

Clinical Research

Iatrogenic Aortic Dissection Complicating Percutaneous Coronary Intervention for Chronic Total Occlusion

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ABSTRACT

Background: We aimed to determine the prevalence of iatrogenic aortic dissection in chronic total occlusion (CTO) recanalization procedures, and to assess the management strategy and outcome of such a complication.

Methods: This study was a retrospective analysis of CTO percutaneous coronary intervention (PCI) cases performed by a single CTO experienced operator. Iatrogenic aortic dissection was defined as persistent contrast staining in the aortic cusp or root.

Results: Among 956 CTO PCI cases, iatrogenic aortic dissection occurred in 8 patients for an overall frequency of 0.83%. The right coronary artery was the CTO involved vessel in all cases with ostial location and severe calcifications in 37.5% and 62.5% of cases, respectively. Four patients underwent the antegrade approach and a retrograde strategy was adopted in the remaining 4 patients. The iatrogenic aortic dissection started from the right sinus of Valsalva in 87.5% of cases and catheter trauma was the presumed mechanism of dissection in most cases. Stenting of the entry point was performed in all cases, and dissection was limited (< 40 mm) in all patients. No patients required emergency surgery. One cardiac death was observed 12 days after the index procedure (12.5%), and a mean follow-up of 31.5 months was uneventful in the remaining 7 patients.

RÉSUMÉ

Introduction : Notre but était de déterminer la prévalence de la dissection iatrogène de l'aorte lors des interventions de recanalisation d'une occlusion totale chronique (OTC) et d'évaluer la stratégie de prise en charge et les résultats de cette complication.

Méthodes : L'étude dont il est question ici était une analyse rétrospective des cas d'interventions coronariennes percutanées (ICP) d'OTC réalisées par un seul opérateur expérimenté dans les d'OTC. La dissection iatrogène de l'aorte était définie comme une coloration de contraste persistante de la cuspidé ou de la racine aortiques.

Résultats : Parmi les 956 cas d'ICP d'OTC, la dissection iatrogène de l'aorte survenait chez 8 patients selon une fréquence globale de 0,83 %. L'artère coronaire droite était le vaisseau touché par l'OTC dans tous les cas situés à l'ostium et ayant des calcifications graves, soit dans 37,5 % et 62,5 % des cas, respectivement. Quatre patients subissaient l'approche par voie antérograde, puis les 4 patients restants subissaient une approche par voie rétrograde. La dissection iatrogène de l'aorte partait du sinus de Valsalva droit dans 87,5 % des cas et le traumatisme par cathéter était le mécanisme présumé de la dissection dans la plupart des cas. L'implantation de l'endoprothèse au point d'entrée était réalisée dans tous les cas, et la dissection était limitée (< 40 mm) chez tous les patients. Aucun patient n'avait besoin d'une

It is well demonstrated that successful revascularization of chronic total occlusion (CTO) improves left ventricular function,¹ increased myocardial perfusion,^{2,3} reduced left ventricular remodelling,⁴ and increased electrical stability.⁵ However, despite the development of techniques and equipment^{6–8} with high success rates (75%–90%) achieved by

experienced operators,^{9,10} percutaneous coronary intervention (PCI) in CTO lesions remains associated with a greater incidence of procedural complications compared with non-CTO PCI.^{11,12}

Dissection of the ascending aorta is a very rare iatrogenic complication of PCI with an incidence of 0.03%–0.06%.¹³ The trigger of such a complication is a dissection of the coronary sinus of Valsalva, which progressively extends to the ascending aorta. The appropriate therapeutic strategy is still controversial.

The aim of this study was to determine the prevalence of aortic dissection occurring in CTO revascularization procedures and to assess the management strategy and the outcome of such a complication.

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See page 326 for disclosure information.

Conclusions: CTO recanalization procedures might be associated with a greater incidence of iatrogenic aortic dissection than non-CTO PCI. The therapeutic strategy and outcome depend on the rapidity of the entry point sealing and the degree of extension of the dissection into the aorta in serial imaging assessment.

Methods

Study population

This study was a retrospective analysis of CTO PCI cases performed by a single CTO experienced operator, from January 2006 to April 2014. Iatrogenic aortic dissection was defined as persistent contrast staining in the aortic cusp or root.

