

Iatrogenic Aortic Dissection: Review of the Literature

John A. Elefteriades, MD*, Mohammad A. Zafar, MBBS, Bulat A. Ziganshin, MD

Aortic Institute at Yale-New Haven Hospital, Yale University School of Medicine, New Haven, Connecticut, USA

Key Words

Iatrogenic aortic dissection • Dissection

Copyright © 2016 Science International Corp.

AORTA received almost simultaneously the four separate reports (included in this issue) of iatrogenic aortic dissection following coronary angioplasty [1-3] and transaortic aortic valve replacement [4]. Medical management was successful in all these cases. In an ad hoc review of the literature, we have tabulated the currently available case series of iatrogenic aortic dissection (Table 1). The thrust of these case reports [1-4] and literature review (Table 1) points toward the

adequacy of medical management in most cases. For dissections induced by coronary angioplasty, immediate sealing of the inciting proximal coronary tear by stenting appears important in securing safe medical outcome.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

Comment on this Article or Ask a Question

Table 1. Summary of available case series on iatrogenic aortic dissection.

Authors & Year	# Patients with IAAD*	Case of Dissection	Type/Extent of Dissection	Treatment & Outcomes	Authors' Recommendations
Dunning <i>et al.</i> 2000 [5]	9, Incidence= 0.02% In patients with acute MI = 0.19%	- In all 9 cases a RCA dissection extended retrograde to the aortic root. - In 44% of cases Amplatz guide catheters were employed.	Proposed a classification system for IAAD: <u>Class 1</u> : (n=4) Focal dissection restricted to the ipsilateral cusp. <u>Class 2</u> : (n=3) Involving the cusp and extending up the ascending aorta < 40mm. <u>Class 3</u> : (n=2) Involving the cusp and extending up the ascending aorta > 40mm.	- All 4 <u>Class 1</u> cases were successfully treated with coronary stenting and medical management. - <u>Class 2</u> : 1 patient successfully treated with emergency CABG, the other 2 with coronary stenting and medical management. - <u>Class 3</u> : Both underwent emergency surgery and died. Both had presented originally with an acute MI.	- Class 1 and Class 2 dissections are best treated by sealing the entry point in the coronary artery by means of stenting. - Surgical intervention is usually warranted for Class 3 dissections.

* IAAD = Iatrogenic (specifically cardiac catheterization induced) acute Type A dissection.



Table 1. (Continued)

Authors & Year	# Patients with IAAD*	Case of Dissection	Type/Extent of Dissection	Treatment & Outcomes	Authors' Recommendations
Yip <i>et al.</i> 2001 [6]	7, Incidence=0.05%	- 6 patients had a retrograde IAAD from the RCA to the coronary sinus and 1 from the LAD to the coronary sinus - Caused by balloon inflation in 5 cases, guiding catheter (6 Fr) in 1 and thrombectomy system in 1.	- IAAD localized (Group L) to the coronary sinus in 5 patients and extended into the ascending aorta (Group AA) in 2.	- All 5 cases in Group L managed successfully by coronary stenting. A 6-month follow-up Thallium scan showed a perfusion defect in 2 patients who also had angina and restenosis of the RCA on coronary angiography. The other 3 were asymptomatic and had normal scans. - Stenting was unsuccessful in 1 patient in Group AA who then refused emergency surgery and died. The other patient (LAD aortocoronary dissection) underwent successful emergency surgery.	- Immediate coronary stenting to seal the entry site of the aortocoronary dissection and prevent its expansion should be performed. - Surgical intervention is necessary for patients with severe IAAD and complications. Coronary stenting is still beneficial in stabilizing these patients prior to surgery.
Carstensen and Ward 2008 [7]	4 cases by the authors and a review of 63 cases reported in literature.	<u>Authors' Cases:</u> - 2 due to the guide catheter, 1 due to balloon and 1 due to wire. RCA was PCI target in 3 cases, LCX in 1. <u>Literature Review:</u> - Guide catheter in the majority, unclear in several others.	<u>Authors' Cases:</u> - 2 extended to the mid-ascending aorta, 2 limited to the coronary sinuses. <u>Literature Review:</u> - In 37 (59%) cases the dissection was limited (Group L) to the coronary sinus. - In 26 (41%) cases there was rapid extension (Group RE) above the annulus or aortic valve involvement.	<u>Authors' Cases:</u> - Immediate ostial stenting upon recognition of the dissection. - 10-32 month follow-up. Repeat CT/TEE showed resolution of the dissection in all cases with no complications. <u>Literature Review:</u> - Overall: Conservative Therapy n=15 (2 deaths); Stenting n=36 (0 deaths); Surgery n=12 (3 deaths). - 11 cases of Group L were managed conservatively, 25 by stenting (1 had dissection progression despite stenting so had surgery) and 1 underwent immediate surgery. - 4 of 26 cases in Group RE were managed conservatively; 2 died suddenly. In 13 cases stenting was done but this failed in 2 and they had surgery. 9 underwent surgery: of these 3 died all of whom were having PCI for an acute MI.	- Ostial stenting should be performed promptly upon recognition of an aortocoronary dissection so as to seal and check the expansion of the dissection.

