



CARE Study

**Proactive Air Management
in CT Power Injections**
A Comprehensive Approach
to Reducing Air Embolisation¹

McDermott MC, Barone WR, Kemper CA, 2021¹

medrad® Centargo
CT Injection System

Proactive Air Management in CT Power Injections: A Comprehensive Approach to Reducing Air Embolisation (CARE Study)¹

Venous air embolism is a known complication of contrast-enhanced CT, and prevention of air injection is an important topic. Although serious events due to injections of large amounts of air are rare, studies show that small amounts of air have been found to occur in up to 55% of all contrast-enhanced CT procedures.²⁻⁷



Air bubbles (less than 1 mL), although not a safety threat, are visible in images and may create artifacts that could impact image quality.¹

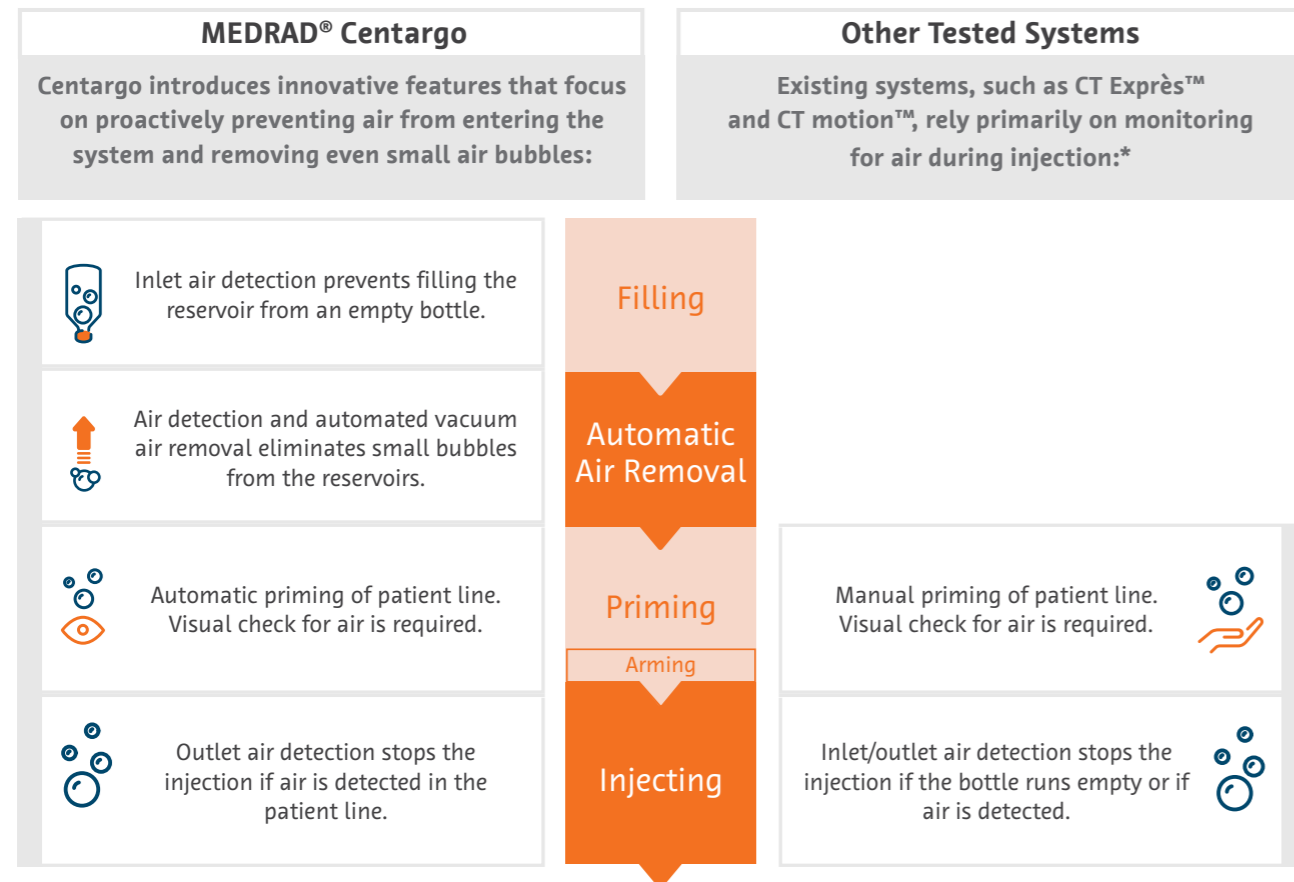


Air detected during the injection disrupts workflow and may cause the patient unnecessary radiation exposure from a repeated scan.¹

The objective of this study was to review these challenges on contemporary systems, to propose a novel proactive air management approach, and finally, to analyse the injected air volumes under simulated clinical use.

Review of Air Management Approaches

The MEDRAD® Centargo Injection System's additional proactive air management automatically removes air bubbles, reduces the amount of air in line, and may prevent interrupted injections due to detected air.



Adapted from McDermott et al., 2021, Figure 3; A comparative overview of reactive and proactive air management approaches.¹
*Latest commercially available software versions used for all tested systems on date of testing (March 2020).

