



# Customer Experience Insight

## Exceeded Contrast Dose Threshold - CT

### Key Takeaways

Using anonymized data collected by the Radimetrics™ Enterprise Platform we identified a customer with a contrast dose outlier and initiated an investigation to gain further insight.

- Radimetrics™ Enterprise Platform offers both contrast dose\* and radiation dose management tools.
- For an effective dose optimization program, contrast injection details should be assessed along with scanning protocol details.
- Monitoring radiation dose alone may lead to missed opportunities related to overall quality improvements.

### Contrast Dose Threshold Alert Leads to Better Insight

A 63 Year old female was referred to radiology for a contrast enhanced Computed Tomography Pulmonary Angiogram (CTPA) of the chest to rule out PE (Pulmonary Embolus) and a contrast enhancement Computed Tomography (CT) neck study.

Following the imaging events, we received an Exceeded Contrast Dose email alert from Radimetrics™ Enterprise Platform. The Contrast Dose Threshold Maximum volume was set to 150 mL for a 24 hour period in this instance of Radimetrics™ Enterprise Platform. The platform supports the flexibility to allow a user to set a Contrast Dose Threshold based on the departments policy for this value of interest.



Category	Count
Examination Dose	1

Examination Dose Notifications		
Patient ID	Accession Number	Details
00212853X	00036858X	VOI – Contrast Volume (Iodine) Value = 199 mL Threshold = 150 mL Dose Source: Scanner Output Study = CT CTA Chest 71275 Q9969 Criteria = ALL Modality – CT Model = Bayer Medical Care. Inc Certegra Station = EWCT3 Date/Time = 01/08/2015 5:00 PM Institution = Unknown

Figure 1 – Details received from Radimetrics™ Enterprise Platform automated email alert. Blue arrow – Represents the total volume of iodinated contrast delivered to the patient. Red arrow – Represents the Contrast Dose Threshold value set for a 24 hour period.

The standard injection protocol for a CTPA study in this department calls for 75 mL of iodinated contrast media. The standard injection protocol for a contrast enhanced CT Neck study is 50 mL of iodinated contrast media. The alert indicated the patient had received 199 mL of contrast. The volumes combined for each study would not have exceeded the Contrast Dose Alert Threshold of 150 mL.

In order to better understand what may have led to this Contrast Dose Alert we reviewed the study details in Radimetrics™ Enterprise Platform.

