

# Interventional Cardiology



## NEWS



## RESEARCH HIGHLIGHTS



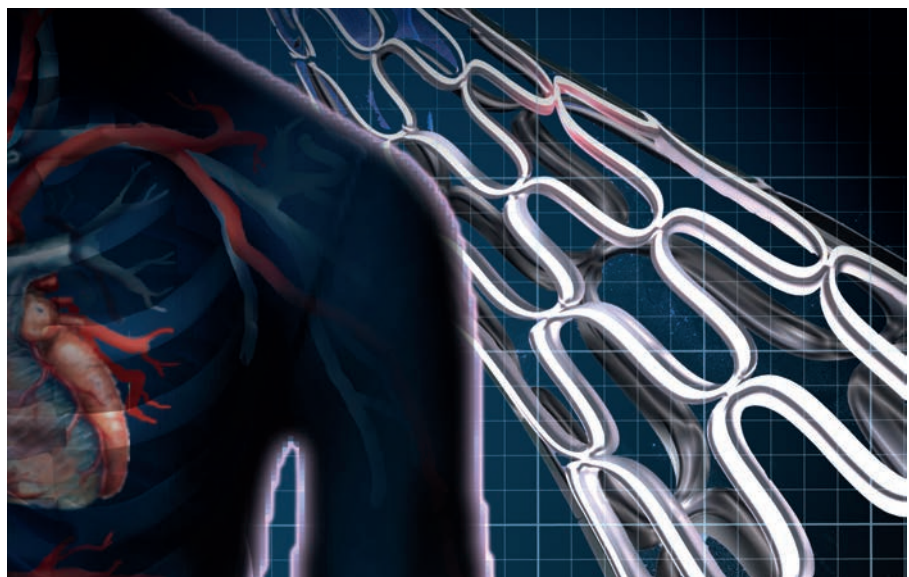
## Transcatheter aortic valve replacement demonstrated suitable for patients with left ventricular dysfunction

Researchers from the University of Padova (Padova, Italy) have performed a multicenter study demonstrating that transcatheter aortic valve replacement (TAVR) is beneficial for patients with severe left ventricular dysfunction, leading to clinical improvement and sustained recovery in left ventricular fraction.

The group, led by Chiara Fraccaro (University of Padova, Padova, Italy), studied prospectively collected data on 384 symptomatic aortic stenosis patients, that were either inoperable or high-risk for surgery, and underwent TAVR between 2007 and 2010. Patients were split into two groups depending on left ventricular ejection fraction (LVEF); 50 patients (group A) had a LVEF of  $\leq 35\%$ , while 334 patients (group B) had a LVEF  $> 35\%$ . Clinical, anatomic and hemodynamic variables, as well as procedural results and follow-up outcomes were compared

between the groups. Patients with severe dysfunction exhibited worse device success, increased risk of aortic regurgitation and increased in-hospital and 30-day mortality. At 1-year follow-up of the eligible patients, all-cause death was higher in group A than group B (29 vs 12%, respectively). Cardiovascular death was similar in both groups (10 vs 6%, respectively) and 2-year survival estimated by Kaplan–Meier analysis was higher in group B (76%) than in group A (52%). Group B patients, with higher superior LVEF function at baseline, retained higher LVEF; however, only group A patients derived a significant benefit from TAVR.

Fraccaro explained that the take-home message for clinicians from this study is that the presence of severe left ventricular dysfunction is not to be considered a contraindication to TAVR. She explained to *Interventional Cardiology* that “even if





30-day mortality is higher for patients without severe left ventricular dysfunction, TAVR seems to be a valuable therapeutic option for these high-risk patients, providing prompt clinical recovery with short hospital stay and amelioration in left ventricular function.”

She also explained that the statistical power of the study is insufficient to analyze predictors of 30-day mortality. In addition, she noted that in-hospital mortality could be minimized by proper patient selection. “First of all, it is of crucial importance to establish if the patient presents a true aortic stenosis instead of a pseudostenosis. Secondly, the presence or not of a contractile reserve by echo-dobutamine could help to stratify the operative risk and the prognosis. The most critical patients are those with a true aortic stenosis without contractile reserve, which from historical data have a 30-day mortality of about 30% after traditional valve replacement. However, even in this subset of patients, TAVR might not be contraindicated after adequate patient prognostic counselling, because of the low risk of after-load mismatch related to the optimal hemodynamic profile of transcatheter prosthesis with respect to surgical aortic valve.”

“There are also procedural factors we should consider to reduce procedural mortality,” she explained. “First of all, the mortality rate could probably be minimized by preferring a transfemoral approach when feasible. Secondly, the duration of pacing should be minimized because it could not be well tolerated. Finally, care should be taken to maintain a good blood pressure level during the critical procedural phase by proper use of inotropic drugs.”

