OPtimal stEnt deployment stRategy oF Contemporary sTents

Published: 09-06-2022
Last updated: 11-07-2024

Primary objectiveThe primary objective is to evaluate whether a standard pre- and postdilatation of the modern DES results in a more optimal stent implantation compared to DS as evaluated by OCT in patients with stable coronary artery disease....

Ethical review	Approved WMO
Status	Recruiting
Health condition type	Coronary artery disorders
Study type	Interventional

Summary

ID

NL-OMON51377

Source
ToetsingOnline

Brief title
PERFECT PSP

Condition

- Coronary artery disorders

Synonym
coronary artery disease

Research involving
Human

Sponsors and support

Primary sponsor: Albert Schweitzer Ziekenhuis
Source(s) of monetary or material Support: Salveo Medical B.V.,Vakgroep Cardiologie Albert Schweitzer Ziekenhuis en CAREDO B.V. en grant van Cooperatief Medisch Specialistisch bedrijf ASz U.A.

Intervention

Keyword: Angiography, Coronary artery disease, Optical coherence tomography (OCT), Optimal Stent deployment

Outcome measures

Primary outcome

The primary endpoint of the study is suboptimal stent results which is

defined as a composite of major stent underexpansion and major edge dissection

measured by OCT at lesion level directly after completion of the stent

implantation according to the protocol

Stent malapposition (categorical variable) is defined as:

• Unacceptable stent expansion: The minimal stent area (MSA) of the proximal

segment is <90% of the proximal lumen area, and/or the MSA of the distal

segment is <90% of the distal reference lumen area on OCT

PLUS

• Presence of incompletely apposed stent struts on OCT (defined as stent struts

clearly separated from the vessel wall (lumen border/plaque border) without any

tissue behind the struts with a distance from the adjacent intima of >=0.2 mm

and not associated with any side branch: i.e. the Prati criterium)

Edge dissections (categorical variable) will be presented as:

• Dissections on OCT of >=60 degrees of the circumference of the vessel at the

site of dissection and >=3 mm in length

Secondary outcome

The following secondary imaging endpoints will be assessed with OCT:

• Tapered Stent expansion (%)

• Minimal stent area (MSA)

• Acute recoil (%, assessed on coronary angiography)

• Stent malapposition (%): defined as frequency of incompletely apposed stent struts (defined as stent struts clearly separated from the vessel wall (lumen border/plaque surface) without any tissue behind the struts with a distance from the adjacent intima of >=0.2 mm and not associated with any side branch).

• Mean stent expansion (%): mean stent area (stent volume/analysed stent length) divided by the average of proximal and distal reference lumen areas x 100

• Intra-stent plaque protrusion and thrombus: defined as any intraluminal mass protruding at least 0.2 mm within the luminal edge of a stent strut

The first clinical endpoint is MACE, a composite of time- to-first event rate of cardiac death, target vessel MI, ischemia-driven target vessel revascularization (TVR) assessed at 1-,3- and 5-year follow-up

Other secondary clinical endpoints of the study are:

• Target Lesion Failure (TLF; defined as cardiac death, target vessel-myocardial infarction and clinically indicated target lesion revascularization)

• Target Vessel Failure (TVF; defined as cardiac death, target vessel-myocardial infarction and clinically indicated target vessel revascularization)

• All cause mortality

• Stent Thrombosis (definite or probable; ARC definition)

• The percentage of post OCT stent result optimalization; composite of

additional post-dilation and/or stent placements after OCT

• Cost-effectiveness (total number of stent, balloons, wires and repeat

hospitalizations due to MACE)

Study description

Background summary

Historically, when coronary stents were initially introduced in the late 1980*s and up until the 1990*s, the standard and mandatory standard treatment of a significant stenosis was with pre-dilation prior to stent placement. Predilatation has the benefit of cracking the hardest, most calcific parts of the plaque, as well as providing information on the lesion length and vessel diameter. Thus improving proper size selection of the stent. After stent implantation, an additional postdilatation could be performed in order to improve and maximize stent diameter and expansion.

This standard routine changed in the early 2000s when a technique called *direct stenting* (DS) was pioneered. In DS, no predilatation was performed to crack the plaque and test the lesion length and vessel diameter. Instead, after coronary angiography, a stent was selected and directly placed over the stenosis. The landmark ISAR-DIRECT trial1 was conducted in 2000 and found no difference in clinical outcomes as death, myocardial infarction and restenosis between two different stent implantation techniques: direct stenting (DS) versus conventional stenting after pre-dilation (CS). Various studies in the 2000s demonstrated similar results; DS has been considered a safe and effective treatment in patients who undergo percutaneous coronary intervention (PCI) 1-4 and may reduce contrast use, procedure time and costs compared to the more labor intensive CS5. However, DS also has some potential disadvantages that might increase procedural risks and may lead to suboptimal clinical results. A higher risk of failure to initially cross the lesion, errors in stent placement, incorrect stent sizing, underexpansion, stent dislodgment, and embolization are among the complications of DS.

