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REVISION [Manuscript ID: 58015]

As requested by the Editor:

- Revised CONCLUSION section is included (red text below)
- High-Resolution images are now in SEPARATE PowerPoint document with fully editable text, figures, and arrows (uploaded Online). Figures are removed from this text-only document and are available in the separate file for processing by the Editor.
- (Sections are also submitted separately as text-only, via the online Website, per instructions)

TITLE:

Fluoroscopy: An Essential Diagnostic Modality in the Age of High-Resolution Cross-Sectional Imaging

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Author Contributions: Shalom N primarily wrote the paper and collected cases, data and images; Auster M assisted with writing the paper, and collected cases, data, and imaging; Gong G performed editorial review and provided cases and imaging.

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Per the Request of the Editor:

Editable Figures, Text & Arrows

(Please note: the following captions/legends are also uplodaded as text-only via website)

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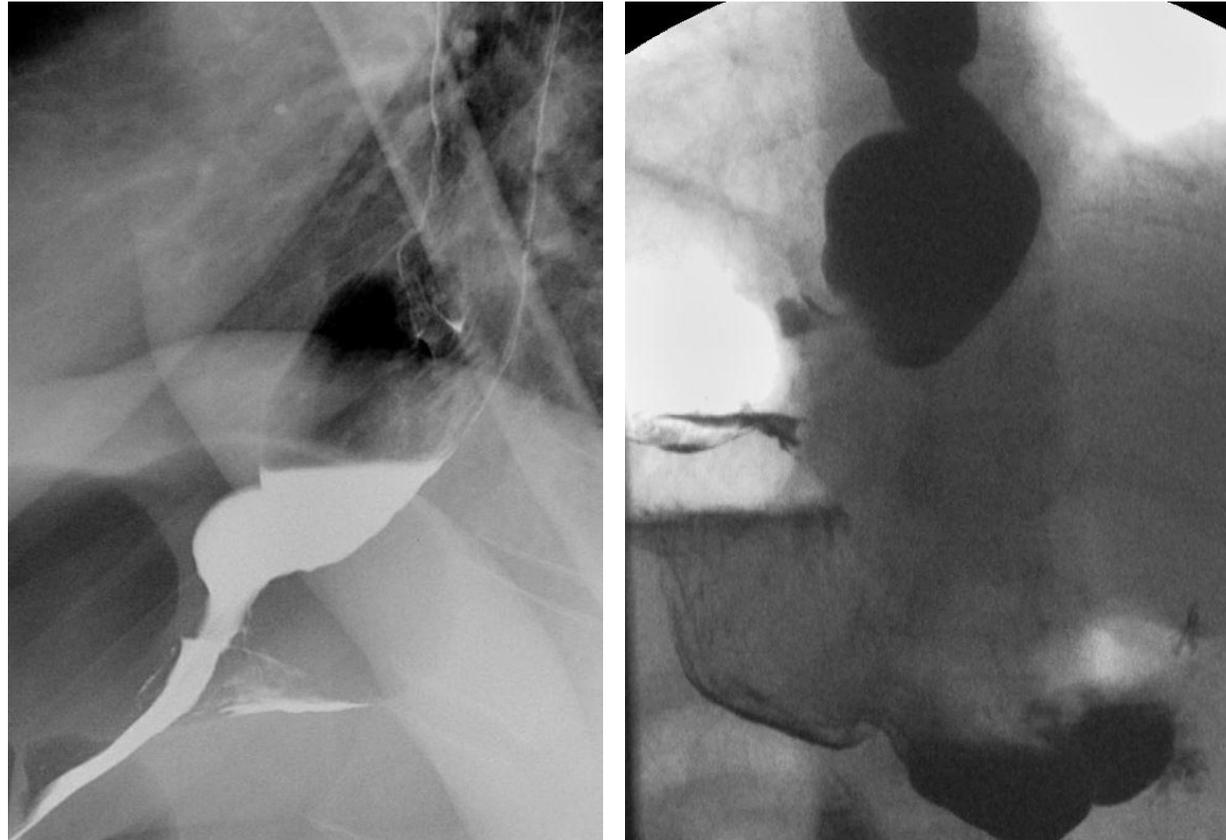
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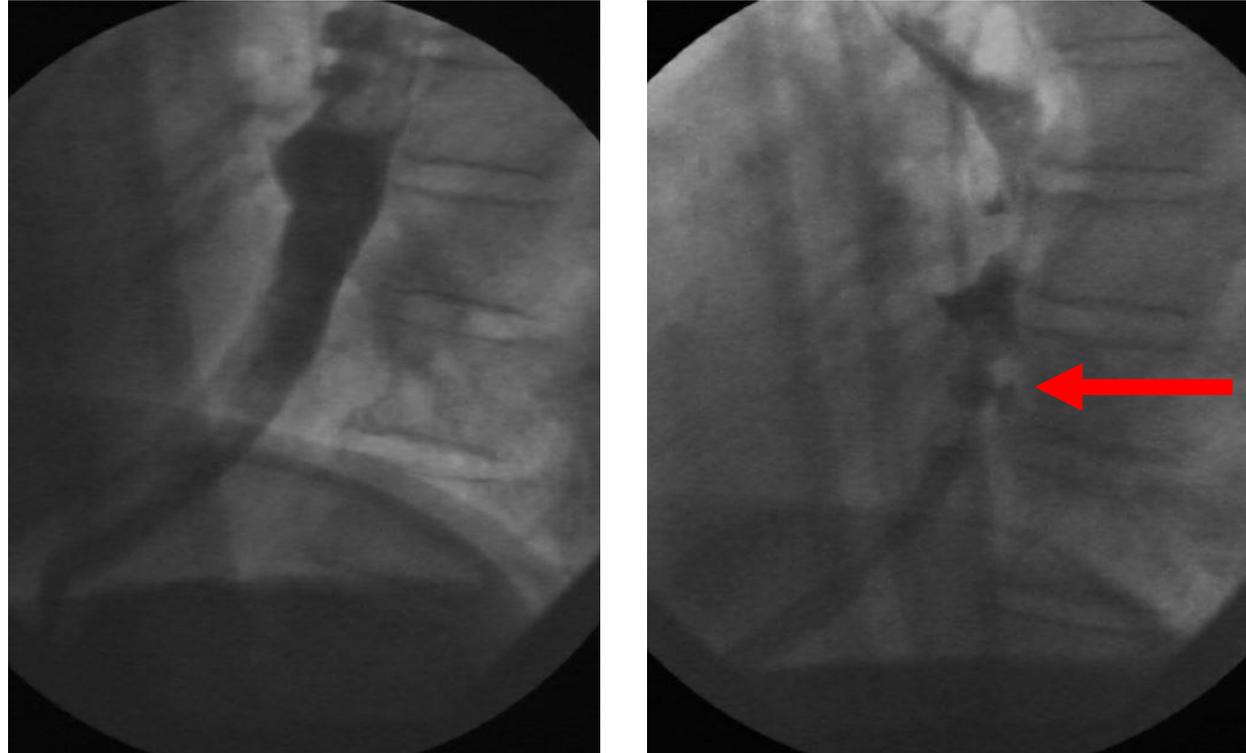
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Figures 1a, 1b. Achalasia. Fluoroscopic evaluation showing esophageal dilation and distal tapering of the esophagus.