Fraccaro also pointed out that in their dataset of patients with left ventricular dysfunction, severe periprostheses leakage remained a strong predictor of morbidity and mortality. Therefore, any efforts should be made to prevent it by an accurate sizing of the prosthesis by multimodality imaging, including multidetector computed tomography, and correct valve deployment.

– Written by Francesca Lake

Source: Fraccaro C, Al-Lamee R, Tarantini G et al. *Transcatheter aortic valve implantation in patients with severe left ventricular dysfunction: immediate and mid-term results, a multicenter study.* *Circ. Cardiovasc. Interv.* 5(2), 253–260 (2012).

## 10-year study demonstrates the first fully biodegradable stent safe for use in humans

The Igaki-Tamai® stent (Kyoto Medical Planning, Kyoto, Japan) is the first-in-man fully biodegradable stent and has demonstrated similar rates of major adverse cardiac events to bare-metal stents and acceptable long-term safety at 10-year follow-up of patients treated with the device between 1998 and 2000.

The stent is made of poly-L-lactic acid, which metabolizes to carbon dioxide and water and dissolves into the artery wall without leaving foreign material behind. This reduces the occurrence of in-stent blood clots. Currently, it is approved in Turkey and some EU countries to treat peripheral artery disease. Kunihiko Kosaga (Shiga Medical Center for Adults, Shiga, Japan), coauthor of the study, explained that the stent is currently not approved

for treating coronary arteries as long-term clinical data is needed to clarify the coronary safety of the stent.

The stent was implanted into 50 Japanese patients with 63 lesions. At 10-year follow-up, rates of scaffold thrombosis, all-cause death, nonfatal myocardial infarction and target lesion revascularization/target vessel revascularization were analyzed, along with results from angiography and intravascular ultrasound. Of the patients who completed follow-up, 98% were survival free from cardiac death and 87% were free from all-cause death. Half of the patients remained free from major adverse cardiac events. The rate of target lesion revascularization was 16% at 1 year, rising to 18% at 5 years and 28% at 10 years. Two scaffold thromboses were recorded, although one was reported

to be due to a sirolimus-eluting stent implanted for a nearby lesion. The stent struts were reported to be totally absorbed within 3 years.

The authors concluded that the acceptable rates of major adverse cardiac events suggest the long-term safety of the Igaki-Tamai stent, and added that they feel the results are “essential in paving the way for a bioabsorbable drug-eluting poly-L-lactide stent, especially from the standpoint of long-term safety.”

– Written by Francesca Lake

Source: Nishio S, Kosuga K, Igaki K et al. *Long-term (>10 years) clinical outcomes of first-in-man biodegradable poly-L-lactic acid coronary stents: Igaki-Tamai stents.* *Circulation* 125(19), 2343–2353 (2012).



## Research suggests metal allergy does not affect outcomes following stent implantation

Stent implantation into patients with a history of metal allergy has raised concerns in the past, however a team from the Mayo Clinic (MN, USA) has recently published research from a single-center study that suggests metal allergy has no impact on outcomes following stent implantation.

The team compared 29 allergic patients with coronary stent implantation with 250 nonallergic patients. Of the allergic patients, 26 were hypersensitive to nickel and nine to chromium. The group found statistical similarity between the allergic and control groups for all outcomes studied, which included in-hospital death, 30-day death, 4-year death and

target lesion revascularization. No change was observed in counts of circulating eosinophils and lymphocytes after stenting in the allergic group.

Rajiv Gulati, corresponding author of the study, explained that “These findings should provide some reassurance to clinicians and patients who are faced with this clinical issue, especially as there has been scarce and conflicting information in the literature.” Past research has focused on restenosis; Gulati notes that these studies suffered from some design limitations and yielded conflicting results.

Product labeling for stents marketed in the US currently warn about

contraindications in patients with metal allergies. Gulati notes that his group’s findings suggest that the mechanism of skin reaction to metal exposure may differ from that within the arterial wall. However, he points out that while there are little data supporting the need for warnings on product labels, further research is still needed to confirm his team’s findings.

– Written by Francesca Lake

Source: Romero-Brufau S, Best PJ, Holmes DR Jr et al. Outcomes after coronary stent implantation in patients with metal allergy. *Circ Cardiovasc Interv.* 5(2), 220–226 (2012).

## Comparative study demonstrates that bypass surgery is better than percutaneous intervention for coronary heart disease

Researchers from the Christiana Care Health System (DE, USA) have recently reported results of an observational study that may help aid decision-making regarding the choice between coronary artery bypass graft surgery (CABG) and coronary angiography for patients with coronary artery disease.

