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ROLE OF INTRACORONARY LYSIS/ANTI-COAGULATION FOR MASSIVE THROMBUS BURDEN

Dr Ajay Swamy, Hyderabad

The incidence of large thrombus burden in ST-segment elevation myocardial infarction (STEMI) is around 15% stands as an independent predictor for distal embolization, no reflow phenomenon, stent thrombosis, and long-term adverse cardiovascular events. Despite the recognized significance of managing this condition, thrombectomy trials have yielded negative results due to various challenges, including the absence of angiographic thrombus requirements, limitations in the volume of thrombus removal with manual aspiration catheters, trackability issues to the lesion of interest, difficulties in maintaining aspiration power without thrombus loss, and concerns regarding distal and proximal embolization as well as microvascular obstruction.

Regrettably, there is a notable dearth of data on effective therapies for large thrombus burdens. Continuous mechanical extraction thrombectomy, when combined with potent antiplatelet therapy, emerges as a promising approach.

Exploring pharmacological interventions, the early administration of dual antiplatelet therapy (DAPT) with potent P2Y12 inhibitors has shown promise in reducing thrombus burden. Cangrelor, an intravenous P2Y12 receptor antagonist, has shown to significantly decrease death, myocardial infarction, ischemia-driven revascularization, or stent thrombosis at 48 hours.

In my approach to managing STEMI cases with a substantial thrombus burden, in Default STEMI, I prefer ticagrelor or cangrelor, transradial access, unfractionated heparin. Thrombus grade assessment guides further decisions; for cases with Thrombolysis in Myocardial Infarction (TIMI) 0 flow, passing a wire and utilizing dotter or low-pressure percutaneous transluminal coronary angioplasty helps grade the thrombus. In situations where proximal thrombus is identified, direct stenting with a single drug-eluting stent is favored. Alternatively, if the thrombus is distal or extensive, thrombectomy with computer-aided thrombectomy is initiated. In the event of unsuccessful measures, additional considerations such as excimer laser coronary angioplasty are contemplated, with potential stent placement delay.

IS ASPIRIN ON THE WAY OUT?

Dr Aditya Kapoor, Lucknow

Recent data challenges the traditional approach to maintaining aspirin as a long-term component of DAPT in patients following percutaneous coronary intervention (PCI). The SMART-CHOICE and STOPDAPT-2 trials have presented findings suggesting that a transition to a single antiplatelet therapy (SAPT) strategy, using P2Y12 inhibitor alone after the initial 1- to 3-month DAPT course, demonstrates advantages such as reduced bleeding risk without causing harm in terms of ischemic events and this positive outcome remains consistent across various subgroups. However, it's worth noting that this consistency does not extend to the small subgroup of patients with severe chronic kidney disease.

Furthermore, this benefit appears to be independent of the specific choice of P2Y12 inhibitor. The trials indicate that ticagrelor is overrepresented and prasugrel is underrepresented, while clopidogrel monotherapy has been tested primarily in Asian populations. Despite these variations, the consistent positive outcomes across different subgroups suggest a potential shift in the role of aspirin in long-term DAPT post-PCI.

MULTIVESSEL DISEASE IN ACS PATIENTS WITH CARDIOGENIC SHOCK: GUIDING STRATEGIES FOR PCI

Dr Alaide Chieffo, Italy

Nearly 80% of acute coronary syndrome (ACS) patients with cardiogenic shock have multivessel disease.

For ACS patients undergoing PCI of the infarct-related artery (IRA) with angiographically significant stenosis in at least one non-IRA the following strategy is recommended:

- Cardiogenic shock: Immediate PCI of IRA only (Class I); Staged complete revascularization (Class IIa).
- STEMI: Complete revascularization, either during the index procedure or within 45 days (Class I).
- Non-ST-elevation ACS: Complete revascularization (Class IIa); Functional invasive evaluation of the non-IRA during the index procedure (Class IIb).

