Que devient l'aval d'une CTO réussie?

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Déclaration de relations professionnelles

- Proctor CTO :
  - Boston Scientific Corporation
  - Terumo
  - Abbott Vascular

Définition d'une CTO réussie

- Restauration d'un flux d'aval de bonne qualité
- Timi 3
- Lit d'aval bien visualisé
- Lit d'aval de bonne qualité
- Disparition de la reprise contro-latérale?

Restauration du flux

- Indépendant de la technique utilisée
- Dépend de la longueur de l'occlusion
- Du diamètre du lit d'aval
- De la qualité du lit d'aval
- Du type de reprise

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Qualité du lit d'aval

- Sous perfusé pendant une longue période avec inversion des flux et remodelage concentrique
- Flux concurrentiel
  - Parfois très puissant (collatéralité épicardique)
  - Temps long
  - Nitrés rétrograde
- 3 problèmes possibles :
  - Spasme diffus
  - Athéromateux et sténoses distales
  - Résultat après CTO non optimal
- Prédictible? -> voir films antérieurs++++ (pontage)

Lit d'aval diffusément spasmé

- Phénomène fréquent après désobstruction
- Favorisé par
  - Ancienneté de l'occlusion
  - Autorégulation durant la période occluse…
    - Remodelage concentrique
    - Altération pariétale et augmentation des résistances
  - Guides rigides, multiples
- Evolution du lit d'aval après CTO (Park 2012) : amélioration dans 70% des cas

Effet vasomoteur après revascularisation

The Recanalization of Chronic Total Occlusion Leads to Lumen Area Increase in Distal Reference Segments in Selected Patients

An Intravascular Ultrasound Study

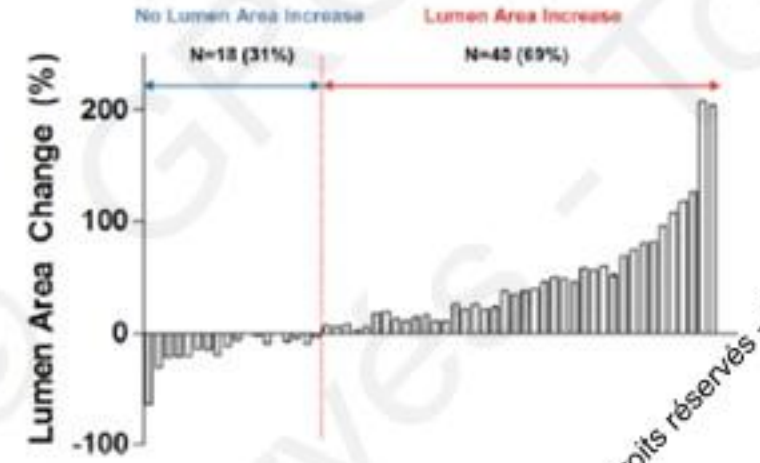

Figure 2. Change of Lumen Area Between Baseline and 6 Months After TO Recanalization of the 58 Patients

