

The Role of CT-Guided Optimal Fluoroscopic Projection Angle to Guide Stenting of Occluded Pulmonary Arteries

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AUTHORS' CONTRIBUTIONS

Yao Mi and Mingwang Ding are responsible for writing, while Cao Yunshan is in charge of review and proofreading.

DISCLOSURES

No potential conflict of interest was disclosed.

HUMAN AND ANIMAL RIGHTS

No human or animal experiments were conducted in this study.

CONSENT

Patient information has been removed to ensure privacy protection.

ABSTRACT

We report the case of a 71-year-old woman with pulmonary artery occlusion due to fibrosing mediastinitis who successfully underwent computed tomographic optimal fluoroscopic projection angle-guided stenting of the pulmonary artery.

CASE REPORT

BACKGROUND

Treatment of pulmonary artery occlusion due to fibrosing mediastinitis can be challenging, particularly without optimal fluoroscopic projection angle guidance, it is difficult for the guidewire to pass through the occluded pulmonary artery and may increase the risk of perforating the vessel.

CASE REPORT

A 71-year-old woman had exertional dyspnea 3 years. Computed tomographic pulmonary angiography (CTPA) showed localized stenosis due to proliferative fibrotic tissues compressing pulmonary artery (PA) and pulmonary vein (Figure 2A), confirming the diagnosis of fibrosing mediastinitis (FM). The patient's preoperative CTPA showed stenosis of the left lower pulmonary artery trunk and severe stenosis of the left pulmonary artery (A10). First, perform MIP (Maximum Intensity Projection) processing on the image. On the axial plane, locate the target vessel (move the vertical and horizontal cross-reference lines to the center of the target vessel), ensuring

that the vertical reference line remains aligned with the midpoint of the pulmonary artery in both the coronal and sagittal planes. Next, adjust the reference line in the axial plane so that it follows the central longitudinal axis of the target vessel. The coronal plane will then display either a left anterior oblique (LAO) or right anterior oblique (RAO) angle (Fig. 1A), which corresponds to the C-arm rotation along the left-right axis of the patient. Similarly, adjust the reference line in the sagittal plane to align with the central longitudinal axis of the target vessel. The coronal plane will then display either a cranial (CRA) or caudal (CAU) angle (Figure 1B), corresponding to the C-arm tilt along the head-foot axis of the patient. The final angle displayed in the coronal plane represents the optimal projection angle for imaging (Figure 1C). After multidisciplinary group discussions, the patient accepted the diagnosis and treatment plan of PA stent implantation.

The optimal fluoroscopic projection angle was right anterior oblique (RAO) 5°, caudal (CAU) 20° determined by CTPA (Figure 2B). Selective pulmonary artery arteriography with RAO 5°, CAU 20° showed stenosis of the left lower pulmonary artery trunk and occlusion of the left pulmonary artery (A10)

(Figure 2C). Successful implantation of a 4.5*20mm stent in the left pulmonary artery (A10) and 8*27mm stent in the left lower pulmonary artery trunk (Figure 2D). The postoperative course was uneventful, and the patient was discharged.

DISCUSSION

FM is a rare condition and characterized by proliferative fibrotic tissues compressing pulmonary artery, bronchus and/or pulmonary vein [1]. Pulmonary angioplasty is a valuable treatment for FM-induced stenosis and occlusion of the pulmonary arteries [2]. The complex course of pulmonary arteries increases the difficulty of pulmonary angiography [3]. When the lesion is located at the ostium of a branch artery with a steep takeoff angle from the main artery, it may lead to suboptimal contrast filling. In such cases, CTPA can serve as an important supplementary imaging modality.

TEACHING POINT

This case shows that CTPA is a convenient and accurate way to diagnose pulmonary artery stenosis, and the optimal fluoroscopic projection angle determined from preoperative CTPA improves procedural efficiency and reduces equipment consumption and radiation exposure, and may be important for guiding interventional treatment of pulmonary artery stenosis or occlusion.

QUESTIONS

Question: The difficulty of CT pulmonary angiography in fibrosing mediastinitis?

1. Distorted pulmonary vasculature due to fibrous compression, leading to abnormal vessel course, stenosis, or occlusion.
2. False positives or false negatives.
3. The CT imaging strategy needs to be optimized.

Explanation:

1. Impaired contrast filling in narrowed arteries, reducing image quality. Collateral vessel proliferation (e.g., dilated bronchial arteries) mimicking pulmonary branches.
2. False positives: Fibrotic tissue may mimic thrombi (requires enhancement pattern analysis). False negatives: Severe stenosis with poor contrast opacification can be missed. Overlapping complications (e.g., pulmonary venous stenosis, bronchial compression) requiring multiplanar reconstruction (MPR).
3. Scan protocol: High-resolution CT ($\leq 1\text{mm}$ slices) with ECG gating; tailored contrast timing. Post-processing: MPR, maximum intensity projection (MIP), and volume rendering (VR) to assess stenosis extent.

