



# Soft-Tip Stylet and Saline Instillation Technique: Making Difficult Percutaneous CT-Guided Biopsies Possible

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## Abstract

Finding a safe needle path during percutaneous computed tomography-guided biopsy is sometimes difficult due to concern for injuring a vital structure. Saline instillation technique has been used to displace the structure out of the way. Another useful tool is a soft-tip stylet. A soft-tip also referred as blunt-tip stylet for the introducer cannula is provided with some coaxial biopsy sets in addition to standard sharp-tip stylet. While the sharp-tip stylet is fitted with introducer cannula for piercing skin, muscle, and fascia, a soft-tip stylet may be used for avoiding injury to structures like vessels and bowel loops especially while advancing introducer cannula through fatty tissue. Additionally, it is also useful for avoiding injury to nerves and giving pleural anesthesia. Although its use has been described in medical literature, many radiologists are still not utilizing this tool to its full potential. In this educational exhibit, various applications of soft-tip stylet and saline instillation technique have been depicted using representative cases.

## Keywords

- ▶ percutaneous CT-guided biopsy
- ▶ saline instillation technique
- ▶ soft-tip stylet

## Background

Percutaneous computed tomography (CT)-guided needle biopsy is an established technique for obtaining tissue sample from deep-seated lesions. However, sometimes it is difficult to find a safe needle path due to concern for injuring a vital structure. Many techniques like saline instillation technique or changing patient's position have been used to displace vital structures out of needle path.<sup>1–4</sup> A soft-tip also referred to as blunt-tip stylet for the introducer cannula is provided with some coaxial biopsy sets in addition to standard sharp-tip stylet. Although its use has been described in medical literature, many radiologists are still not utilizing this tool to its full potential.<sup>5</sup> The combination of saline instillation and use of soft-tip stylet further increased safety of the procedure.

While using a sharp-tip stylet, it is important to create a wider saline window for safely advancing the needle without injuring adjacent structures. With a soft-tip stylet, usually a small amount of saline instillation is enough to dissect the fascial plane and displace any membranous structures, and this makes enough room for advancing the introducer cannula. Many a times, even saline instillation is not needed if introducer cannula along with soft-tip stylet is sliding smoothly without transgressing the anatomical structures.