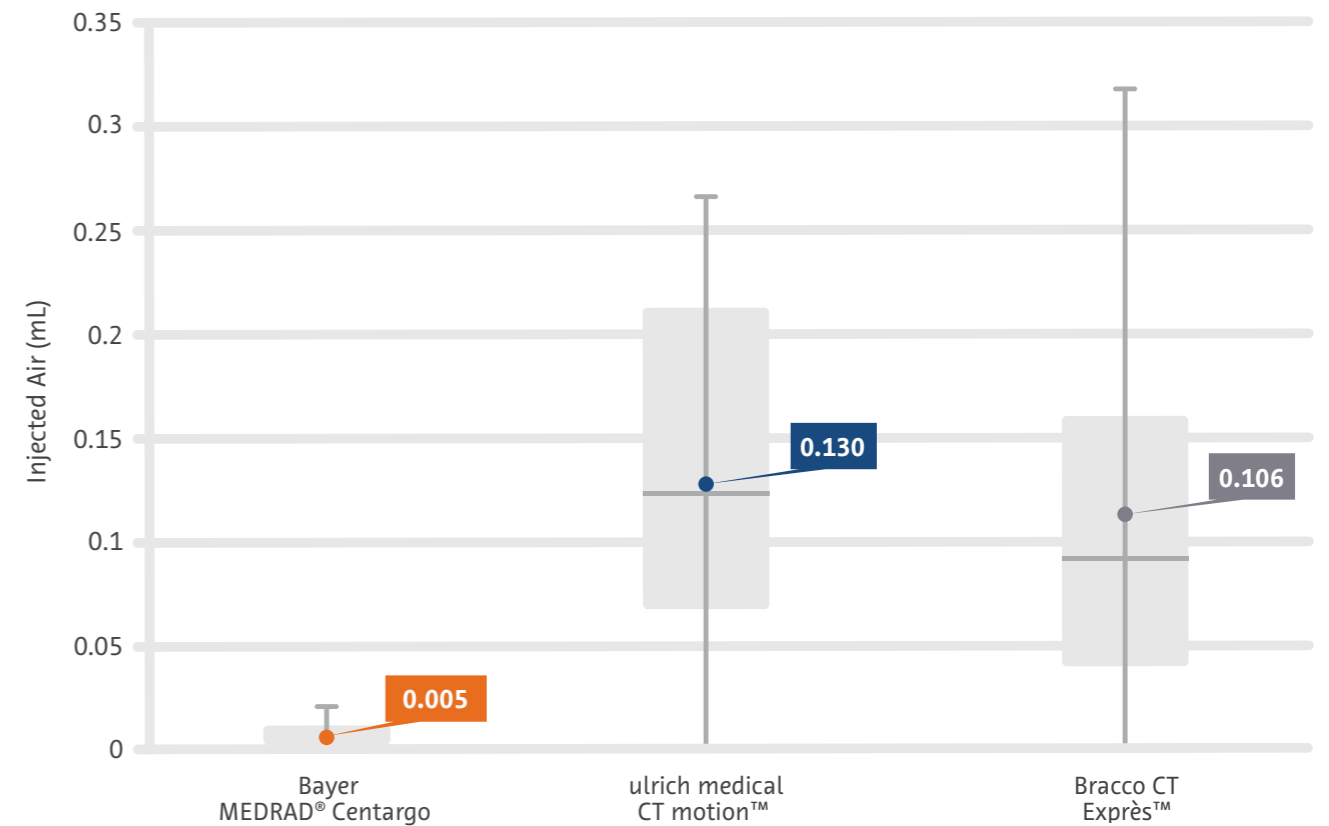
Comparison of Injected Air Volumes in Simulated Clinical Use

The proactive air management system of Centargo injected significantly less air compared to tested systems employing reactive approaches.¹

While all tested systems are expected to prevent the injection of large air volumes, small bubbles generated during filling may be injected without being detected by the air sensors. The air sensors in the proactive air management of Centargo, including automatic air removal, reduced the air detected in the air trap.

To measure the effectiveness of the additional proactive air management, a custom air trap was designed. The air trap collected bubbles injected through the patient line during simulated clinical use and average calculated air volumes of 5 microliters.

Measured Injected Air Volumes vs. Injection System



Adapted from McDermott et al., 2021, Figure 12; Mean and standard deviation for 30 injections per system. Centargo provided a significant decrease in injected air volume compared to other tested systems ($p < 0.05$).¹

The results demonstrate the advantages of the innovative features of MEDRAD® Centargo for air management:



The reduction of injected air during simulated use studies with MEDRAD® Centargo resulted in a decrease in observable venous air embolism and image artifacts.^{1**}



Proactive air management may also reduce workflow disruptions of aborted injections that may result in additional exposure for patients.¹

**as shown in a vascular phantom

1. McDermott MC, Barone WR, Kemper CA. Proactive Air Management in CT Power Injections: A Comprehensive Approach to Reducing Air Embolisation. *IEEE Trans Biomed Eng.* 2021;68(3):1093-1103.
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Radiology

Bayer Australia Ltd
875 Pacific Highway
Pymble NSW 2073
Australia
Phone: 1800 008 757
ABN: 22 000 138 714



Manufacturer

Imaxeon Pty Ltd
Unit 1, 38 – 46 South Street
Rydalmere, NSW 2116
Australia
Phone: 02 8845 4999
Fax: 02 8845 4936

Australian Sponsor

Imaxeon Pty Ltd
Unit 1, 38 – 46 South Street
Rydalmere, NSW 2116
Australia
Phone: 02 8845 4999
Fax: 02 8845 4936
Customer Service: 1800 633 723



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