**Certegra®**  
@ Point of Care

**Radimetrics™**  
Enterprise Platform

\*Requires Medrad® Stellant® Injection System with Certegra® Workstation

## CT Neck

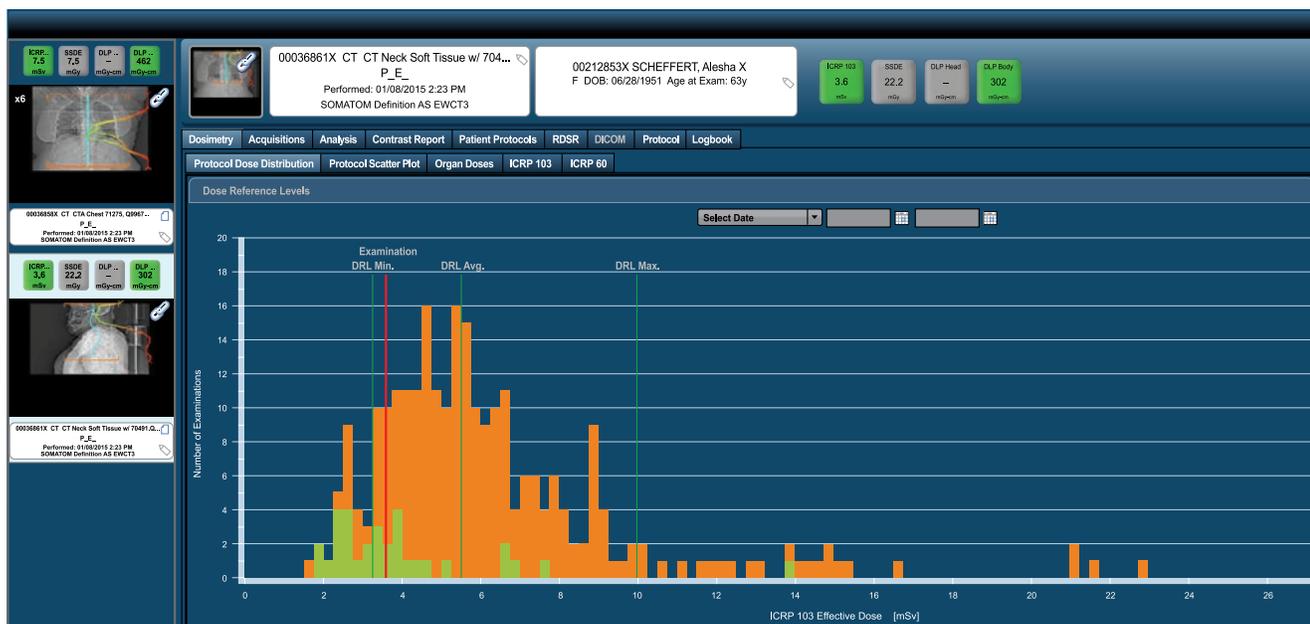


Figure 2 – Radiation Dose Protocol Distribution CT Neck. Orange Bars represent Enterprise Radiation Dose Ranges for this study type. Green Bars represent Scanner Radiation Dose Ranges. Minimum Dose Reference Level, Average Dose Reference Level and Maximum Dose Reference Levels are labeled with green lines. The red line represents the Dose Reference Level for this specific exam.

The Dosimetry Tab for radiation (ICRP 103) indicated neither study exceeded the Radiation Dose Threshold for the exam type. Figure 2 demonstrates the radiation dose distribution for a CT Neck exam. The dose was 3.6 mSv, well below the Maximum Dose Reference Level for this study type.

## CTPA

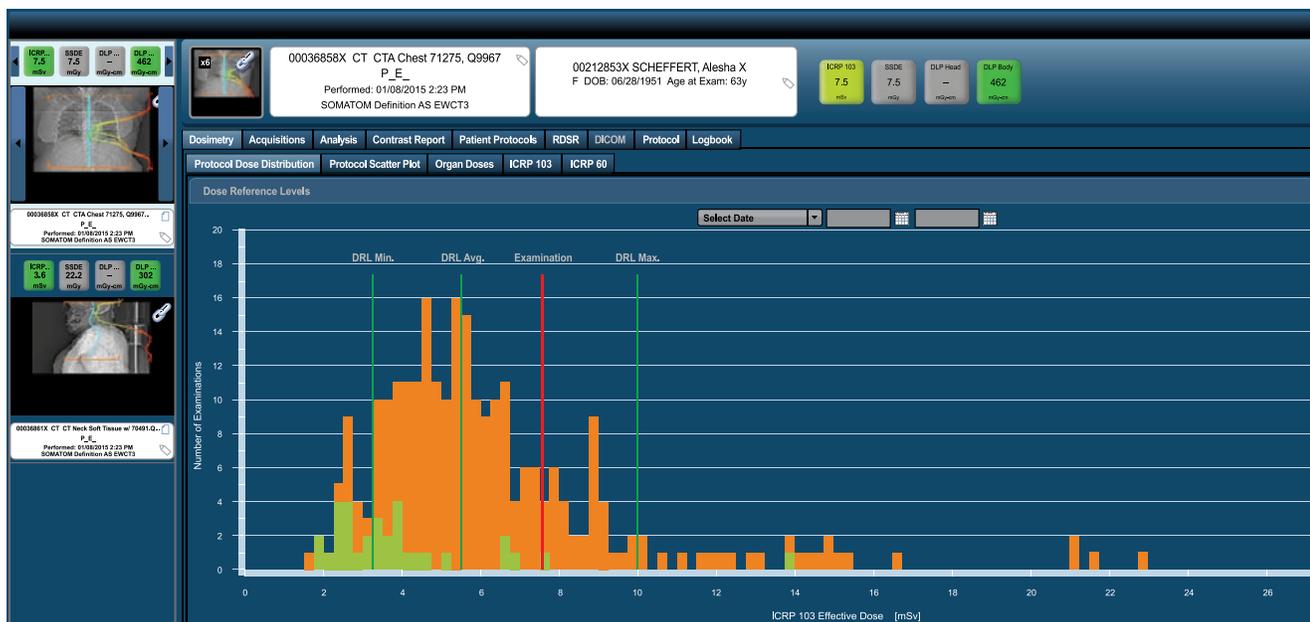


Figure 3 - Radiation Dose Protocol Distribution CTPA Chest. Orange Bars represent Enterprise Radiation Dose Ranges for this study type. Green Bars represent Scanner Radiation Dose Ranges. Minimum Dose Reference Level, Average Dose Reference Level and Maximum Dose Reference Levels are labeled with green lines. The red line represents the Dose Reference Level for this specific exam.

