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Devices on chest X-ray

Tomáš Rohan, Radim Gerstberger, Monika Poláčková

Learning Outcomes

- The student will become familiar with catheters and devices that can be described on a chest x-ray

- The student will learn the correct position of the central venous catheter on a chest X-ray

Content of the lecture

- Central venous access (CVC, PICC, port catheters)
- Pacemaker electrodes (PM, ICD) and other cardiovascular devices
- Tracheal tube and tracheostomy
- Nazogastric and nasoeneteric tubes

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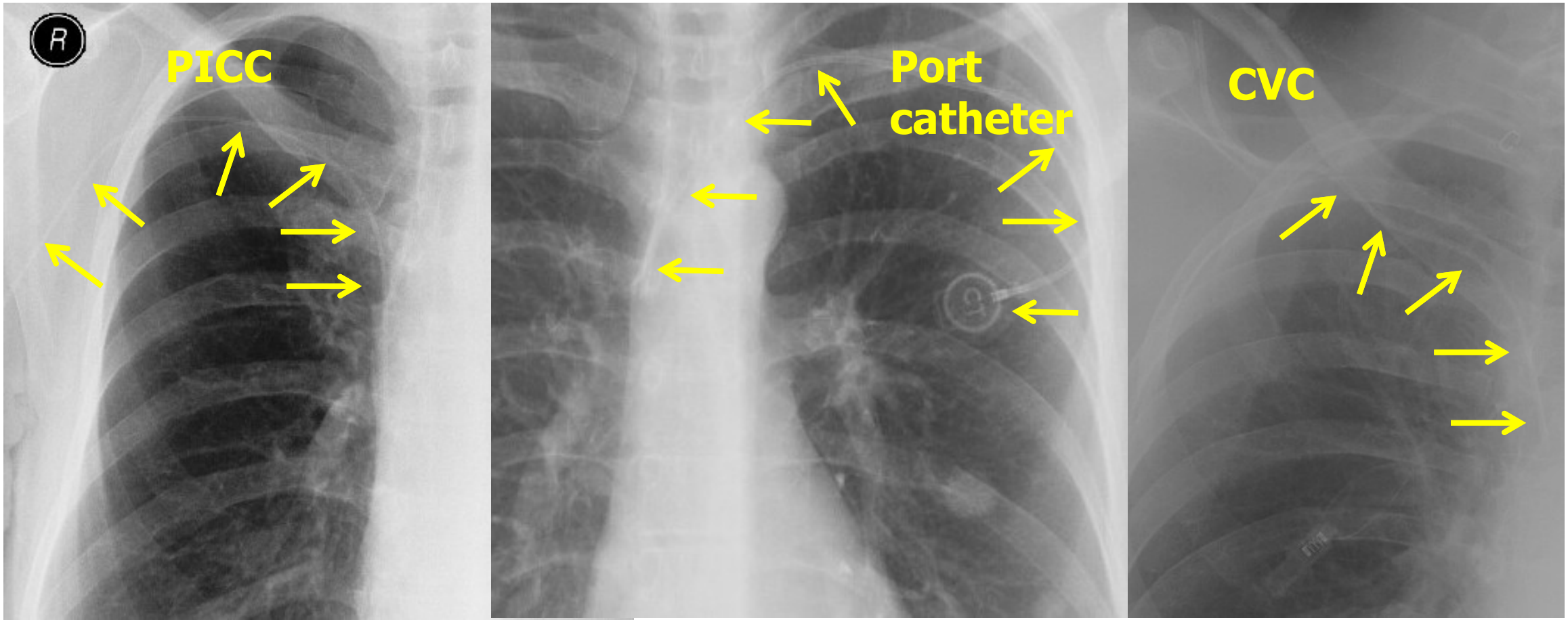
CVC, PICC, port catheters



What to focus on?

- Pneumothorax
- Position of the tip
- Course (kinked, twisted,...)
- Integrity failure
- Change over time on the control X-ray

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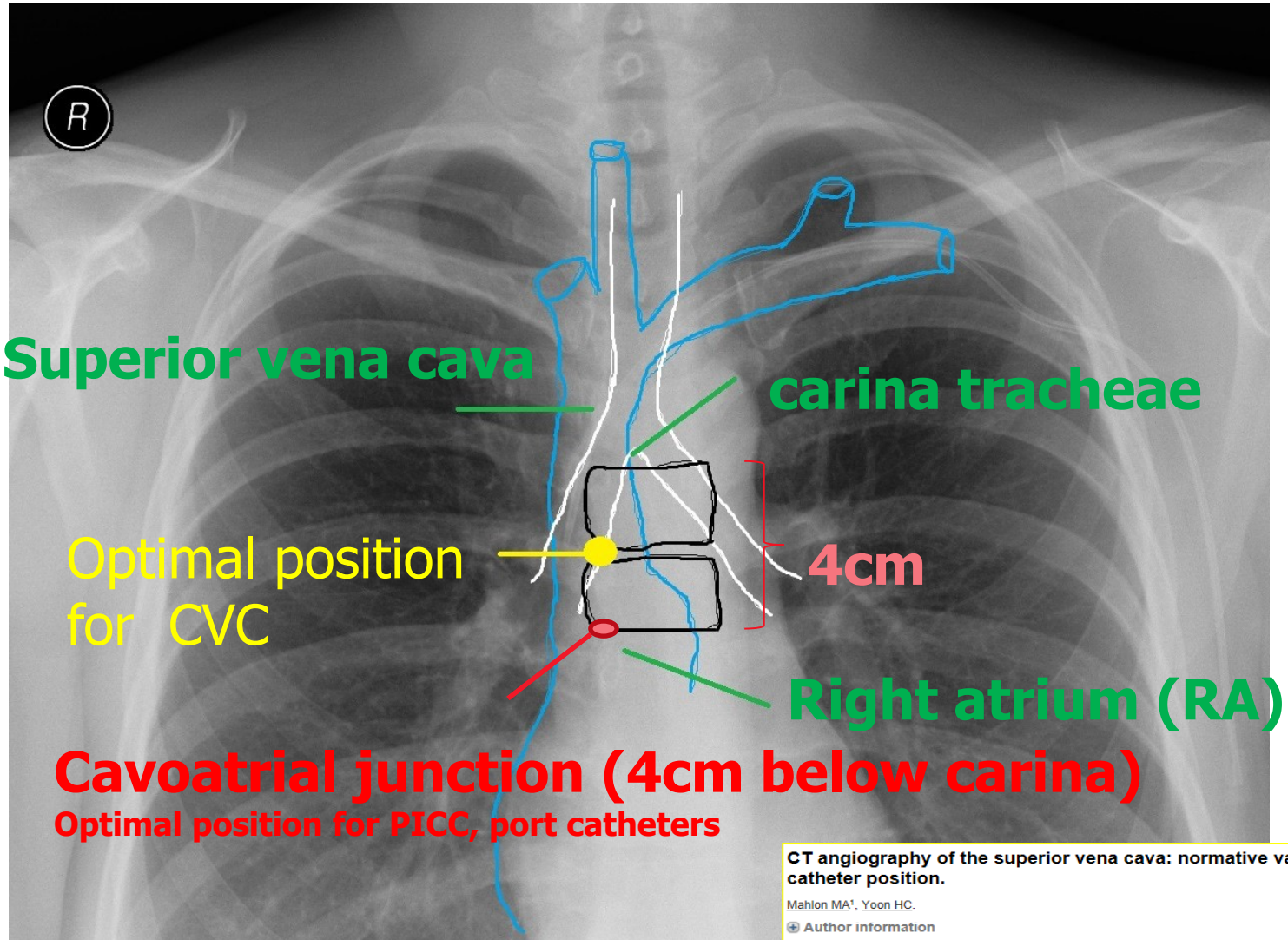
Optimal position of CVC



CT angiography of the superior vena cava: normative values and implications for central venous catheter position.

Mahlon MA[1], Yoon HC.

Author information

Abstract

PURPOSE: To determine normative data for radiographic landmarks of the superior vena cava (SVC) and the location of the junction of the SVC with the right atrium for use in the placement of central venous catheters.

MATERIALS AND METHODS: The authors retrospectively reviewed 112 pulmonary computed tomographic (CT) angiograms obtained in seven men and seven women from each decade of life between the ages of 20 and 99 years. For each patient, the length of the SVC was measured from its origin to the cavoatrial junction. The distances from the carina and right tracheobronchial angle to the cavoatrial junction and the origin of the SVC were also measured. Interobserver variation in choosing the location of the carina and tracheobronchial angle was analyzed.

RESULTS: The mean length (+/-standard deviation) of the SVC was 70.7 mm +/- 14.1. The mean distance from the superior margin of the SVC to the carina was 30.4 mm +/- 11.2, from the carina to the cavoatrial junction 40.3 mm +/- 13.6, from the superior margin of the SVC to the right tracheobronchial angle 21.7 mm +/- 10.8, and from the right tracheobronchial angle to the cavoatrial junction 49.0 mm +/- 13.6. There was a statistically significant difference in interobserver variation in selecting the location of the right tracheobronchial angle as compared to choosing the carina.

CONCLUSION: Placement of the central venous catheter tip at or just below the level of the carina during inspiration ensures placement in the SVC. Placement of the central venous catheter tip approximately 4 cm below the carina will result in placement near the cavoatrial junction.

Mahlon, M.A.; Yoon, H.-C. CT Angiography of the Superior Vena Cava: Normative Values and Implications for Central Venous Catheter Position. J Vasc Interv Radiol 2007, 18, 1106–1110, doi:10.1016/j.jvir.2007.06.002.

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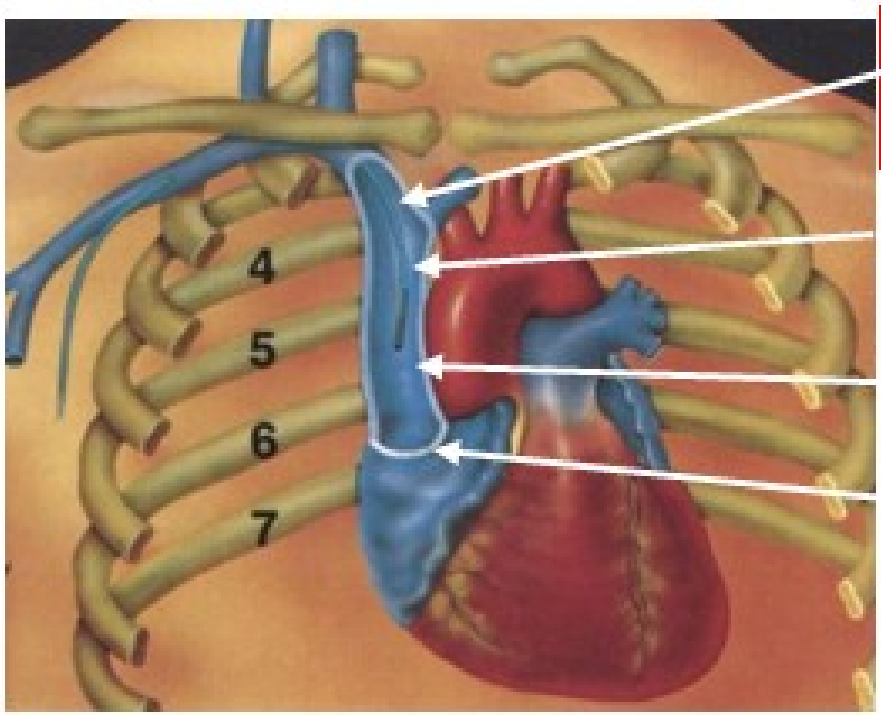
Complications of CVC

- malposition (the tip of the catheter is not in optimal position – not in distal third of SVC or in cavoatrial junction)
  - primary
  - secondary
- thrombosis, mechanical obstruction
- arrhythmias



Caers, J., Fontaine, C., Vinh-Hung, V. *et al.* Catheter tip position as a risk factor for thrombosis associated with the use of subcutaneous infusion ports. *Support Care Cancer* **13,** 325–331 (2005). https://doi.org/10.1007/s00520-004-0723-1