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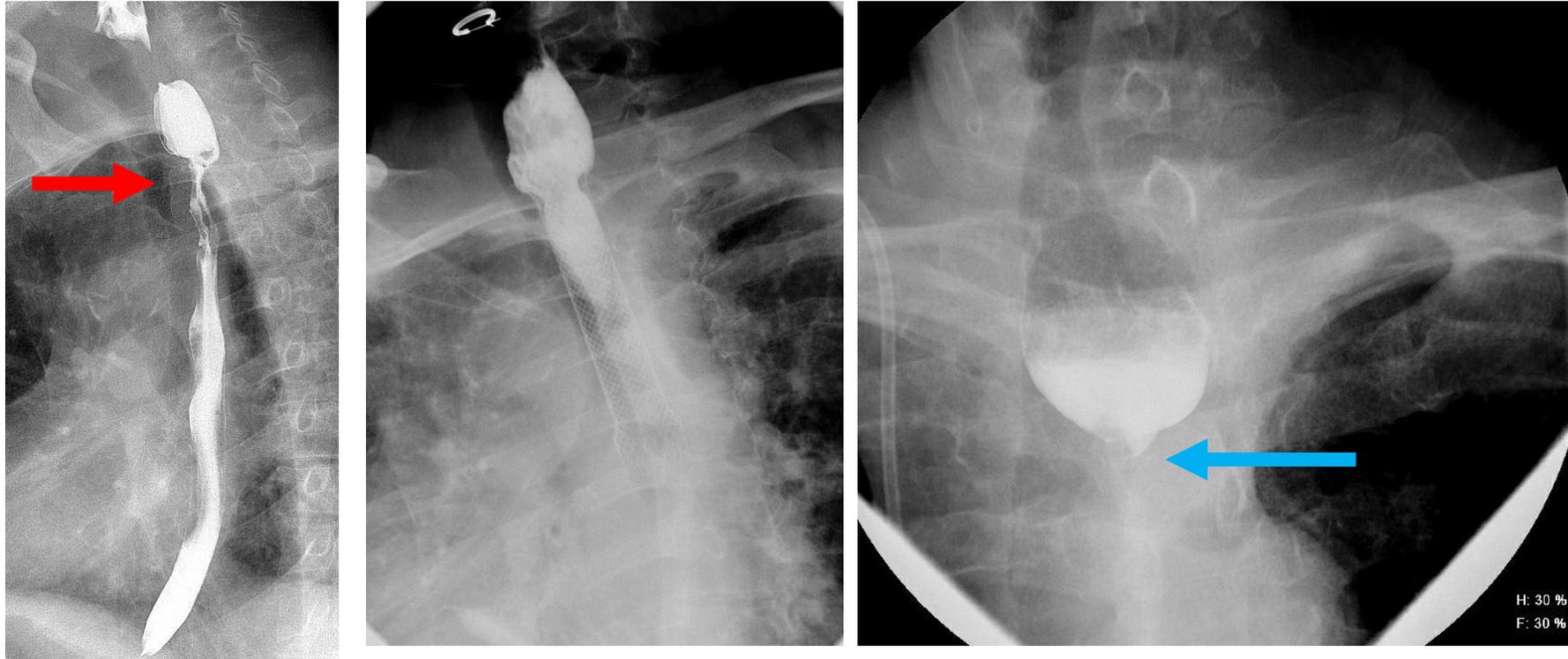
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Figures 2a, 2b. Esophageal pseudodiverticulosis. Numerous outpouchings noted along the esophageal contour on oral contrast fluoroscopic examination (red arrow).

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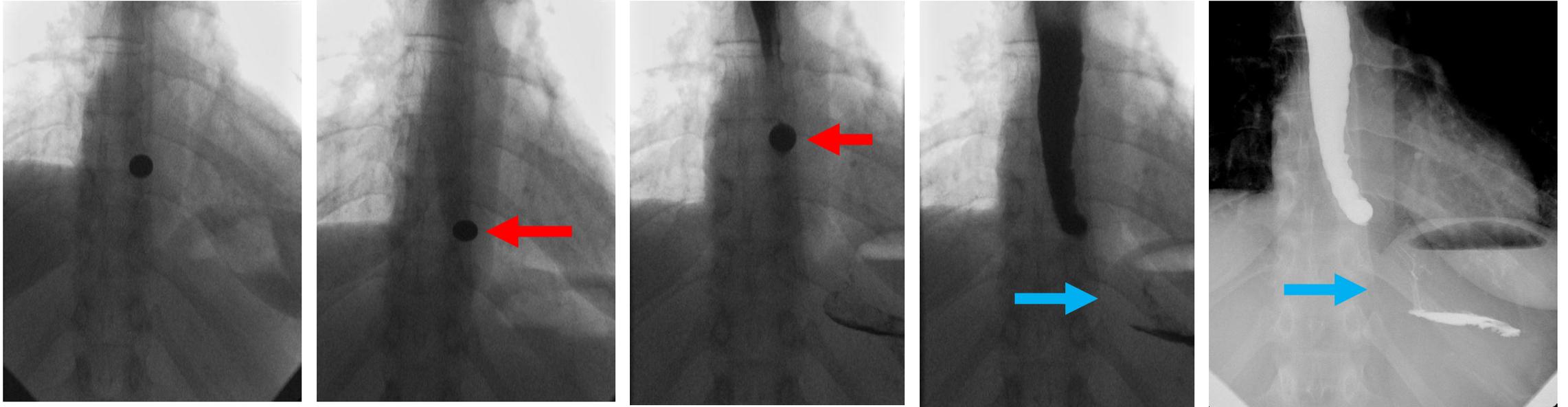
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Figures 3a, 3b, 3c. Carcinoma of the esophagus showing long segment moderate stenosis with irregular border and “apple core” appearance at the upper esophagus (red arrow, upper left). Stent was placed, with follow-up exam showing worsening stricture, with near complete occlusion of the esophagus (blue arrow).

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Figures 4a, 4b, 4c, 4d, 4e. Value of “real-time” evaluation. Nonpropulsive esophagus is seen, with incomplete passage of barium tablet (red arrows), and ultimately minimal passage of contrast (blue arrows).