Figure 3 demonstrates the radiation dose distribution for a CTPA exam. The dose was 7.5 mSv for all acquisitions associated with the CTPA exam for this patient. The dose is below the Maximum Dose Reference Level for this study type.

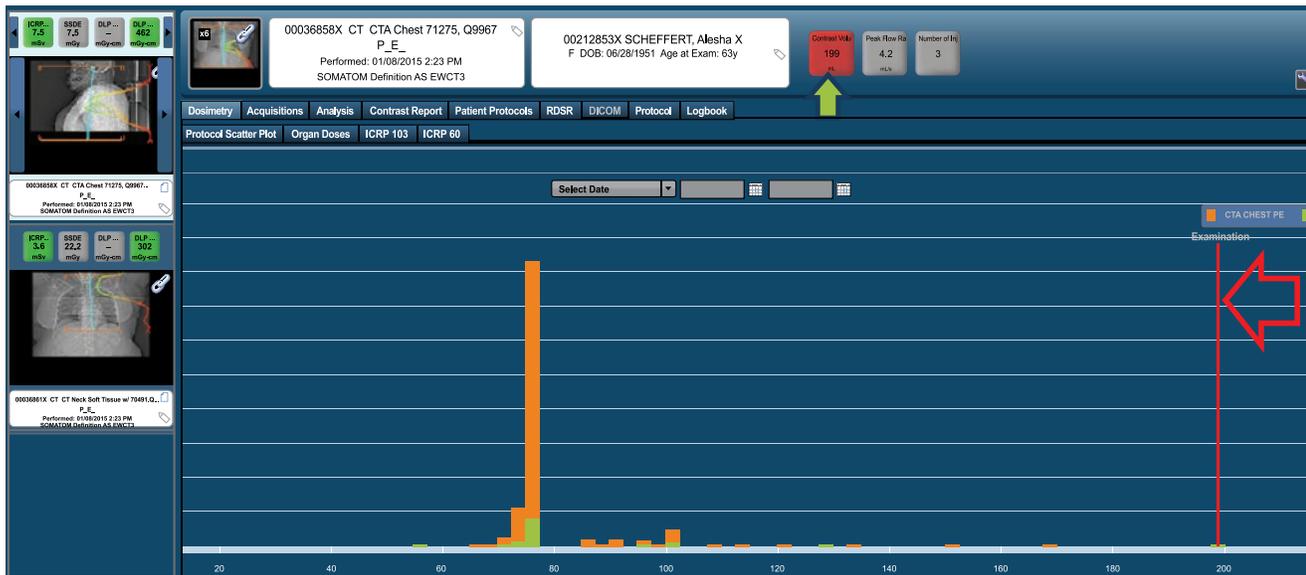


Figure 4 – Contrast Dose Volume Distribution. Red Tile (green arrow) indicated the volume of contrast has exceeded the Contrast Dose Threshold. The Contrast Dose Threshold is set at 150 mL. The orange bars represent the contrast volumes for this study type across the enterprise. The green bar represents the contrast volumes for this study type on this scanner. The majority of studies are acquired with 75 mL of contrast. The red line (red arrow) represents this patient and reflects the patient received 199 mL of contrast media for two studies.

We next looked at cumulative Contrast Dose Volume distribution of both exams. The majority of studies are acquired with 75 mL of contrast. The red line shows that the patient received 199 mL of contrast.

