

C-arm fluoroscopic cone-beam CT for guidance of chemical thoracic sympathectomy

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To the Editor:

Nerve blocks using neurolytic agents (e.g., ethanol, phenol) in deep tissues have been performed under fluoroscopic or conventional computed tomography (CT) guidance. The recent development of C-arm fluoroscopic cone-beam CT, however, has made it possible to perform both real-time procedural evaluation (C-arm fluoroscopy) and three-dimensional (3D) image acquisition (cone-beam CT) in the same room without having to move the patient [1–3].

We performed thoracic sympathectomy using ethanol in a 46-year-old female patient with complex regional pain syndrome in the right arm, after careful evaluation of the indications [4]. She suffered from spontaneous burning pain with a mean pain intensity of 7 on a numerical rating scale (PI-NRS; 0 = no pain, 10 = worst pain imaginable). With the patient in the prone position, we introduced two 10-cm, 21-gauge needles along the right lateral sides of the T2 and T3 vertebral bodies under fluoroscopic guidance (Fig. 1a, b) using DynaCT (Siemens Medical Solutions, Forchheim, Germany), and then injected 1 ml iopamidol, a radiopaque contrast medium, dissolved in 1 ml 2% lidocaine. Under technical support

from a radiologic technologist, CT and 3D images were constructed. We verified proper needle positioning and proper spread of the medium during and just after injection (Fig. 1c–h), and then confirmed that there were no signs of intercostal nerve block or Horner's syndrome. Finally, 1.5 ml ethanol was injected through each needle. The total duration of this procedure was 40 min, including 5 min for constructing CT and 3D images. The patient's PI-NRS decreased to 3 within 1 month after sympathectomy and has remained stable at 3 or 4 for at least 3 months. No adverse effects of the procedure were observed.

Although a case of lumbar sympathectomy under C-arm fluoroscopic cone-beam CT has been reported [1], the usefulness of this technique for thoracic sympathectomy has not. Chemical thoracic sympathectomy can cause complications, including pneumothorax, intercostal neuritis, Horner's syndrome, and bradycardia [5], if the needles penetrate the pleura or the neurolytic agent spreads to the somatic roots or the lateral side of the T1, T4, or T5 vertebrae. C-arm fluoroscopic cone-beam CT provides information about both the spread of contrast media and the positional relationship between needles and bones before injection of the neurolytic agent, in addition to information from fluoroscopy alone. This technique could therefore be effective for preventing all these complications, except pneumothorax, as the needles might already penetrate the pleura before CT and 3D images are constructed.

Although this technique needs 5–10 min for constructing CT and 3D images, in addition to the time required for nerve block under conventional fluoroscopic guidance, it could be useful in preventing the complications of nerve blocks, especially those using neurolytic injections in deep tissues, e.g., lumbar or thoracic sympathectomy, celiac

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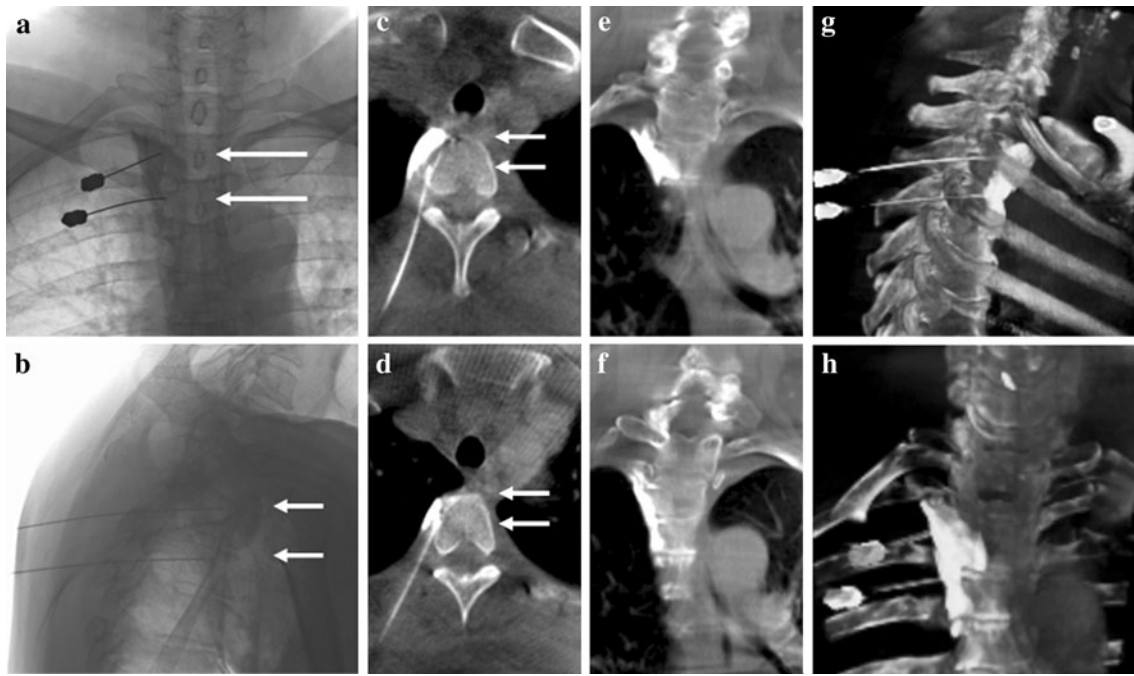


Fig. 1 Fluoroscopic images from C-arm fluoroscopic cone-beam computed tomography (CT) in a patient undergoing chemical thoracic sympathectomy (**a**, **b**). Transverse images (**c**, **d**) and coronal images (**e**, **f**) from cone-beam CT are shown. *Arrows* in **a** and **b** indicate levels of **c** and **d**, and those in **c** and **d** indicate levels of **e** and **f**. **g**,

h 3D images from cone-beam CT. CT images show that a part of the contrast medium spread to the paraspinal gutter (**c**), contacting the parietal pleura (**e**, **f**), although the tips of the two needles contacted the vertebral bodies properly (**c**, **d**). 3D images show that contrast medium did not spread to the intercostal nerves (**g**, **h**)

plexus block, splanchnic nerve block, inferior mesenteric plexus block, and superior hypogastric plexus block.

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