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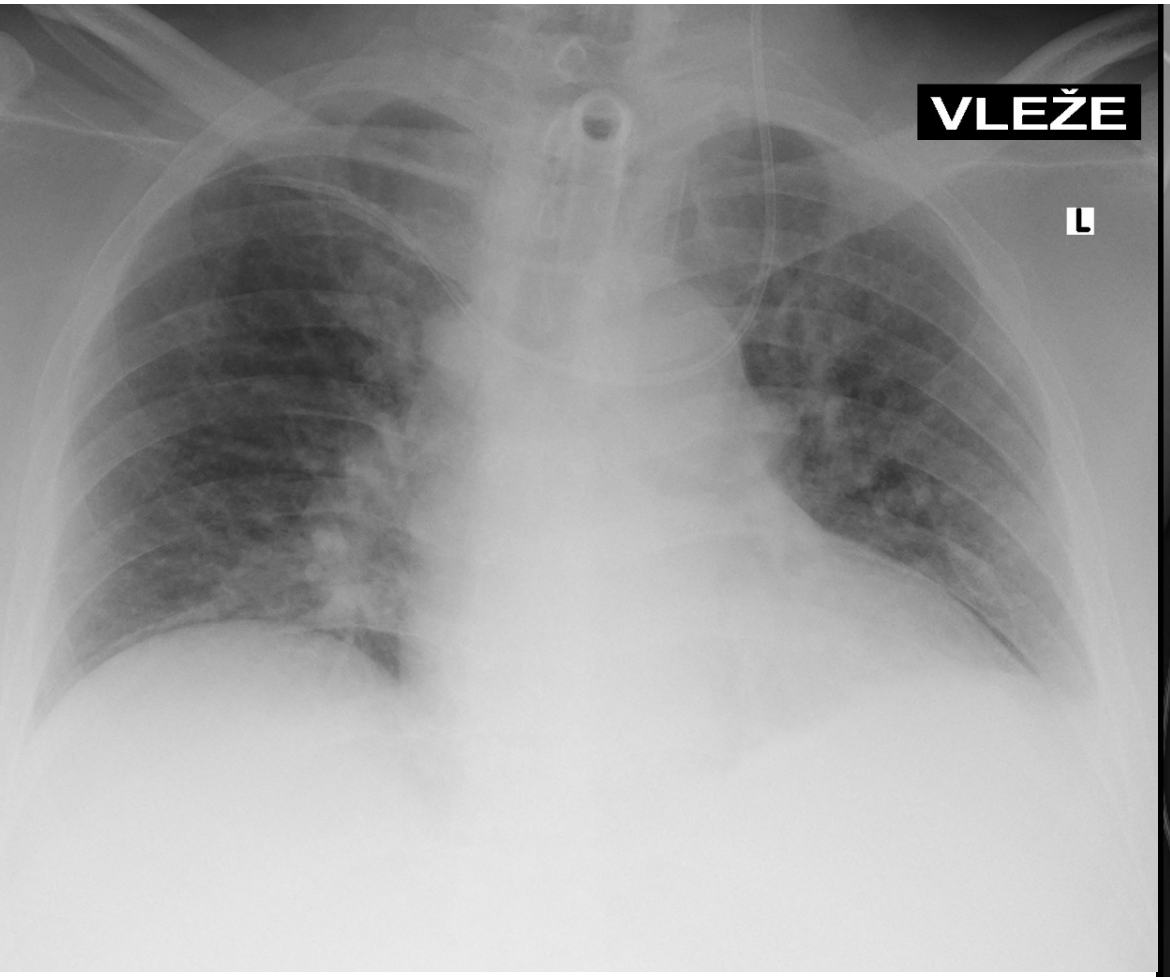
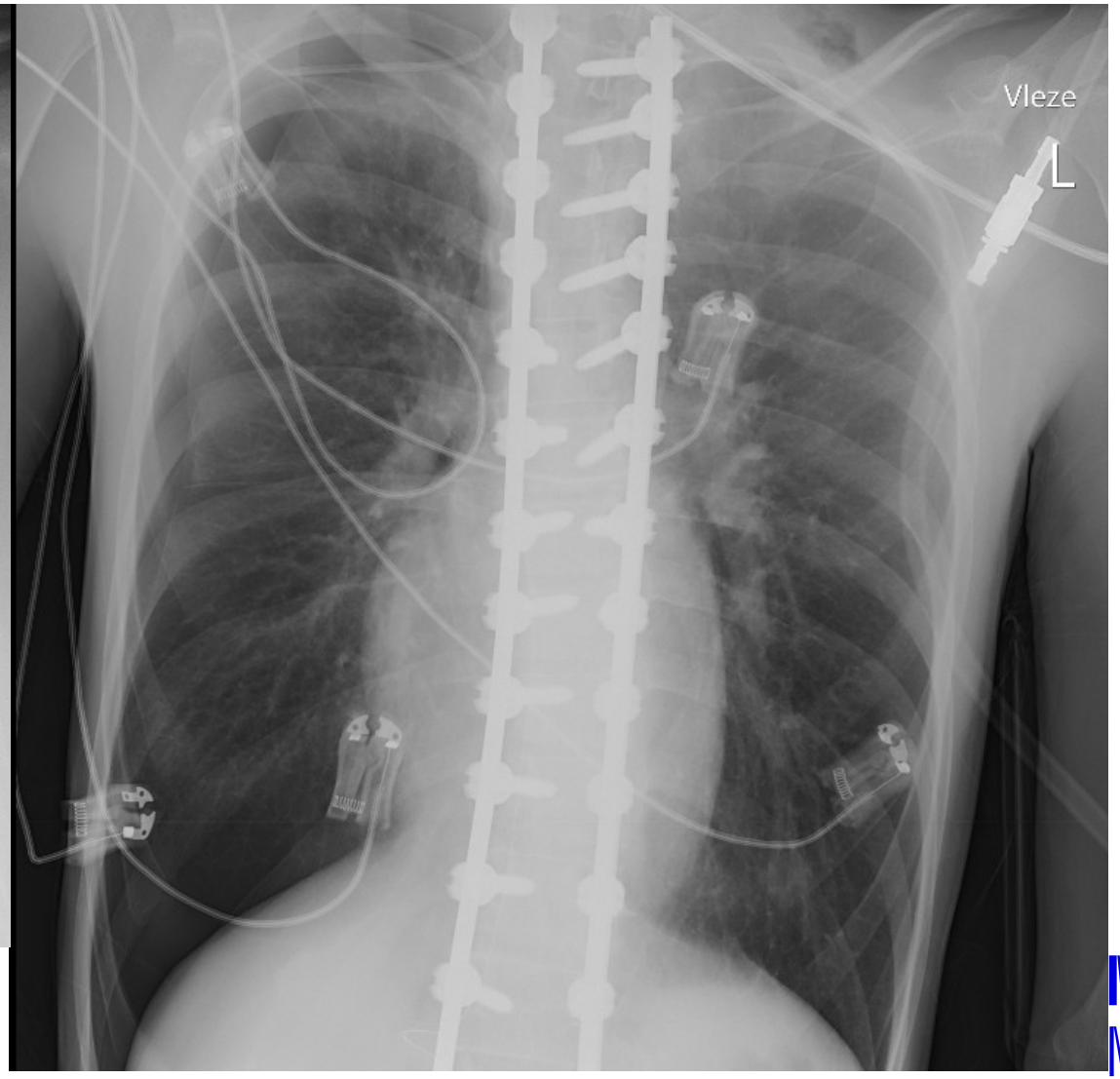
Complications of CVC





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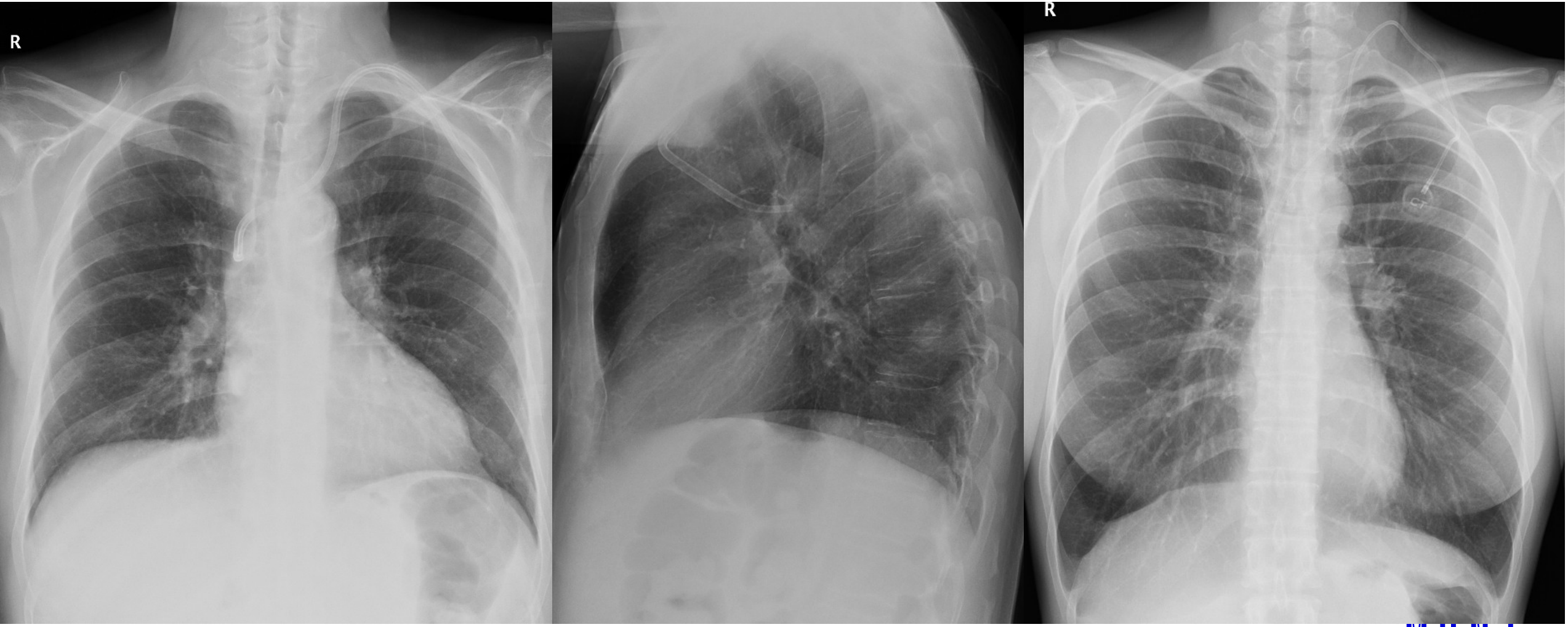
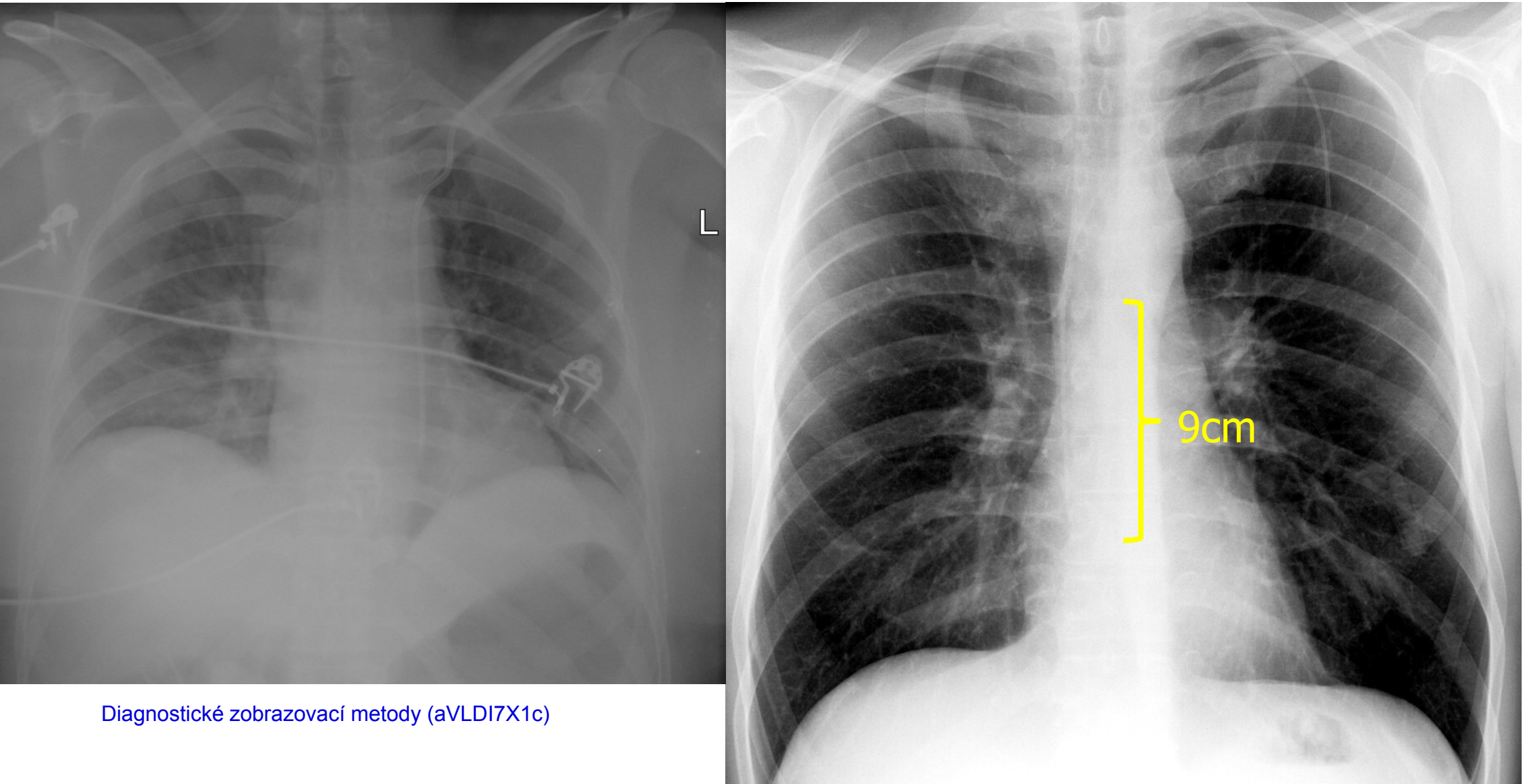
Complications of CVC