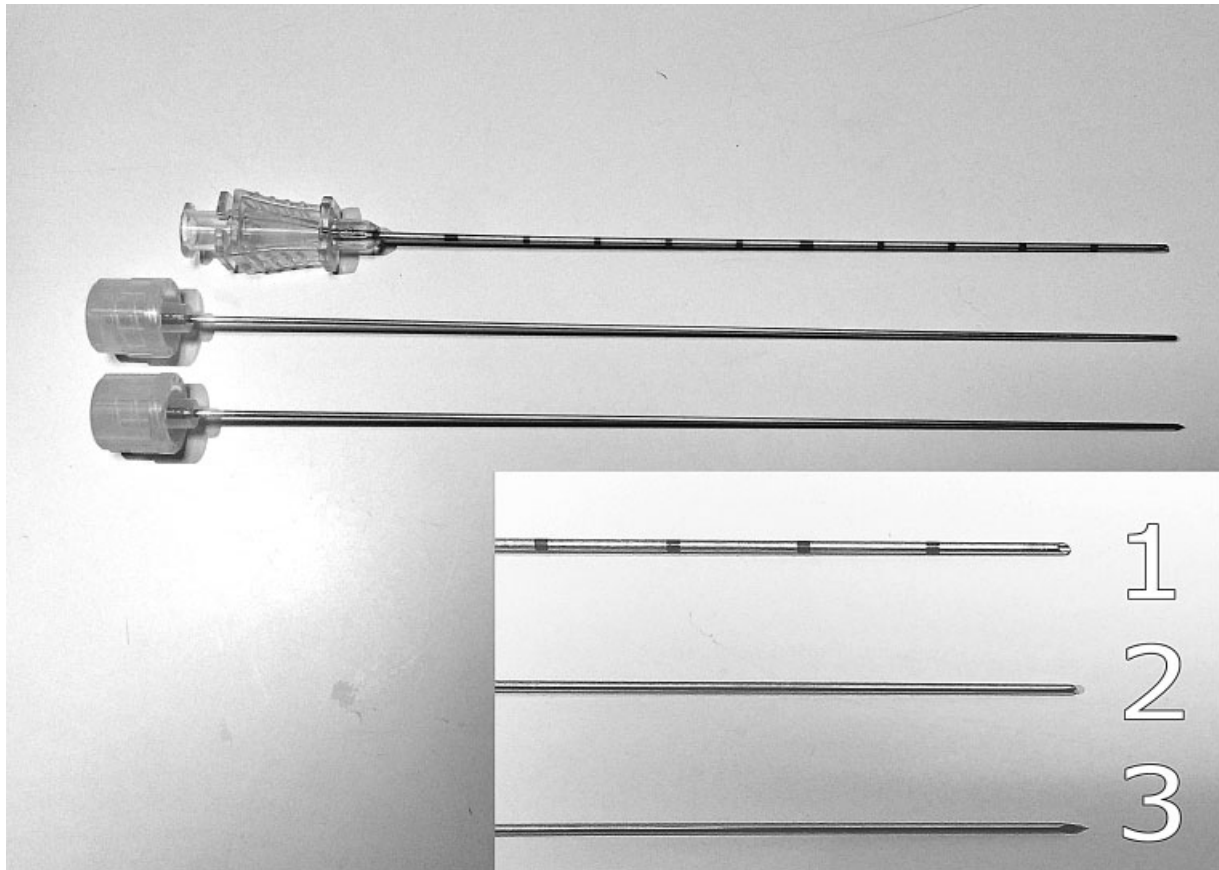
## Illustrative Cases

In all representative cases shown in this exhibit, percutaneous CT-guided biopsies were performed using an 18- or 20-gauge coaxial biopsy set (Bard Mission Core Biopsy Instrument, BARD, Arizona, United States) (▶ Fig. 1). While a sharp-tip stylet is fitted with introducer cannula for piercing skin, muscle, and

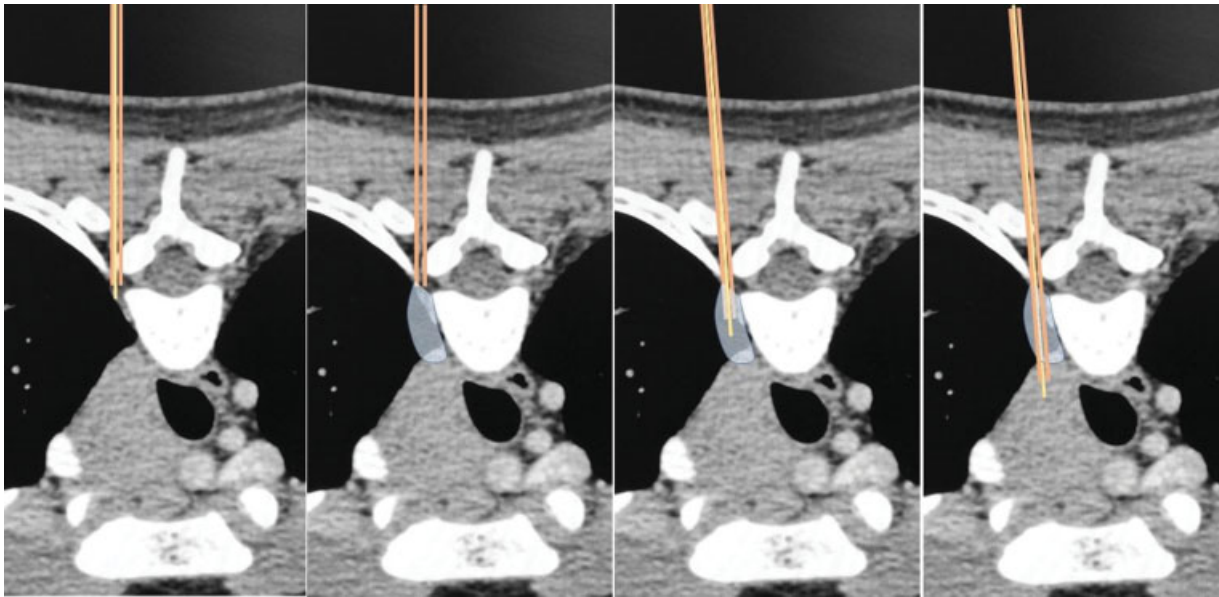
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**Fig. 1** Introducer cannula (1) of coaxial biopsy set with a soft-tip or blunt-tip stylet (2) and a sharp-tip stylet (3).