Park *et al.* J Am Coll Cardiol Intv 2012;5:827-36

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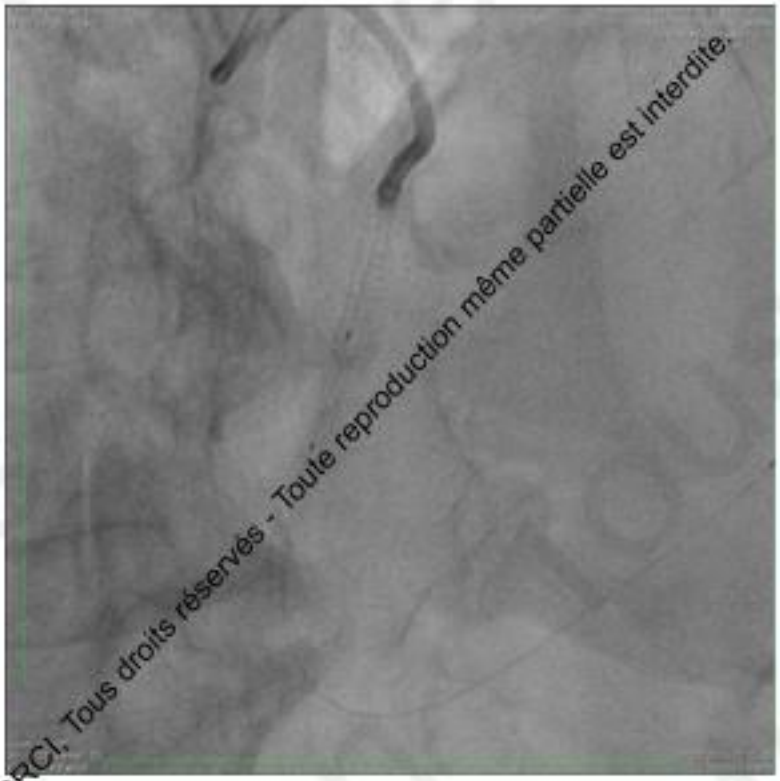
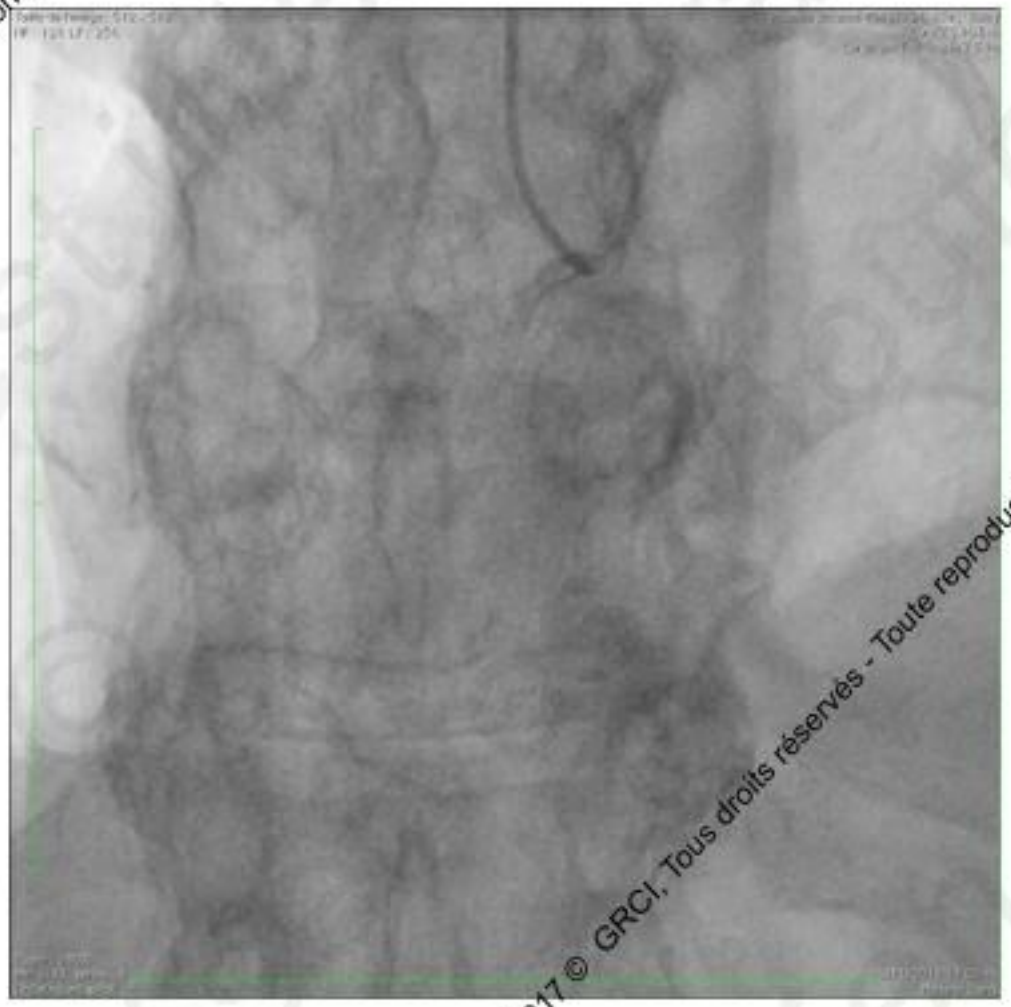
Lit d'aval diffusément spasmé

- Nitrés (rétrograde)
- Savoir attendre
- Injections finales sans guide
- Disparition du flux concurrentiel
- Éléments indépendants favorisants l'expansion artérielle :
  - Ancienneté de l'occlusion
  - Utilisation des statines
  - Mauvaise collatéralité

