Invasive management without stents in selected acute coronary syndrome patients with a large thrombus burden: a prospective study of optical coherence tomography guided treatment decisions.

Souteyrand G, MD[a,b] ; Amabile N, MD, PhD [c] ; Combaret N, MD[a,b] ; Hammas S, MD[c] ; Prati F, MD, PhD[d] ; Berry C, MD PhD[e] ; Pereira B, MD[f], ;Lusson JR, MD, PhD[,a,b], Caussin C,MD[c] ; Motreff P, MD, PhD[a,b].

[a] Department of Cardiology, Clermont-Ferrand University Hospital, Clermont-Ferrand, France.

[b] Cardio Vascular Interventional Therapy and Imaging (CaVITI), Image Science for Interventional Techniques (ISIT), UMR CNRS 6284, Auvergne University, Clermont-Ferrand, France.

[c] Department of Cardiology, Centre Marie Lannelongue, Le Plessis-Robinson, France.

[d] Department of Interventional Cardiology, San Giovanni Hospital, Rome, Italy.

[e] BHF Glasgow Cardiovascular Research Centre, Institute of Cardiovascular and Medical Sciences, University of Glasgow, and Golden Jubilee National Hospital, Glasgow, United Kingdom

[f] Department of Clinical Research (DRCI), Biostatics Unit, Clermont-Ferrand University Hospital, Clermont-Ferrand, France.

Address for correspondence: Géraud SOUTEYRAND. Department of Cardiology, Clermont-Ferrand University Hospital, Clermont-Ferrand, France.

Phone: +33. 473751308

Email address: gsouteyrand@chu-clermontferrand.fr

STRUCTURED ABSTRACT

Aims:

To assess whether a strategy of invasive management without stents in selected acute coronary syndrome (ACS) patients with a large thrombus burden (LTB) might be feasible and safe.

Methods and results:

We performed a prospective non-randomised observational cohort study of invasive treatment decisions guided by optical coherence tomography (OCT) in selected ACS patients with LTB. Among 852 ACS patients who had undergone invasive coronary angiography, 101(11.8%) patients with large thrombus burden on initial angiography underwent thrombectomy to restore TIMI-3 flow without stenting. All of these patients then had repeat angiography with OCT (Day 0-2 (Group1), Day 3-6 (Group2) or Day 7-30 (Group3)).

No adverse events occurred between the initial and second angiograms. Residual thrombus was detected in 68% of patients with OCT (respectively, 94%, 79% and 32% in Group1, Group2 and Group3) and 20% of cases with angiography. Plaque rupture was detected by OCT in 65% of cases. Minimal lumen area was 2.81mm^2, 3.40mm^2 and 4.89mm^2 in Group1, Group2 and Group3, respectively. 62% of patients were stented (respectively, 76%, 61% and 50%). During a minimum follow-up period of 12 months in all patients, 1 non-fatal MI occurred and 1 PCI was performed for angina.

Conclusions:

Medical management without stents is safe and feasible in selected ACS patients with LTB. OCT revealed culprit lesion characteristics that were not disclosed by angiography and facilitated treatment decisions.

KEY WORDS

Acute coronary syndrome, optical coherence tomography, coronary thrombosis, myocardial infarction, percutaneous coronary intervention.

CONDENSED ABSTRACT

We assessed the feasibility and safety of invasive management and selected stenting or not, as guided by angiography and OCT, in ACS patients with LTB. In a 2-stage strategy, angiography was used to select patients for delayed stenting, and in the second procedure angiography and OCT were used to decide on stenting or not. OCT improved the assessment of culprit lesion characteristics and thrombus burden. Of 101 STEMI patients, 38% did not receive a stent. There were no adverse events related to OCT and only 2 non-fatal MACEs occurred during 12 months of follow-up.

