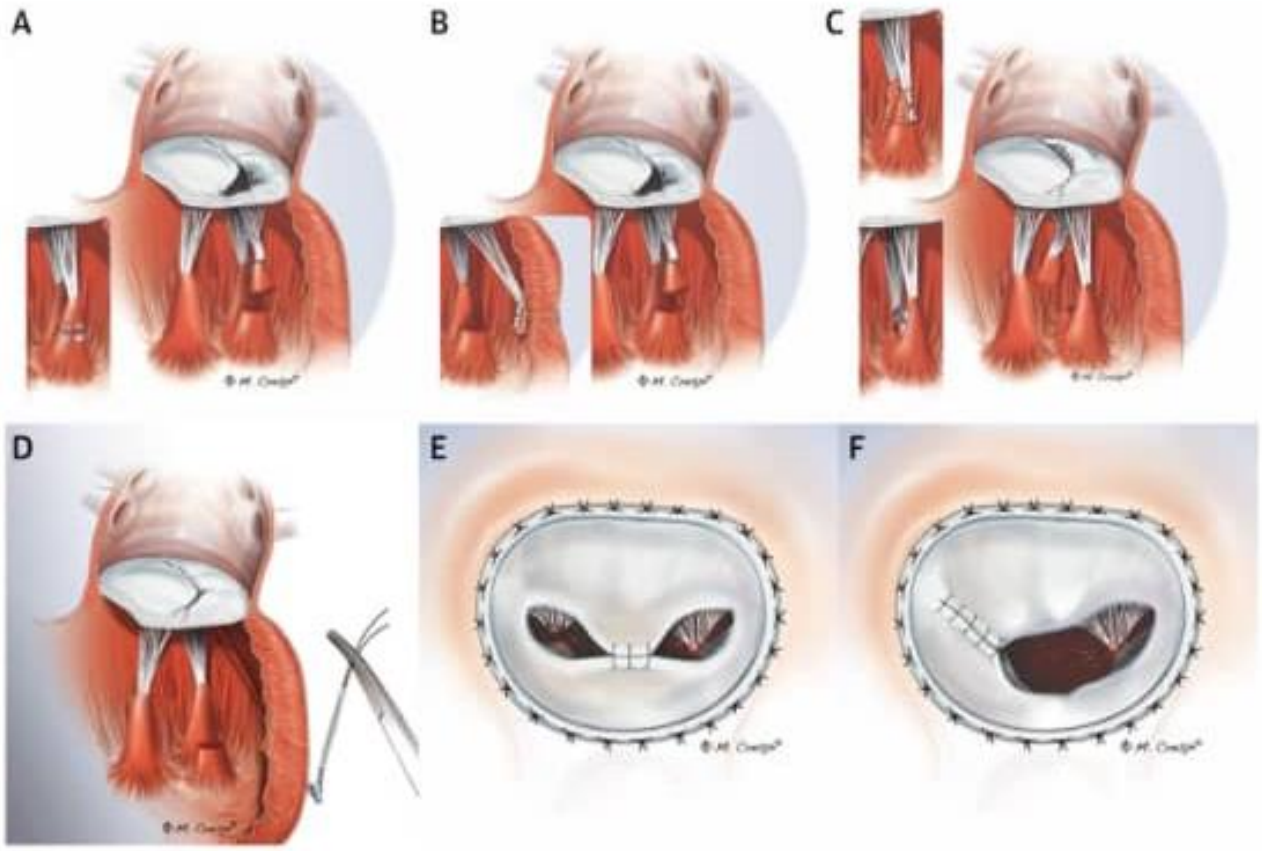
After myocardial infarction (A) tip papillary muscle rupture. (B) Complete papillary muscle rupture. (C) Functional mitral regurgitation phenotype with posterior mitral leaflet restriction and local left ventricular remodeling.