Exemple de lit d'aval spasmé



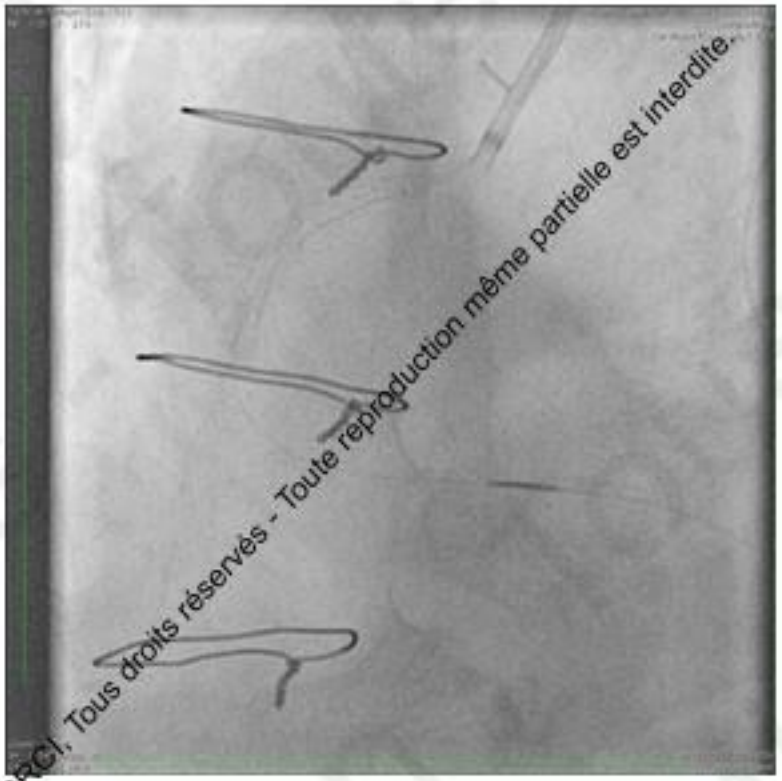
Évolution à 4 mois



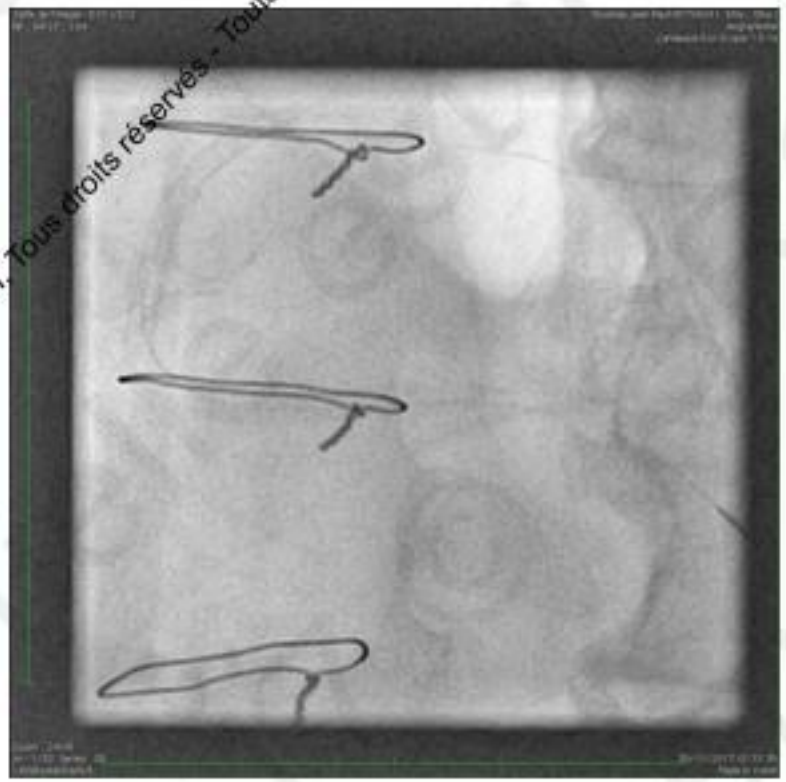
Lit d'aval athéromateux avec sténoses

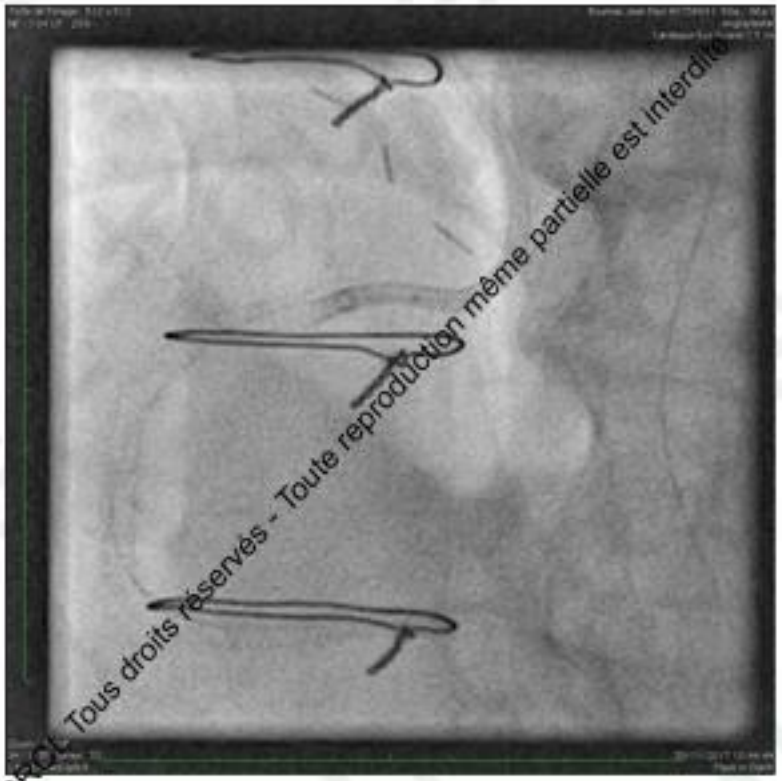
- Ne pas laisser de sténoses significatives et ne pas hésiter à stenter même long
- Stenting secondaire après stenting de la zone obstruée
  - Parfois difficile
  - Utiliser Mother and Child pour délivrance distale
  - S'aider de l'injection contro-latérale avec ballon antérograde gonflé