Complications of CVC



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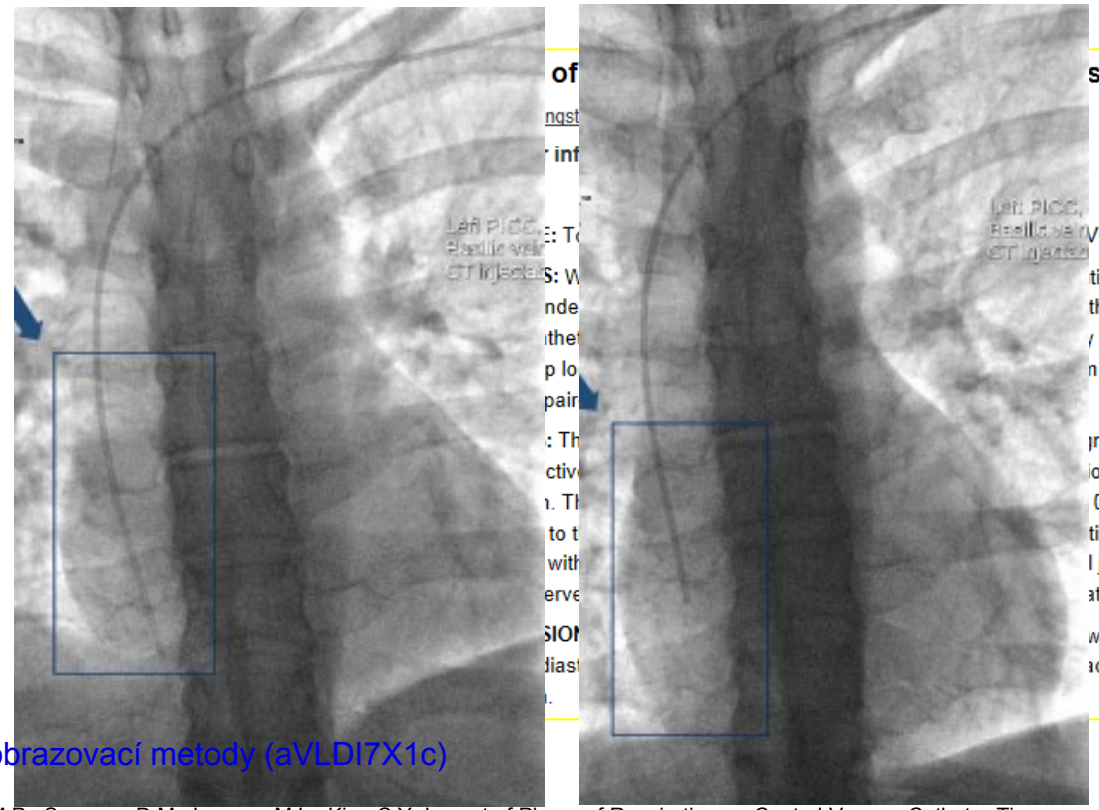
CVC tip position

- Is there a difference between upright and supine postibion? **NO**
- Is there a difference between inspiration and expiration? **YES 9mm**



s catheter tip position.

VC tip position using cross-sectional imaging.

tive patients (eight men and 16 women, mean age 56.3 years, range 18-
the thorax in inspiration and expiration. Only patients with a central
that might affect lung volumes were included. Measurements of the
n inspiratory and expiratory phase images in each patient and compared

nificantly longer during inspiration compared to expiration (9 mm and 7
or and inferior cavo-atrial junction did not change significantly with
0-25 mm) cephalad during inspiration compared to expiration (P=0.001)
tip movement correlated significantly with the degree of diaphragmatic
l junction was on average 11 mm inferior to the right cardiomediastinal
ation (R=0.78, P<0.001).

with respiratory motion, with a mean excursion of 9 mm. The right
actual location of the superior cavo-atrial junction in expiration, but not in

Diagnostické zobrazovací metody (aVLDI7X1c)

Pan, P.P.; Engstrom, B.I.; Lungren, M.P.; Seaman, D.M.; Lessne, M.L.; Kim, C.Y. Impact of Phase of Respiration on Central Venous Catheter Tip Position. J Vasc Access 2013, 14, 383–387, doi:10.5301/jva.5000135.

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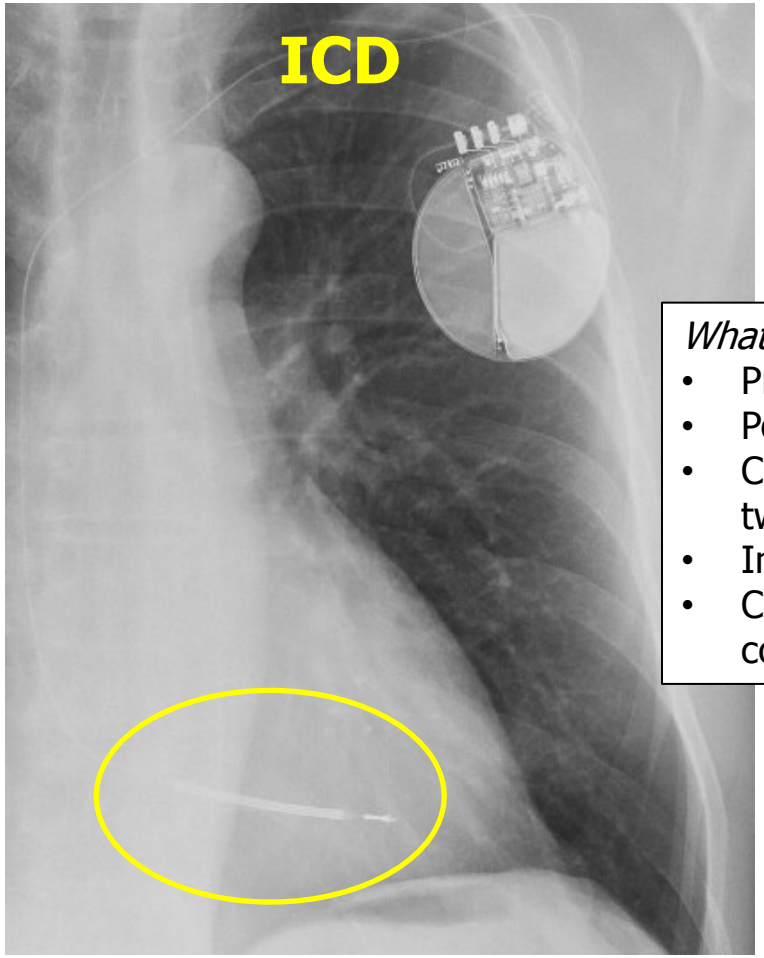
Content of the lecture

- Central venous access (CVC, PICC, port catheters)
- **Pacemaker electrodes (PM, ICD) and other cardiovascular devices**
- Tracheal tube and tracheostomy
- Nazogastric and nasoeneteric tubes

Pacemaker electrodes



What to focus on?

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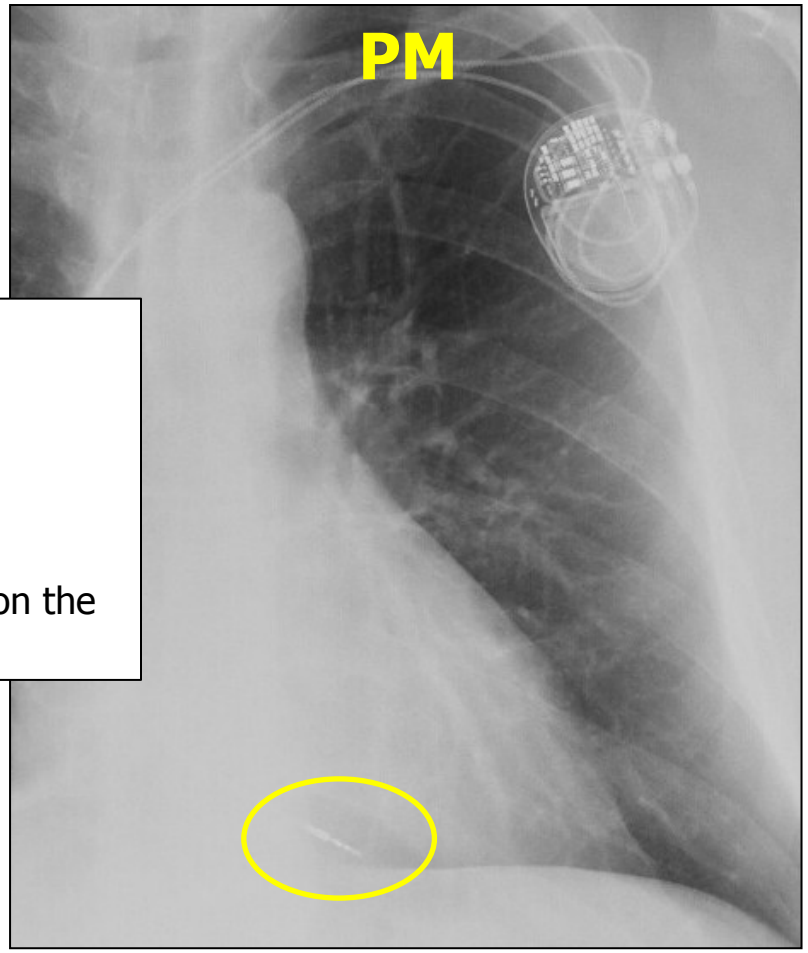

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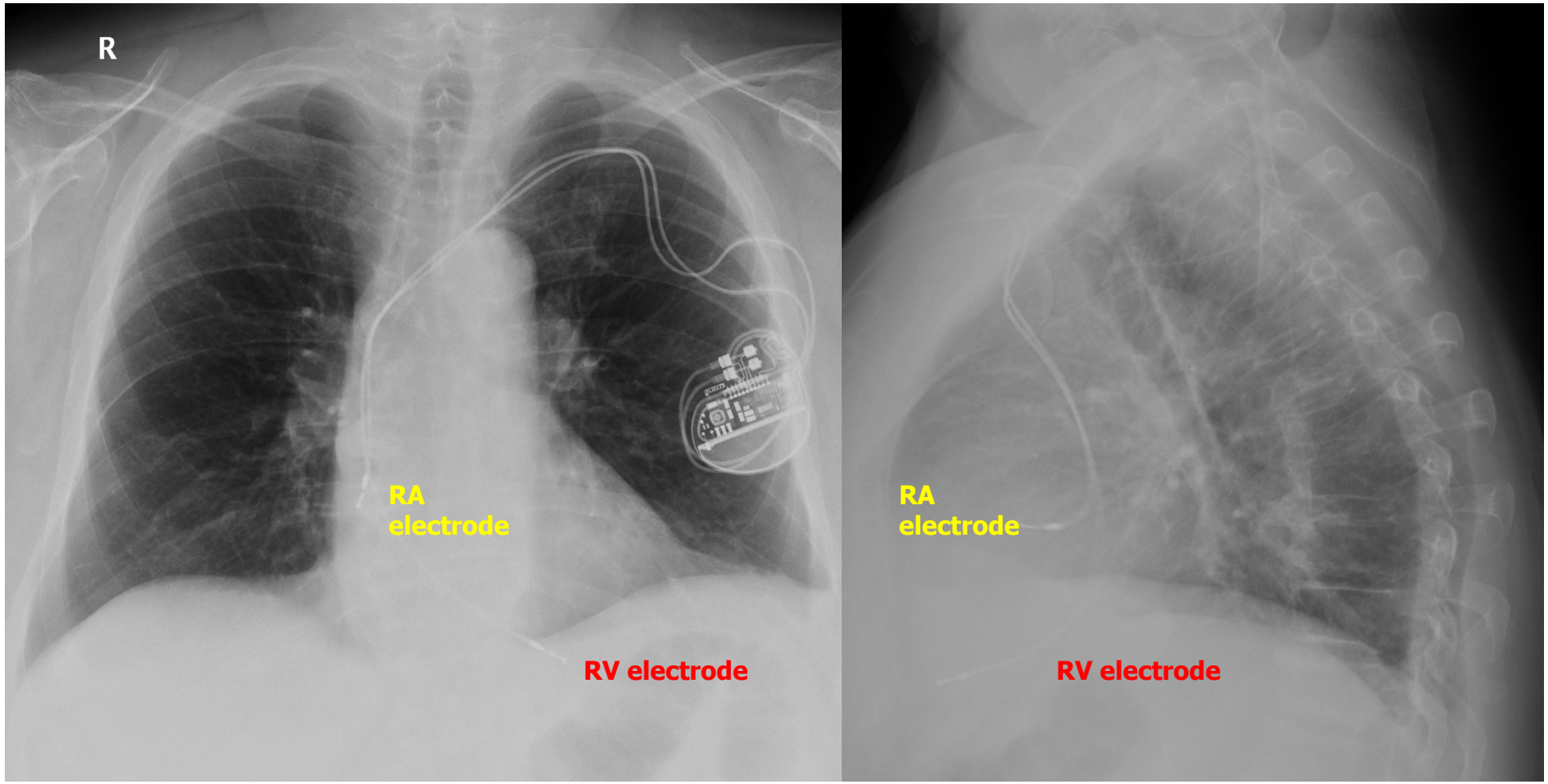
Correct position - pacemaker