FIGURE 6 Illustration Showing Mitral Valve Replacement in Papillary Muscle Rupture Setting



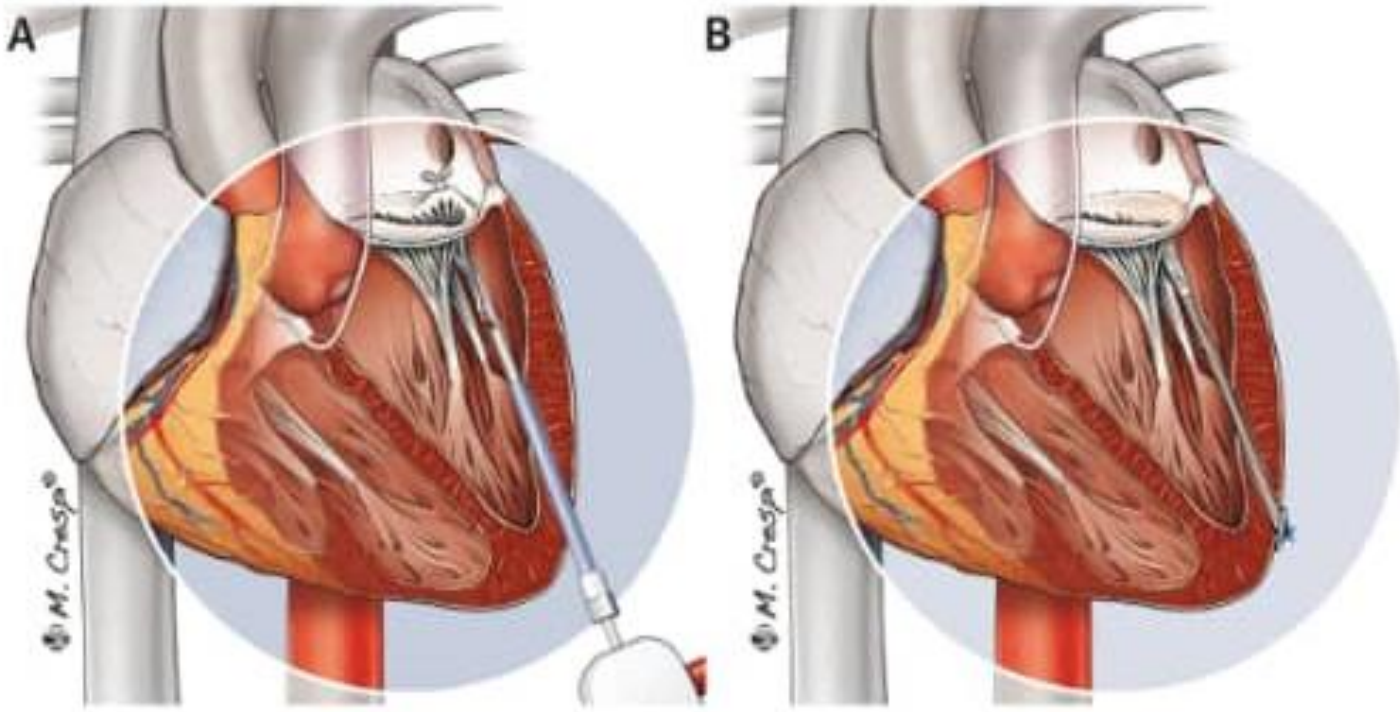
(A) Replacement with mechanical valve. (B) Replacement with biological valve. Both prosthesis implantation with preservation of the valve apparatus.

FIGURE 7 Illustration Showing Techniques of Mitral Valve Repair in the Presence of Papillary Muscle Rupture



(A) Papillary muscle resuture; (B) reimplantation of papillary muscle into myocardium; (C) ruptured papillary muscle suture to the normal papillary muscle; (D) papillary muscle resection and leaflet suture to myocardial wall; (E) central Alfieri + annuloplasty ring; (F) para-commissural edge-to-edge repair technique.

FIGURE 12 Acute MR Treated by Neochord Implantation



(A) Beating heart artificial chordae implantation in chordal or incomplete papillary muscle rupture. (B) Device implanted on prolapsing leaflet and attached to left ventricular apex.


عقاب کوه – تفت
Thank you for your attention
2013