Lit d'aval athéromateux et sténosé

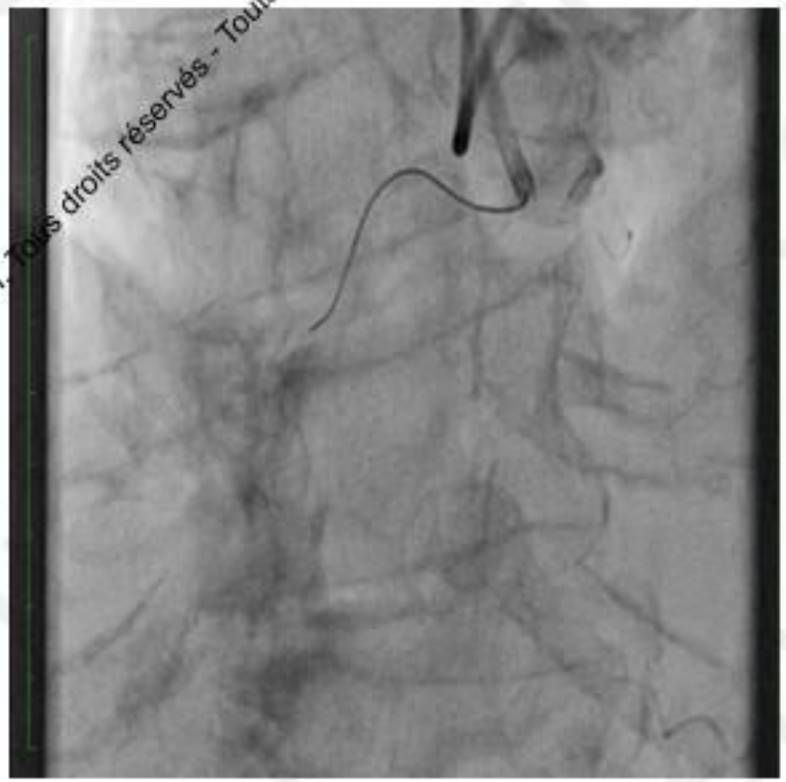


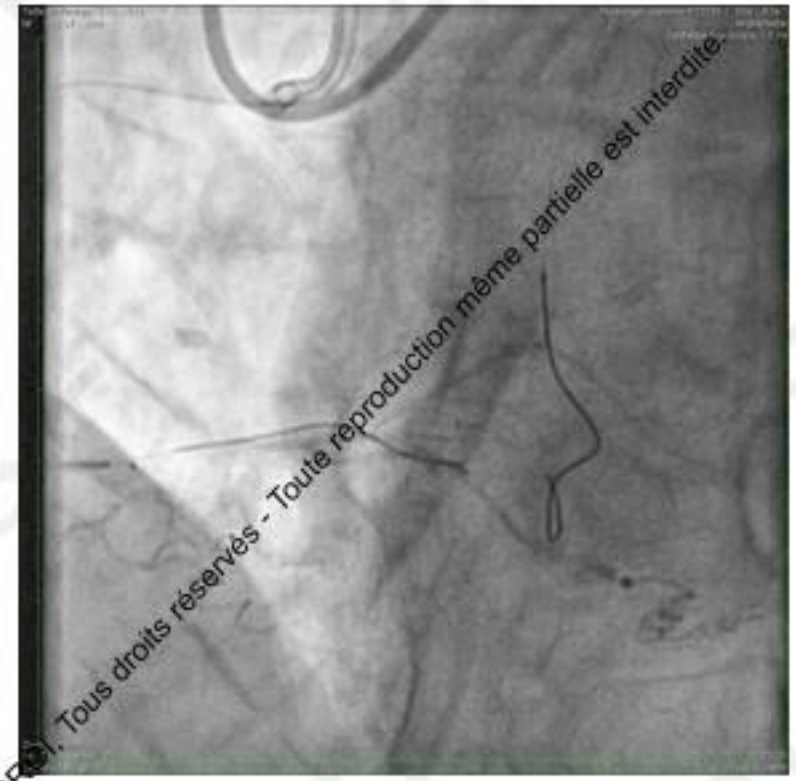