In conclusion, the approach to primary PCI in acute myocardial infarction complicated by cardiogenic shock (AMICS) should prioritize immediacy. The goal

of achieving complete revascularization, either during the index procedure or within 45 days, is paramount in the management of AMICS.

Mechanical circulatory support (MCS) emerges as a viable option to bolster PCI efficacy, provided specific criteria are met. First and foremost, appropriate device selection is crucial, aligning with the patient's clinical needs. Timely implantation, occurring before or concurrent with PCI, is essential for maximizing the benefits of MCS. Additionally, the expertise of the medical center is a determining factor, necessitating a high level of proficiency in both PCI and MCS procedures. Lastly, the availability of a multidisciplinary cardiogenic shock team further ensures a comprehensive and coordinated approach to AMICS management.

HEMODYNAMICS OF SHOCK

Dr David J Moliterno, USA

In the context of cardiogenic shock, characterized by cardiac-induced hypoperfusion, certain key hemodynamic parameters serve as crucial indicators. These include a systolic blood pressure (SBP) below 90 mmHg persisting for at least 30 minutes, along with a cardiac index <2.2 L/min/m² (or 1.8 without support). Adequate intravascular volume and a pulmonary wedge pressure exceeding 15-18 mmHg are additional parameters that contribute to the hemodynamic profile of cardiogenic shock.

In summary, cardiogenic shock is typified by hypotension and a low cardiac index, reflecting the inadequate perfusion of vital organs. Furthermore, elevated preload and afterload contribute to the hemodynamic complexities associated with this condition. Left untreated, cardiogenic shock carries a substantial mortality risk, often correlating with the patient's age. Therefore, understanding and effectively managing the hemodynamics of coronary artery disease emerge as crucial targets in addressing cardiogenic shock and optimizing patient outcomes.

NAVIGATING REPERFUSION STRATEGIES: FACTORS FAVORING FIBRINOLYTIC-BASED PHARMACOINVASIVE APPROACH

Dr Thomas Alexander, Tamil Nadu

Certain factors distinctly favor the adoption of a fibrinolytic-based pharmacoinvasive approach in reperfusion strategies for STEMI. This strategy gains prominence when there is an anticipated delay exceeding 60 minutes in initiating primary PCI, especially in settings lacking PCI capability or facing strain within the health care system. The selection of a fibrinolytic-based

pharmacoinvasive approach is further justified when the diagnosis strongly indicates acute coronary artery occlusion and the patient presents with lower-risk features, notably the absence of cardiogenic shock.

Crucially, the suitability of this strategy hinges on specific temporal considerations, such as the early onset of symptoms, ideally within 3 hours but extending up to 12 hours. Furthermore, for this approach to be viable, there should be no absolute contraindication to fibrinolytics, and the patient should not pose a high risk of bleeding.

ANTIPLATELET STRATEGIES DURING EMERGENCY PCI IN DAPT NAIVE PATIENTS

Dr Ambuj Roy, New Delhi

During emergency PCI in patients who have not previously received DAPT, antiplatelet strategies become paramount. Cangrelor emerges as a potential candidate for a specific role in such scenarios.

Cangrelor's potential role is particularly relevant in cases where patients face challenges in taking oral medications, such as intractable vomiting or sedation. Additionally, individuals with poor gastrointestinal absorption due to conditions like shock or opioid use may benefit from the intravenous administration of cangrelor. The drug also presents a potential role in managing high-risk coronary anatomy, serving as a bridge antiplatelet therapy for patients awaiting coronary artery bypass grafting (CABG). Moreover, cangrelor can be considered a bridge therapy for patients requiring emergent cardiac or noncardiac surgery shortly after undergoing a recent PCI. Importantly, its relative safety profile in patients with a high risk of bleeding, owing to its rapid reversibility and the absence of a specific antidote requirement, adds to its appeal in these scenarios.