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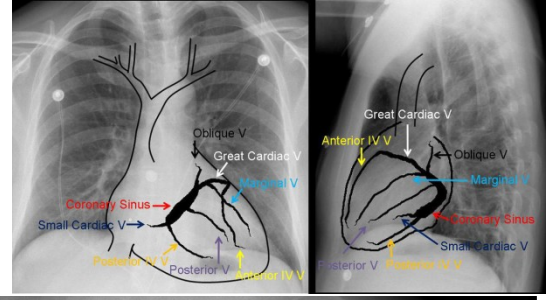
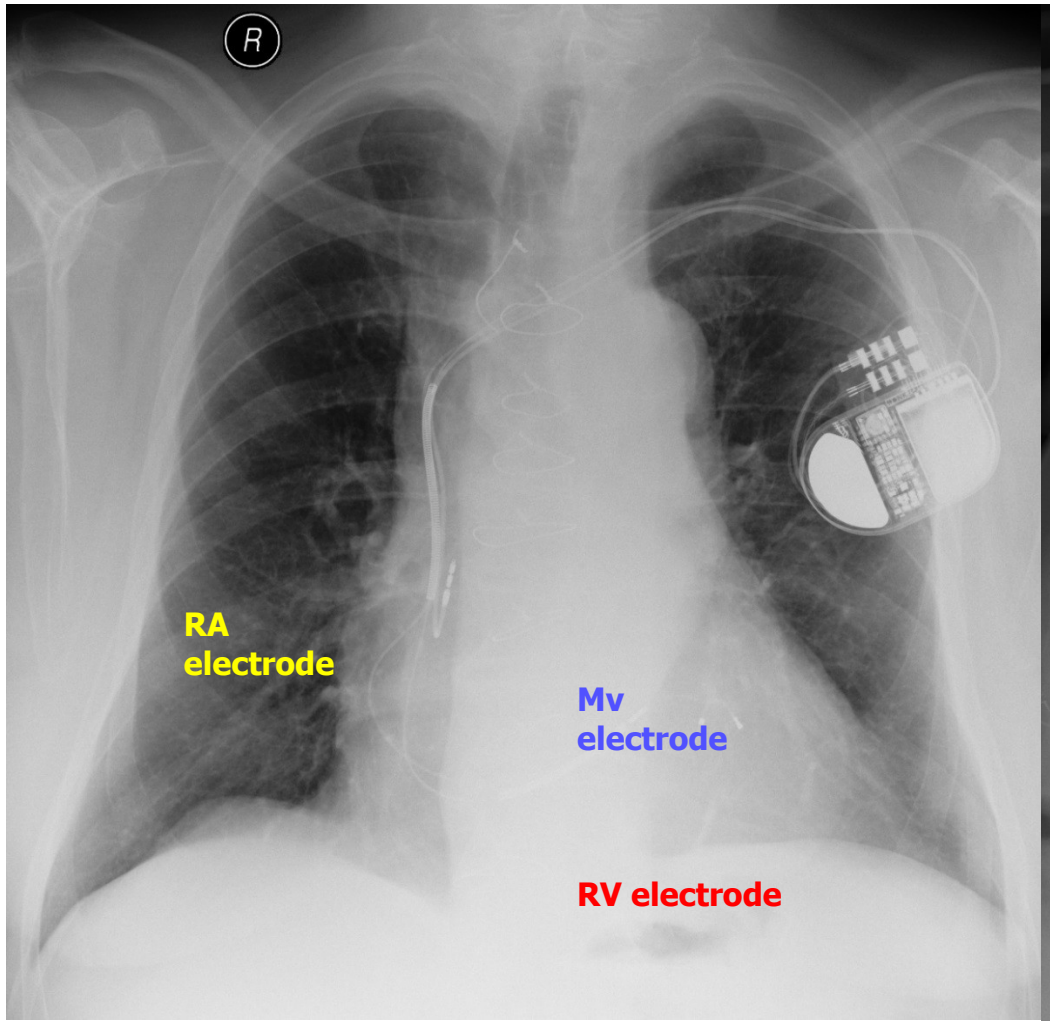
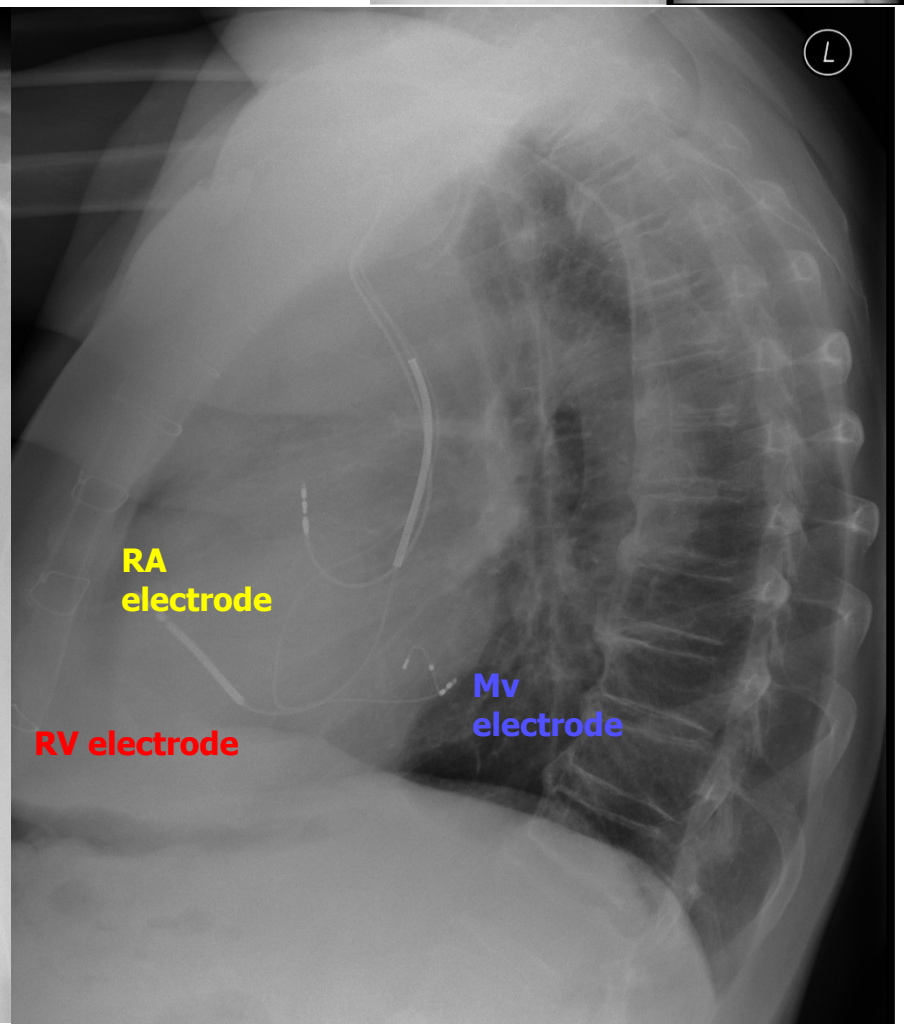
Correct position - ICD







Diagnostické zobrazovací metody (aVLDI7X1c)

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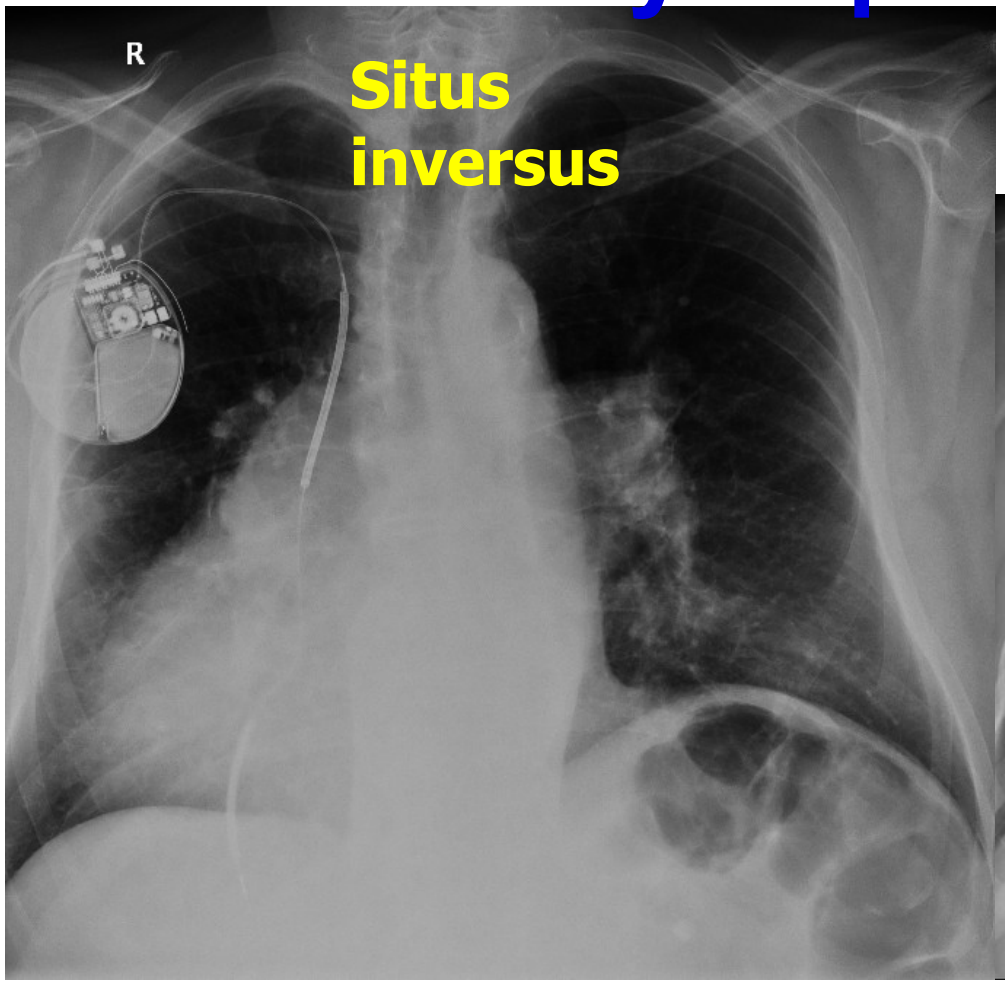
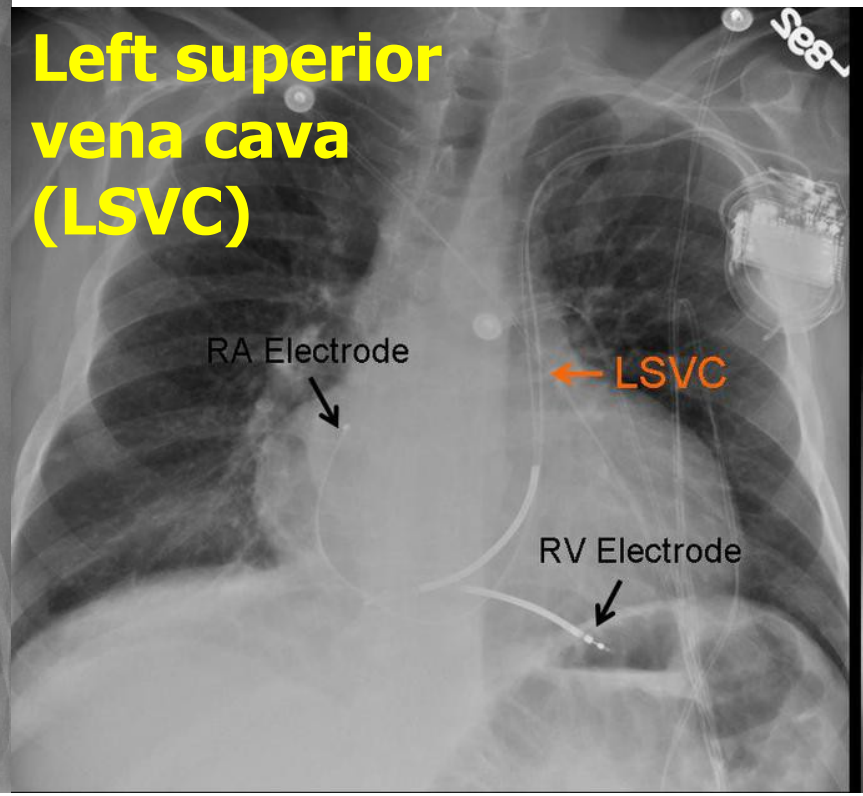
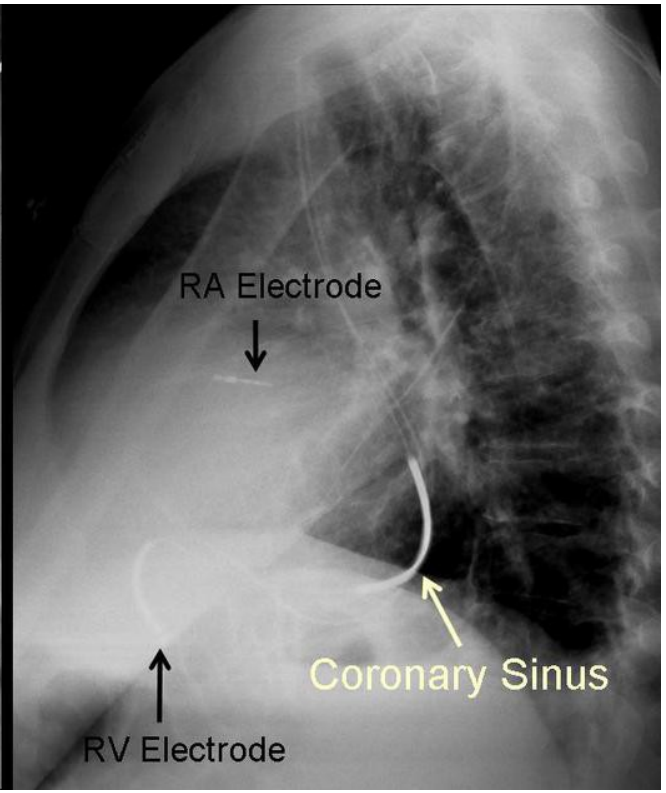
Gutierrez, F.; Rossini, S.A.; Bhalla, S.; Cummings, K.; Capiel, C. Cardiac Pacemakers: What the Radiologist Needs to Know Available online: https://epos.myesr.org/poster/esr/ecr2010/C-0741 (accessed on 7 October 2021).