ABBREVIATIONS LIST

ACS : acute coronary syndrome

BMI : body mass index

BMS : bare metal stent

CPK : creatine phospho kinase

DES : drug eluting stent

IVUS : intravascular ultrasound

LAD : left anterior descending coronary artery

LCX : left circumflex

LMWH : low molecular weight heparin

LTB : large thrombus burden

LVEF : left ventricular ejection fraction

MACE : major adverse cardiac event

MLA : minimal lumen area

NSTEMI :non ST segment elevation myocardial infarction

OCT : optical coherence tomography

OFDI : optical frequency domain imaging

PCI : percutaneous coronary intervention

QCA : quantitative coronary angiography

RCA : right coronary artery

STEMI : ST segment elevation myocardial infarction

TIMI : thrombolysis in myocardial infarction

INTRODUCTION

Early invasive management in patients with an acute coronary syndrome (ACS) is supported by evidence-based clinical guidelines[1],[2] guidelines and overall, prognosis has improved in recent years[3]. In ACS patient treated with PCI, stenting is almost always performed[4] .

The purpose of stenting is to prevent acute vessel closure after reperfusion[5]. However, although stenting is routinely performed, stents can cause complications acutely (e.g. distal embolization, stent thrombosis) and in the longer term (e.g. restenosis and late/very late stent thrombosis). In ACS patients, coronary thrombus is a consequence of plaque rupture and persistent or large coronary thrombus (LCT) is a risk factor for adverse outcome after percutaneous coronary intervention (PCI) with stenting[6]. Stent deployment in a thrombotic lesion may dislodge thrombus leading to microcirculatory embolization with a no-reflow effect on reperfusion[7], which is a cause of heart failure acutely and in the longer term. Furthermore, stent outcomes may be sub-optimal in thrombotic lesions due to malapposition of the stent on the coronary wall, and stent malapposition may also lead to adverse outcomes in the longer term. Large Thrombus Burden (LTB) (defined as a thrombus with length more than twice the diameter of the coronary artery by Sianos *et al*) is also associated with an increased risk of late stent thrombosis[8]. Reduction of thrombus burden during PCI improves procedure-related outcomes and is recommended in clinical guidelines. For example, the TAPAS study[9] showed that mechanical thrombectomy improved myocardial blush and reduced the rate of 30-day major adverse cardiac events (MACE)[10,11].

We questioned whether stenting could be safely avoided in selected patients with LTB and therefore potentially obviate the risk of complications associated with stenting. Given the emergence of new anti-thrombotic treatments and improved lesion assessment with intra-vascular imaging techniques, such as optical coherence tomography (OCT)[12], we reasoned that stenting may not be mandated in all patients. OCT is a high-resolution (10 µm) endocoronary imaging technique based on near-infrared light. It provides fine in vivo analysis of the 3-layer structure of the arterial wall[13], and of atherosclerotic lesions[14] and highly sensitive thrombus detection[15]. OCT has been used since 2005 for imaging ACS-culprit lesions[16,17] and for immediate[18] and late (neointimal cover[19,20)] post-procedural stent follow-up.

The present study concerned the feasibility, safety and clinical utility of OCT-guided treatment decisions in ACS patients during routine clinical practice. Our rationale was that detailed assessment of thrombus and culprit lesion characteristics by high-resolution endocoronary imaging could guide treatment decisions for coronary stenting after thrombus aspiration.

MATERIAL AND METHODS

Methods

Eligible patients

Between January 2010 and November 2011, 852 patients were admitted for ACS in two French hospital centers (Clermont-Ferrand University Hospital Center and Marie Lannelongue Surgical Center, Plessis-Robinson). One hundred and one ACS patients were included in the present observational study.

The inclusion criteria were the following:

- age ≥18 years;
- STEMI or NSTEMI with high risk clinical characteristics including recurrent symptoms, tachycardia, hypotension or heart failure, according to European guidelines[21];
- l~~L~~arge thrombus burden (thrombus length more than twice arterial diameter) on initial angiography, whatever the initial TIMI flow;
- a~~A~~ culprit coronary artery amenable to OCT imaging (including vessel diameter <5 mm without significant tortuosity or calcification that might restrict the optical catheter).