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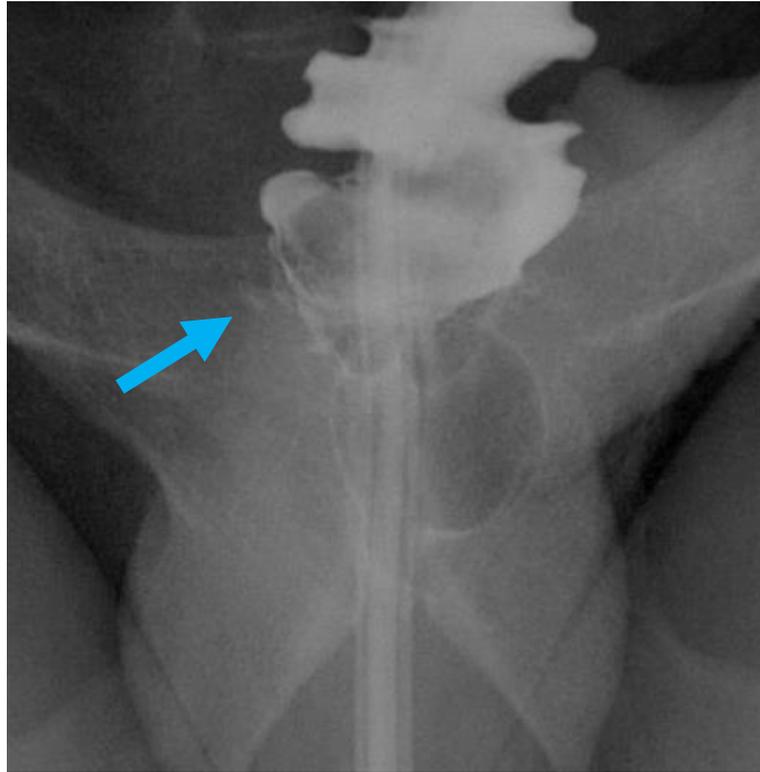
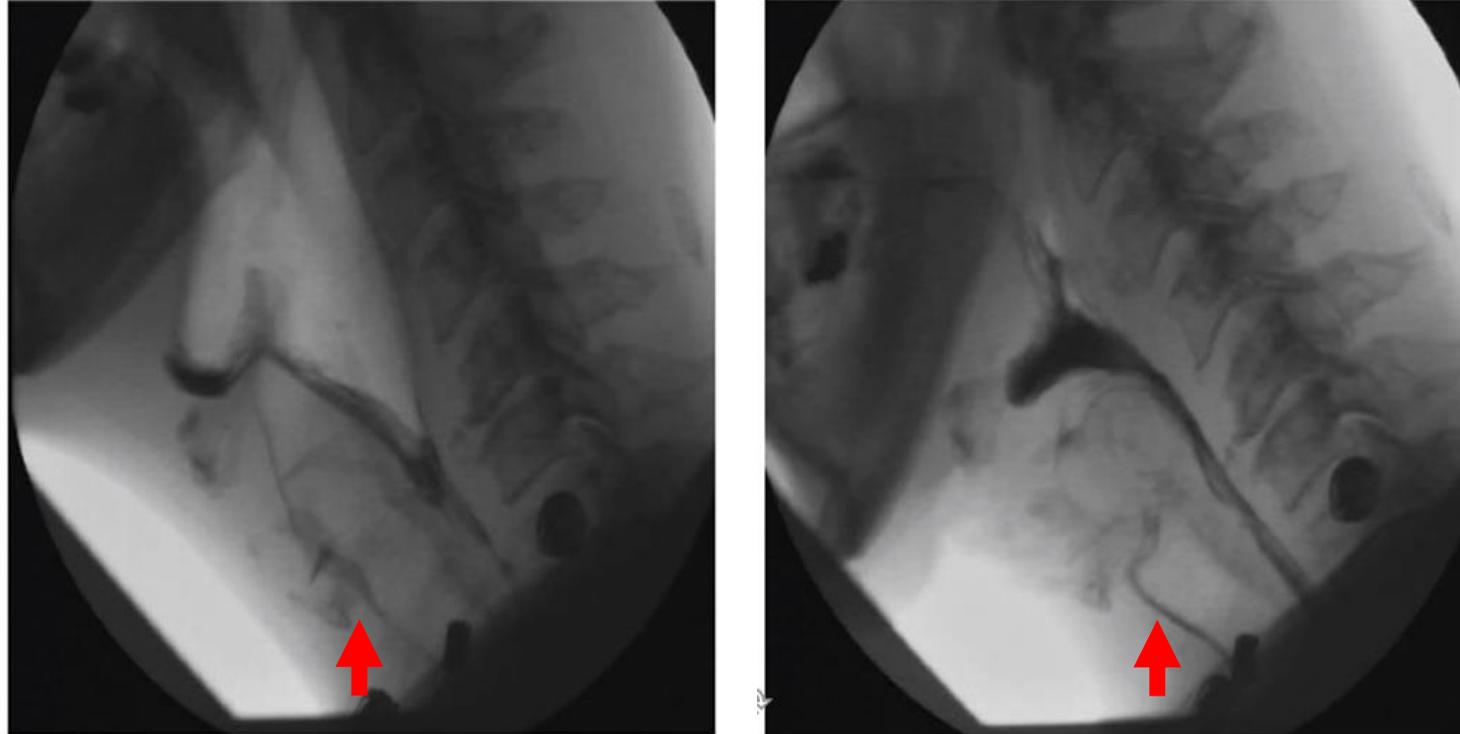


Figure 5. Fluoroscopic views of the rectal region status post anastomosis suggested a tiny focal area of extraluminal contrast (blue arrow), noted in the right posterior aspect of the rectum near the suture line.

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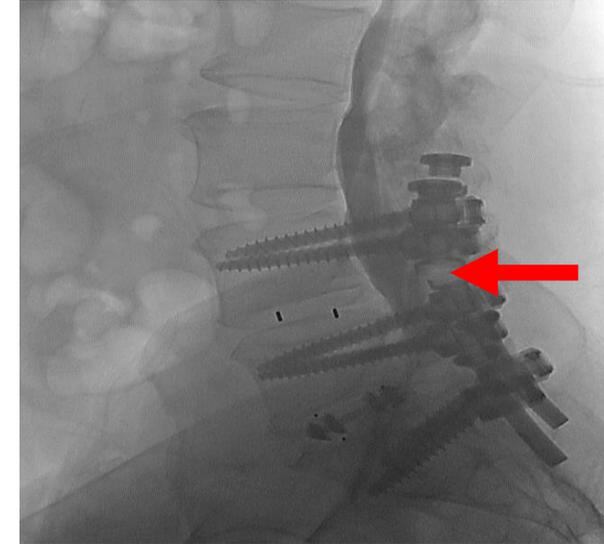
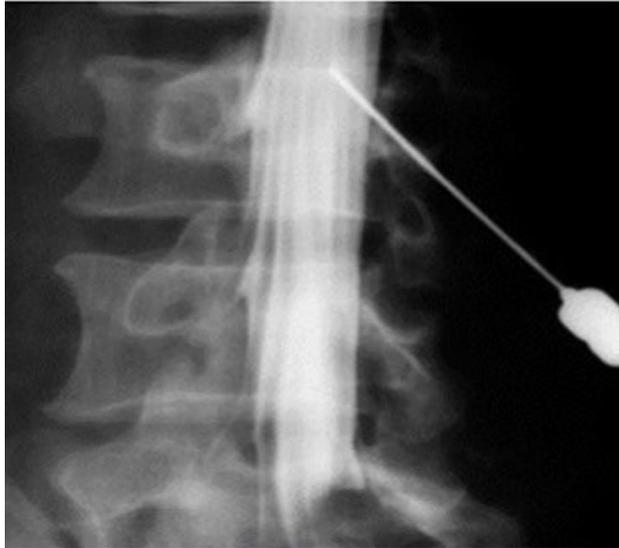
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Figures 6a, 6b. Thin liquid administration showing aspiration during Modified Barium Swallow examination. The second figure shows the same patient, showing aspiration with nectar. Real time labeling was used to identify otherwise difficult-to-differentiate consistencies (red arrows).