The study was a result of a collaboration between the American College of Cardiology Foundation and the Society of Thoracic Surgeons, which examined over 180,000 patients. These patients were aged 65 years or over, had two- or three-vessel coronary artery disease and were without myocardial infarction for health outcomes following CABG or angiography. Of these patients, 86,244 underwent CABG and 103,549 underwent the percutaneous intervention procedure. The patients were followed up for a median of 2.67 years.

At 1 year, no significant difference was

reported in adjusted mortality between the groups receiving CABG or angiography. At 4 years, the group receiving the percutaneous procedure exhibited a higher mortality. Similar results were also demonstrated in subgroups and when using different analytical methods. William Weintraub, lead investigator of the study, noted that while the study is the most general ever done, the results do not imply that CABG will be better for every patient. However, he explained that “It does push the needle toward coronary surgery, but not overwhelmingly so.” He added that “When we’re recommending coronary surgery to patients, even though it is a bigger intervention than the percutaneous coronary intervention, we can now have a little more confidence that the decision is a good one.”

Previous studies have had conflicting results. However, doctors tend to choose

the less-invasive percutaneous option when faced with a choice between the treatments. Weintraub explained that “This study should help inform decision-making concerning the choice of revascularization in patients with stable ischemic heart disease.” Nevertheless, he points out that there are limitations of such observational studies, in that the groups may not have the same risk level, so it is possible that the worse outcomes in the angiography patients were related to these patients being more ill in general. “We used sophisticated statistics to account for different levels of risk,” he noted, “but there may be differences between the two groups that we could not account for.”

– Written by Francesca Lake

Source: Weintraub WS, Grau-Sepulveda MV, Weiss JM et al. Comparative effectiveness of revascularization strategies. *N. Engl. J. Med.* 366(16), 1467–1476 (2012).



## Implantable cardiac electronic device infection: a growing danger?

Cardiac device infection is an emerging issue, with a 210% increase in incidence between 1993 and 2008. A new study analyzing patient characteristics has found that complications related to infection, such as secondary valve infection, heart failure and bacteremia, were associated with an increase in in-hospital and 1-year mortality, causing the authors to raise concern for the need of prevention of infection as a priority.

Cardiac-based electronic devices, including pacemakers and implantable cardioverter–defibrillators, are becoming increasingly implanted worldwide, with estimates of more than 4.2 million patients that underwent implantation in the USA between 1993 and 2008. Care of cardiac device infective endocarditis requires antibiotic therapy, surgical- or catheter-based removal of the device, and if necessary, device reimplantation. In some cases, other complications can occur, requiring critical care of the patients.

The study used data from the International Collaboration on Endocarditis-Prospective Cohort Study conducted in 61 centers, in 28 countries, from 2000 to 2006. Cardiac device infective endocarditis was found in 6.4% of the 2760 patients with definite infective endocarditis, which included 85.9% of patients with permanent pacemakers, 11.9% of patients with an implantable cardioverter–defibrillator device type. Reinforcing the seriousness of device infection, the study found that, following enrollment, 26 patients (14.7%) died during hospitalization and 41 patients (23.2%) died within the first year. Complications such as cardiac valve infections (37.3% of patients with cardiac device infective endocarditis), heart failure (15.3%) and persistent bacteremia (15.8%) were especially found to be associated with high in-hospital and 1-year mortality rates, raising awareness of how serious infections

can be and how complications should be monitored.

In the article, the authors stressed the value of prevention. “The high rates of mortality emphasize the need for improved preventive measures, including optimal skin decontamination and appropriate antibiotic administration at the time of cardiac device insertion or manipulation, as well as careful attention to any invasive or intravascular procedures performed after device implantation.”

They then went on to conclude that “Given that numbers of cardiovascular implantable electronic devices placed are increasing rapidly, further studies on the prevention and treatment of this serious complication are needed.”

– Written by Louise Rishton

Source: Athan E, Chu VH, Tattevin P et al. *Clinical characteristics and outcome of infective endocarditis involving implantable cardiac devices*. JAMA 307(16), 1727–1735 (2012).

## Decreased complication rate seen in interventions using vascular closure devices as opposed to manual compression

Giora Weisz and colleagues, from Columbia University Medical Center (NY, USA) have demonstrated that use of a vascular closure device (VCD) results in a lower rate of complications than use of manual compression in patients undergoing transfemoral coronary angiography and percutaneous coronary intervention.