The exclusion criteria were the following (at least 1):

- pregnancy or breast-feeding;
- contra-indication for glycoprotein (GP) IIb/IIIa inhibitor (abciximab, eptifibatide or tirofiban);
- admission for cardiac arrest;
- cardiogenic shock;
- known creatinine clearance < 30 ml/min

All patients received treatment with 250 mg of aspirin, a loading dose of clopidogrel (600 mg) or prasugrel (10 mg) and therapeutic anti-coagulation (unfractionated (50/kg or low molecular weight heparin (1mg/kg)).

Protocol for treatment decisions

A flow chart which summarizes the decision pathway is shown in Figure 1. The timing of the OCT procedure was at the operator's discretion during the first month after the acute phase.

Medical management protocol

The initial objective was to achieve optimal reperfusion by thrombus aspiration (Export Aspiration Catheter, Medtronic, Minneapolis, Minnesota) and treat the patients with optimal medical therapy including aspirin, a loading dose of clopidogrel or prasugrel and a bolus of abciximab in line with clinical guidelines[1].

Optimal reperfusion was defined in presence of TIMI flow =3 associated with regression of pain and >50% reduction in ST elevation at the post-intervention ECG.

Coronary stenting was indicated when 1 or more of these characteristics were absent. Alternatively, when optimal coronary reperfusion was achieved, the treatment decision (based on a second angiogram and OCT analysis) could, at the operator's discretion, be immediate or else postponed to allow time for the beneficial effects of optimal anti-thrombotic therapy, including dual anti-platelet therapy, glycoprotein IIbIIIa inhibitor therapy and anti-coagulation with low molecular weight heparin.

Three study groups were defined according to the timing of repeat OCT imaging: Acute OCT (days 0-2), Early OCT (days 3-6) and Late OCT (days 7-30). The different time-points (acute, early and late) were pre-defined in order to assess the relationship between the interval from the initial angiogram (and duration of anti-thrombotic therapy) vs. culprit lesion morphology, as revealed by OCT.

The indication for a stent was based on a stenosis >70% or plaque prolapse as revealed by OCT. The three criteria required to define plaque prolapse were (1) an appearance of a mobile plaque in continuity with the coronary wall with (2) evidence of plaque prolapse into the lumen and (3) a maximal plaque length exceeding one-third of the arterial diameter.

All patients received optimal medical therapy, and including some patients who did not receive a stent and instead received optimal medical therapy alone.

When PCI with stenting was performed, OCT was used to assess the final stent result including for stent malapposition, defined as a strut/wall distance greater than the thickness of the strut (including polymer if any)[22,23], significant intra-stent thrombotic protrusion (intraluminal tissue protrusion forming an arch between the stent struts[22,23], considered moderate when less than and significant when more than 500 µm thick) or proximal/distal edge dissection (upstream or downstream: edge dissection).

Invasive management protocol

The treatment decision algorithm is shown in Figure 1.

Angiographic assessment criteria

Angiographic measurements were taken in the Axis Siemens cathlab (Siemens Medical Solutions Inc., Malvern, Pennsylvania) after intracoronary injection of isosorbide dinitrate.

The following measurements were obtained: baseline TIMI flow, percentage stenosis on QCA (Quantitative Coronary Angiography: Siemens Quantcor, Siemens Medical Solutions), arterial reference segment diameter (mm), minimum arterial diameter (mm), and thrombus length (mm). For an occluded culprit artery, thrombus length was determined from the first angiogram after coronary reperfusion.

Angiographic analysis was performed by 2 independent investigators who were not involved in the clinical procedures. Disagreements were resolved by adjudication from a third observer.

OCT assessment criteria

The technique of OCT acquisitions (Frequency Domain OCT, version C7XR, St Jude Medical Inc., Saint Paul, Minnesota) was in line with recent expert review documents[22,23].