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Figures 7a, 7b, 7c. Needle positioning using real-time fluoroscopy for introduction of non-ionic contrast into the intrathecal space. Real time evaluation allows for close monitoring of contrast placement in the setting of pre-existing hardware (red arrow), which may limit evaluation on other modalities.

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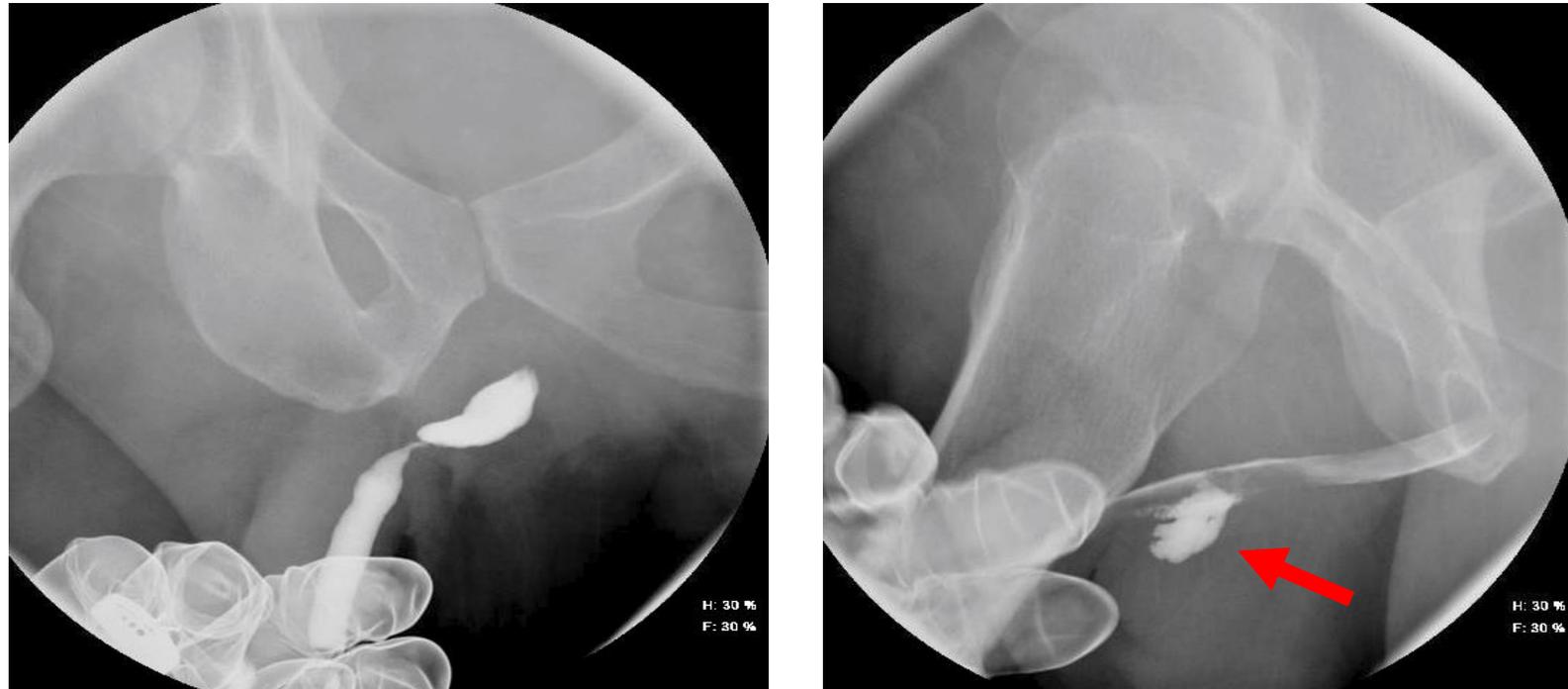
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Figure 8. Hysterosalpingogram shows bilateral spillage through both Fallopian tubes, as part of an infertility workup.

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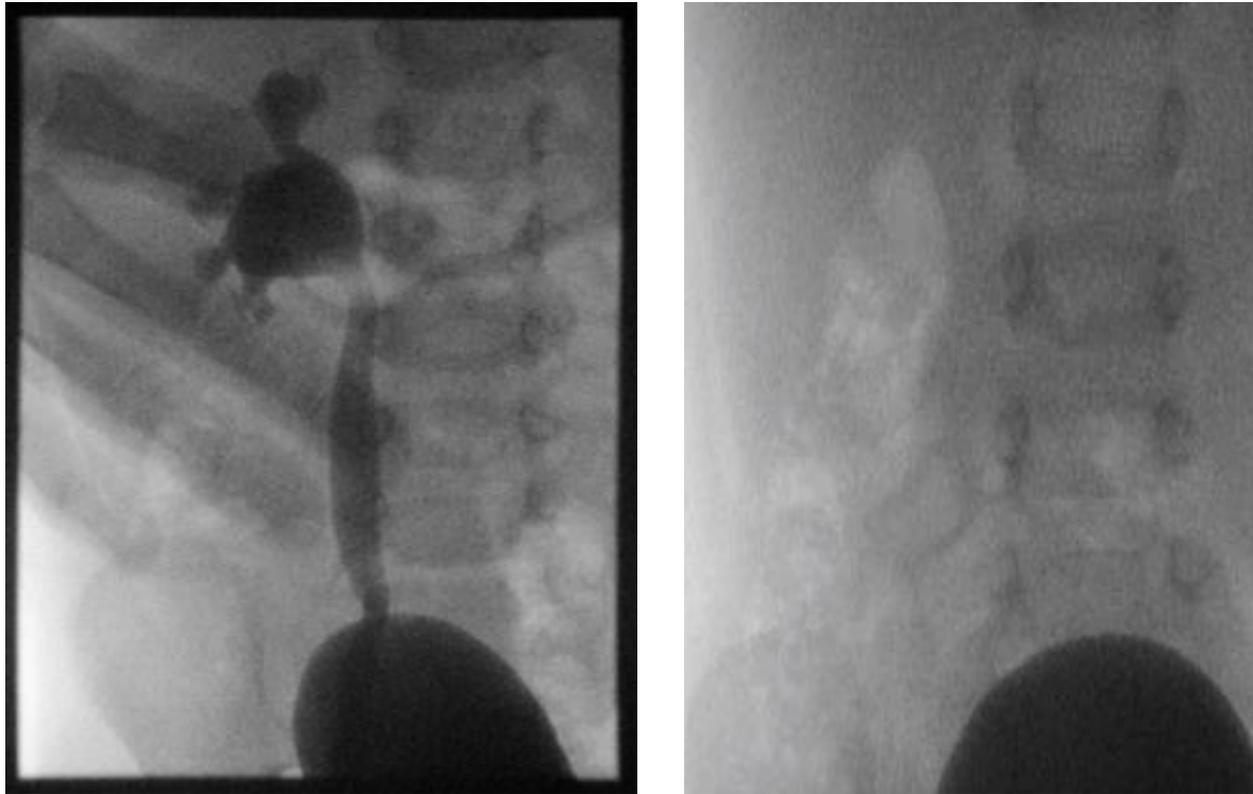
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Figures 9a, 9b. Retrograde urethrocytogram showing significant stricture of the bulbar urethra. Post-urethroplasty fluoroscopic examination showing focal extravasation of contrast (red arrow). Foley catheter was therefore not removed.