**Fig. 2** Illustrating the technique (same case as shown in ► **Fig. 6**). Initially the outer cannula is advanced in the paravertebral location. While crossing the chest wall a sharp-tip stylet is used; however, when the needle reaches close to the lung it is exchanged with soft-tip stylet for safety. Saline instillation is done to push the lung away and create a window. While advancing needle toward the lesion, again a soft-tip stylet is used as it will not pierce the pleura. Finally, when outer cannula reaches the lesion margin, then a sharp-tip stylet can be used to get into the lesion.

fascia, a soft-tip stylet may be used for avoiding injury to structures like lung, vessels, and bowel loops especially while advancing cannula through fatty tissue or between fascial planes (► **Fig. 2**). The soft-tip stylet tends to displace the vital

structures or slide over them rather than injuring them. Important applications of soft-tip stylet have been described below, and in some cases used in combination with saline instillation.



**Fig. 3** (A) Lytic destruction of cervical vertebra with associated soft tissue mass, biopsy was performed from an anterior approach. (B) Soft-tip stylet used to avoid injury to carotid artery and esophagus. (C) Final cannula position in the lesion.

**Neck region:** A soft-tip stylet can be used to insert cannula close to the thyroid gland, pharynx, esophagus, and neck vessels (►Fig. 3).

**Mediastinum (anterior parasternal approach):** A soft-tip stylet is helpful to slide the introducer cannula close to the ascending aorta, internal mammary arteries, pulmonary artery, and pleura (►Figs. 4 and 5).

**Mediastinum (posterior paravertebral approach):** A soft-tip stylet helps to avoid injury to the spinal nerve roots, descending aorta, esophagus, lung, and azygos vein (►Fig. 6).

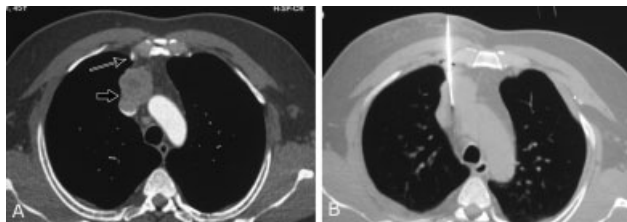
**Abdomen:** A soft-tip stylet is used to slide introducer cannula over the kidney, liver, splenic capsule, and displacing the ureters or bowel loops (►Figs. 7, 8, 9). It is also used for avoiding injury to mesenteric, splenic, epigastric, and iliac arteries (►Fig. 10). The soft-tip stylet has also been used as a lever to displace a structure manually especially the bowel loops.<sup>1</sup>

**Retroperitoneum (posterior approach):** A soft-tip stylet is used to slip close to the kidney capsule, ureter, colon, vertebra, or spinal nerves. Similarly, it can be used to avoid injury to the inferior vena cava (►Figs. 11 and 12).

**Pelvis:** A soft-tip stylet is used to avoid injury to the iliopsoas muscle, iliac vessels, ureter, colon, and urinary bladder (►Fig. 13).

#### Other Uses

During vertebral or paravertebral biopsies, often the needle path runs close to exiting nerve, again a soft-tip stylet may



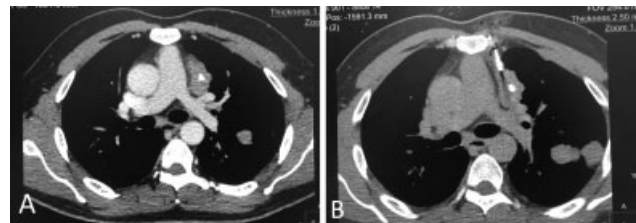
**Fig. 4** (A) Internal mammary artery (thin arrow) is coming in the needle path while choosing right parasternal approach for the biopsy of prevascular nodal mass (thick arrow). (B) Soft-tip stylet was used to avoid injury to the lung and internal mammary artery. Final cannula position in the lesion.

help push the nerve aside while advancing the introducer cannula (►Fig. 14). It is also useful for slipping introducer cannula close to bones without injuring periosteum which is a pain-sensitive structure.

