

CORONARY PERFORATION

HOW TO DEAL WITH IT!

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BACKGROUND

- Dissection or intimal tear propagates through all the 3 layers of arterial wall
- It is one of the most dreaded complications of CTO-PCI
- Resulted cardiac tamponade(0.5%) necessitating emergency pericardiocentesis and sometimes cardiac surgery

RISK FACTORS

- CTO-PCI:27.6%
- Oversized compliant balloons (balloon-to-artery ratio >1.2)
- High inflation pressure
- Hydrophilic and stiffer wires
- Calcified and tortuous arteries
- Rotational atherectomy

CLASSIFICATION

Type	Definition
I	Focal extraluminal crater without extravasation
II	Pericardial or myocardial blush without an exit hole larger than 1 mm
III	Frank streaming of contrast through an exit hole larger than 1 mm
IV	Contrast spilling directly into anatomic cavity chamber such as coronary sinus and the right ventricle
V	Distal perforation related to the use of hydrophilic and/or stiff wires

PREVENTION

- Keep ACT optimum
- IIIa-IIb use when indication is must
- UFH is preferable to Bivaluridin in complicated cases because easy reversal with protamine
- Multiple views
- Dual injections
- Delayed watch
- Start with workhorse wire
- IVUS
- Confine wire to true lumen
- Do not dilate in side branch or collaterals

MANAGEMENT: TYPE 1 PERF.

In type I perforations, treatment is limited to careful observation for 15–30 min with repeated injections of contrast media. No further action is required if degree of extravasation does not increase or diminishes. However, increased extravasation is treated with reversal of anticoagulation and/or prolonged balloon inflation at or proximal to the perforated segment

MANAGEMENT: TYPE 2/3 PERF.

Should start with inflation of balloon over the site of perforation to occlude the flow (prolonged inflation of 10–30 min usually at 2 atm). However, this attempt is sometimes difficult to continue because of ischemia (uncommon in CTO–PCI due to presence of collaterals). To relieve chest pain and avoid ischemia to distal area during balloon inflation, a microcatheter over another guidewire is positioned distal to site of perforation and the patient's own arterial blood via microcatheter is injected (microcatheter distal perfusion technique).

MANAGEMENT: SEVERE BLEED

- Reversal of heparin with protamine is indicated only after removal of all equipments from coronary artery
- Infusion of fresh frozen plasma is the only means of reversing anticoagulation with bivalirudin
- Intravenous fluids, vasopressors, and urgent pericardiocentesis
- Initial standard balloon catheter inflation is performed at site of perforation for at least 5–10 min for preparation of a perfusion balloon catheter and performing pericardiocentesis
- Subsequent serial prolonged balloon inflation (for 20–30 min) may successfully seal the perforation or can provide time to prepare a polytetrafluoroethylene (PTFE) covered stent
- 7-F guiding catheter is ideal as the PTFE covered stent is bulky, rigid, and difficult to deliver. It may be difficult to negotiate through previously deployed stents, necessitating techniques such as distal anchor and use of delivery catheters, such as Guideliner catheter (Vascular Solutions, Minneapolis, MN)

PTFE STENT IMP: TECHNIQUE

This technique frequently requires dual guide technique to minimize bleeding in to the pericardium while preparing for cover stent delivery and deployment. This technique involves contralateral access and use of a separate guide catheter to deliver stent. A second guidewire is advanced just proximal to the occluding balloon, which is then deflated and retracted, allowing passage of new guidewire and covered stent for complete closure of the perforation

MANAGEMENT: TYPE 3 PERF.



**ЛЕЧЕНИЕ ПЕРФОРАЦИИ КОРОНАРНОЙ АРТЕРИИ
С ПОМОЩЬЮ СТЕНТА, ПОКРЫТОГО ПЕРИКАРДОМ**

**TREATMENT OF CORONARY ARTERY PERFORATION
WITH PERICARDIUM COVERED STENT
(ITGI MEDICAL)**

HEART INSTITUTE, HADASSAH UNIVERSITY HOSPITAL, JERUSALEM, ISRAEL

PTFE STENTS: PROPERTIES

- These PTFE-covered stent demonstrate quite high stent thrombosis rate (5.7%) and angiographic re-tstenosis (32%) in various clinical settings. Even mild tortuosity may hamper the positioning this stent because of rigidity due to double-stent structure.
- The M-Ggurad stent (Inspire MD, Tel Aviv, Israel) is a bare metal stent (BMS) covered by ultrathin polymer (polyethylene terephthalate) mesh sleeve on its external surface. The wrapping net of this stent is designed to diffuse stent pressure on the vessel wall, so in the site of perforation the net compresses homogeneously on the ruptured layer. Yet this stent is not designed to fully cover the vessel wall.
- The pericardial covered stent (PCS, ITGI Medical, Or Akiva, Israel) highly deliverable balloon expandable fully covered stent allowing prompt deployment in case of emergency..

THE PK POPYRUS (BIOTRONIC)

A sixth generation BMS of cobalt-chromium alloy, thinner struts of which allow exceptional flexibility and deliverability, even in challenging vessels The polyurethane covering the stent is only 90 μm thin resulting in 24% reduction in diameter over a sandwich design. It is 5-F and 6-F compatible, thereby eliminating the need to switch access catheters during the emergency situations.

THE PK PAPYRUS

Covered single stent design allows for low crossing profile and 5F guide catheter compatibility*

Jostent Graftmaster 3.0/16
Sandwich design



PK Papyrus 3.0/15
Covered single stent design



Crossing profile
[mm diameter]



24% reduction



Guide catheter compatibility*



Data on file at BIOTRONIK; * \varnothing 2.5-4.0 mm

SCHEMATIC PRESENTATION



SURGERY

Type II and III perforations unresponsive to the above measures would require emergent cardiac surgery.

AUTOTRANSFUSION

Type IV perforation usually does not require treatment

TYPE 4 PERF.



TYPE 5 PERFORATION

- Distal guidewire manipulation
- First to be treated by proximal balloon inflation
- If Persistent leakage
- Embolization may be considered with microcoils, gelfoam, clotted autologous blood, thrombin, polyvinyl alcohol, and subcutaneous tissue. When injecting material in a perforated artery, care must be taken to prevent spilling the material in other coronary arteries or branches by inflating a balloon proximal to the injection site, or injecting through the distal lumen of an inflated over-the-wire-balloon

MANAGEMENT : TYPE 5 PERF



**... THANK YOU FOR YOUR
KIND ATTENTION !**