These stent implantation technique trials of the early 2000s led to a clinical reality which continues until today, in which coronary stent implantation has

become *unprotocolized*, i.e. each operator has his/her own, individual and fairly subjective experience and reasons for applying or avoiding pre- and post-dilation in specific conditions. However, the results of these trials do not apply to the modern clinical practice of coronary stenting. First, the current patient population undergoing PCI cannot be compared to the population that was treated in the early 2000s. Patients today are significantly older, have more comorbidity such as diabetes, prior PCI and consequently present with much more complex coronary anatomy and more advanced atherosclerosis1,6. Secondly, stents have undergone several major transformations in the last 20 years. Stent metal alloys and architecture have improved and strut thickness has been reduced. Stents can now be delivered to complex anatomies which could not be treated in the early 2000s. In addition, current stents are drug-eluting, which prevents in-stent restenosis1,6. Because of the better stent design and improved background pharmacological therapy, event rates of death and myocardial infarction (MI) after PCI have significantly decreased within in the last decades. One-year event rates of approximately 20 % in ISAR-DIRECT have now been reduced to approximately 6 %, as we have recently reported in the follow-up of 8137 PCI patients1,6. The non-significant differences in major adverse cardiac events (MACE) of 2-3% between DS and CS arms in the old trials1-4 are considered clinically highly significant in contemporary clinical practice.

Advances in intracoronary imaging, such a highly detailed coronary imaging technique called Optical Coherence Tomography (OCT), have revealed that an optimal stent result is not achieved in a high percentage (up to 31%) of the stent implantations7. However suboptimal stent placement was already present with one of the ten different OCT criteria. Nevertheless suboptimal stent implantation results in a 3.5-fold increased risk of death, myocardial infarction (MI) or target lesion revascularization (TLR) within one-year follow-up of the observational CLI-OPCI II study 7(MACE rate of 25.2% with suboptimal versus 7.1% risk at optimal stent result). As a consequence, there is an urgent need to revisit the optimal stent implantation technique.

Contemporary coronary stents are based on metallic alloys. In the past decades however a different concept of non-metallic so-called bioresorbable stents (BRS) was developed, introduced and subsequently abandoned due to an increase in MACE, primarily of stent thrombosis and MI. Intriguingly, one of the major lessons learned from this past BRS era is that optimization of the implantation technique with predilatation and postdilatation could reduce adverse cardiac events over time8-10 . As a result of these findings, the PSP concept: Pre-dilation, Sizing and Post-dilation was introduced and highly recommended for BRS. Post-hoc studies revealed a reduced risk of cardiac death, MI and revascularization when the PSP technique was used in BRS11. Whether routine pre- and postdilatation compared to DS also results in optimal stent implantation in modern metallic drug-eluting stents (DES) has not been investigated and, hence is currently unknown.

A prior hypothesis: we hypothesize that the PSP technique will be superior to DS technique in optimal stent placement in patients with stable angina pectoris (SAP) receiving DES. Additionally, we hypothesize that the PSP technique has a lower risk on cardiovascular events compared to DS technique in patients with SAP.

Study objective

Primary objective
The primary objective is to evaluate whether a standard pre- and postdilatation of the modern DES results in a more optimal stent implantation compared to DS as evaluated by OCT in patients with stable coronary artery disease.
Secondary objective
The secondary objective is to evaluate clinical cardiovascular outcomes in patients with stable coronary artery disease.

Study design

This study is a prospective, single-blind clinical study, randomizing patients to PSP implantation technique vs direct stenting technique in a 1:1 ratio. The clinical investigation will be conducted in the Albert Schweitzer hospital, Dordrecht, the Netherlands.

Intervention

Patients are treated according to the randomized regimen from the day of randomization till the last planned staged PCI procedure for all lesions. Patients will be kept blinded for the randomization arm till the end of the study. At the end of the study patients will be informed about the results. There are no restrictions in number of target lesions.