OCT analysis focused on the presence of thrombus[22,23]; thrombus burden, based on its extension (thrombus area, longitudinal extension) and thrombus score[22,23]; reference segment lumen area; minimum lumen area; percentage area stenosis; and presence of plaque rupture or erosion. OCT analyses were performed by 2 independent investigators, specifically addressing the feasibility and interpretability of images of region of interest in each examination, and any procedure-related complications.

Clinical assessment and follow-up

Follow-up included screening for MACE (death, recurrence of myocardial infarction or need for surgical or percutaneous revascularization) and functional assessment (recurrence of angina) on systematic 12-months' post-procedural consultation.

Statistics

Statistical analysis was performed using Stata software, version 12 (StataCorp, College Station, TX, US). The tests were two-sided, with a type I error set at α=0.05. Quantitative parameters were presented as the mean ± standard deviation (SD) for each group and as the number of patients and associated percentages for categorical variables. Comparisons between groups were analysed using the Chi-squared or Fisher's exact test for categorical variables followed by Marascuillo procedure, and by ANOVA or Kruskal-Wallis test (normality verified by Shapiro-Wilk test and homoscedasticity by Bartlett test) followed by appropriate post-hoc multiple comparisons test (Tukey-Kramer or Dunn) for quantitative variables. In second step, relations between different parameters and groups were improved considering the delay as a quantitative parameter (and not as three groups determined by clinical and statistical relevance). When appropriate, correlation coefficients (Pearson or Spearman) were used.

RESULTS

Population

Of 852 all comer ACS patients treated in our hospitals between 1 January 2010 to 1 November 2011, 101(11.8%) patients (53±13 years, 78% male; 94% STEMI, 6% NSTEMI) were included. These patients had a LTB in the culprit artery on initial angiography and were treated with aspiration thrombectomy. Twenty two percent of these patients were treated with pre-hospital thrombolysis. The clinical characteristics of the patients are shown in Table 1. Overall, 38 **(38%)** patients did not receive a stent in the culprit lesion and were treated medically.

Angiography results

The results of the initial and subsequent angiograms are shown in Tables 1 and 2, respectively. OCT was performed at Days 0-2 (Group 1, including n=18 patients with immediate post-thrombectomy analysis), Days 3-6 (Group 2) or Days 7-30 (Group 3). Stenting was performed when the residual stenosis in the culprit lesion was >70% of the reference area or when there was evidence of plaque prolapse. Clinical follow-up lasted for 12 months.

OCT results

The OCT procedure was uncomplicated in all patients and all of the OCT recordings were of diagnostic quality (Table 3).

Thrombus was revealed in 68.3% with OCT and 20.8% of patients with angiography alone. Thrombus burden diminished over time and was revealed by OCT in 94.1% of patients in Group 1, 78.8% of patients in Group 2 and 32.4% of patients in Group 3, with mean thrombus scores of 21.6, 13.6 and 4.2, respectively. Thus, maximum thrombus area and length also diminished over time with sequential increases in minimum lumen area and reduced percentage stenosis across the groups. Mean lesion length was 13.5 mm and was less than 15 mm in 70% of cases.

Plaque rupture was disclosed by OCT in 66 patients (65.3%) (Figure 2). In these cases, fibrous cap thickness ranged from 30 to 210µm, for a median 73.6 µm. Plaque erosion was diagnosed in 25 patients in absence of thrombus or rupture : 22 of 25 patients with plaque erosion suspected were in the non immediate groups **(n=7 in the G2 and n=15 in the G3).** There were only 3 patients in the first group. In 10 other patients the shadow related to light attenuation by residual thrombus precluded diagnostic evaluation of the lesion: the diagnostic value of OCT is reduced in cases with red thrombus.