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FIGURES

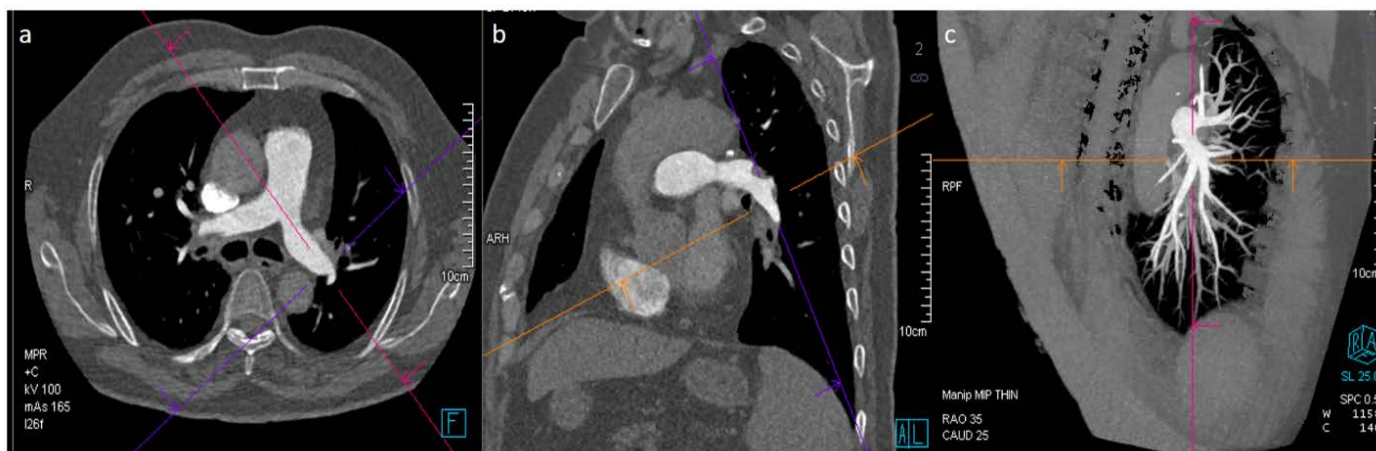


Figure 1: **A:** On the axial plane, the target vessel was identified, and the cross-reference lines were adjusted to align with the vessel's central longitudinal axis. **B:** On the sagittal plane, the cross-reference lines were positioned at the center of the target vessel and aligned along its central longitudinal axis. **C:** The coronal MIP image demonstrates optimal visualization of the target vessel, displaying maximal diameter and length. The optimal projection angle is indicated in the lower-left corner (LAO: left anterior oblique, RAO: right anterior oblique, CRAN: cranial, CAUD: caudal).

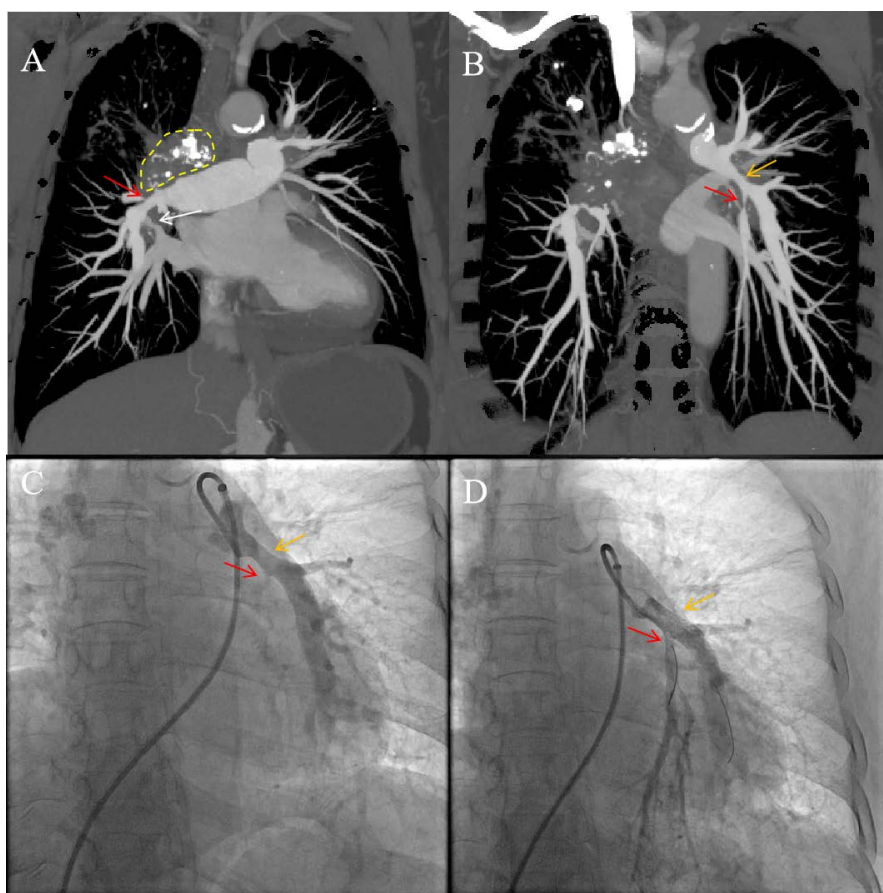


Figure 2: Enhanced computed tomography showed stenosis of pulmonary artery (red arrow) and pulmonary vein (white arrow) compressed by proliferative fibrotic tissues (yellow dots) in mediastinum (A). preoperative CTPA showed stenosis of the left lower pulmonary artery trunk (orange arrow) and severe stenosis of the left pulmonary artery (red arrow) (B). Selective pulmonary artery arteriography showed stenosis of the left lower pulmonary artery trunk (orange arrow) and severe stenosis of the left pulmonary artery (red arrow) (C). Selective pulmonary artery arteriography showed stenting in the left lower pulmonary artery trunk (orange arrow) and left pulmonary artery (red arrow) (D).

KEYWORDS

computed tomography imaging; Pulmonary vascular intervention; fibrosing mediastinitis; pulmonary artery; Digital subtraction pulmonary angiography

ABBREVIATIONS

CTPA = COMPUTED TOMOGRAPHIC PULMONARY ANGIOGRAPHY

PA = PULMONARY ARTERY

FM = FIBROSING MEDIASTITIS

MIP = MAXIMUM INTENSITY PROJECTION

LAO = LEFT ANTERIOR OBLIQUE

RAO = RIGHT ANTERIOR OBLIQUE

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