Lit d'aval athéromateux et sténosé



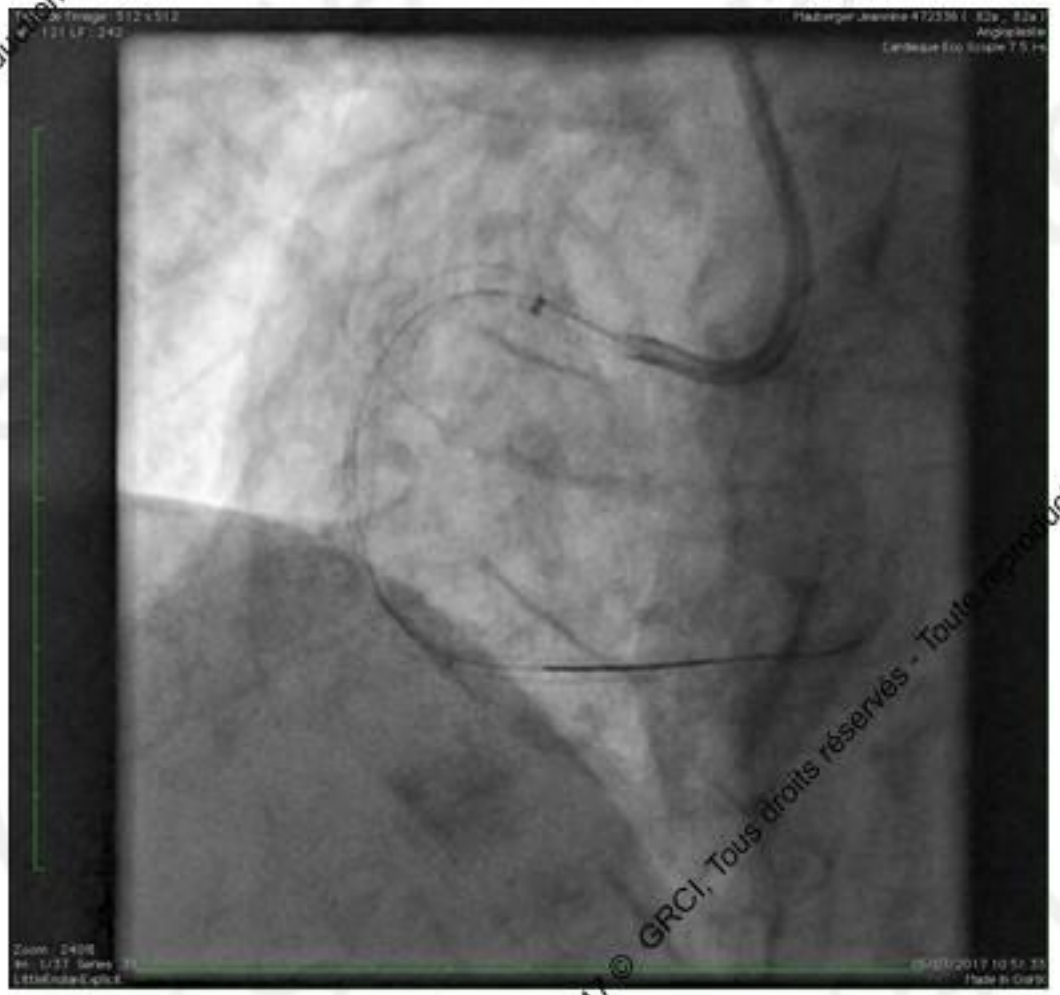


Qualité du résultat insuffisant (dissection distale)