Variability of pacemaker/ICD electrodes







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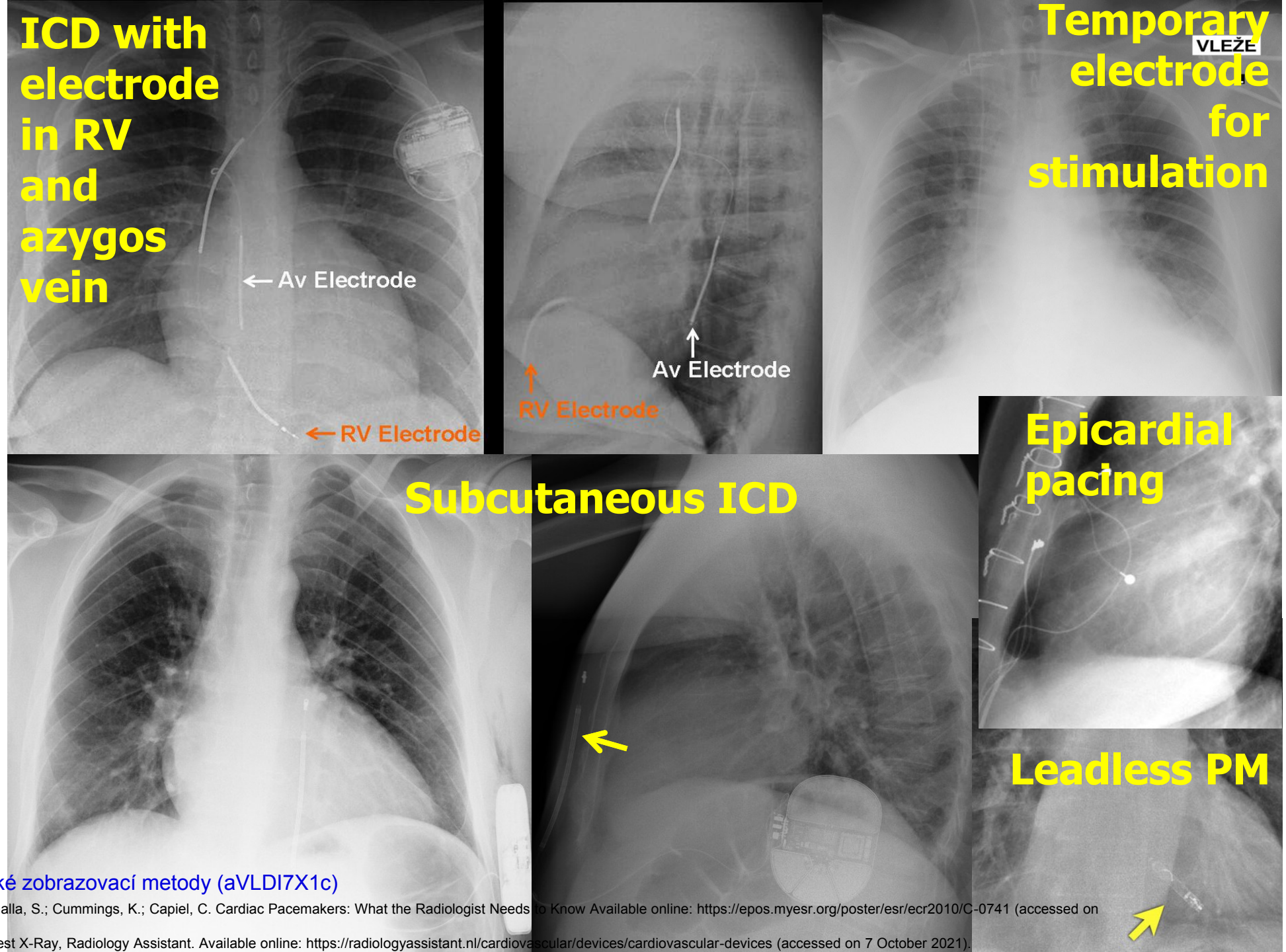
Other types of pacemakers/ICD



Gutierrez, F.; Rossini, S.A.; Bhalla, S.; Cummings, K.; Capiel, C. Cardiac Pacemakers: What the Radiologist Needs to Know Available online: https://epos.myesr.org/poster/esr/ecr2010/C-0741 (accessed on 7 October 2021).
Cardiovascular devices on Chest X-Ray, Radiology Assistant. Available online: https://radiologyassistant.nl/cardiovascular/devices/cardiovascular-devices (accessed on 7 October 2021).

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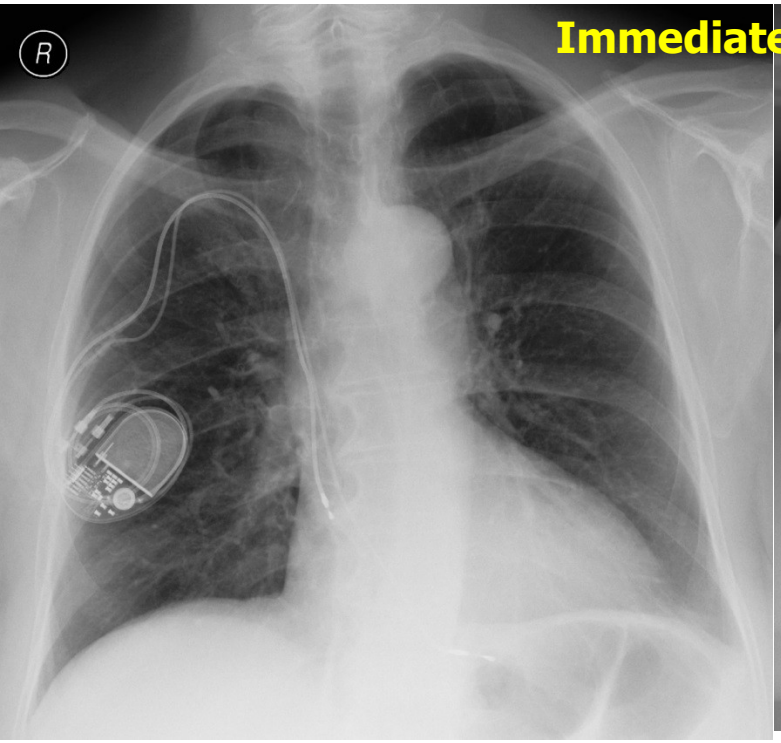
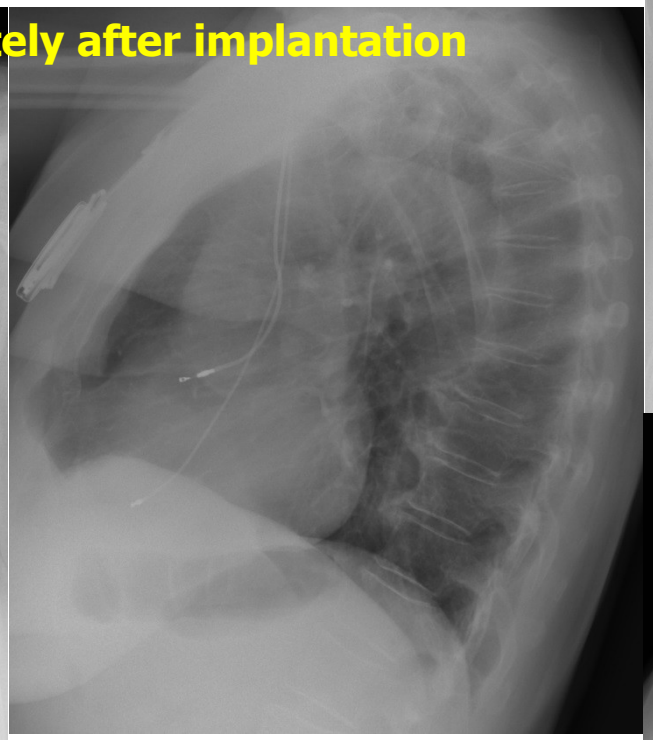
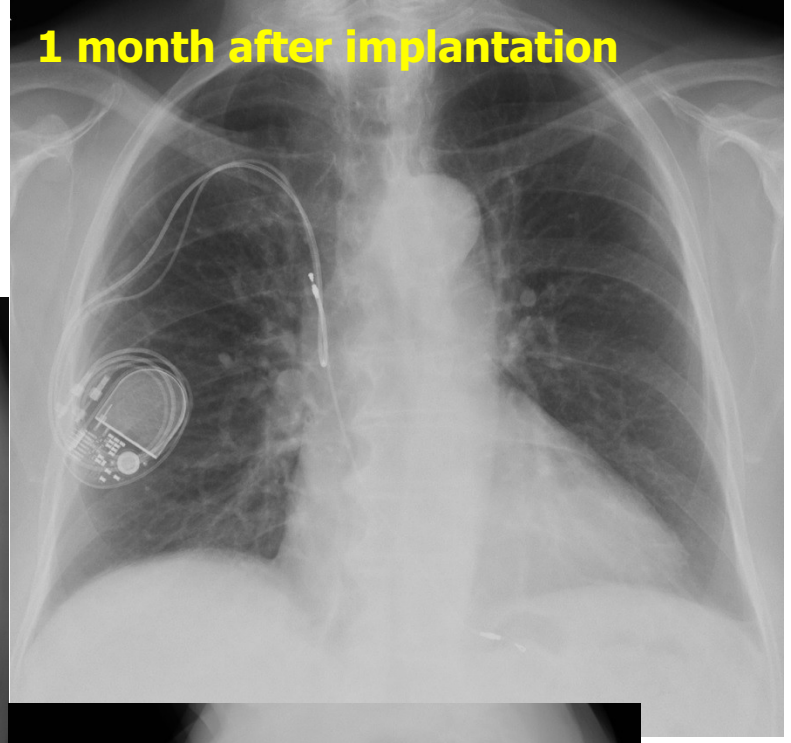
Complications of pacemaker/ICD electrodes