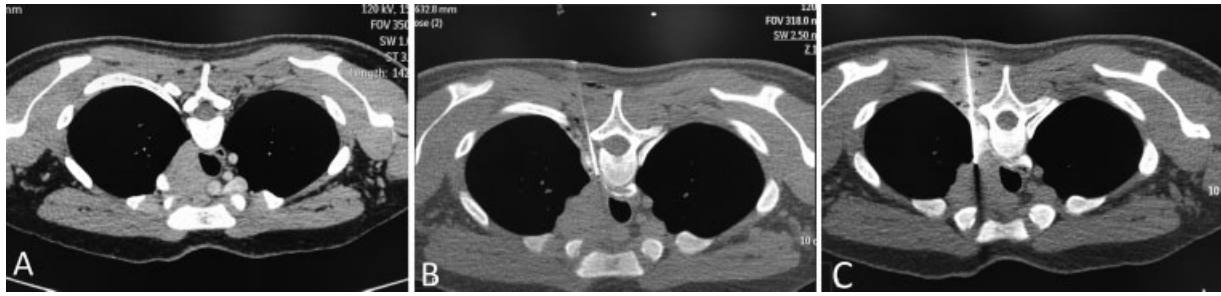
During lung biopsies, giving local anesthesia to the pleura is important as it is a pain-sensitive structure. Pleural anesthesia is even more important during targeting small lung nodules, as these patients need to hold the breath at the time of advancing the needle into the lung; however, if the pleura is not anesthetized, the sharp pain of pleural puncture may cause movement or improper breath holding. Anesthetizing the pleura makes insertion of needle pain-free from chest wall into the lung. While manipulating the introducer cannula close to the pleura, soft-tip stylet is safer than sharp-tip stylet which may inadvertently cause pneumothorax (►Fig. 15). A flat-tip bevel of the introducer cannula (►Fig. 1) can also be manipulated close to the pleura safely and intercostal muscles may be pierced by making rotatory motions.

#### Limitations

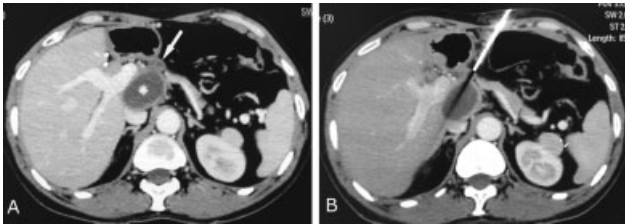
Soft-tip stylet cannot be used to pierce tough structures like the skin, fascia, or muscles. It can distort the anatomy by pushing the anatomical structures rather than sliding over them; however, when used in between the fascial planes in conjunction with saline instillation, usually the introducer cannula slips



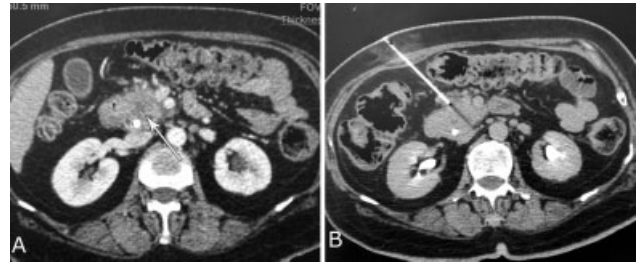
**Fig. 5** (A) Anterior mediastinal mass close to main pulmonary artery is noted. Lung was coming in the biopsy path and main pulmonary artery was also in close proximity. (B) A combination of saline instillation technique and soft-tip was used to target the lesion without injuring the lung and vessels. This was biopsy-proven case of invasive thymoma with pleural metastasis along oblique fissure.