Definitions

CTO was defined as a coronary obstruction with Thrombolysis in Myocardial Infarction (TIMI) flow grade 0 with an estimated duration > 3 months.¹⁴

The indication for the percutaneous treatment of CTO was based on the demonstration of viable myocardium in the territory of the occluded vessel using echographic or scintigraphic provocative tests, whereas no CTO angiographic characteristic was considered as an absolute contraindication to attempt PCI.

Angiographic success was defined as a residual stenosis < 30% with a final TIMI flow grade 3 at the end of the procedure.

Two experienced interventional cardiologists evaluated together the cine films of patients who experienced iatrogenic aortic dissection, as a consequence of the CTO recanalization procedure; and a cardiologist involved in cardiovascular imaging reviewed their echocardiograms and computed tomography (CT) angiograms.

The Dunning classification¹⁵ was used to describe the extension of aortic dissection: class 1 was defined as a focal dissection restricted to the coronary cusp; in class 2 the dissection extended up the ascending aorta but < 40 mm; and class 3 included dissections extending from the coronary cusp up to the ascending aorta > 40 mm.

Major adverse cardiac and cerebral events were defined as cardiac death, acute myocardial infarction, stroke, or further revascularization.

Procedure

All procedures were scheduled, and all patients were pretreated with 100 mg of aspirin daily. At the beginning of the procedure, patients received intravenous unfractionated heparin (80-100 IU/kg) to maintain activated clotting time > 300 seconds, and activated clotting time was monitored every 30 minutes to determine if an additional bolus of unfractionated heparin was necessary. No patients were treated with glycoprotein IIb/IIIa inhibitors or bivalirudin. A 600-mg loading dose of clopidogrel before the procedure was

chirurgie d'urgence. Une mort cardiaque était observée 12 jours après l'intervention de référence (12,5 %), et un suivi moyen de 31,5 mois s'était déroulé sans incident chez les 7 patients restants.

Conclusions : Les interventions de recanalisation d'OTC seraient associées à une plus grande fréquence de dissection iatrogène de l'aorte que les non-ICP d'OTC. La stratégie thérapeutique et les résultats dépendent de la rapidité de la fermeture du point d'entrée et du degré d'extension de la dissection de l'aorte à l'évaluation de l'imagerie sérielle.

administered if patients were not pretreated. The choice of the guiding catheter, the CTO recanalization approach, the use of CTO devices, and the choice of aortic dissection treatment were completely based on the operator's discretion and experience.

Statistical analysis

Continuous variables were presented as mean and ranges. Categorical variables were presented as counts and percentages. All data were processed using the Statistical Package for Social Sciences, version 21 (SPSS, Chicago, IL).

Results

Prevalence of iatrogenic aortic dissection and characteristics

Among 956 patients with at least 1 CTO lesion, treated by a single CTO dedicated experienced operator, iatrogenic aortic dissection was diagnosed in 8 patients for an overall frequency of 0.83%. The mean age was 63.5 years (range, 53-71 years) and 6 patients (75%) were male. Four patients (50%) were diabetic; hypertension and dyslipidemia were observed in 87.5% and 62.5% of cases, respectively; and 5 patients (62.5%) were current smokers. A history of myocardial infarction was noticed in 3 patients (37.5%), and all patients underwent previous revascularization: previous PCI in 4 cases (50%), and previous coronary artery bypass in 4 cases (50%). The clinical presentation was stable angina in all patients: Canadian Cardiovascular Society class 2 in 7 patients (87.5%), and Canadian Cardiovascular Society class 3 in the remaining patient (12.5%). The mean left ventricular ejection fraction was 52.5% (range, 45%-55%). All patients had multivessel disease with 1 CTO lesion, and the right coronary artery (RCA) was the target vessel in all cases. An ostial CTO location was observed in 3 cases (37.5%); severe calcification in 5 cases (62.5%); and 5 patients (62.5%) had a CTO length \geq 40 mm. No intrastent CTO was noticed, and a previous attempt was performed in 2 patients (25%).

In Table 1 the patients' baseline characteristics are summarized.

Procedural details

A double femoral 7-French access was performed in all patients. An antegrade approach was attempted in 4 cases (50%), and a retrograde strategy was performed in 4 patients (50%). The dissection involved the right sinus of Valsalva in 7 cases (antegrade, n = 4; retrograde, n = 3) and the left sinus was involved in the remaining retrograde case. The catheters

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