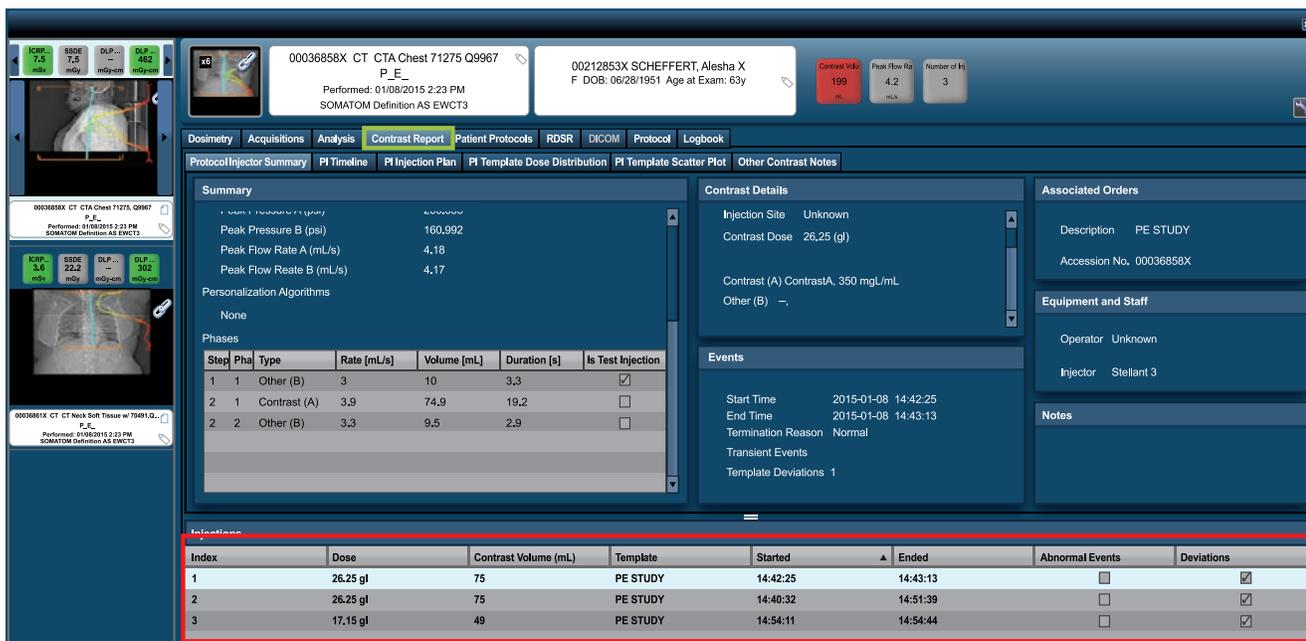


Figure 5 - Contrast Injection Detail. The red box shows that the patient received three contrast injections for two studies.

After recognizing this as an outlier for contrast volume, we next looked at the Contrast Injection Detail in the Contrast Report to determine how many injections were given and determine the root cause of the exceeded volume. The patient was scheduled for two studies, and this should have resulted in only two injections. One injection would be for the CT Neck study and one injection for the CTPA study. The data shows the patient actually received three contrast injections - two contrast injections with 75 mL and one injection with 49 mL.

To understand the injection profile, we reviewed each injection separately. Review of the Injection time lines indicated all three injections completed normally and without any pressure or flow rate limiting.