Randomization to PSP treatment
If the patient is randomized to the PSP treatment arm, the procedure will be performed
following the PSP protocol. The definitions of the PSP technique are:
• Predilatation is mandatory with a balloon diameter equal to or maximally 0.5 mm less than the distal reference vessel diameter. We hypothesize that this lesion preparation and fracture of the calcium may result in better stent apposition, less recoil and higher minimal stent area (MSA) Also see endpoints.
• The DES should be deployed at 2 atm. above the nominal pressure. This relatively low stent deployment pressure may prevent stent edge dissections.
• The postdilatation is mandatory with a shorter length and (at least 0.25mm) larger diameter non-compliant balloon at 16 atm. The apposition, minimal stent area (MSA) and recoil may improve with this large, high pressure postdilatation. The slightly shorter balloon can prevent edge dissections.

OCT will be performed at the end of the procedure.

Randomization to direct stenting treatment
• The DES is directly placed without any lesion preparation and deployed at a pressure at the discretion of the operator. Ideally a pressure would be achieved in which angiographic expansion of the DES is complete (without significant dog-boning)
• In certain instances, the operator will not be satisfied with the angiographic appearance after DS and would like to perform an additional *bail-out* postdilatation. Ideally, this should not occur, but cannot be avoided in certain cases to achieve an optimal treatment for the patient. In this situation (expected to occur in maximal 30 % of the DS arm) the patient, who has already provided informed consent and has been randomized, will be transferred to a third arm, the so-called PERFECT PSP registry arm. Excluding these patients from the DS arm is the most robust method of purely investigating the difference between PSP and DS (without additional manipulations). These cases will be accounted for in the block randomization

Use of co-intervention
Decisions of the usage of guidance (like FFR/ iFR, RFR) pre-PCI and usage of medication during the procedure is left at the discretion of the operator.

Multivessel PCI
If a lesion is not suitable for direct stenting, it is allowed to treat this lesion during the index procedure. These non-randomized lesions must be treated prior to randomization and must have been successful and uncomplicated (defined more stringently as angiographic diameter stenosis 5 minutes) or prolonged ST-segment elevation or depression (>5 minutes), or cardiac arrest or need for defibrillation or cardioversion or hypotension/heart failure requiring mechanical or intravenous hemodynamic support or intubation).

Study burden and risks

Complication rate of control OCT measurement is low, and complications are self-limiting or easily treatable. Therefore, this study is classified as negligible risk research, according to the NFU risk classification. The additional imaging with OCT may benefit the patients enrolled in the study. Post-PCI imaging allows to detect and treat sub optimal results, such as edge dissections, tissue protrusion or under-expansion.

Contacts

Public
Albert Schweitzer Ziekenhuis

Albert Schweitzerplaats 25
Dordrecht 3300AK
NL
Scientific
Albert Schweitzer Ziekenhuis

Albert Schweitzerplaats 25
Dordrecht 3300AK
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

1. Stable angina patients or acute coronary syndrome patients with bystander stable coronary artery disease
2. With one or more significant epicardial stenosis in native coronary arteries suitable for direct stenting, according to the judgement of treating operator. The use of fractional flow reserve (FFR) or resting indices like iFR and RFR to assess lesion severity is encouraged.
3. Subject must be at least 18 years of age
4. Written consent to participate in the study

Exclusion criteria

1. Lesions not suitable for direct stenting, like (sub)-total stenosis, severely calcified lesions
2. Culprit lesions of acute coronary syndrome cannot be randomized to the trial. After successful treatment of the ACS culprit lesion, patients however can be randomized in the trial in case of remaining stable non-culprit lesions that thought to be stented directly of during a staged procedure.

3. Lesions not suitable for OCT catheter delivery and imaging, e.g. left main or ostial right coronary artery stenosis, lesions in coronary bypass grafts or tortuous anatomy
4. Treatment for in-stent restenosis
5. Bifurcation lesions in which a two-stent technique or a proximal postdilatation is planned.
6. Treatment of coronary artery bypass grafts
7. Creatine Clearance <= 30 ml/min/1.73 m2 (as calculated by MDRD formula for estimated GFR)
8. Known hypersensitivity or allergy for cobalt chromium
9. Known comorbidity associated with a life expectancy < 1 year
10. Unable to understand and follow study-related instructions or unable to comply with study protocol
11. Known comorbidity associated with a life expectancy < 1 year

Study design

Design

Study type:	Interventional
Intervention model:	Parallel
Allocation:	Randomized controlled trial
Masking:	Single blinded (masking used)
Control:	Active
Primary purpose:	Diagnostic

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	05-09-2022
Enrollment:	247
Type:	Actual

Medical products/devices used

Generic name:	OCT: Optical Coherence Tomography
Registration:	Yes - CE intended use

Ethics review

Approved WMO Date:	09-06-2022
Application type:	First submission
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)
Approved WMO Date:	08-07-2024
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
ClinicalTrials.gov	NCT05292651
CCMO	NL79106.100.21