Treatment and evolution

The treatment and follow-up information are given in Table 3. **All patients were treated by double anti-platelet therapy (DAP) and received low-molecular weight heparin anticoagulation during the initial hospital phase. LMWH was stopped when patients were discharged from the hospital. A total of 27 patients out of 101 were discharged from the hospital before the second angiography.**

Only 63 patients (62.4%) underwent coronary stenting and no complications occurred. The mean stent diameter was 3.40 +/- 0.6 mm and the mean length was 20.4 +/- 7.1 mm. In all 63 patients, only 1 stent was implanted per lesion, including 9 with bifurcation lesions that had been managed by provisional T-stenting. The other 38 patients were managed medically. None required coronary artery bypass graft.

OCT was performed at the end of the procedure in all patients treated with PCI in order to assess the final stent results (Figure 3). There was evidence of limited (<1 mm) coronary edge dissection in 6 patients (9.5%). Malapposition was observed in 11 patients (17.5%) and intrastent protrusion in 45 (moderate [<500 µm] in 27 [48.5%] and significant

[>500 μm] in 18 [28.5%]). Post-stent arterial reference area was 9.28 +/- 3.19 mm^2, with a mean reference diameter of 3.32 +/- 0.75 mm and minimum arterial area of 7.51 +/-3.52 mm^2.

The peak serum CPK ranged from 93 to 8,695 IU, with a median of 1,257. The mean left ventricle ejection fraction measured by echocardiography was 56.2% [37-80].

Two MACEs events occurred (2%) during follow-up during 12 months follow-up. An 71 year old man who had been managed medically experienced angina and had a clinically-indicated elective angiogram which showed culprit lesion progression which was treated with a drug-eluting stent. An 83 year old man managed by angioplasty, showed non-fatal ischemic ACS at 8 months post-procedure. There were no cases of sudden death or ~~of~~ myocardial infarction.

DISCUSSION

Our main finding is that using stratified management involving a staged approach with invasive management selectively guided by OCT combined with optimal anti-thrombotic therapy, nearly half of the ACS patients selected for this form of management were safely treated without a stent. In all, nearly 1/8th of all-comer ACS patients in our hospitals were selected for this treatment pathway.

Our treatment algorithm was predicated on the use of optimal ant-thrombotic therapy to prevent coronary re-occlusion in patients who were not treated with a stent and high resolution intra-vascular imaging to stratify patients for stenting or not. We found that 1) sustained use of parenteral anti-thrombotic therapy was safe and not associated with bleeding problems, 2) staged repeated invasive management was safe, 3) OCT was feasible and safe in this setting, 3) OCT revealed thrombus burden and culprit lesion characteristics with superior resolution than angiography alone,4) OCT helped guide treatment decisions to stent or not (i.e. treat with medical therapy alone) and, 5) angiography underestimates thrombus burden, detecting 20.8% residual thrombus after thrombectomy, versus 68.3% on OCT.

Pathology studies by Virmani have shown that ACS are most often due to plaque rupture or erosion[24]; was and these observations have been subsequently confirmed on IVUS and on OCT[24,26,27]. Fibrous cap thickness is critical to onset of these complications, thickness <65 μm being associated with high risk of rupture[28]. The underlying stenosis is not necessarily tight, as the thrombotic component predominates in arterial occlusion. In case of LTB, stenting incurs a risk of no-flow, distal embolisation[29,30] and malapposition. Kim, using

OCT[31], showed that late stent malapposition and neointimal coverage defect were observed more frequently in ACS than in chronic angina.