## First Injection

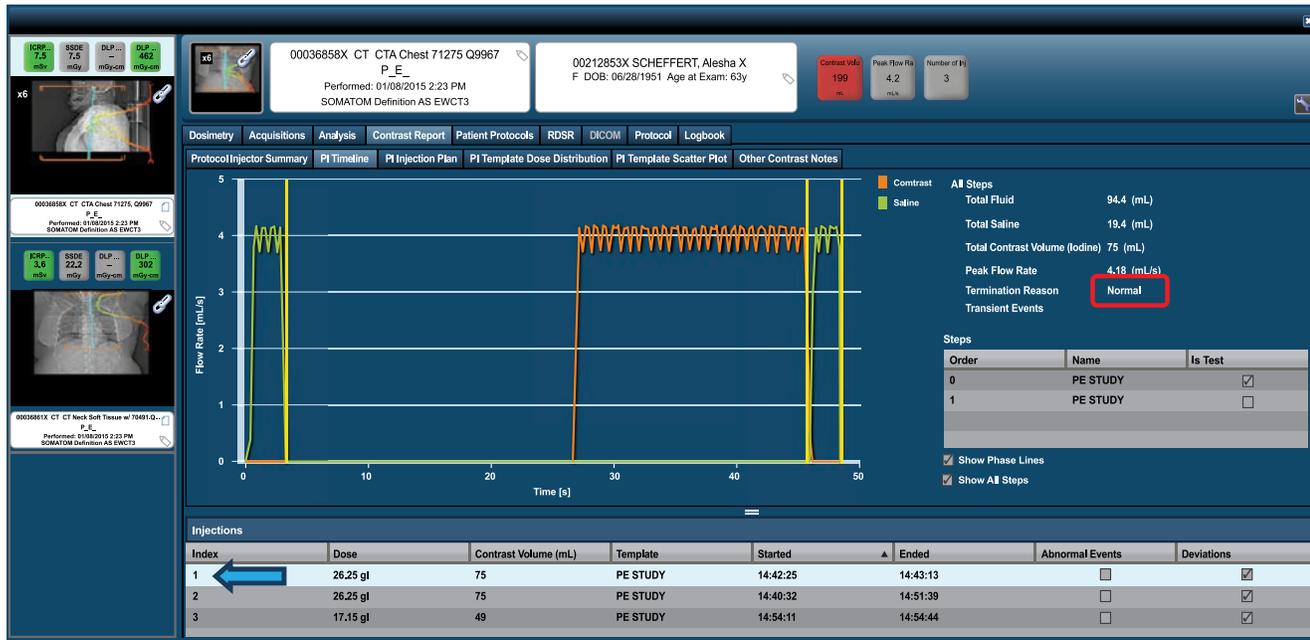


Figure 6 - First Injection – 75 mL delivered – Normal Completion at 14:43:13. The small red box on the right of the screen indicates the injection completed normally.

We assume this first injection was for the CTPA study based on the fact it was performed at 4 mL per second.

## Second Injection



Figure 7 - Second Injection – 75 mL delivered – Normal Completion at 14:51:39. The small red box on the right of the screen indicates the injection completed normally.

We believe the second injection was a repeat of the CTPA injection based on the study description and the injection details of 4 mL per second for 75 ml of contrast.

## Third Injection



Figure 8 - Third Injection - 49 mL delivered – Normal Completion at 14:54:44. The small red box on the right of the screen indicates the injection completed normally.

We believe this third injection was the CT Neck injection based on the flow rate of 2 mL per sec.

We have now reviewed all three injections and have confirmed all injections completed normally without pressure or flow rate limiting and none of the injections were aborted by the user. The next logical area to review would be the Scan Acquisitions detail. We selected the Acquisitions Tab in Radimetrics™ Enterprise Platform and the following details are displayed for the CTPA study. The Acquisition Detail Display demonstrates the acquisition acquired for the CTPA study. At this point we could clearly identify that the CTPA study was completed twice.

## CTPA

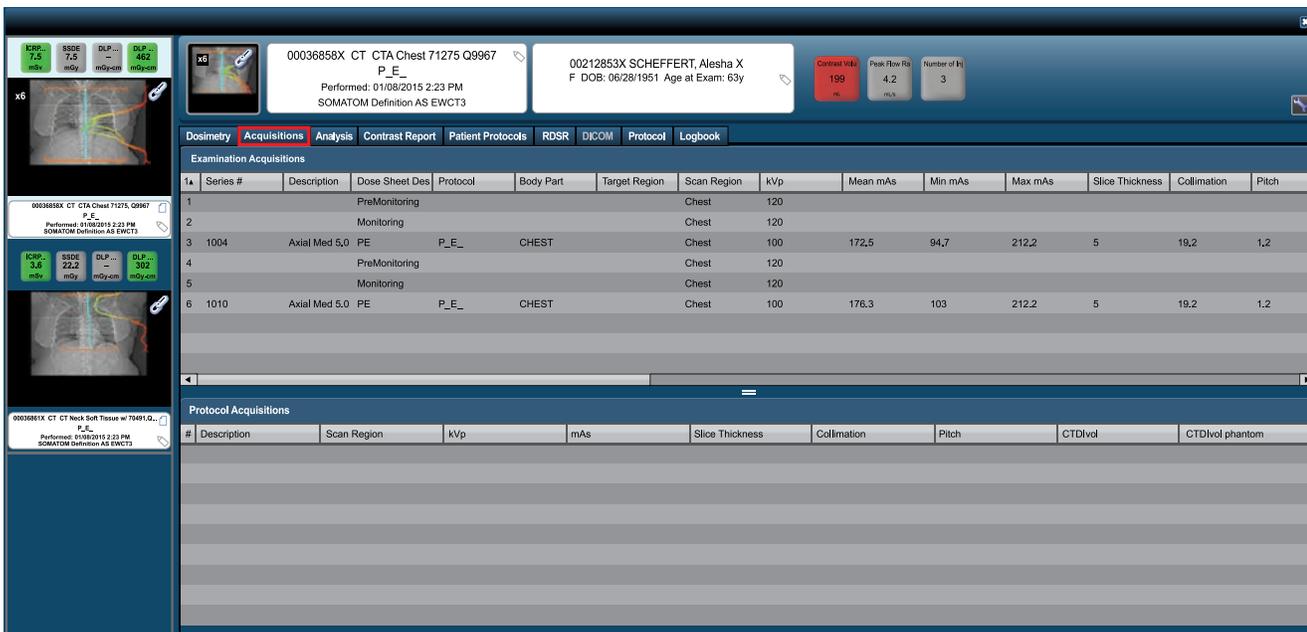


Figure 9 – Scan Acquisition Tab CTPA Study.