* IAAD = Iatrogenic (specifically cardiac catheterization induced) acute Type A dissection.

Table 1. (continued)

Authors & Year	# Patients with IAAD*	Case of Dissection	Type/Extent of Dissection	Treatment & Outcomes	Authors' Recommendations
Núñez-Gil <i>et al.</i> 2015 [8]	74, Incidence = 0.06%	- Catheter in 68 patients (91.8%) [6F size in 65 (87.8%)], 0.035-in wire in 4. - RCA was engaged in 42 patients (56.8%), the LCA in 30 (40.5%).	- Dunning Class 1 in 45 patients (60.8%); Class 2 in 12 (16.2%) and Class 3 in 15 (20.3%).	- 36 patients managed conservatively, 35 underwent stent placement and 3 referred for surgery. - 2 early deaths due to cardiogenic shock. - During long-term follow-up (median = 51.2 months), no patient suffered any sequelae of IAAD; completely healed aorta in 5 patients confirmed by imaging.	- After stabilization of the early critical phase of the IAAD, complete healing of the aorta occurs and no complications are observed in the long term. - The entrance of the dissection in the coronary artery should be closed by placing a stent. - Retrograde IAAD not involving a coronary may be treated conservatively and monitored closely via serial imaging. - Patients with major symptoms, expanding dissections and coronary flow obstruction may need surgical intervention.
Shah <i>et al.</i> 2016 [9]	2 cases by the authors and a review of 86 cases reported in literature.	- Catheter trauma in 34 (54%) [sizes specified in 23: 5 cases occurred due to 6F, 12 due to 7F and 6 due to 8F], balloon inflation in 15 (23.8%) and contrast injection in 13 (20.6%). - RCA was intervention target in 66 patients (76.7%), the LAD in 10 (11.6%), the LCx in 6 (7%), the LMCA in 3 (3.6%), and the obtuse marginal branch in 1 (1.2%).	- Confined to the root in 33 (38.8%) patients, extending to the ascending aorta in 35 (41.1%), the aortic arch in 11 (12.9%) and the descending aorta in 6 (7.1%).	- 46 (53.5%) patients treated by stenting only, 29 (33.8%) surgically and 19 (22.1%) conservatively. - 6 patients (4 with Debakey 2 and 2 with Debakey 1 IAAD) died: 3 were conservatively treated (cause of death in 1 unknown, 1 refused surgery after unsuccessful stenting of dissection origin and suffered re-infarction and the 3rd had dissection extension into the descending aorta and died 4 months later of cardiogenic shock) and 3 were surgically treated (2 died due to post-op multi-organ failure and the 3rd could not be weaned off CPB).	- The majority of patients, including those with more extensive dissections (Dunning Class 3) can be managed conservatively or by the placement of a stent. - The patient's hemodynamic status and how quickly the entry point of the dissection is closed by stenting to prevent its progression, determine treatment measures.