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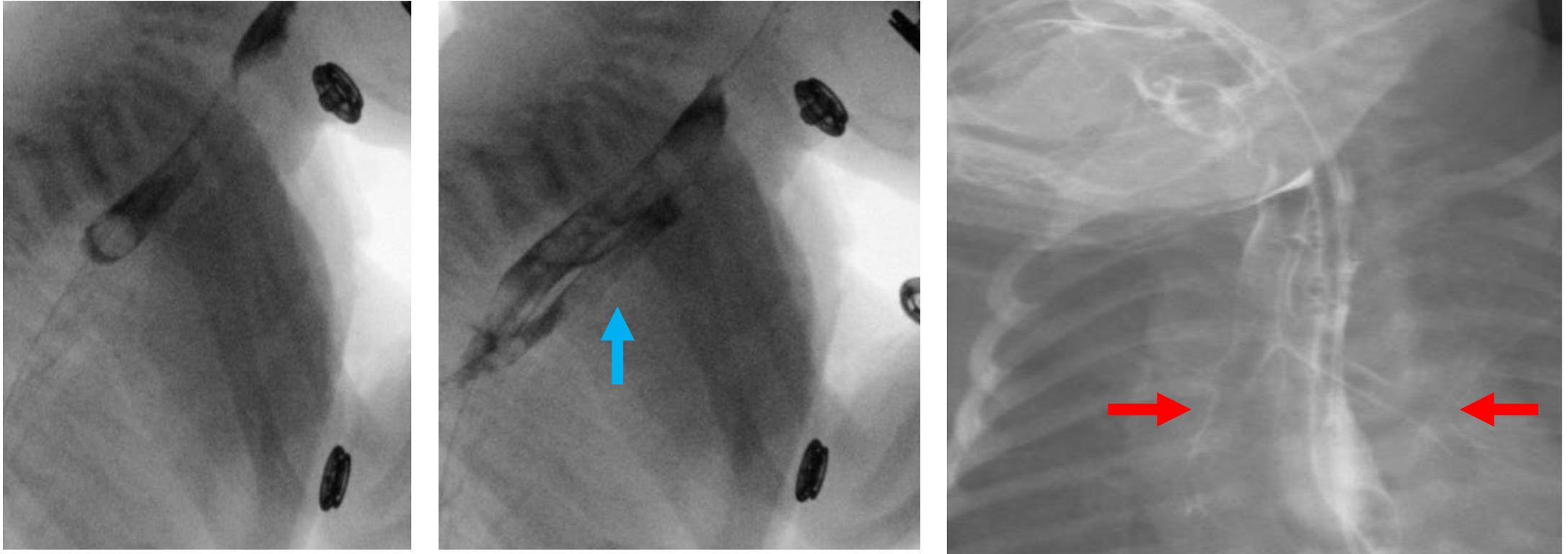
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Figures 10a, 10b. Fluoroscopy demonstrating Grade IV severity of hydronephrosis, with resolution.

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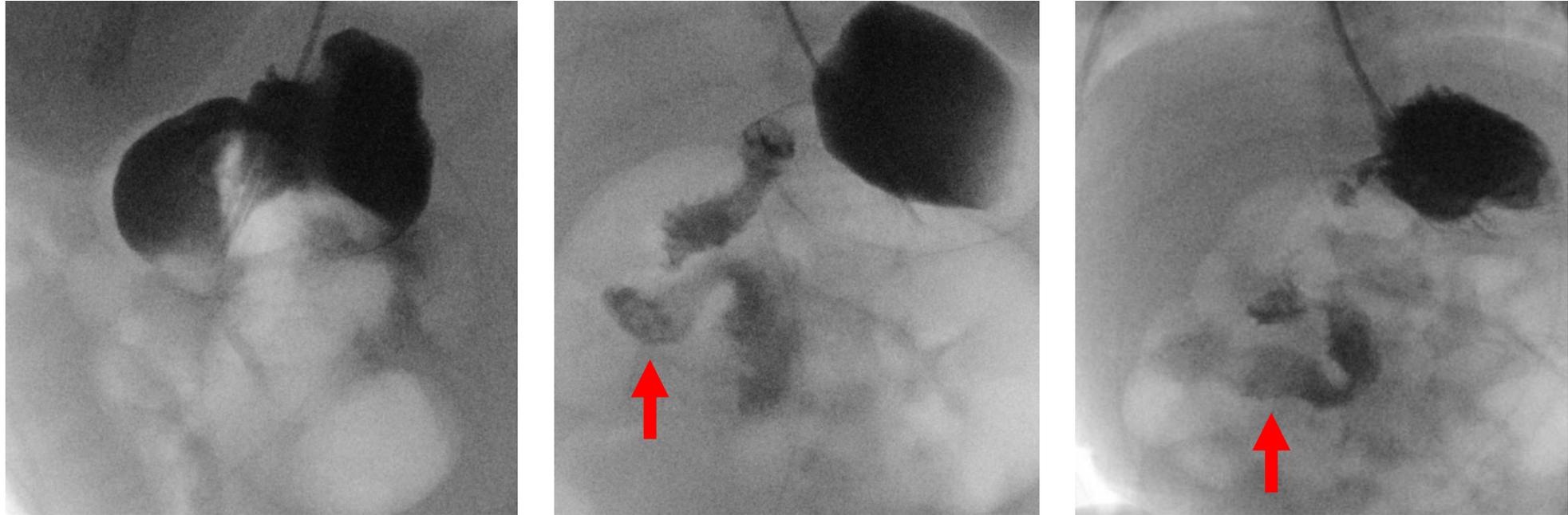
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Figures 11a, 11b, 11c. Lateral and supine fluoroscopic images demonstrating a fistulous tract between the proximal esophagus and proximal trachea on lateral views (vertical blue arrow), with striking outline of the trachea and mainstem bronchi, compatible with tracheoesophageal fistula (red arrows).