The group conducted a retrospective review and nested case–control study of 7994 patients undergoing elective transfemoral coronary angiography and percutaneous coronary intervention over 3 years. Patients received one of four types of VCDs, or received manual compression. Patients with postprocedure femoral vascular access complications were compared

with patients without complication. Of the 9108 procedures studied, significant complications occurred in 74, with 32 in patients undergoing manual compression and 42 in patients who received a VCD. Use of a VCD was shown to be a predictor of reduced complication risk in both a study on the 74 patients with complications and a study of the entire study population.

Weisz explained to *Interventional Cardiology* that the results are significant as “This study identifies a low rate of complications (0.81%), with superior results with VCDs in comparison with manual compression. Groin bleeding and pseudoaneurysm were the most common postprocedure vascular complications.

Complications were associated with older age and the placement of larger arterial sheath sizes.”

She also explained that “These data support vascular closure device use in elective coronary procedures to achieve rapid access site hemostasis with a significantly decreased rate of vascular complication.”

– Written by Francesca Lake

Source: Smilowitz NR, Kirtane AJ, Guiry M et al. *Practices and complications of vascular closure devices and manual compression in patients undergoing elective transfemoral coronary procedures*. Am. J. Cardiol. doi:10.1016/j.amjcard.2012.02.065 (2012) (Epub ahead of print).



## DEB-AMI trial suggests that drug-eluting balloon followed by bare-metal stent is not superior to using only bare-metal stents

Recently presented results from the DEB-AMI trial, which studied the use of drug-eluting balloons (DEBs) in acute ST-segment elevation myocardial infarction, have suggested that implantation of a bare-metal stent (BMS), preceded by use of a DEB, is no more effective than using a BMS alone at preventing restenosis.

The multicenter international trial randomized over 150 ST-segment elevation myocardial infarction patients to one of three arms, which included a BMS-only group, a DEB plus BMS group and a paclitaxel-eluting stent (PES) with successful thrombus aspiration group. The trial utilized the paclitaxel-eluting DIOR® DEB (Eurocor, Bonn, Germany). The primary end point was 6-month angiographic late lumen loss and the secondary end points included 6-month binary restenosis and 12-month major adverse cardiac events, which included cardiac death, myocardial infarction and target vessel revascularization. A subgroup of patients were also assessed for stent malapposition and endothelial function.

The rates of in-stent late lumen loss, binary restenosis and major adverse cardiac events were shown to be similar for both the BMS-only and DEB groups, and both groups showed inferior results compared

with the PES group. Rates of cardiac death and Academic Research Consortium-defined stent thrombosis were similar for all groups. The subgroup analysis of 27 patients demonstrated that use of a DEB before implantation resulted in more uncovered and malapposed stent struts than use of a BMS alone, but less than resulted from use of the PES. Following a study of the endothelial function of 21 patients using angiographic change in minimum lumen diameter after acetylcholine infusion, both the DEB and PES groups exhibited paradoxical vasoconstriction related to the incremental doses of acetylcholine. The authors explained that their findings could be explained in a variety of ways. First, the DEB could deliver insufficient paclitaxel to the lesion site. Second, 40% of the patients did not undergo predilation with a regular balloon, a process that potentially improves drug uptake. Third, predilation may reduce drug loss as the balloon passes through, due to lesion crossing. A small analysis of 42 patients suggested that those who underwent predilation had less late luminal loss than those who did not. Pieter Stella and colleagues, investigators of the study (University Medical Center Utrecht, Utrecht, The Netherlands), explained that the results suggest use of a DEB “might

indeed have clinical significance when applied to an appropriate number of patients. Hence, future larger randomized studies should be performed to put the current findings into perspective.”

Robert Schwartz of the Minneapolis Heart Institute (MN, USA) explained that whilst this is a negative study, it is too early to be pessimistic regarding the prospects of DEBs as the DIOR balloon may simply have not had the correct drug-release characteristics for this application.

– Written by Francesca Lake

Sources: Belkacemi A, Agostoni P, Nathoe HM et al. First results of the DEB-AMI (drug eluting balloon in acute ST-segment elevation myocardial infarction) trial: a multicenter randomized comparison of drug-eluting balloon plus bare-metal stent versus bare-metal stent versus drug-eluting stent in primary percutaneous coronary intervention with 6-month angiographic, intravascular, functional, and clinical outcomes. *J. Am. Coll. Cardiol.* doi:10.1016/j.jacc.2012.02.027 (2012); Stella PR, Belkacemi A, Dubois C et al. A multicenter randomized comparison of drug-eluting balloon plus bare-metal stent versus bare-metal stent versus drug-eluting stent in bifurcation lesions treated with a single-stenting technique: six-month angiographic and 12-month clinical results of the drug-eluting balloon in bifurcations trial. *Catheter Cardiovasc. Interv.* doi:10.1002/ccd.23499 (2012) (Epub ahead of print).

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