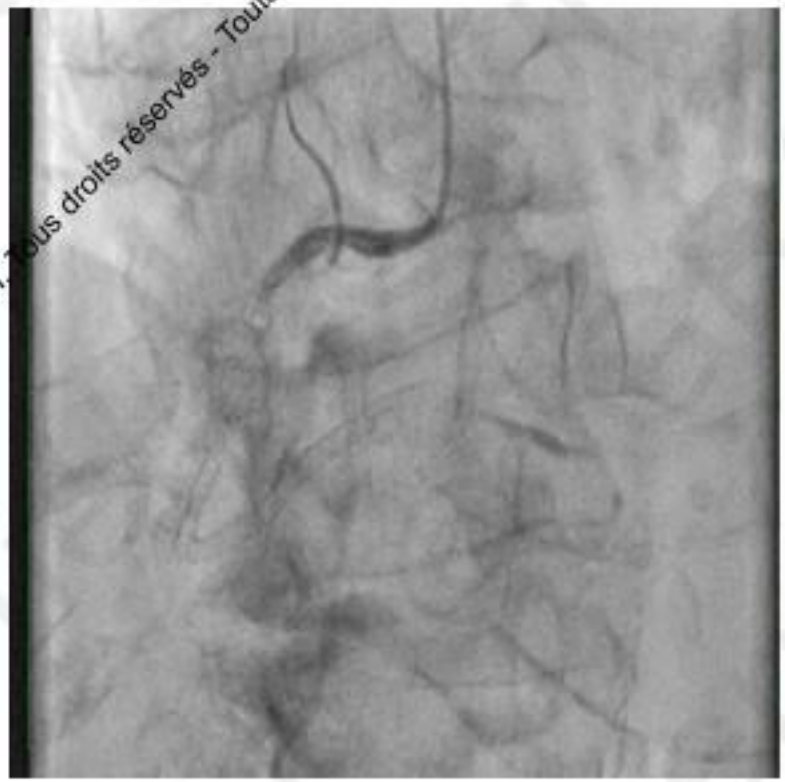




Qualité du résultat insuffisant



Contrôle à 3 mois et final



Appréciation du lit d'aval

- Intérêt de l'IVUS ?
- Intérêt de la FFR ?
- Intérêt de l'OCT ?

IVUS endocoronaire et CTO

- IVUS-CTO trial
  - B.K.Kim and al, Circ.Cardiovasc Interv, 8 (2015),p. e00592
- AIR-CTO trial
  - N.L.Tian and al, EuroIntervention, 10 (2015), pp. 1409-17

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Circulation
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Clinical Impact of Intravascular Ultrasound–Guided Chronic Total Occlusion Intervention With Zotarolimus-Eluting Versus Biolimus-Eluting Stent Implantation: Randomized Study

Byeong-Keuk Kim, Dong-Ho Shin, Myeong-Ki Hong, Hun Sik Park, Seung-Woon Rha, Gary S. Mintz, Jung-Sun Kim, Je Sang Kim, Seung-Jin Lee, Hee-Yeol Kim, Bum-Kee Hong, Woong-Chol Kang, Jin-Ho Choi and Yangsoo Jang
for the CTO-IVUS Study Investigation*

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http://circinterventions.ahajournals.org/content/suppl/2015/07/08/CIRCINTERVENTIONS.115.002592.DC1

Coronary Interventions

Clinical Impact of Intravascular Ultrasound–Guided Chronic Total Occlusion Intervention With Zotarolimus-Eluting Versus Biolimus-Eluting Stent Implantation

Randomized Study

Byeong-Keuk Kim, MD; Dong-Ho Shin, MD; Myeong-Ki Hong, MD; Hun Sik Park, MD; Seung-Woon Rha, MD; Gary S. Mintz, MD; Jung-Sun Kim, MD; Je Sang Kim, MD; Seung-Jin Lee, MD; Hee-Yeol Kim, MD; Bum-Kee Hong, MD; Woong-Chol Kang, MD; Jin-Ho Choi, MD; Yangsoo Jang, MD; for the CTO-IVUS Study Investigators*

Background—There have been no randomized studies comparing intravascular ultrasound (IVUS)–guided versus conventional angiography–guided chronic total occlusion (CTO) intervention using new-generation drug-eluting stent. Therefore, we conducted a prospective, randomized, multicenter trial designed to test the hypothesis that IVUS-guided CTO intervention is superior to angiography-guided intervention.

Methods and Results—After successful guidewire crossing, 402 patients with CTOs were randomized to the IVUS-guided group (n=201) or the angiography-guided group (n=201) and secondarily randomized to Resolute zotarolimus-eluting stents or Nobori biolimus-eluting stents. The primary and secondary end points were cardiac death and a major adverse cardiac event defined as the composite of cardiac death, myocardial infarction, or target-vessel revascularization, respectively. After 12-month follow-up, the rate of cardiac death was not significantly different between the IVUS-guided group (0%) and the angiography-guided group (1.0%; *P* by log-rank test=0.16). However, major adverse cardiac event rates were significantly lower in the IVUS-guided group than that in the angiography-guided group (2.6% versus 7.1%; *P*=0.035; hazard ratio, 0.35; 95% confidence interval, 0.13–0.97). Occurrence of the composite of cardiac death or myocardial infarction was significantly lower in the IVUS-guided group (0%) than in the angiography-guided group (2.0%; *P*=0.045). The rates of target-vessel revascularization were not significantly different between the 2 groups. In the comparison between Resolute zotarolimus-eluting stent and Nobori biolimus-eluting stent, major adverse cardiac event rates were not significantly different (4.0% versus 5.2%; *P*=0.45).