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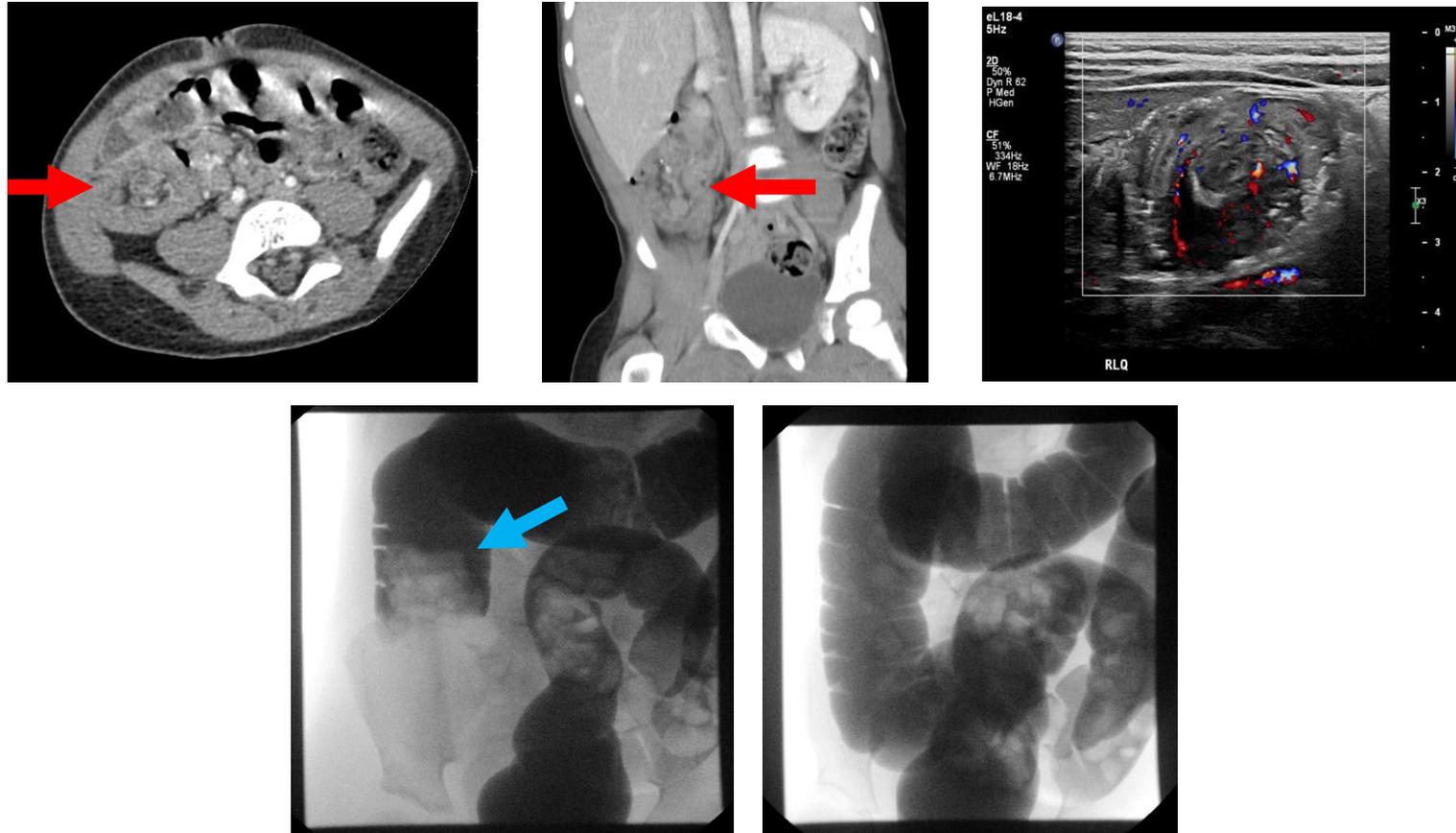
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Figures 12a, 12b, 12c. Intestinal malrotation, with duodenal structures appearing to the right of the midline. Follow-up study, performed several days later, with similar characteristic findings (red arrows).

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Figures 13a, 13b, 13c, 13d, 13e. Overnight emergent pediatric intussusception reduction from start to finish with multi-modality. Initial CT shows suspected ileocolic intussusception (red arrows). Subsequent ultrasound of the right lower quadrant with confirmatory findings with telescoping bowel loops. **Final two images showing fluoroscopically guided contrast enema, with visualization of telescoped bowel loops (blue arrow) and subsequent resolution.**

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Figure 14a, 14b. “Beyond CT” in the determination of bowel extraluminal collections. The supine position is utilized in CT as in **Figure 14a**, where the G-port of a GJ tube was injected with contrast, then seen localizing to the dependent fundus. **Figure 14b** shows real-time fluoroscopic projections with patient in the near-lateral position, showing a fistulous communication with anterior abscess and duodenal sweep (vertical red arrow).

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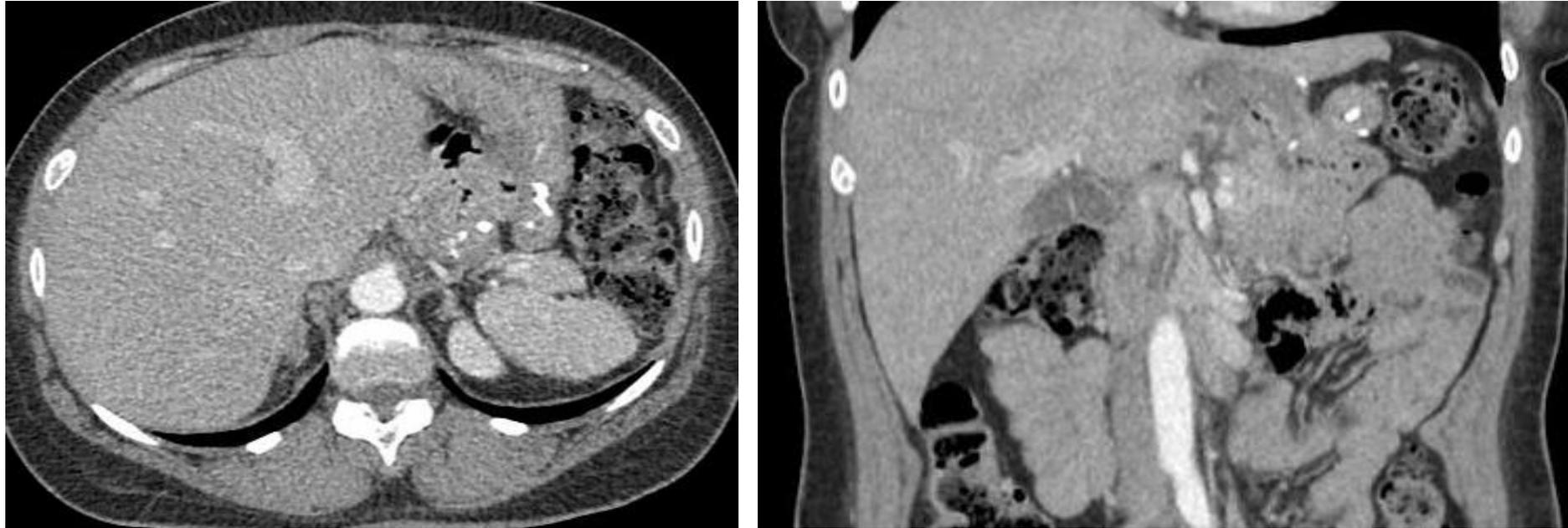
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Figure 15a, 15b, 15c. Contained gastric leak in a patient status post both gastric sleeve and Roux-en-Y procedures, with steep oblique and delay imaging showing contrast entering a contained leak and quite easily seen on fluoroscopic examination. Finding was not identified on initial CT examination.

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Figures 16a, 16b. Initial contrast CT evaluation of patient (status post gastric bypass) presenting with abdominal pain. The CT was read as negative.