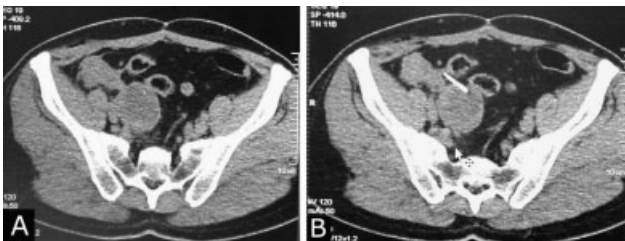
**Fig. 6** (A) Anterior approach was not possible for this right paratracheal node due to superior vena cava. (B) Long posterior paravertebral route was taken. Initially saline instillation was performed to displace the pleura laterally. Initially the needle trajectory was going close to the trachea. (C) Needle was partially withdrawn, redirected, and advanced close to pleura using soft-tip stylet.



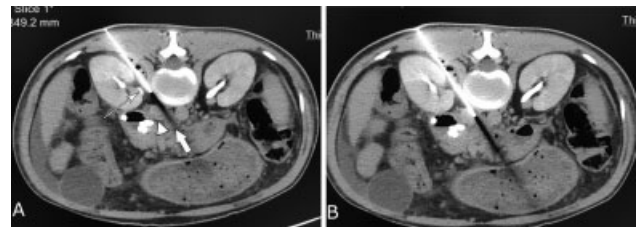
**Fig. 7** (A) Necrotic periportal node (star) developed in a previously operated case of cholangiocarcinoma. Another smaller node (arrow) noted close to the larger node. (B) Soft-tip stylet used to avoid injury to stomach and small perigastric blood vessels.



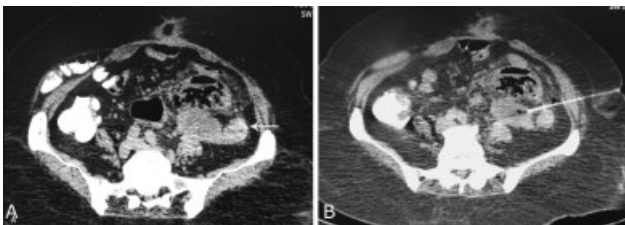
**Fig. 10** (A) Pancreatic head mass (arrow) with common bile duct (CBD) stent in situ. (B) Soft-tip stylet used to avoid injury to mesenteric vessels and bowel loops. Final position of introducer cannula.



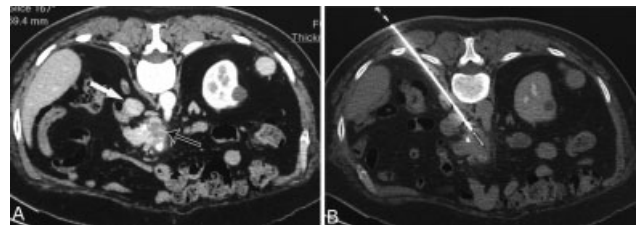
**Fig. 8** (A) Recurrent peritoneal deposit in a case of operated gastrointestinal stromal tumor. (B) Soft-tip stylet was used while advancing introducer cannula close to small bowel loops.



**Fig. 11** In a case of gall bladder carcinoma with enlarged aortocaval lymph node (thick arrow) biopsy was performed to know the nature of the node. (A) Soft-tip stylet was used while advancing cannula near the renal capsule, ureter (thin arrow), vertebra, and inferior vena cava (arrowhead). (B) Final position of introducer cannula.



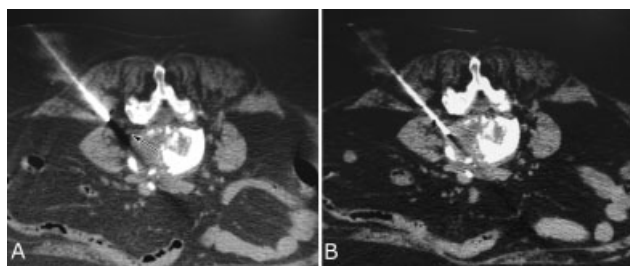
**Fig. 9** (A) Elderly lady presented with a mass medial to descending colon (arrow). No posterior approach was available due to iliac blade. (B) Soft-tip stylet used to cross the narrow window available between large bowel loops.



