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Needle slippage from needle hub hardware during ablation

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Dr. Little and his colleagues report successful results for lung tumor microwave ablation. [1] One underappreciated technical pitfall which can be seen with microwave ablation in the lung is needle slippage and stabilization. This may become more relevant with the emergence of microwave and cryoablation needles which often have heavy hubs, hardware and cords exerting forces on the needle, which can change the depth or angle of insertion of the needle when not stabilized by the operator's hand. This may pull the needle off-angle or deeper than desired, and may be more common in compliant lung tissue.

In one patient, while performing microwave ablation of a lung cancer, the microwave needle advanced 2cm further towards the heart, due to the weight of the device and gravity towards the table (Figure 1). A similar phenomenon can also be seen with steep cranio-caudal access for ablations in the liver dome during respiration, with the liver moving along the needle insertion axis (ie- subcostal skin to liver dome). A common simple technique for needle stabilization is propping the needle's handle in position by rolling sterile towels around its hub, however the needle is not absolutely fixed in place. The "stick" feature in cryoablation may also mitigate this pitfall and prevent migration.

Disposable needle guidance and stabilization devices, such as the SeeStar® (AprioMed, Uppsala, Sweden) [2,3] and the SimpliFY™ (NeoRad, Oslo, Norway), may help address this challenge. These sterile devices are placed on the skin, and the needle is placed into the clamp of the device allowing fixation of the microwave needle in the insertion angle. (Figure 2)

However, not all guiding devices secure the depth of insertion. The SimpliFY™ has a mobile needle gripper with an adjustable screw/clamp that can subsequently be used to hold the needle in place at the pre-determined depth. (Figure 2a) In contrast, note the similar SeeStar® allows for simultaneous alignment of the needle along both angular axes (Figure 2b), but does not have a mechanism to secure the depth of the needle insertion. Physicians performing percutaneous interventions should be aware of the possibility of needle slippage and theoretical risks posed to surrounding tissue and organs, as well as potential solutions.

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Figure 1. Cone beam CT before (A) and after (B) needle slippage. Planned needle path and planned treatment volume (C) in navigation and ablation planner software (Allura Xper FD20, Phillips Healthcare, Best, Netherlands)

Figure 2. SimpliFY™ (A) stabilizing an radio-frequency ablation needle (Covidien, Boulder, CO, USA) and SeeStar® (B) stabilizing a cryo-ablation needle (Endocare , HealthTronics Inc, Austin, TX, USA) Note bending of needle shaft caused by tension from stiff and heavy needle hub hardware (A).