Myocardial infarction or acute coronary syndromes, the actual term depending on the current definition, under which its various presentations are subsumed, remains the major clinical event in patients with atherosclerosis of the coronary arteries.

Besides its clinical presentation, the ECG is still the most important diagnostic tool in the emergency department. While anterior and inferior infarctions are usually easy to detect based on typical ST-segment elevations or lowering or T-wave inversions, lateral and posterior infarctions are often more challenging even for experienced cardiologists. Therefore, the Current Opinion "The end of an electrocardiographic dogma: a prominent R wave in V1 is caused by a lateral not posterior myocardial infarction. New evidence based on contrast-enhanced cardiac magnetic resonance—electrocardiogram correlations" by Antoni Bayes de Luna from the Institut Català Ciències Cardiovasculars-Hospital Sant Pau in Barcelona, Spain is a timely opinion paper. Thanks to ECG—contrast-enhanced cardiac magnetic resonance correlations, the authors of this Current Opinion refute the dogma that a prominent R wave in lead V1 in patients who had a myocardial infarction is due to posterior myocardial infarction. The authors have demonstrated with very high specificity that in such patients the infarct scar is located in the lateral wall. As they point out in their article, this is not just a name change, it is a change in location resulting in clinical implications.

Thrombus formation is a dynamic process regulated by flow, blood cells, and plasma proteins, and a crucial event in the development of coronary occlusion. Without it, coronary artery disease would rarely be fatal. Of note, coronary thrombi in patients with ST-segment elevation myocardial infarction (STEMI) contain not only platelets and fibrin, but also inflammatory blood cells, releasing a vast number of cytokines. Lina Badimon from the Barcelona Cardiovascular Research Center in Spain extended such findings in a study entitled "Changes in thrombus composition and profilin-1 release in acute myocardial infarction." A total of 86 patients with STEMI in which thrombectomy was performed were included. Intracoronary thrombi and blood from the site of coronary occlusion and the systemic circulation were obtained. While thrombi obtained <3 h after symptom onset were predominantly composed of platelets and fibrin(ogen), those retrieved after >6 h were characterized by a reduced platelet content, increased leucocyte infiltration including monocytes, neutrophils, T-cells and B-cells, and undifferentiated progenitor cells. Furthermore, differences between early and late thrombi were noted in the cell cytoskeleton-associated proteome (beta-actin and tropomyosin 3 and 4). Using discovery proteomics, the authors identified profilin-1 and detected higher levels in early compared with late coronary thrombi. In vitro platelet aggregation studies showed that platelets secrete profilin-1 upon complete activation. The authors conclude that coronary thrombi exhibit rapid dynamic changes in both structure and cell composition as a function of elapsed time from onset of pain to the intervention. Aged ischaemic thrombi were more likely to have reduced profilin-1 content by releasing profilin-1 into the circulation. The time from onset of pain to intervention in STEMI patients and hence the age of an occlusive thrombus can be assessed based on profilin-1 levels in the peripheral circulation.

Arrhythmias are an important and potentially fatal complication of myocardial infarction. They are related to ischaemic myocytes with resulting re-entry mechanisms or changes in the conduction system. The second original research paper, "High-grade atrioventricular block in acute coronary syndromes: insights from the Global Registry of Acute Coronary Events," by Shaun G. Goodman from the Terrence Donnelly Heart Centre at the University of Toronto in Canada focused on the later complication as there is limited information on the incidence of and death associated with high-grade atrioventricular block in patients with infarction receiving contemporary management according to guidelines. The incidence of high-grade atrioventricular block was analysed in 59 229 patients enrolled in the GRACE registry of which 2.9% of patients had high-grade atrioventricular block. A total of 22.7% of those patients died in hospital, with an odds ratio of 4.2. Of note, the association between high-grade atrioventricular block and in-hospital death varied with type of presentation, with an odds ratio of 3.0 for STEMI, 6.4 for non-STEMI, and 8.2 for unstable angina. A high-grade atrioventricular block present at the time of presentation rather than occurring in hospital, and early percutaneous coronary intervention or fibrinolysis were associated with improved survival, whereas temporary pacemaker insertion surprisingly was not. Patients with high-grade atrioventricular block surviving to discharge had similar adjusted survival at 6 months compared with those without it. Thus, although the incidence of high-grade atrioventricular block is low and decreasing, this complication continues to have a high risk of in-hospital death.

