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Editorial

Should we be more direct with STEMI patients?

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Over the past two decades, primary percutaneous coronary intervention (PCI) has become the preferred initial treatment for patients with acute ST-segment elevation myocardial infarction (STEMI). Despite improvements in adjuvant pharmacotherapy and advances in PCI technology, distal embolization and subsequent no-reflow due to a large thrombus burden continue to be an issue in patients undergoing PCI for STEMI. Direct stenting without balloon pre-treatment has been used as a technique to possibly reduce the likelihood of distal embolization which could occur in conventional stenting during balloon pre-dilatation. Routine use of direct stenting; however, is limited by the necessity to fully visualize the vessel as well as the ability to deliver and expand a stent without balloon pre-dilatation. Visualization of the entire vessel is a prerequisite to direct stenting because it ensures that there is not a significant stenosis distal to the occlusion site and confirms that the distal portion of the stent is in the main vessel rather than a side branch. Unfortunately, greater than or equal to Thrombolysis in Myocardial Infarction (TIMI) 2 flow prior to stent placement in STEMI patients may not be possible secondary to vessel occlusion from a large thrombus burden.

Data regarding the clinical efficacy of direct stenting in STEMI are limited and conflicting. The Comparison of Outcomes of Direct Stenting Versus Stenting After Balloon Predilation in Patients With Acute Myocardial Infarction (DIRAMI) study randomized 248 patients with STEMI to direct or conventional stenting with bare metal stents [1]. The results showed no significant difference in one-year morality, 5-year morality, no-reflow, or ST-segment resolution. Direct stenting with bare metal stents; however, did result in a greater rate of restenosis (30% vs. 16%, $p = 0.024$). These results differ from a cohort study comparing direct and conventional stenting in 423 STEMI patient undergoing PCI with bare metal stents [2]. Direct stenting was performed in 110 (26%) of the patients as was associated with a lower incidence of no-reflow (5.5% vs. 12%, $p = 0.040$) and a lower 1-month mortality rate (1% vs 8%, $p = 0.008$).

In this issue of *The Journal,* Eitel and colleagues present the findings of their study comparing the clinical and anatomical results of direct versus conventional stenting in patients with STEMI undergoing primary PCI [3]. Unlike prior trials, MRI was used to objectively assess anatomical outcomes. The authors performed a predefined substudy of the LIPSIA CONDITIONING trial which was a prospective, controlled, single-center randomized trial investigating the effects of ischemic preconditioning plus postconditioning in STEMI patients undergoing primary PCI [4]. 171 patients who underwent conventional stenting with balloon pre-dilatation were case matched to 171 patients who underwent direct stenting for age (± 5 years), sex, and TIMI flow prior to PCI. Three-vessel coronary artery disease (CAD) was more prevalent in the conventional stenting group (22% vs. 16%, $p = 0.043$) and thrombectomy was used more often in the direct stenting group (73% vs. 50%, $p < 0.001$). The results of the study showed that direct stenting resulted in a significantly smaller infarct size on MRI 2–5 days after the index event (16% vs. 19%, $p = 0.046$) and a lower 6-month mortality rate (5% vs. 12%, $p = 0.034$).

Despite the authors' efforts to case match the patients, significant differences exist between the two groups. Therefore, are the results of the current study due to the "benefits" of direct stenting or are they due to the clinical differences between the two groups? Specifically, is the difference in mortality due to the greater prevalence of 3-vessel CAD in patients undergoing conventional stenting (22% vs. 16%)? Prior studies have demonstrated a higher mortality rate in patients with 3-vessel CAD who present with acute myocardial infraction and suggest that this certainly could be a possible etiology for the survival difference between the two groups [5]. In addition, could the greater use of thrombectomy in the direct stenting group (73% vs. 50%) have affected the results? The greater use of thrombectomy in the direct stenting group may have been due to the greater need for visualization of the distal vessel prior to stent placement in the direct stenting group. Recent studies have demonstrated that manual thrombectomy in STEMI patients does not result in a significant reduction in mortality and appears to increase the risk of peri-procedure stroke [6] (of note, the stroke rate was similar between the two groups in the current trial). Earlier studies of thrombectomy in STEMI; however, suggest that thrombectomy results in a higher myocardial blush grade and greater likelihood of complete ST-segment resolution on EKG [7]. This improvement in myocardial perfusion may have contributed to the small, but significant difference in infarct size between the two group.

Despite these limitations, the authors should be commended for their current trial which included MRI imaging to assess the anatomical

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effects of direct stenting. These results along with the findings from a metanalysis of 12 trials (4 randomized) comparing direct to conventional stenting provide indirect evidence that direct stenting may improve outcomes in STEMI patients undergoing primary PCI [8]. Routine use of direct stenting; however, may still be limited by the inability to visualize the entire distal vessel during STEMI cases. Thrombectomy prior to stent placement may allow for visualization of the distal segment but should not be routinely used due to a possible increase in the risk for peri-procedure stroke [6]. Direct stenting without the ability to visualize the distal vessel should be considered a technically dangerous maneuver and not recommended. Thus, until new techniques are developed to improve TIMI flow prior to stent placement, direct stenting should be reserved for cases where initial wire crossing results in >TIMI 2 flow and stent delivery and expansion are feasible without balloon pre-treatment.

Conflict of interest

The authors report no relationships that could be construed as a conflict of interest.

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