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REFERENCES

Effect of Antiplatelet Therapy on Suboptimal Reperfusion

In ST-segment elevation acute coronary syndrome (STE-ACS), the main purpose is restoration of blood flow in the responsible artery and microvascular reperfusion as soon as possible, thus limiting the extent of irreversible injury.

Suboptimal reperfusion (SOR) is associated with greater infarct size, increased rate of left ventricular dysfunction, and increased mortality rate. (1) It is defined by partial ST-segment depression (< 50%) after pharmacological or mechanical reperfusion.

The causes of SOR are persistent stenosis or thrombosis, dissection or coronary spasm, distal microembolism, acute stent thrombosis, no-reflow phenomenon, reperfusion injury, endothelial cell edema, and myocyte inflammation. (1-4)

We recently published an analysis (4) in which we observed that SOR incidence in a STE-ACS registry was 8.6%, with significantly increased in-hospital mortality in this subgroup of patients [17.6 vs 1.8%, SOR vs optimal reperfusion (OR), p = 0.007].

Furthermore, in the multivariate analysis, we observed that high leuko-glycemic index (LGI) and history of prior revascularization were significantly associated with SOR. Other authors observed that in a series of 1,005 consecutive patients with STE-ACS undergoing primary angioplasty, the independent predictors of SOR were prior infarction, Killip and Kimball (KK) 3-4, diabetes, TIMI flow <2 pre-angioplasty, and TIMI <3 post-angioplasty.

In turn, Mahmoud et al. (2019) (5) found that the independent predictors of SOR were pre-angioplasty hyperglycemia and increased white blood cells (similar to our findings) associated with technical variables related to the angioplasty procedure, such as thrombus formation and number of balloon inflations.

The present analysis evaluated the antiplatelet therapy received, both on admission and maintenance doses, among patients who presented SOR and OR. A cohort of 197 patients with STE-ACS and angioplasty presented 180 cases with OR, and 17 with SOR.

Table 1 shows patient baseline characteristics. All patients in both groups received some antiplatelet treatment –aspirin in 95% of the SOR group, and in 98% of the OR group. The mean loading dose of aspirin in the SOR group was 280 ± 28.0 mg vs. 325 ± 9.9 mg in the OR group (p = 0.11).

Regarding the use of clopidogrel, the mean loading dose was 356 ± 35.6 mg in the SOR group versus 460 ± 11 mg in the OR group (p = 0.0023). There is little evidence of a relationship between the type and dose of the antiplatelet regimen used and the incidence of SOR, but based on our findings we believe there is an association with greater incidence of SOR in patients receiving a less potent antiplatelet regimen prior to reperfusion treatment.

Platelet aggregation would play a key role. Roule et al. (6) found that patients who were associated with SOR continued to have residual platelet reactivity after ticagrelor loading doses. We believe that our findings provide an alternative or additional explanation to the classical concept that higher doses of P2 and 12 are associated with a lower rate of myocardial infarction or death, due to a reduction in thrombotic events associated with the antiplatelet effect of thienopyridines.

Our study has the limitation of insufficient data to analyze the effect of new antiplatelet drugs, such as prasugrel or ticagrelor, so further studies will be necessary to test this hypothesis in order to clarify these results and those mentioned and published by other researchers; (2-4) that is, the occurrence of SOR is associated with a significant increase in in-hospital mortality. However, the hypotheses on SOR diagnosis are still controversial.

Conflicts of interest
None declared.

(See authors’ conflicts of interest forms on the website/Supplementary material).

Ethical approval
Not applicable.
Circulatory Support and Extracorporeal Membrane Oxygenation in Transcatheter Aortic Valve Implantation

Severe aortic stenosis (SAS) is the most common valve disease in elderly patients. As many of these patients have several comorbidities and high risk for conventional surgery, transcatheter aortic valve implantation (TAVI) has been developed as an option. (1)

While TAVI is a proven and safe procedure, it presents risks associated with technical aspects, which are difficult or impossible to anticipate (vascular or ventricular trauma), and others that are specific to the patient, some of which can be prevented in order to avoid an unfavorable prognostic impact. (2)

An 82-year-old diabetic patient with SAS, ejection fraction of 15%, and history of aortic valve replacement, was hospitalized for heart failure, requiring inotropic support and mechanical ventilation, with prohibitive risk for conventional surgery (EuroSCORE II 70.5%). The case led to surgical team consensus of using TAVI as therapeutic approach. Due to the preoperative condition and the high chance of hemodynamic intolerance during the procedure, a circulatory support device (extracorporeal membrane oxygenation, ECMO) was used.

Arterio-venous cannulation of the femoral vessels (with 21F venous cannula and 17F arterial cannula (MAQUET AG, Hechingen, Germany) was performed. A Sapien prosthesis (Edwards Sapien XT, Edwards Lifescience, Irvine, CA) was implanted. As during the procedure, the patient developed extreme bradycardia and deep cardiogenic shock, circulatory support with ECMO (CardioHelp®, MAQUET, Hechingen, Germany) was provided. This allowed the procedure to be completed successfully (Images A and B) and the patient was transferred to ICU under drug and respiratory support.

Once the echocardiography revealed myocardial functional recovery, the device and the drug and respiratory support were successively weaned, a process demanding 96 hours. Several case reports such as the present one, together with two clinical series, pose the usefulness of this strategy in selected patients. Husser et al. reported 18 cases of prophylactic use of ECMO, which represent 8% of total TAVI performed with 97% implant success and 7% mortality at 30 days, while Seco et al. performed 11 ECMO in 100 TAVI patients, with one death (9%). (3, 4)

Stretch et al. reported an increase in the use of mechanical circulatory support in patients over 80 years of age, which rose from 6.2% between 2004 and 2007 to 11.9% between 2008 and 2011. The question is whether the lack of mechanical circulatory support availability could become ethically unacceptable, and even legally controversial, given the increasing growth of TAVI procedures. (5, 6) The indications for prophylactic use of ECMO during TAVI include severe ventricular function impairment, pacemaker intolerance

### Table 1. Baseline characteristics of OR vs. SOR patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>SOR</th>
<th>Odds ratio</th>
<th>p</th>
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<tbody>
<tr>
<td>N = 197</td>
<td>180</td>
<td>17</td>
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<td>0.974</td>
</tr>
<tr>
<td>Age ≥ 70 years</td>
<td>36</td>
<td>5</td>
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<td>Male sex</td>
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<tr>
<td>Diabetes</td>
<td>26</td>
<td>6</td>
<td>1.00</td>
<td>0.026</td>
</tr>
<tr>
<td>Prior myocardic infarction</td>
<td>14</td>
<td>4</td>
<td>1.00</td>
<td>0.056</td>
</tr>
<tr>
<td>Prior revascularization</td>
<td>6.7%</td>
<td>29.4%</td>
<td>0.008</td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES**

6. Rout V, Thibaut H, Andrien L et al. Acute Cardiovascular Care, Residual platelet reactivity after pre treatment with Ticagrelor prior to PPCI, associated with SMR. EHJ 1-7 2019