In summary, the initial antiplatelet strategy during emergency PCI aligns with standard practices seen in routine cases. However, in instances where bleeding risk is elevated, the use of clopidogrel without a loading dose may be a more frequent consideration. Cangrelor, with its capacity for rapid loading, proves valuable in critically ill patients and serves as a bridge therapy in high-risk situations.

THE NUTS AND BOLTS OF IMPLEMENTING THE SHOCK TEAM

Dr Amir Kaki, Michigan

The successful implementation of a shock team necessitates guiding the intricacies of complex decision-making

and technologies, emphasizing the advantages of multidisciplinary, multispecialty team-based care.

The program's overarching goals encompass achieving 100% utilization of pulmonary artery catheters, the protocolization of care processes, and the early implementation of advanced MCS techniques such as Impella and extracorporeal membrane oxygenation (ECMO). Proficiency in managing large bore vascular access, encompassing skills related to access and shunts, is a key component, necessitating collaboration among a diverse team comprising intensive care specialists, critical care professionals, cardiothoracic surgeons, and the dedicated ECMO team.

When faced with decisions regarding the escalation of care within the shock team framework, several critical indicators guide the decision-making process. These include escalating lactate levels, the need for multiple vasopressors with a simultaneous decrease in cardiac index and Impella support, decreasing mean arterial pressure (MAP), low cardiac power output (CPO) coupled with elevated right atrial pressure, diminishing mixed venous saturation, and a SAVE risk score indicating a 42% chance of in-hospital survival.

In conclusion, the shock team is more likely to achieve invasive hemodynamics, utilize advanced MCS modalities, and exhibit lower risk-adjusted mortality rates. The implementation of standardized protocols underlines the team's commitment to optimizing care for patients in critical shock scenarios.

COMPLETE REVASCULARIZATION IN STEMI – FOR ME, ANGIOGRAPHY IS THE DECISION-MAKER

Dr Ajit Desai, Mumbai

A significant portion of STEMI patients, ranging from 30% to 50%, present with multivessel disease. Following the compelling evidence from the COMPLETE trial and randomized controlled trials from seven other studies, including meta-analyses, the superiority of complete revascularization over culprit-only revascularization has been established. This has been solidified by the Class IA recommendation in the ACC/AHA 2021 guidelines for complete revascularization in STEMI.

There are challenges when incorporating fractional flow reserve (FFR) in STEMI scenarios. The hyperemic reaction is impaired in both the culprit and non-culprit vessels in the acute myocardial infarction (AMI) setting due to various underlying mechanisms, including myocardial necrosis, hemorrhagic microvascular injury, compensatory hyperkinesis, and neurohumoral vasoconstriction. This impairment leads

to an underestimation of FFR in nonculprit lesions, highlighting a limitation in its accuracy. Moreover, the availability of FFR may pose practical challenges.

In conclusion, coronary angiography assessment of nonculprit vessels in STEMI is deemed fairly reliable, while FFR may exhibit fallacies in assessment in STEMI. Despite this, FFR can still prove useful in the context of complete revascularization, particularly during the index hospitalization procedure, for borderline lesion assessment.

THE USE OF FRACTIONAL FLOW RESERVE

Dr Ajay Swamy, Hyderabad

Fractional flow reserve (FFR) serves as a comprehensive tool by incorporating considerations such as stenosis severity, myocardial territory, viability, and collateral perfusion. The routine integration of FFR during diagnostic coronary angiography has demonstrated substantial impacts on patient management across various studies.

In the RIPCORD study, FFR influenced the management decisions for patients in 26%, while the POST-IT study and the R3F study reported even higher percentages at 44% and 43%, respectively. Across these studies, FFR played a crucial role in altering judgments regarding the significance of a lesion compared to angiography alone. The R3F study particularly emphasized the safety and efficacy of pursuing a revascularization strategy guided by FFR, deviating from the suggestions made by angiography.