Conclusions—Although IVUS-guided CTO intervention did not significantly reduce cardiac mortality, this randomized study demonstrated that IVUS-guided CTO intervention might improve 12-month major adverse cardiac event rate after new-generation drug-eluting stent implantation when compared with conventional angiography-guided CTO intervention.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01583952.

(*Circ Cardiovasc Interv.* 2015;8:e002592. DOI: 10.1161/CIRCINTERVENTIONS.115.002592.)

Key Words: coronary occlusion ■ drug-eluting stents ■ ultrasonography, interventional

Percutaneous coronary intervention (PCI) for chronic total occlusion (CTO) is still challenging, and there are unmet needs even with the availability of drug-eluting stents (DESs).[1–3] Despite the development of novel techniques and technologies for CTO intervention, the increased clinical and angiographic risk factors accompanying more complex procedures have been associated with worse clinical outcomes.[4–6] The use of intravascular ultrasound (IVUS) has been recommended as 1 way to improve overall PCI clinical outcome; however, few studies have evaluated its use during CTO intervention, and no randomized study has compared IVUS-guided CTO intervention with conventional angiography-guided intervention.[7–9]

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*The names of all investigators of the CTO-IVUS study are listed in the Data Supplement.

**The Data Supplement is available at http://circinterventions.ahajournals.org/lookup/suppl/doi:10.1161/CIRCINTERVENTIONS.115.002592/-/DC1.

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IVUS CTO Study (Kim and al)

- A 12 mois :
  - Réduction MACE (Cardiac death, MI, Target Vessel Revascularisatio) 2,6 vs 7,1% (p 0,035)
  - Réduction Composite endpoint (Death,,MI) 0 vs 2% (p 0,045)
- sous taillée, peu d'évènements

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CIT2014

AIR-CTO Trial

Comparison of Angiography- versus IVUS- guided Stent Implantation for Chronic Total Coronary Occlusion Recanalization

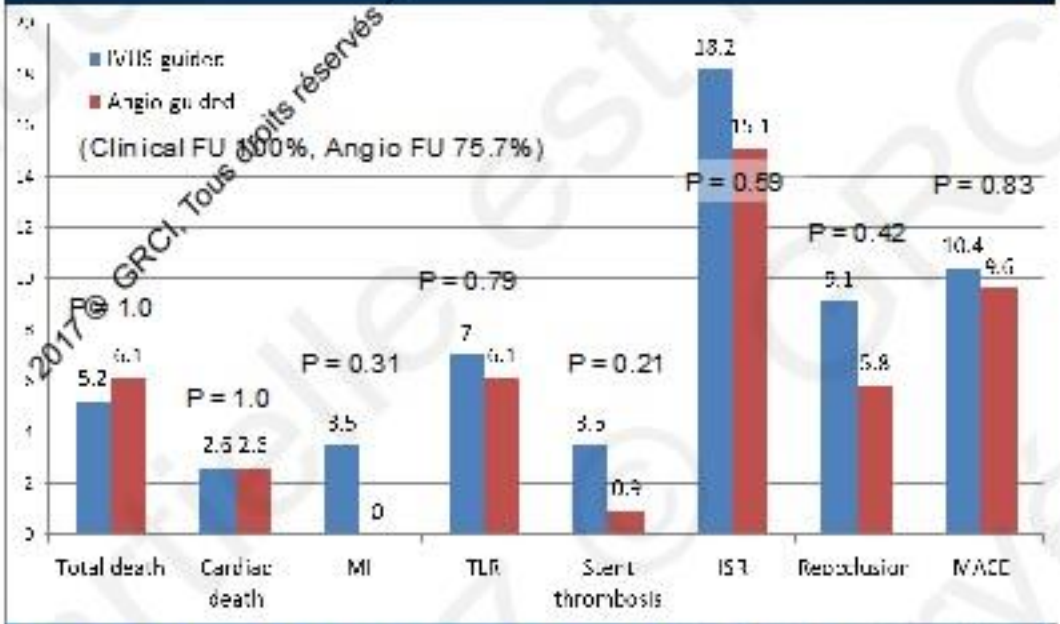
(ChiCTR-TRC-00000151)