- We can easily identify the following:
- |    |                                  |    |   |
|----|----------------------------------|----|---|
| 1. | PreMonitoring – Placement of ROI | 4. | PreMonitoring – Placement of ROI (Region of Interest) |
| 2. | Monitoring – Bolus Tracking      | 5. | Monitoring – Bolus Tracking                           |
| 3. | Diagnostic Acquisition           | 6. | Diagnostic Acquisition                                |

Patient information listed on the GUIs has been changed to fictitious information.

# CT Neck

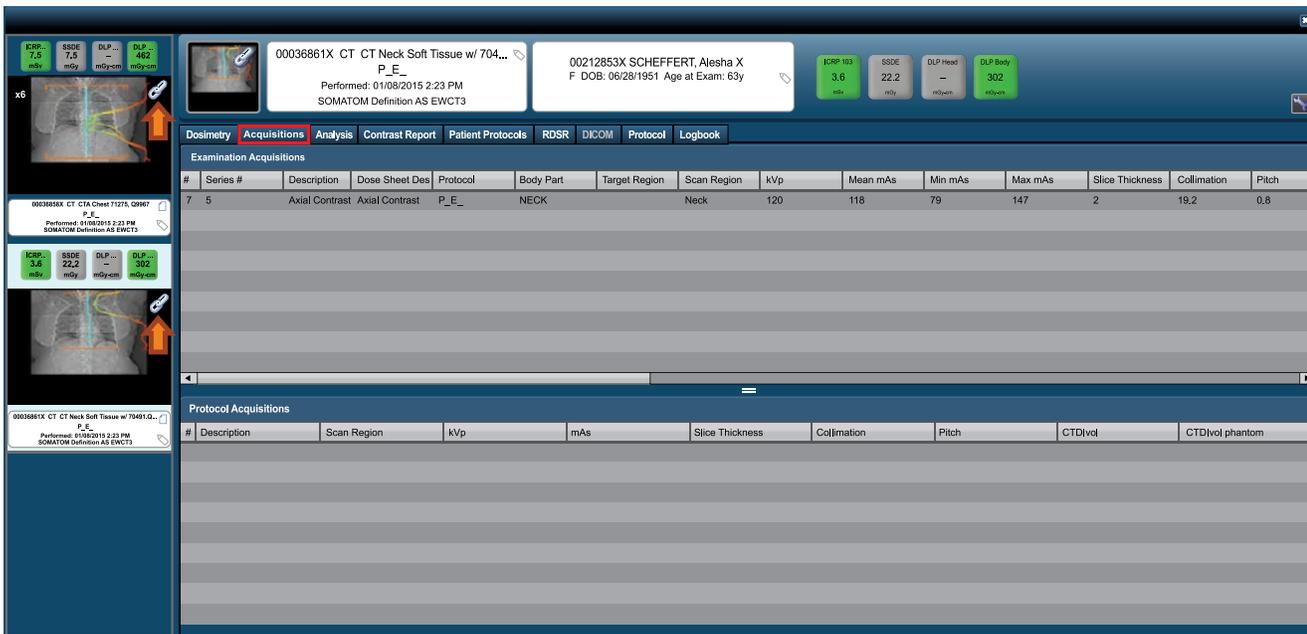


Figure 10 – Scan Acquisition Tab CT Neck Study. We can quickly see these two studies are associated because they are linked as shown by the orange arrow located on radiographic image.

We can also review the acquisition for the CT Neck study by selecting the second radiographic image on the left and selecting the Acquisition Tab. The CT Neck acquisition details are displayed in Figure 10. It shows the CT Neck study was acquired with one axial series.

## Summary:

Through the use of Radimetrics™ Enterprise Platform we can review details related to a contrast injection and the radiation events associated with CT exams. In the case reviewed above, it appears the CTPA diagnostic scan acquisition and contrast injection were acquired twice. This led to the alert for exceeding the Contrast Dose Threshold. It is unclear why a second injection and radiation event were required based solely on the injection details, however, we can easily identify that the injection did not pressure or flow rate limit. These consolidated details may assist you when speaking to the staff and investigating study outliers.

In CT, Radimetrics™ Enterprise Platform offers the unique ability to investigate details related to both radiation and contrast which may assist with quality initiative programs that are common in today's radiology practice.

Furthermore, this example demonstrates when monitoring radiation doses alone a quality improvement opportunity may be missed.

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