Myocardial infarction: mechanisms, diagnosis, and complications

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Myocardial infarction continues to have a high risk of in-hospital death.
In the third original research paper entitled ‘Antipsychotic drugs and risks of myocardial infarction: a self-controlled case series study’, Ruth Brauer and colleagues from the London School of Hygiene and Tropical Medicine investigated this association using the self-controlled case series design that eliminates between-person confounding effects. All patients with a first recorded myocardial infarction and prescription for an antipsychotic identified in the Clinical Practice Research Datalink linked to the Myocardial Ischaemia National Audit Project were selected for the self-controlled case series. A classical case–control study was undertaken for comparative purposes comparing antipsychotic exposure among cases and matched controls. The authors identified 1,546 exposed cases for the self-controlled case series and found evidence of an association during the first 30 days after the first prescription of an antipsychotic. The incidence rate ratio for first-generation agents was 2.82, and 2.5 for second-generation agents. In the case–control study for new users of first-generation agents, the odds ratio was 3.19 within 30 days of their myocardial infarction.

In the third original research paper entitled ‘Global DNA methylation analysis of human atherosclerotic plaques reveals extensive genomic hypomethylation and reactivation at imprinted locus 14q32 involving induction of a miRNA cluster’ by Einar Altwegg and colleagues from the A. I. Virtanen Institute in Kuopio, Finland, and accompanied by an expert Editorial by Christian Weber from the University of Munich in Germany, the authors conducted a genome-wide analysis to identify differentially methylated genes in atherosclerotic lesions. DNA methylation at promoters, exons, and introns was identified by massive parallel sequencing and gene expression by microarrays, quantitative PCR, immunohistochemistry, and western blots. Interestingly, hypomethylation of chromosomal DNA predominated in atherosclerotic plaques and two-thirds of lesions. DNA methylation at promoters, exons, and introns was identified by massive parallel sequencing and gene expression by microarrays, quantitative PCR, immunohistochemistry, and western blots. Interestingly, hypomethylation of chromosomal DNA predominated in atherosclerotic plaques and two-thirds of genes exhibited a >2.5-fold differential in DNA methylation and were up-regulated as compared with healthy mammary arteries that served as controls. The imprinted chromatin locus 14q32 was an extensively hypomethylated area with highly induced expression of the microRNAs (miRNAs) miR127, -136, -410, -431, -432, and -433, and the capillary formation-associated gene RTL1. The top 100 list of hypomethylated promoters exhibited >1,000-fold enrichment for miRNAs, many of which mapped to locus 14q32. Unexpectedly, gene body hypermethylation was also found to correlate with stimulated miRNA expression. Thus, in atherosclerotic lesions, genomic methylation changes markedly, with the imprinted chromosomal locus 14q32 being the most prominent gene cluster activated via hypomethylation and several clustered up-regulated miRNAs. Thus, epigenetic changes are involved in atherogenesis and may represent new therapeutic targets.

The editors hope that the readers will find this issue of the European Heart Journal of interest.


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Silent myocardial infarction and stroke: findings of multimodality imaging

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A 32-year-old male presented with acute onset of global aphasia and right hemiplegia. Emergent CT angiography demonstrated acute occlusion of the left internal carotid artery. The patient underwent angiography of the carotid arteries (Panel A) and after mechanical thrombectomy symptoms improved. Serial ECGs were normal. Transthoracic (TTE) and transoesophageal echocardiography (TEE) revealed no cardiac thrombi. Coagulability, lipid profile (Cholesterol 4.63 mmol/L, LDL-C 2.74 mmol/L), and cardiac enzymes were normal. The only risk factor was smoking (8 pack-years). A cardiac MRI revealed a small thrombus in the left ventricular (LV) apex measuring 0.9 × 1.8 mm (Panels B and C, arrowhead), apical wall thinning (Panel C, arrow), and dyskinesia (LV ejection fraction 58%), suggesting a myocardial infarction (MI) of undetermined age. Coronary angiography revealed a hazy lesion in the proximal segment of the left anterior descending artery (Panels D and E). Optical coherence tomography (OCT) to clarify the underlying lesion morphology disclosed a recanalized lesion with a ‘multi-channel’ appearance (Panels F–H). The lesion was successfully treated by implantation of a drug-eluting stent and the patient discharged with clopidogrel, rivaroxaban, statin, and ACE-inhibitor. Upon more detailed history, the patient reported crescendo angina pectoris in the preceding months.

Occult cardiac embolism is considered a principal mechanism of cryptogenic stroke. Thrombus formation within the LV cavity is a potential complication of MI. Cardiac MRI has the highest sensitivity to detect LV thrombi and should be considered in the work-up of patients with highly suspicious cardiac origin of stroke and negative standard examinations. Optical coherence tomography may be useful to fully characterize the morphology of coronary culprit lesions.

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