Dislocation



Immediately after implantation





1 month after implantation

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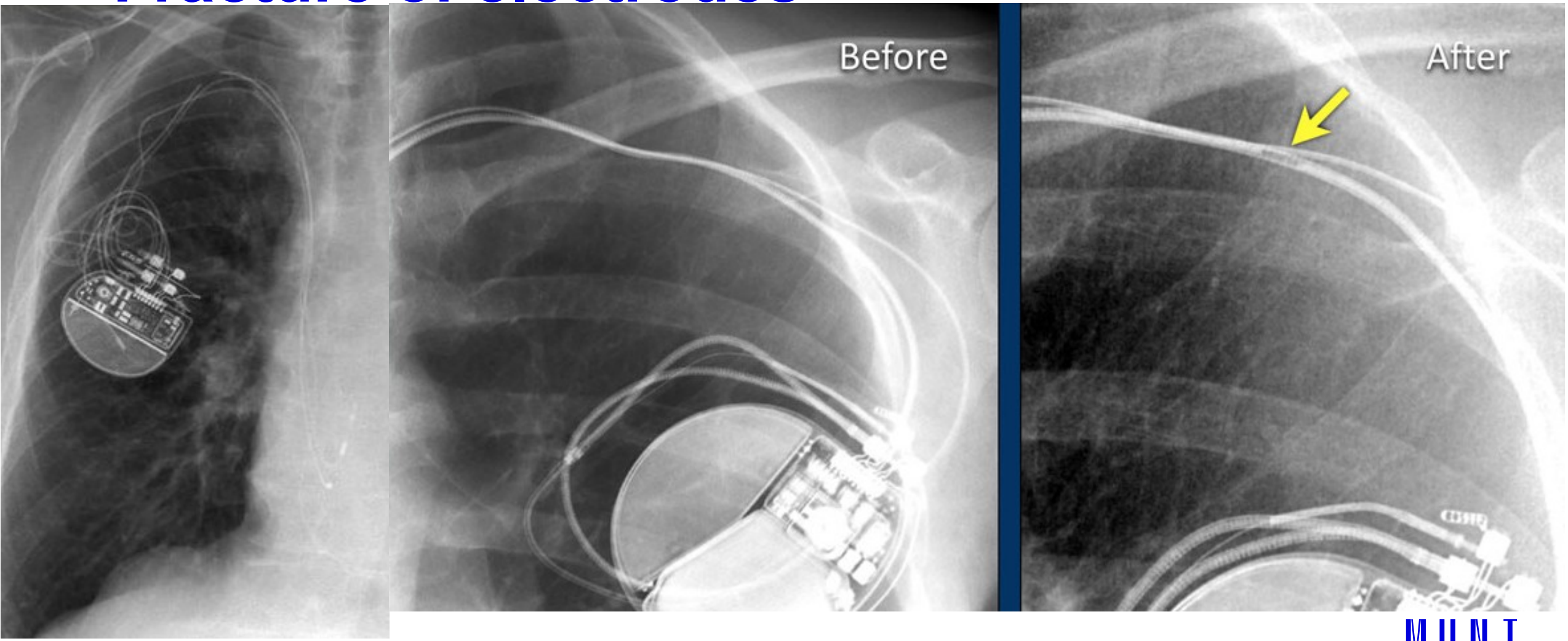
Fracture of electrodes



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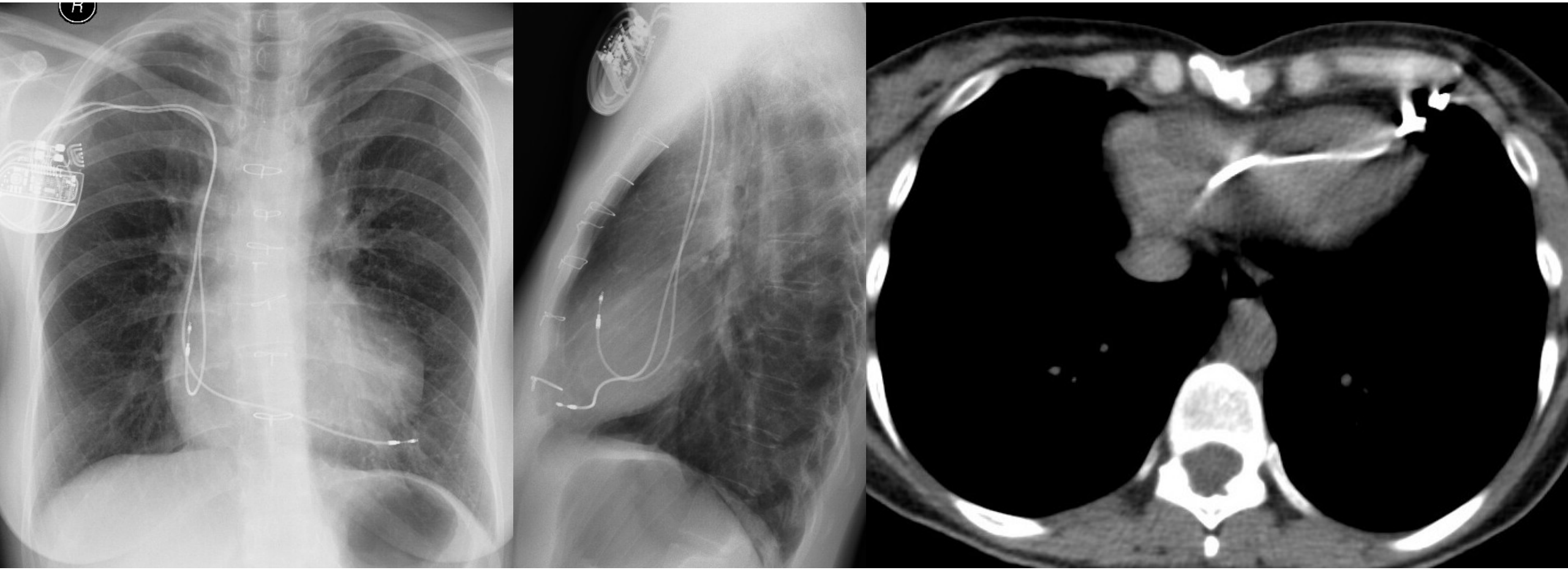
Perforation of right ventricle



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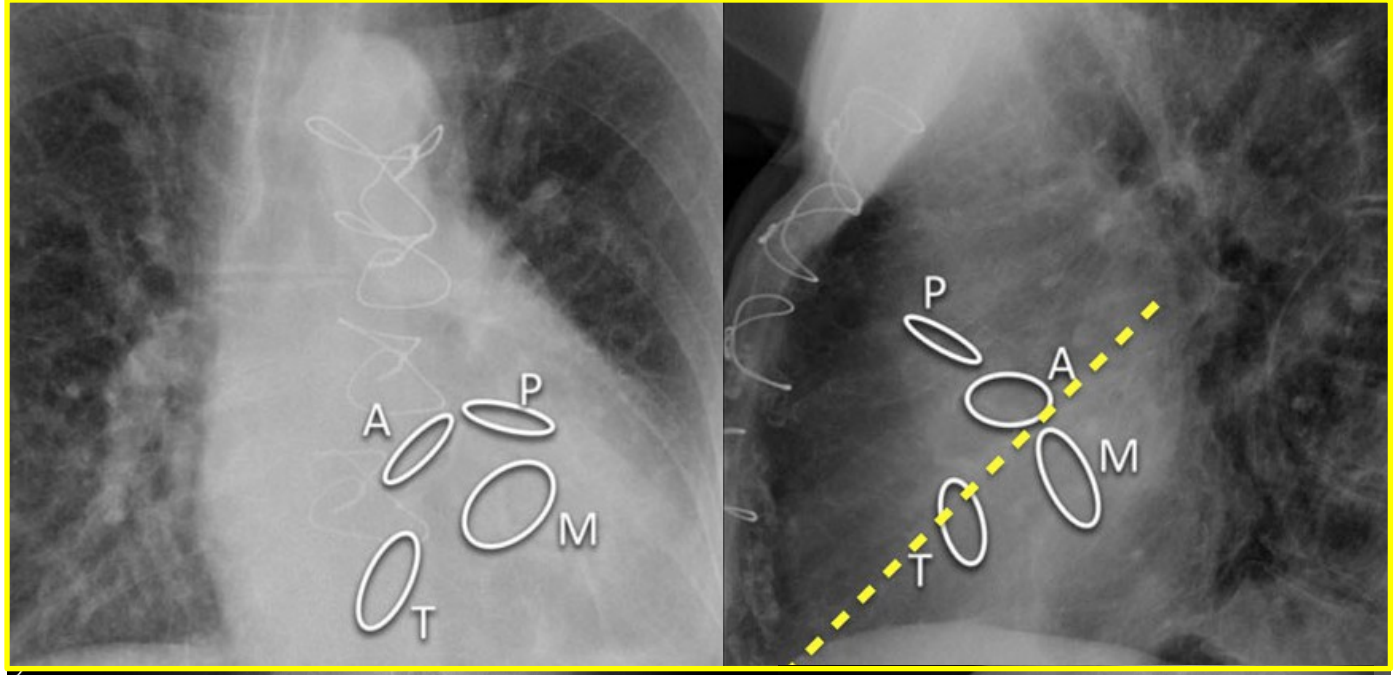
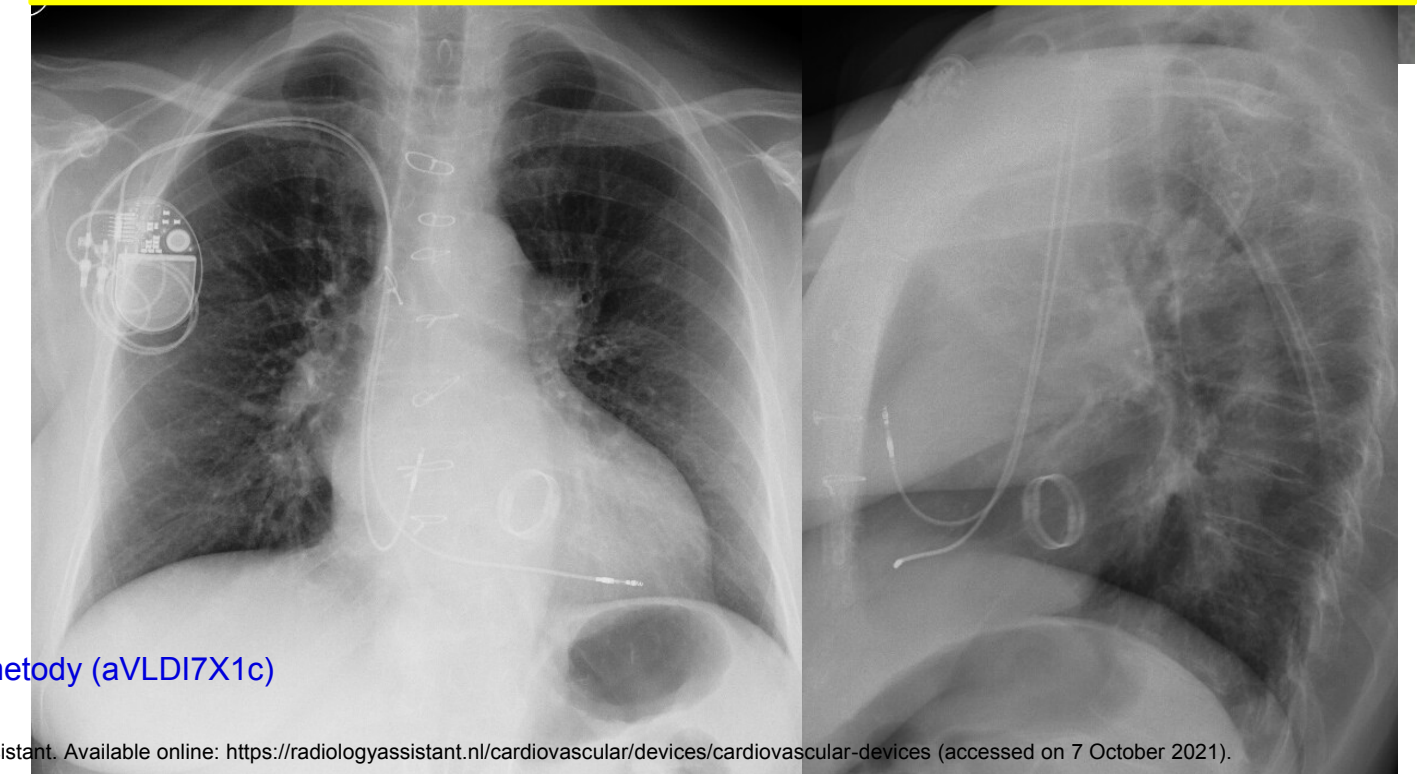
Prosthetic heart valves





