

A Clinical Series for Cardiovascular Angiography: Part 1

Peripheral procedures using the ACIST advanced contrast delivery system: a clinical experience

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Complexities of the PVD Patient in Vascular Intervention

There are approximately 15 to 18 million patients in the United States with peripheral vascular disease (PVD)¹, over 6 million of whom (based on 2007 data) experience a vascular intervention.² Vascular procedures present a unique set of problems for the PVD patient as compared to those with coronary artery disease. PVD patients have been shown to have a higher incidence of diabetes mellitus and chronic renal insufficiency. These patients are generally older and more frail, and often require complex and longer percutaneous peripheral intervention case durations with higher contrast usage, and have higher rates of multiple procedures and reinterventions.¹ These dynamics put PVD patients at an increased risk for complications and emphasize the need for an angiography system that allows the clinician to regulate and limit contrast dosage, permits the use of smaller catheters, and reduces the potential for embolic complications while maintaining optimal diagnostic image quality in patients.

Clinical Use of a Variable Flow-Rate Injection System

The use of a variable flow-rate injection system, specifically the ACIST CVi[®], for cardiac and vascular angiography is gaining widespread usage. This system addresses the aforementioned patient health concerns. Over four and a half million cases have been performed worldwide using the ACIST contrast delivery system; and it's estimated that over one million cases will be performed this year. (*Data on file, ACIST Medical Systems, Inc.) The ACIST CVi has not only demonstrated safe and effective outcomes in numerous clinical studies of diagnostic and interventional angiography, but may offer advantages when compared to manual hand injection and fixed-rate power injector technologies.^{1,3-11}

Findings from these studies^{1,3-11} demonstrate the following patient and staff benefits:

- **Reduced contrast dosage to the patient during angiography: from 20% to as much as 49% less contrast for diagnostic, and from 10% to 35% for diagnostic plus PCI procedures**^{3,4,5}
- **Various system monitoring and safety features** such as air detection sensors, continuous hemodynamic monitoring, and contrast usage tracking^{1,6,7}

- **The ability to use smaller catheters while maintaining diagnostic image quality**^{1,8-12}
- **Ease and procedural efficiency for physicians, technicians, and nurses** facilitated by an *ergonomic hand controller* which aids in reduced hand strain and more precise variable flow-rate delivery of contrast; and a programmable *touch screen interface* with such features as automatic refill capabilities from contrast source into a reusable, multi-use syringe.^{1,6,7}

Two articles published in 2006 by Laird and Allie et al. highlight the benefits of using the ACIST contrast delivery system specifically for PVD patients. Both studies conclude that this variable-rate contrast delivery system provides optimal imaging while minimizing contrast, catheter size, and air embolic complications; and, therefore will be valuable in the vascular suite especially for the complexity of performing procedures on the PVD patient group.^{1,7}

Remarks

Clinicians working in the vascular suite should consider use of the ACIST variable flow-rate contrast delivery system to take advantage of some of the following clinically relevant and distinct advantages, which include the following:

- Optimal visualization of small caliber vessels (e.g: intracranial vessels, plantar vessels)
- Prevents contrast streaming which may falsely appear as a lesion, thrombus, filling defect or dissection in high flow vessels (e.g: carotid artery, renal artery)
- Helps avoid iatrogenic air embolism by providing an air column detector during complex procedures (e.g. intracranial and carotid interventions)
- Measurement of hemodynamic gradients to delineate physiologic significance of indeterminate lesions
- Evaluation of multiple vascular beds during a single vascular procedure independent of the caliber and length of the vessels
- Feasibility in utilizing smaller Fr catheters and sheaths to significantly reduce vascular access complications
- Ability to reduce length of procedures which may correlate with a reduction in procedural complications

- Reduction in contrast usage which is beneficial in patients with renal dysfunction, cardiomyopathy, and wcongestive heart failure
- Some of the advantages mentioned above may contribute to a reduction in the cost of vascular procedures

Practical Application

In an effort to help clinicians manage safe and effective use of the ACIST CVi contrast delivery system, Table 1 provides procedure-specific suggested flow rates, and volume and pressure settings used in our practice. *Of course, these parameter settings should be considered suggested starting points only, with clinicians using their medical expertise to modify for individual patients and disease conditions to determine the appropriate procedure parameters.*

Table 1. Contrast Delivery Parameter Format

Artery	LIMIT RANGES:			Rise Time
	Flow Rate (ml/sec)	Amount (ml)	Pressure (PSI)	
Cerebral	4-6	6-8	450	0.5
Aortic arch vessels	4-6	6-8	450	0.5
Aortic arch ¹	20	30	1200	0.5
Upper extremity	8-10	8-10	900	0.5
Coronary	2-4	4-8	450	0.2
Thoracic aorta ¹	20	40	1200	0.5
Abdominal aorta ¹	20	30	1200	0.5
Mesenteric	4-6	6-8	450	0.5
Renal	4-8	6-8	450	0.5
Bilateral Iliac ¹	20	30	1200	0.5
Iliac ²	8-10	8-10	900	0.5
Femoral	8-10	8-10	900	0.5
Popliteal	10-12	10-12	900	0.5
Tibial	12-15	15-20	900	0.5
Plantar	12-15	15-20	900	0.5

* Disclaimer — This is a suggested format only and is not intended as medical advice. The operator must determine the appropriate protocols.

¹ Contrast delivery through a multiple-hole catheter with a PSI limit of no less than 1200 psi

² Contrast delivered through an end-hole catheter

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