CT-guided Methylene Blue Labeling to Locate a Pulmonary Nodule Before Thoracoscopic Resection

Instilación de azul de metileno guiado por tomografía axial computarizada para localizar y resecar mediante toracoscopia un nódulo pulmonar

Introduction

Video-assisted thoracoscopy is a minimally invasive procedure that is routinely used for the resection of pulmonary nodules in pediatric surgery. However, its use may be limited in the case of small lesions (less than 1 cm) or those located deep within the lung parenchyma with no pleural contact. Thoracoscopic instruments do not have the tactile sensation of a surgeon’s hand, so preoperative marking of the lesion with radiologic techniques is necessary for proper resection.1,2

We present a case in which the combined use of radiological techniques and marking of the lesion with methylene blue provided direct visualization of a nodule, which resulted in successful resection with video-assisted thoracoscopy.

Case Report

The patient was a 12-year-old boy with a history of right nephrectomy due to spindle cell sarcoma in 2007. In 2008, a spinal metastasis required arthrodectomy of T9. A follow-up PET-CT in 2009 revealed a posterior-basal lesion with high uptake in the right lower lobe suggestive of pulmonary metastasis.

Due to its peripheral location and because it was not in close contact with the pleura (3 mm deep), as well as its small diameter (7 mm), we decided to mark the nodule using

![Fig. 1 - (A) Localization of the lesion with computed tomography; (B) CT-guided needle puncture.](image-url)

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computer tomography (CT) guidance (Fig. 1). In the radiology
room, under general anesthesia and using face masks, a
needle puncture was performed through the 5th intercostal
space, guided by CT, and methylene blue was injected (0.1 ml)
(Fig. 2).

Afterwards, the patient was transferred to the operating
room to begin surgery as soon as possible in order to prevent
the diffusion of the injected methylene blue. We proceeded
with the selective intubation of the left main bronchus with a
flexible bronchoscope, positioning the child in the left lateral
decubitus position to start thoroscopic resection. Three
triangled ports (two 5-mm and one 12-mm) were inserted
and, with a 30° camera and ENDOGIA, a wedge measuring
3 cm × 3 cm × 3 cm was resected, including the nodule with
healthy margins. Direct visualization of the punctured area
that had been stained blue allowed us to locate the nodule and
remove it with safety margins. At the end of the operation, the
CO2 was extracted and a chest tube was not required.

During the post-op period, pain was controlled with oral
analgesia. Follow-up chest radiography showed no residual
pneumothorax, and the patient was discharged 12 h after
surgery.

The pathology study of the surgical specimen revealed that
it was a pulmonary metastasis of the renal spindle cell
sarcoma.

**Conclusion**

Video-assisted thoroscopic surgery (VATS) is currently the
approach of choice for the resection of peripheral single lung
nodules for both diagnostic and therapeutic purposes. The
combined use of radiological techniques for marking small
nodules with no pleural contact allows for adequate visuali-
sation of the area to resect, while resolving the limitations of
thoroscopic resection.1,4

The puncture is performed in the intercostal space, close to
the upper edge of the rib to avoid injury to the intercostal nerve
bundle. With CT guidance, the needle or harpoon is positioned
in the exact area of the lesion and a small amount of
methylene blue is injected. CT-guided tumor marking is a
simple and safe procedure that can be performed in the radiology
room, after which the patient is transferred to

the operating room. It always requires general anesthesia, and
its most common complication is pneumothorax.5,6 The main
drawback of this technique is the fast, high rate of diffusion
of methylene blue. It may be helpful to dilute it with autologous
blood from the patient and inject the minimum amount
required; the surgery should be performed immediately
within the hour, if possible.7

The advantages of this minimally invasive surgery versus
traditional thoracotomy are: less postoperative pain, better
recovery of lung function, lower systemic inflammatory
response, shorter hospital stay, better esthetic results and
less thoracic deformity with the growth of the child. The
difficulties and limitations of thoracoscopy can be resolved
with the support of radiological localization and marking
procedures of small, deep nodules.8–10

During the procedure, the radiologist, anesthesitist and
pediatric surgeon should work as a perfectly coordinated
team.

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