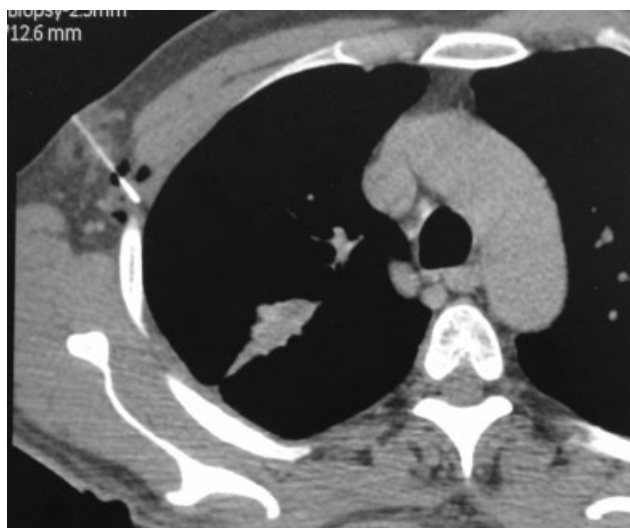
**Fig. 12** (A) Pancreatic uncinate process mass (black arrow) with negative endoscopic ultrasound-guided biopsy. Inferior vena cava (IVC) (white arrow) is coming in the needle path. (B) Soft-tip stylet was used to slip the introducer cannula over the IVC without transgressing it. Final position of cannula with specimen notch of biopsy needle advanced inside the mass.



**Fig. 13** (A) In a follow-up case of carcinoma cervix, a recurrent mass developed involving left lower ureter (ureteric stent in situ). (B) Contrast mixed saline used to displace small bowel loops from needle path. (C) Soft-tip stylet was used to avoid bladder injury while steering the introducer cannula toward main bulk of mass.



**Fig. 14** Lytic lesion of lumbar vertebra in a suspected case of spinal tuberculosis. (A) The exiting nerve (arrow) was coursing close to the needle path. (B) Final position of introducer cannula.



**Fig. 15** Soft-tip stylet used while manipulating introducer cannula close to the pleura. The intercostal muscles were pierced using rotatory movement with the flat tip bevel of the introducer cannula. This helps in giving pleural anesthesia without risk of inadvertent pleural puncture and pneumothorax.

easily over the anatomical structures. Similarly, the soft-tip stylet can be advanced through the fatty tissue while making gentle rotatory movements with little resistance.

## Conclusion

During insertion of introducer cannula for coaxial CT-guided percutaneous biopsy, a soft-tip or blunt-tip stylet can be used for avoiding injury to structures like vessels and bowel loops especially while advancing the cannula through fatty tissue. Additionally, it is also useful for avoiding injury to nerves, muscles, and giving pleural anesthesia. A combination of saline instillation technique with soft-tip stylet further reduces the complications.

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## Conflicts of Interest

There are no conflicts of interest.

## Acknowledgement

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## References

- 1 Goodacre BW, Savage C, Zwischenberger JB, Wittich GR, vanSonnenberg E. Salinoma window technique for mediastinal lymph node biopsy. *Ann Thorac Surg* 2002;74(01):276–277
- 2 Karampekios S, Hatjidakis AA, Drositis J, Gourtsoyiannis N. Artificial paravertebral widening for percutaneous CT-guided adrenal biopsy. *J Comput Assist Tomogr* 1998;22(02):308–310
- 3 Zwischenberger JB, Savage C, Alpard SK, Anderson CM, Marroquin S, Goodacre BW. Mediastinal transthoracic needle and core lymph node biopsy: should it replace mediastinoscopy? *Chest* 2002;121(04):1165–1170
- 4 Gupta S, Seaberg K, Wallace MJ, et al. Imaging-guided percutaneous biopsy of mediastinal lesions: different approaches and anatomic considerations. *Radiographics* 2005;25(03):763–786, discussion 786–788
- 5 de Bazelaire C, Farges C, Mathieu O, et al. Blunt-tip coaxial introducer: a revisited tool for difficult CT-guided biopsy in the chest and abdomen. *AJR Am J Roentgenol* 2009;193(02):W144–8