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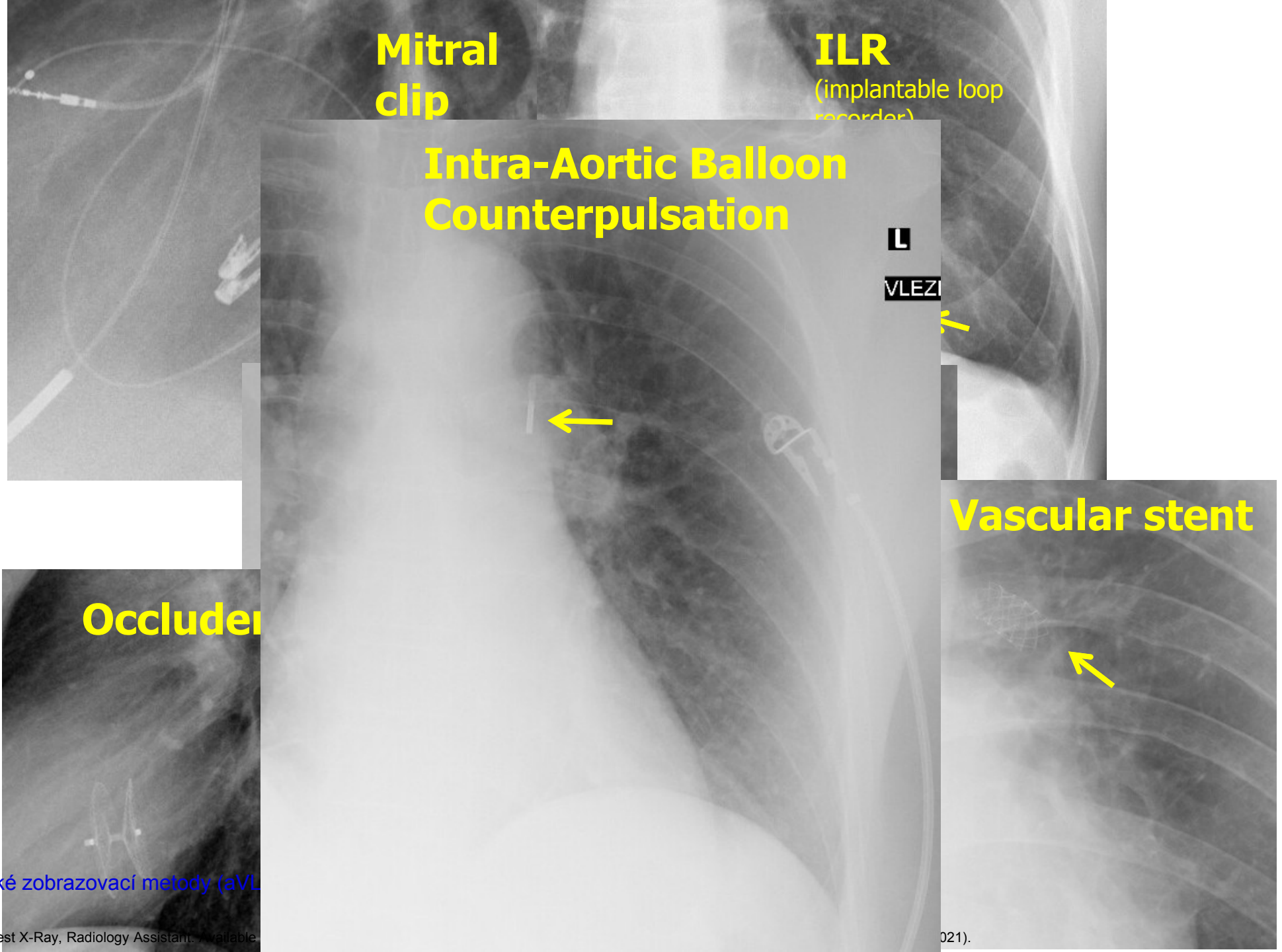
Other cardiovascular devices on X-ray



Cardiovascular devices on Chest X-Ray, Radiology Assistant. Available

021).

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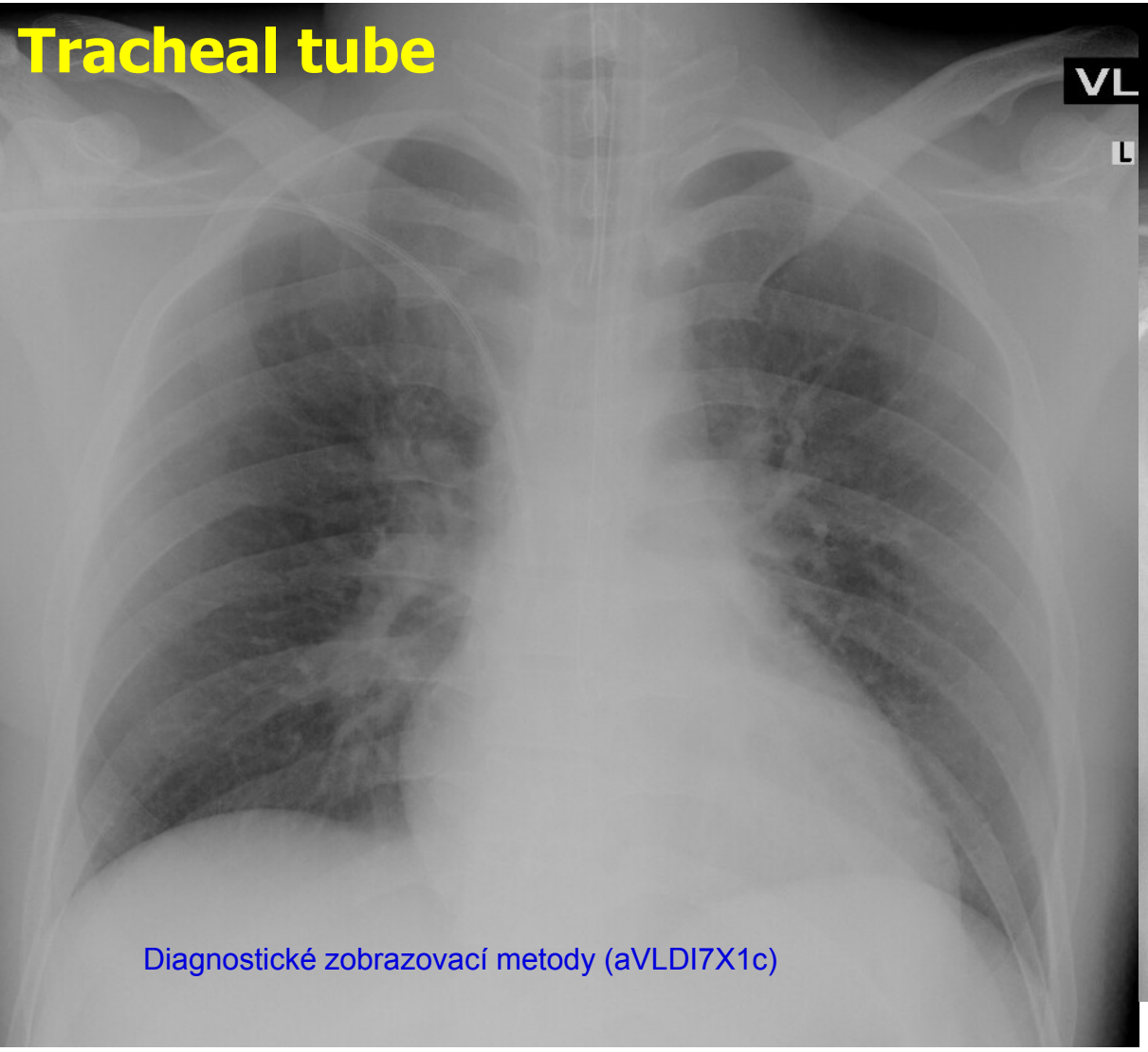
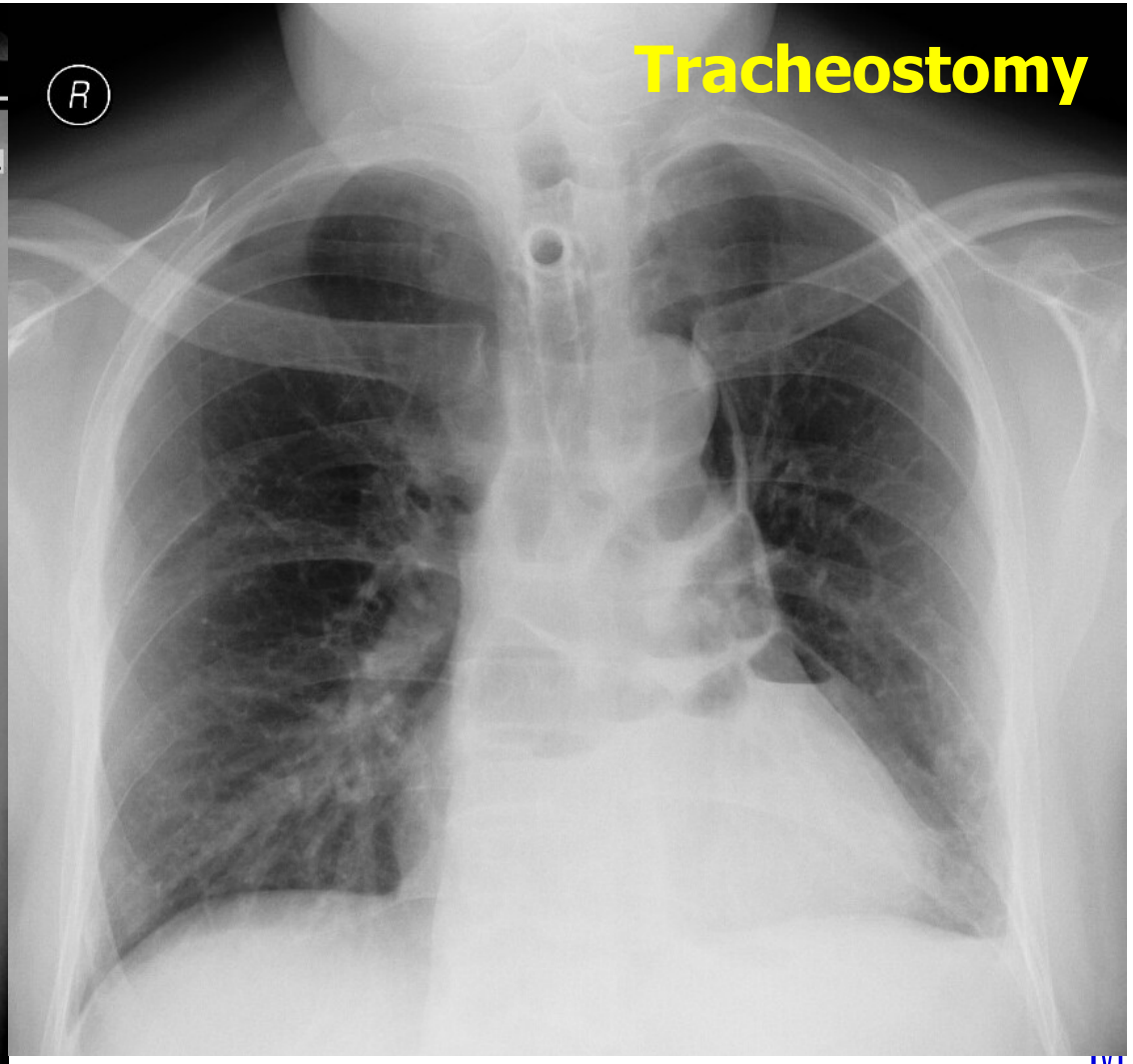
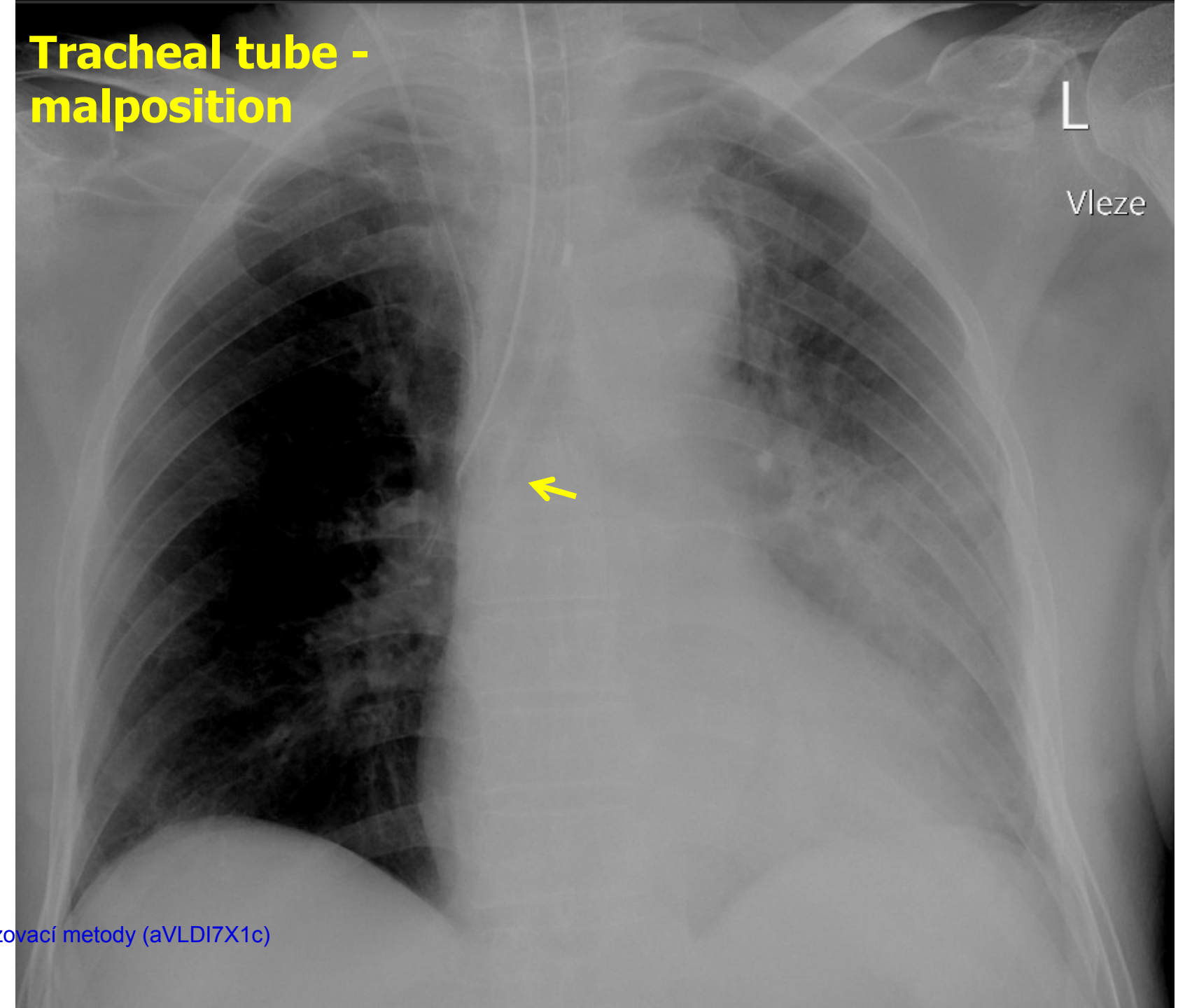
Correct position