* IAAD = Iatrogenic (specifically cardiac catheterization induced) acute Type A dissection.

References

- Roumy A., Kirsch M, Pretre R, Niclaus L. Spontaneous regression of a large iatrogenic dissection of the ascending aorta. *AORTA (Stamford)*. 2016;4:226-228. DOI: [10.12945/j.aorta.2016.16.009](https://doi.org/10.12945/j.aorta.2016.16.009)
- Tam DY, Mazine A, Cheema AN, Yanagawa B. Conservative management of extensive iatrogenic aortic dissection. *AORTA (Stamford)*. 2016;4:229-231. DOI: [10.12945/j.aorta.2016.16.040](https://doi.org/10.12945/j.aorta.2016.16.040)
- Zafar MA, Pang PYK, Henry GA, Ziganshin BA, Tranquilli M, Elefteriades JA. Early spontaneous resolution of an iatrogenic acute Type A aortic dissection. *AORTA (Stamford)*. 2016;4:235-239. DOI: [10.12945/j.aorta.2016.16.067](https://doi.org/10.12945/j.aorta.2016.16.067)
- Thomas T, Poulouse AK, Harris KM. Transient aortic intramural hematoma complicating transaortic valve replacement. *AORTA (Stamford)*. 2016;3:232-234. DOI: [10.12945/j.aorta.2016.16.029](https://doi.org/10.12945/j.aorta.2016.16.029)
- Dunning DW, Kahn JK, Hawkins ET, O'Neill WW. Iatrogenic coronary artery dissections extending into and involving the aortic root. *Catheterization and Cardiovascular Interventions*. 2000;51:387-393. DOI: [10.1002/1522-726X\(200012\)51:4<387::AID-CCD3>3.0.CO;2-B](https://doi.org/10.1002/1522-726X(200012)51:4<387::AID-CCD3>3.0.CO;2-B)
- Yip H-K, Wu CJ, Yeh KH, Hang CL, Fang CY, Hsieh KYK, et al. Unusual Complication of Retrograde Dissection to the Coronary Sinus of Valsalva During Percu-

- taneous Revascularization: A Single-Center Experience and Literature Review. *Chest*. 2001;119:493-501. DOI: [10.1378/chest.119.2.493](https://doi.org/10.1378/chest.119.2.493)
7. Carstensen S, Ward MR. Iatrogenic aorto-coronary dissection: The Case for Immediate Aortoostial Stenting. *Heart, Lung and Circulation*. 2008;17:325-329. DOI: [10.1016/j.hlc.2007.11.140](https://doi.org/10.1016/j.hlc.2007.11.140)
 8. Núñez-Gil JJ, Bautista D, Cerrato E, Salinas P, Varbella F, Omedè P, et al. Incidence, Management, and Immediate- and Long-Term Outcomes After Iatrogenic Aortic Dissection During Diagnostic or Interventional Coronary Procedures. *Circulation*. 2015;131:2114-2119. DOI: [10.1161/CIRCULATIONAHA.115.015334](https://doi.org/10.1161/CIRCULATIONAHA.115.015334)
 9. Shah P, Bajaj S, Shamoan F. Aortic Dissection Caused by Percutaneous Coronary Intervention: 2 New Case Reports and Detailed Analysis of 86 Previous Cases. *Texas Heart Institute Journal*. 2016;43:52-60. DOI: [10.14503/THIJ-14-4585](https://doi.org/10.14503/THIJ-14-4585)

Cite this article as: Elefteriades JA, Zafar MA, Ziganshin BA. Iatrogenic Aortic Dissection: Review of the Literature. *AORTA (Stamford)*. 2016;4(6):240-243. DOI: <http://dx.doi.org/10.12945/j.aorta.2016.16.081>