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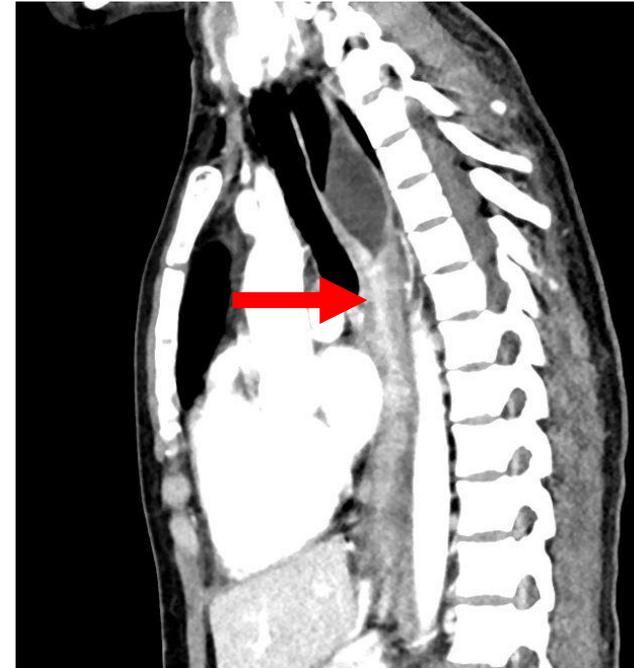
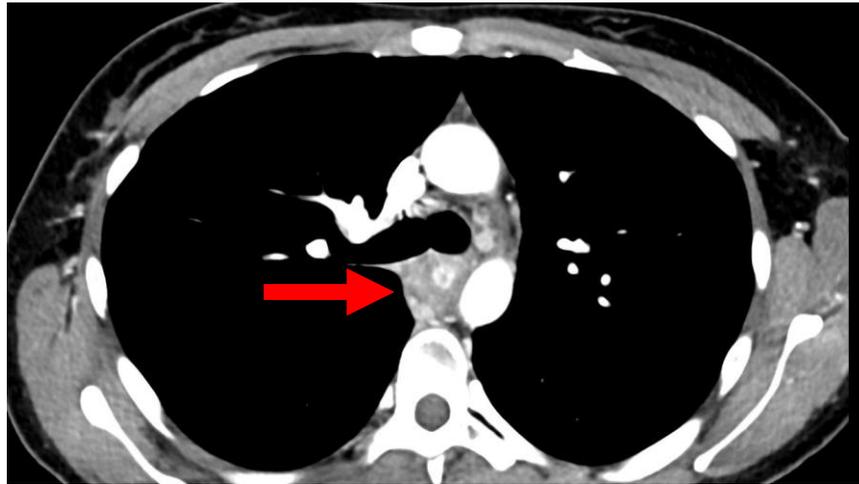
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Figures 16c, 16d. Subsequent discovery of gastro-gastric fistula observed with fluoroscopy. Right anterior oblique positioning was utilized. Findings were then positively correlated on upper endoscopic examination.

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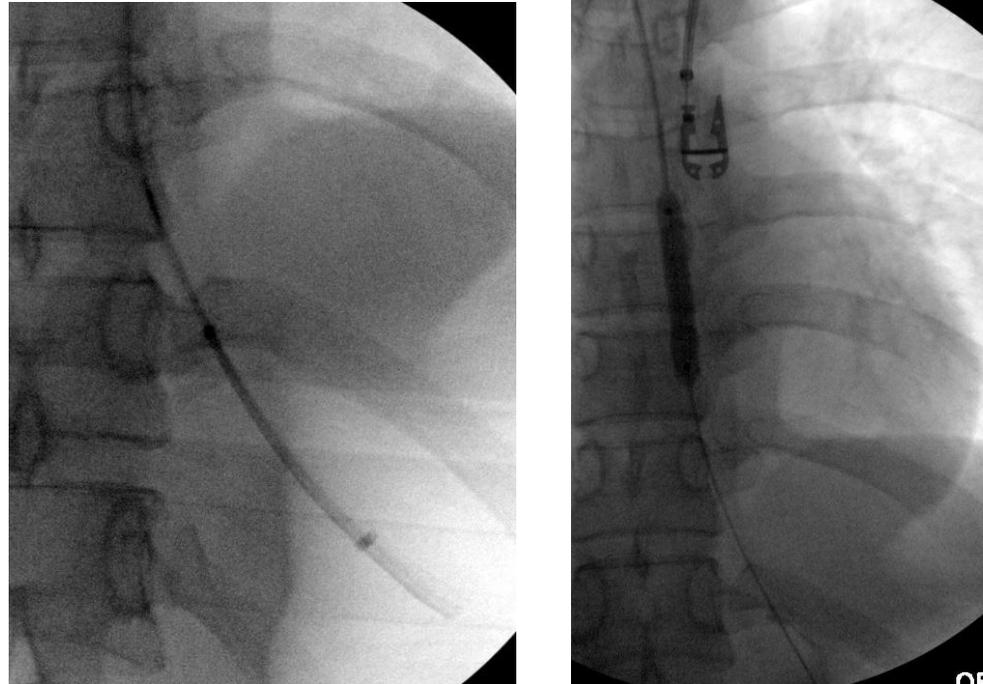
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Figures 17a, 17b. Axial and sagittal CT images showing long-segment esophageal stenosis related to caustic ingestion (red arrows).

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Figures 17c, 17d. With an initial upper endoscopy aborted, repeat upper **endoscopy with the addition of fluoroscopic guidance** allowed passage through a known stricture and eventual stent placement.

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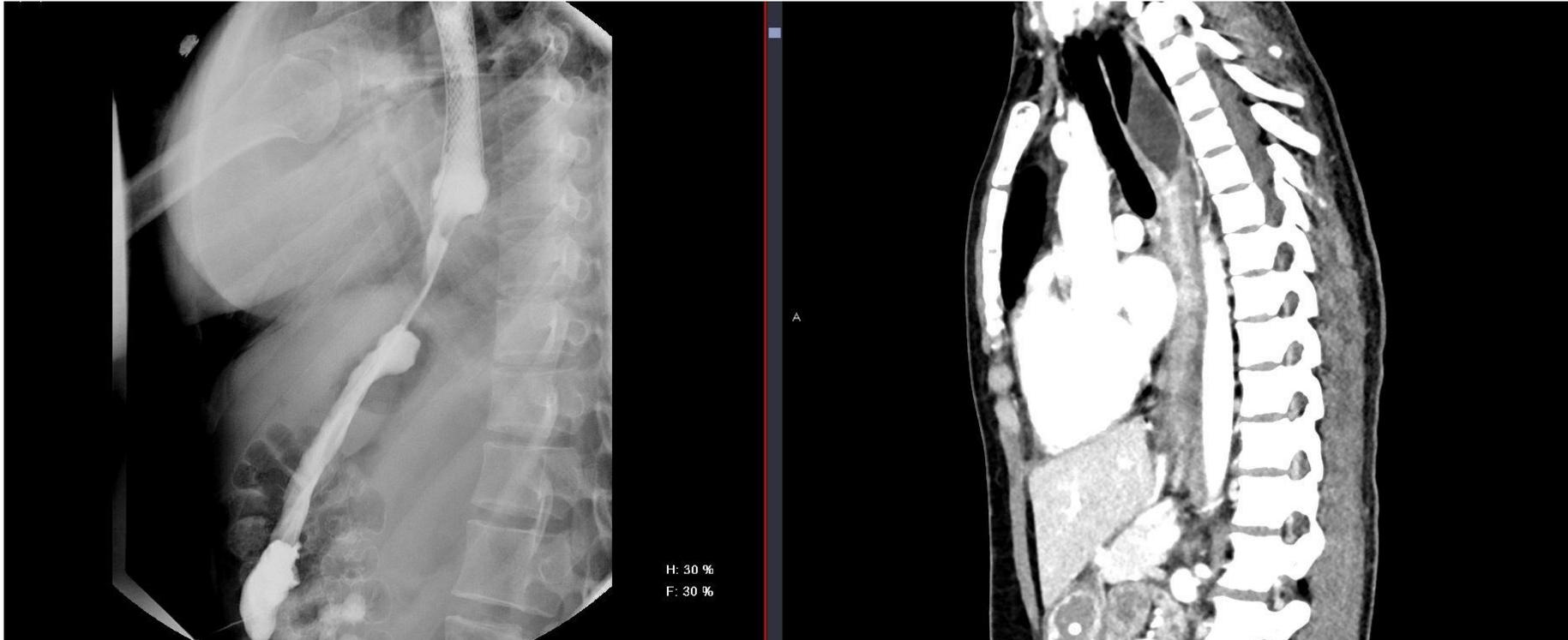