Tracheal tube - malposition



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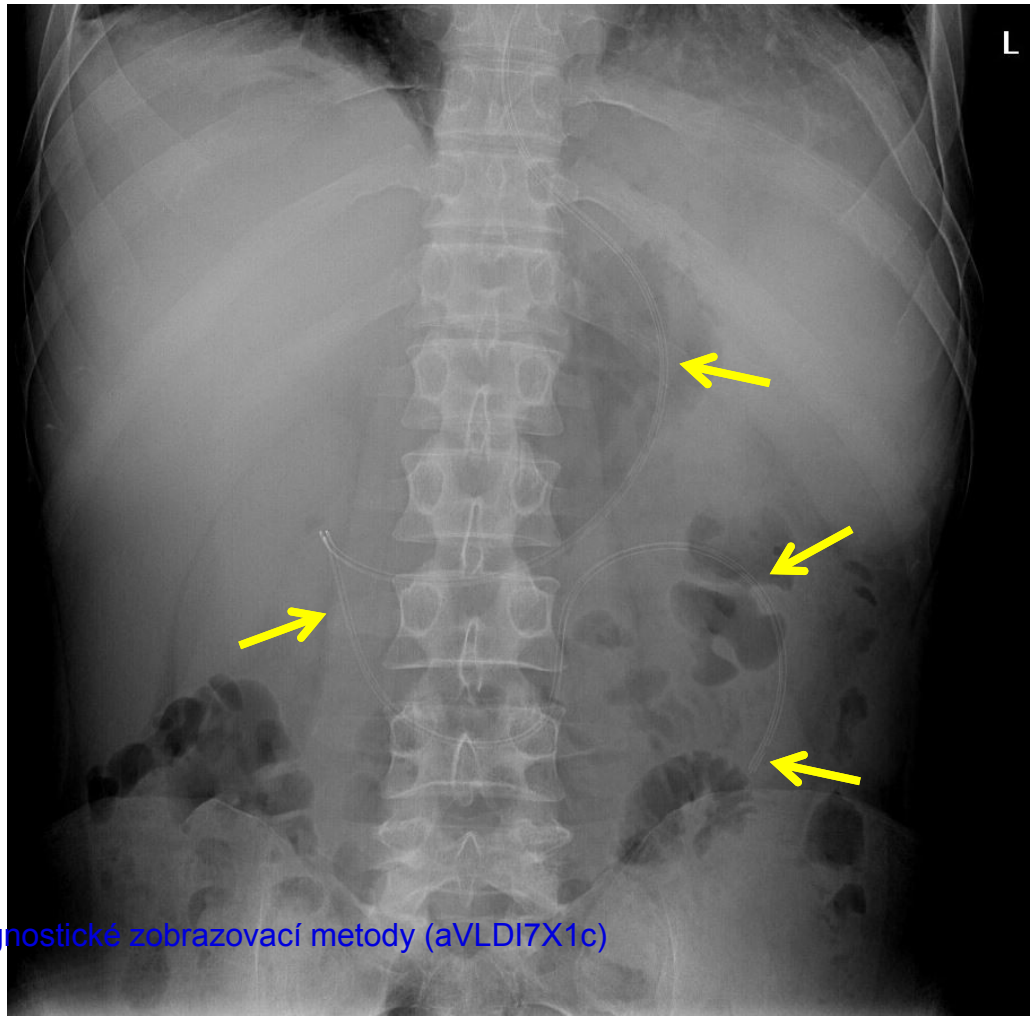
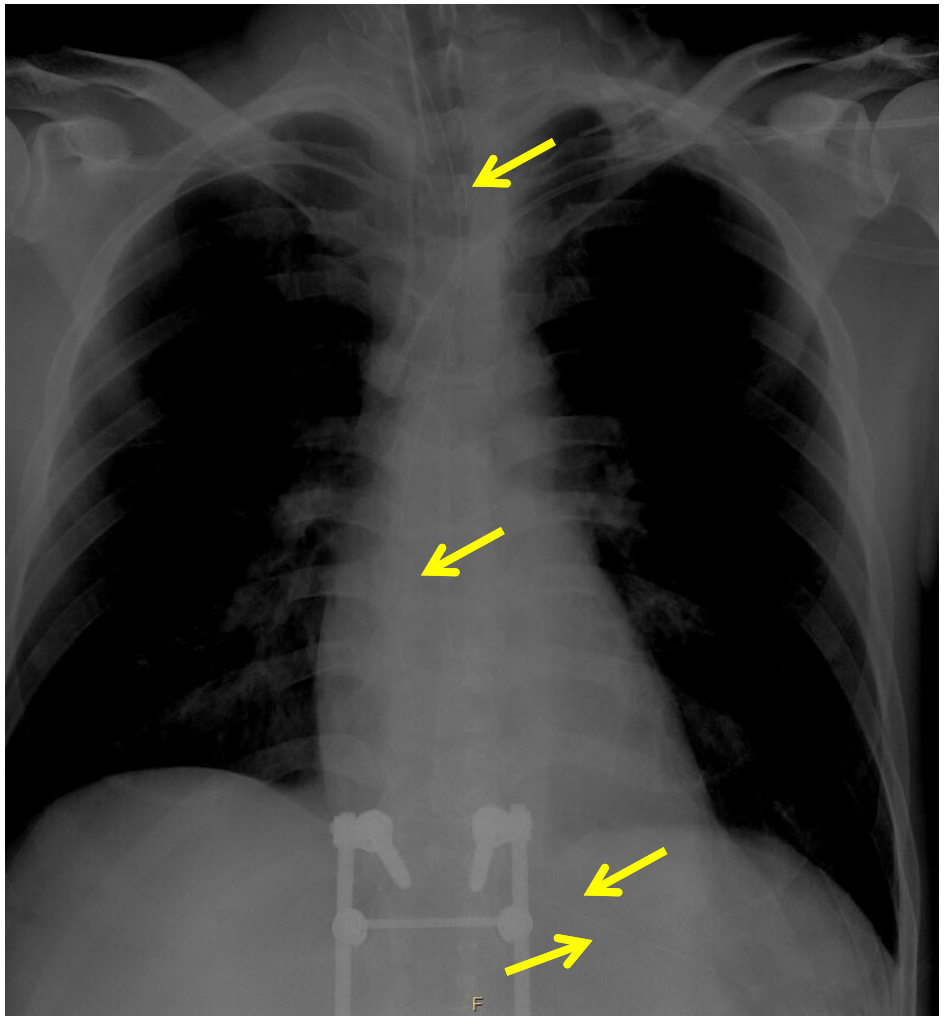
Nazogastric and nazojejunal tube – correct position





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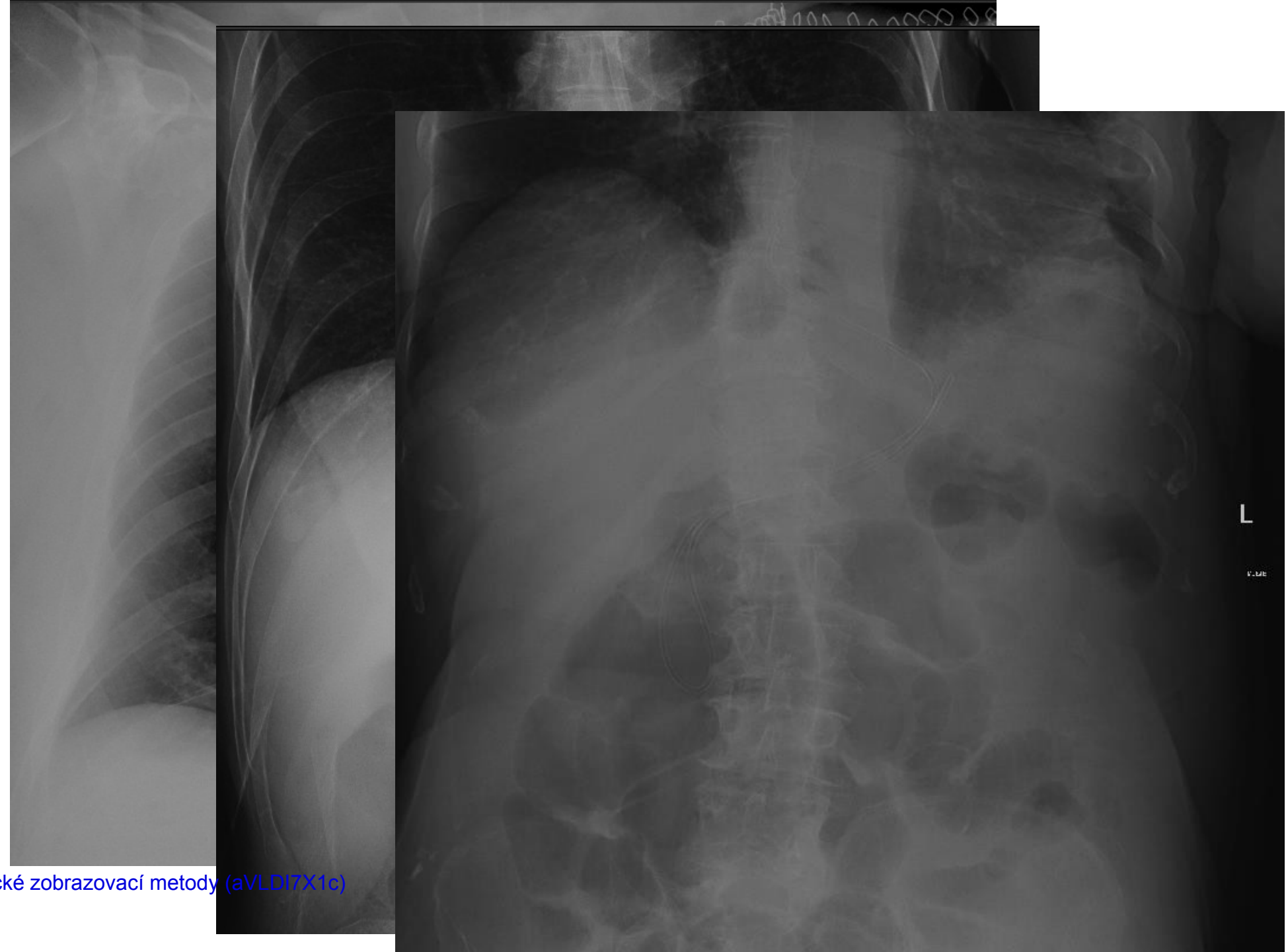
Nasogastric or nasojejunal tubes - malposition



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Take home message

- The importance of X-ray in assessing the position and complications of catheters and tubes
- Optimal position of central venous catheters

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