Historically, culprit lesion stenting has been the evidence-based standard of care for coronary artery disease amenable to PCI in ACS patients. However, several groups are re-examining this approach, and new treatment strategies are now emerging. Isaaz's[32] 2-step Minimalist Immediate Mechanical Intervention (MIMI) strategy consists in restoring TIMI-3 flow in the acute phase and postponing stenting from D0 to D2-5 to allow optimization of the result or indeed reconsideration of indications. ~~The modern~~Contemporary antithrombotic ~~regime~~ therapy, including ~~(~~glycoprotein IIb/IIIa inhibitor therapy, ~~loading dose of~~ dual antiplatelet drugs~~s~~, and anticoagulation,~~)~~ ~~allows such a wait-and-see~~facilitates the safety of an observational approach, minimizing the risk of early thrombosis. Jolicoeur's recent meta-analysis[33] of 6 studies (5 non-randomized) found deferred stenting to be safe (3 coronary re-occlusions before control, in 283 patients) and beneficial (improved LV function), with a lower 1-year MACE rate. The present study applied this 2-step strategy, with the interval to control (up to day 30) left at the operator's discretion while awaiting optimal thrombectomy using anti-GPIIb/IIIa and/or thrombo-aspiration as often as possible (respectively, 76.2% and 72.3% of cases). Results confirmed the feasibility and safety of this attitude: in 101 patients, there were no MACEs before angiogram 2, taken at a mean 9 days (median, 5 days).

~~The present~~Our study also confirmed that, in a setting of ACS, OCT was feasible, with no procedural complications in any of the 101 patients.~~,~~ OCT ~~and~~ provided consistently interpretable imaging~~data~~. The new generation of OCT (OFDI: Optical Frequency Domain Imaging) is faster and ~~easier~~ simpler to perform[34]. OCT enables analysis not only of thrombus burden but also of the ACS-culprit lesion, for which Kubo[15] demonstrated its superiority to angioscopy and IVUS: in this pilot study, OCT in the acute phase visualized thrombus in 100% of cases, plaque rupture in 73% and erosion in 23%. In 101 cases of ACS, the present study identified 66 plaque ruptures (65% of cases) with a mean cap thickness of 73 µm, and 22 plaque erosions.

Finally, OCT can guide treatment, optimizing stenting and sometimes **indicates** isolated medical therapy. By sometimes postponing angiographic control, more complete thrombus regression can be obtained, with improved assessment of the atheromatous component of the stenosis. **Previous works highlighted the negative impact of high thrombus burden within the culprit lesion on short and long-term outcome during STEMI[35] or NSTEMI[36]. Thrombectomy techniques can improve these results by dramatically reducing**

thrombus load during ACS, but a complete disappearance is rarely obtained and real benefits of the technique have been recently challenged[37]. Following thrombectomy, if there is no significant stenosis, the indication for stenting can be reviewed. Plaque erosion and with a moderate stenosis may show spontaneous cicatrization healing, scar formation and re-endothelialization of the arterial wall and: the favorable prognosis under optimal medical management seen onboth IVUS in such cases[38] was recently confirmed onand OCT have provided information on plaque healing with medical therapyby Prati [27]. Thirty-eight of the present 101 patients were managed medically, without stenting, (38%). At 12 months' follow-up, only 1 of the 38 showed evolution toward ischemic stenosis, requiring stenting at 6 months. In the series as a whole, there were no acute events (ACS or sudden death). Previous studies investigated the feasibility of deferred PCI for STEMI treatment under optimal antithrombotic therapy, on the basis of angiographic findings only [39,40]. These series reported that this procedure could be performed safely in selected patients and also induced a decreased rate of culprit lesion stenting. Hence, Echavarria-Pinto and colleagues observed that stenting could be avoided in 29.2% of their patients, which is comparable to the present data. **However**, the real impact of culprit lesion OCT analysis on the need for stent remains difficult to assess, as we do notsince our study did not include have an angiography-only control group of patients treated by angiography analysis alone, further randomised controlled studies are needed to assess the influence of OCT-guided treatment decisions for stenting or not of culprit lesions. . This point was out of the range of the present pilot study but could be investigated in future randomized trials.