Notably, the POST-IT study, which included a substantial proportion of ACS patients, revealed that assessing lesions using FFR led to a change in the management strategy for almost half of the patients.

However, there are scenarios where the use of FFR may not be warranted. For instance, in cases of typical angina and ischemia identified through noninvasive testing in a region supplied by a vessel with a high-grade stenosis, FFR may not provide additional meaningful information. Similarly, in the assessment of the culprit vessel in a STEMI, where prompt intervention is often required, the routine use of FFR may be less relevant.

PERCUTANEOUS THERAPIES FOR APE LOCO-REGIONAL THROMBOLYSIS

Dr Atul Mathur, New Delhi

Percutaneous therapies for acute pulmonary embolism (APE), particularly loco-regional thrombolysis, aim to improve oxygenation, the maintenance of MAP and

systemic perfusion through inotropic support, enhancement of pulmonary hemodynamics by reducing pulmonary artery pressure and pulmonary vascular resistance, and the reduction of thrombus burden through techniques like lysis or thrombectomy. Additionally, there is a pivotal emphasis on preventing recurrence and long-term complications, such as chronic thromboembolic pulmonary hypertension.

Endovascular therapy may be associated with complications, spanning a spectrum from access-related issues like bleeding and vascular injury to more complex challenges like distal thrombus migration, arrhythmias, wire perforation, and pulmonary artery hemorrhage. Notably, bradycardia and hypotension, particularly associated with rheolytic thrombectomy, can arise due to adenosine and bradykinin release from cellular breakdown. To mitigate access site complications, the adoption of ultrasound-guided micropuncture access and the use of closure devices, like pre-close (Perclose ProGlide) in combination with manual compression, prove beneficial in reducing bleeding complications linked to large-bore venous access.

In summary, the effective management of APE requires timely risk stratification, particularly in patients at high risk. Incorporating clinical evidence of RV dilatation and dysfunction from imaging and laboratory data and assessing the residual clot burden is integral to appropriate risk stratification. Notably, advancements in endovascular devices have become significant in cases requiring escalated therapy for APE, and catheter-directed thrombolysis emerges as a unique and effective strategy with a low bleeding and complication rate. Success in these approaches necessitates a thorough understanding of their indications, limitations, and supporting evidence.

CARDIOGENIC SHOCK: CLASSIFICATION AND RISK STRATIFICATION

Dr George D Dangas, USA

Traditional diagnostic criteria in clinical trials involve hypotension (SBP <90 mmHg for >30 minutes or the need for support to maintain SBP >90 mmHg) and end-organ hypoperfusion indicators. The European Society of Cardiology (ESC) guidelines, however, emphasizes clinical signs and additional laboratory parameters for hypoperfusion recognition.

Recognizing cardiogenic shock as a dynamic process, the Society for Cardiovascular Angiography and Interventions (SCAI) proposed a shock severity classification in 2019, categorizing patients into five stages: A (at risk) for developing cardiogenic shock, but hemodynamically stable; B (beginning), clinical evidence of hemodynamic instability determined by tachycardia or hypotension, but without hypoperfusion; C (classic), clinical and biochemical evidence of hypoperfusion that requires pharmacological or mechanical support, usually, but not always, accompanied by hypotension; D (deteriorating), clinical evidence of shock and failure of the initial support strategy to restore perfusion; E (extremis), refractory shock or circulatory collapse with highly deranged biochemical markers.

Risk scores for patient stratification, including the ORBI, SHOCK, and IABP-SHOCK II scores, primarily derive from AMI-Cardiogenic Shock registries. The CardShock and INOVA scores address mixed populations of cardiogenic shock, with some limitations. The Cardiogenic Shock Prognosis score, based on ED presentation data, proves reliable for in-hospital mortality prediction, while machine learning models and biomarker-based criteria, such as the Cancer of the Liver Italian Program (CLIP) score, offer innovative approaches to risk stratification.