Figure 17e. Subsequent fluoroscopic upper GI examination showing free contrast passage through the stented esophagus, with **direct sagittal comparison to the initial CT in the sagittal plane**

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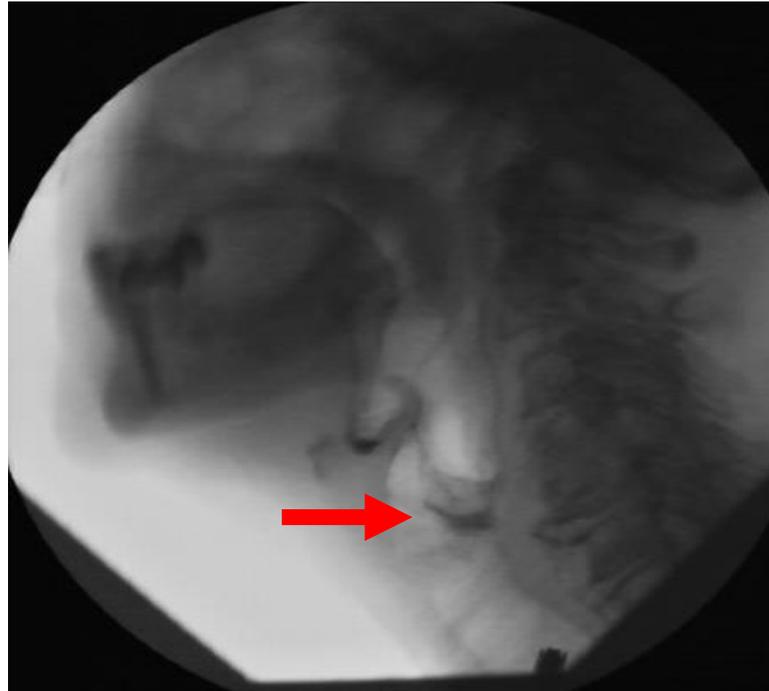


Figure 18a. Initial fluoroscopic examination of a patient with dysphagia demonstrating disorganized swallow and penetration to the level of the vocal cords (red arrow).

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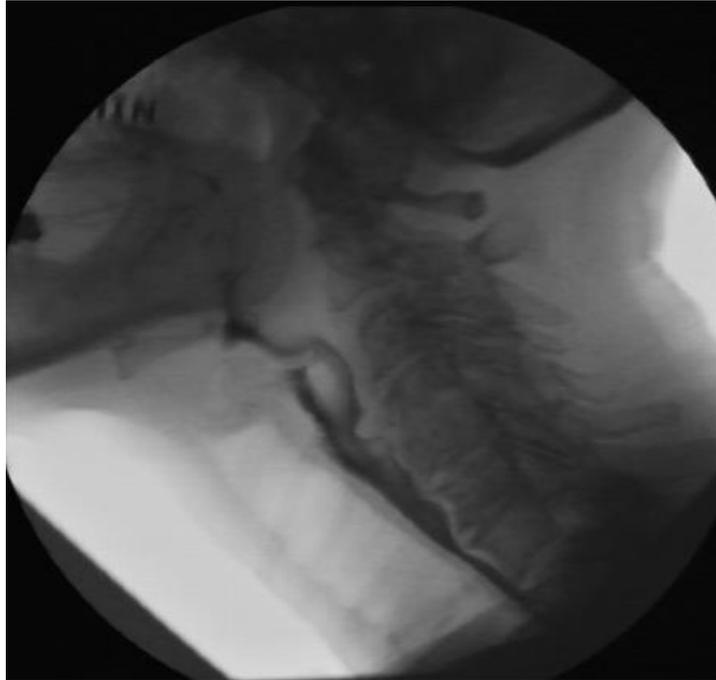


Figure 18b. Follow-up fluoroscopic swallow examination (without neostigmine) demonstrating improvement in organized swallow with only mild flash penetration.

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Figures 18c, 18d. Immediate follow-up examination with administration of neostigmine, showing no significant penetration at multiple consistencies, along with significant improvement in organized swallow (green arrows). Neurology consultation concurred with the diagnosis of myasthenia gravis, particularly based on the fluoroscopic series of examinations.

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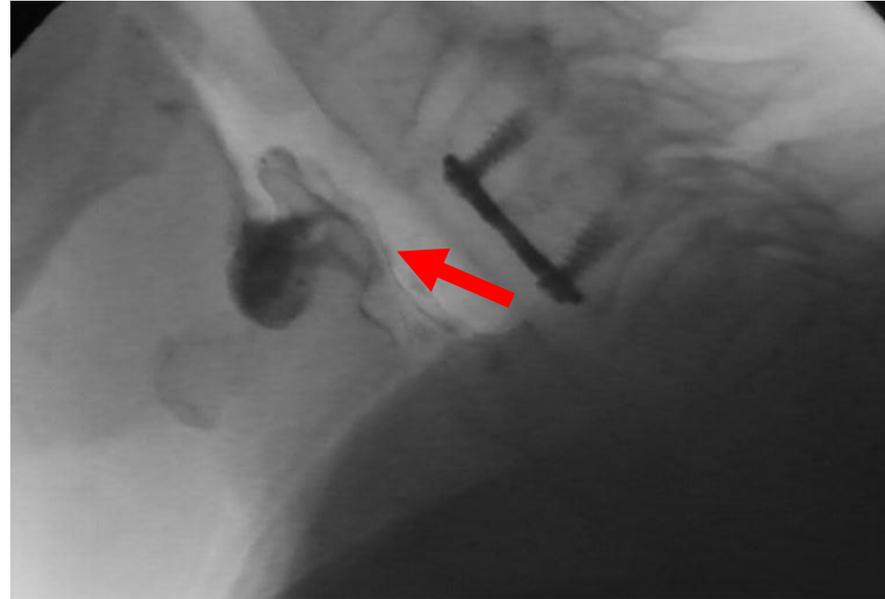


Figure 19a. Incidental discovery of a prominent soft tissue density at the inferior aspect of the epiglottis on fluoroscopic modified barium swallow examination (red arrow).

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Figure 19b. CT Neck, performed after incidental fluoroscopic discovery. Identification of an enlarged, irregular, and enhancing epiglottis concerning for primary mucosal malignancy (red arrow).