Shao-Liang Chen, MD, FACC

Nanjing First Hospital , Nanjing Medical University, China

On behalf of AIR-CTO Trial Investigators

Clinical outcomes



ISR = in-stent restenosis; MI = myocardial infarction; TLR = target lesion revascularisation.
* MACE, defined as a composite of cardiac death, nonfatal MI, or TLR

Procedural records

CIT2014

	IVUS-guided (n = 115)	Angio-guided (n = 115)	P value
CTO stent			
No. stents/patient	1.6 ± 0.9	1.5 ± 0.8	0.376
Stent diameter, mm	3.07 ± 0.45	2.86 ± 0.38	0.0002
Stent length, mm	45 ± 27	45 ± 25	0.814
Stent length ≥40mm	48 (41.7)	39 (33.9)	0.221
Fluoroscopic time, min	70 ± 61	77 ± 69	0.228
Procedure time, min	90 ± 57	87 ± 48	0.667
Contrast, ml	293 ± 136	293 ± 141	0.980
Complete revascularization	78 (67.8)	77 (67.0)	1.0
Final TIMI grade 3	110 (95.7)	112 (97.4)	0.722
CTO success*	115 (100)	115 (100)	1.0
Angiographic failure†	6 (5.2)	3 (2.6)	0.499

mean ± SD or n (%).

Air-CTO study

CIT2014

QCA analysis of in-stent segmeng

	IVUS-guided (n = 88, 76.5%)	Angio-guided (n = 85, 73.9%)	P
Baseline RVD	2.71 ± 0.44	2.75 ± 0.43	0.331
Post-RVD	2.93 ± 0.47	2.95 ± 0.48	0.840
MLD	2.52 ± 0.44	2.52 ± 0.54	0.788
DS	13.89 ± 7.50	14.56 ± 10.89	0.948
Acute gain	2.52 ± 0.44	2.52 ± 0.54	0.788
12-m: RVD	3.02 ± 0.48	2.94 ± 0.53	0.228
MLD	2.30 ± 0.80	2.18 ± 0.75	0.179
DS	24.87 ± 22.54	25.25 ± 23.33	0.945
Late loss	0.24 ± 0.66	0.40 ± 0.73	0.036

mean ± SD or n (%)

CIT2014

In conclusion

- IVUS-guided stenting a CTO lesion is associated with significant reduction of late lumen loss
- In general, Implantation of a DES for CTO lesions has acceptable angiographic and clinical results
- Stenting false lumen does not predict the higher rate of restenosis

Utilisation IVUS CTO

- 10 à 20% (coût, formation…)
- Bien documenté
  - Franchissement de la zone occluse, ostium, etc…
  - Contrôle de la zone occluse, apposition…
- Pas ou peu de documentation sur l'appréciation du lit d'aval
- Sondes mécaniques ?
- Stents plus gros et meilleurs résultats à long terme

FFR et CTO

- Bien documentée sur l'artère donneuse
- Quelques cas décrits sur l'artère désobstruée (FFR passant de 0,50 à 0,92)

FFR et CTO

Utility of Fractional Flow Reserve Measurement in Demonstrating Chronic Ischemic Myocardium in Chronic Total Occlusions of Coronary Arteries

Share Tweet Share Email Share Pin G+ Like 0

Brian Shaw, DO, Vincent Varghese, DO, and Jon C. George, MD, Interventional Cardiology and Endovascular Medicine, Deborah Heart and Lung Center, Browns Mills, New Jersey

Chronic Total Occlusion

Volume 22 - Issue 8 - August 2014

- Cathlabdigest.com
- FFR après passage guide: 0,50 et après stenting 0,94 (calibration dans l'artère controlatérale)

FFR et CTO

- Bien documentée sur l'artère donneuse
- Quelques cas décrits sur l'artère désobstruée (FFR passant de 0,50 à 0,92)
- Pas de « pilotage » de la prise en charge du lit d'aval per procédure
- La qualité du flux dépendant
  - Résultat antérograde
  - Type de collatéralité

OCT et CTO

- Possible, mais uniquement stenting de la zone occluse
- Peu ou pas de données sur la zone occluse
- Pas de données sur le lit d'aval…

Conclusions

- Appréciation parfois difficile, pourtant fondamentale
- Voir films antérieurs (pontages), acquisition longue
- Savoir attendre si spasme diffus, 70% amélioration
- Savoir rester simple :
  - Ne pas laisser de résultat non satisfaisant (dissection distale)
  - Ne pas laisser de sténoses significatives
  - Rôle du flux concurrentiel, notamment épicardique
- IVUS per désobstruction +++ et post ?
- Rôle FFR ? et OCT ?