OCT-guided postponement optimised stenting:of stent implantation was associated with good procedural outcomes: 100% success and no no-reflow events. The rate of malapposition was relatively low, at 17.5%, despite ACS being a known factor for malapposition[31]. Thrombus reduction allows stent diameter and length to be tailored to the lesion, minimizing the risk of restenosis. The stents deployed were wider (3.4+/-0.6mm) than initial QCA (mean reference diameter = 3.22+/-0.59) would have indicated. Finally, postponement reduced the rate of bifurcation stenting: initial angiography implicated bifurcations in 36% of cases, whereas only 9% of patients actually needed bifurcation stenting.

What is the optimal interval for the OCT 'control' imaging in the 2-step management of ACS? Analyzing the 3 tertiles for the control imaging interval shows that thrombus burden tends to decrease over time on whatever criteria:according to thrombus length, maximum area or score. This reduction is associated with increased minimum lumen area and reduced percentage stenosis. This may account for the significantly reducedlower rate of stenting in the late-OCT group (Figure 4).

Study limitations

The main limitation of this study was the non-randomized design meaning we cannot draw conclusions about the influence of OCT over angiography alone on treatment decisions or clinical outcomes. Moreover the timing of OCT procedure was empirically decided by the operator until 1 month. Our study was neither designed nor powered for a health outcome analysis. The study population included selected patients during routine clinical care (approximately 15% of all ACS cases admitted during the study period). Therefore, the conclusions in our study are relevant to patients with a large thrombus burden at initial angiography and should not be extrapolated to all-comer ACS patients especially where initial thrombus burden is light. Moreover, patients from Group 1 underwent early OCT analysis: although white thrombus (that induces minimal backscattering attenuation) was identified in the vast majority of the cases, residual large thrombus burden might have affected the analysis of the underlying plaque morphology. Hence, this factor could potentially explain the lowest incidence of plaque rupture/erosion identified in these patients compared to the others and advocates for the need of delaying the OCT control from the acute event in order to properly assess the underlying morphology of ACS culprit lesions. **Finally, the appropriated OCT criteria to decide whether the culprit lesion should be stented or not are not validated in the settings ofin ACS and STEMIpatients remains to be determined. Importantly, overall, stenting of culprit lesions represents the overall standard of care. In our study,We used a ratio between reference lumen area and minimum lumen area (MLA) to tailor PCI. use in this clinical situation that could be debatable.**

Our proof-of-concept study was designed to assess feasibility and safety and a larger substantive trial will be needed to evaluate the role of OCT-guided treatment decisions in ACS patients with large thrombus burden. A randomised trial with surrogate health outcomes, such as with MRI for infarct size at 30 days, may be the next logical step.

CONCLUSION

OCT in ACS is feasible and complication-free. The present study demonstrated improved assessment of thrombus burden, which angiography tends to underestimate, and improved culprit-lesion analysis.

Following maximal thrombectomy, OCT allowed abstention from stenting in 38% of cases in this pilot study on a selected population. When indicated, stenting was reliable and perhaps better adapted to culprit-lesion morphology.

We believe ~~A~~a randomised controlled trial ~~including~~ of an OCT-guided invasive strategy in ~~the management of~~ ACS patients with LTB should determine the role of this technique in these indications.

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Figure legends

Figure 1: Decision and treatment tree

Figure 2 : Five examples of young patients (<50 years) included in the study: angiographies (A,B,C,D,E) at baseline (top) and after thrombectomy (bottom); OCT frames after thrombectomy (A',B',C',D',E') of the culprit lesion (top) and reference segment (bottom). Only C, D and E were stented, for residual stenosis >70% or plaque prolapse.

Figure 3 : Baseline angiography (A) in a 37 year-old female treated by thrombus aspiration and GPIIb/IIIa inhibitors. Angiography 30 days later, before (B) and after stenting (C). OCT frames of culprit lesion (B1) and reference segment (B2), minimum lumen area (MLA) <30% reference lumen area (RLA). Post-stenting OCT frames showing optimal strut apposition without thrombus protrusion (C1).

Figure 4: Thrombotic score (gray boxes) and stenting rate (white boxes) in each group: acute (D0 to D2), early (D3 to D6) and late OCT (D7 to D30).