Needle decompression

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While the incidence of tension pneumothorax in American war-wounded Servicemembers has decreased since the introduction of body armor, it remains one of the "big three" causes of preventable combat death.1–3 Needle thoracostomy remains the treatment of choice for decompressing trapped air from bronchopleural fistulas, "sucking chest wounds," or some combination thereof.4 While needle decompression (ND) superficially appears to be a technically simple procedure, it is often performed by providers with minimal training; almost all deployed personnel are responsible for this skill because it is taught during Combat Lifesaver courses for lay field-care personnel.3,5 The authors have identified several common pitfalls during cadaver- and animal-based training of field medical personnel that have not been previously emphasized in common training guidance.

There are several brands of catheter-over-needle devices commonly sold for battlefield ND. The original was the Becton Dickinson 14-gauge × 3.25-inch Angiocatheter for Special Placement (BD; http://www.bd.com), which is still packaged in civilian medical format with a peelopen sleeve. Users must be aware that the plastic sheath on the device consists of two separate pieces, with a slipon extension of plastic. The authors have observed novice users under stress attempting to use the device after pulling off the extension without removing the main portion of the sheath, resulting in premature stoppage at approximately a 1-inch depth into the chest, an insufficient depth to be effective.7,8 Instructors should encourage trainees to grasp the sheath at the proximal end, not the tip, when removing. Additionally, users must be instructed to remove the rear flashback chamber cap to allow air to exit the needle and potentially allow for hearing or feeling air release upon entering the pleural cavity. The current Tactical Combat Casualty Care skill sheet does include the following instructions: "Remove the plastic cap from the 3.25-inch, 14-gauge needle. Also remove the cover to the needle's flash chamber."

However, it is not at all clear to novice users that, due to the BD product design, there are effectively two plastic sheaths and a back cap, in addition to the casing in which the device is shipped. Casualty care supply vendors Combat Medical Systems (http://www.combatmedicalsystems.com), H&H Medical (http://buyhandh.com), and North American Rescue Products (http://www.narescue.com) produce near-identical ruggedized packaging that is similar to a cigar tube. They omit the flash cap and have a single-component protective sheath, thus eliminating the problems with using the BD device. For this reason they are specified for most field medical equipment sets. However, the BD version is often purchased by medical units because it can be inexpensively ordered from standard medical-surgical supply vendors and, thus, is frequently encountered by personnel who may not have previously trained with it. Moreover, with both brands, we have observed users grasp the orange-colored plastic catheter while attempting to insert the device into the chest. With this technique, the needle within the catheter is only held by friction, and the cutting tip is quickly pushed inside the plastic catheter. Little force is applied to the rigid needle, and the catheter typically kinks or "accordions" at the distal end—a known cause of needle decompression failures. In effect, the user has changed a sharp device into a blunt trocar that is difficult to force through the thick muscles of the chest. This phenomenon, with resultant failure to penetrate the chest, is visible in recent nationally televised footage of casualty evacuations in Afghanistan and probably occurs more frequently with an anterior approach due to glancing rib impacts and the depth of penetration required at this angle. Providers must be reminded that the needle and its cutting tip are the central focus of the procedure, and the needle hub is the proper grasping location. In this manner, the catheter will be carried through the chest along with the needle itself. Frequently, we and other instructors have observed the catheter being advanced off the rigid needle into the skin and muscle of the chest wall before the catheter has entered the pleural space. However, we have also seen users cover the end of the needle with a thumb or finger, occluding the exit for any air that may be detected upon pleural cavity entrance. Training for this procedure must not overlook these small mistakes in technique that can, and have, led to device failure in actual combat casualties. We recommend their inclusion in training guidelines and skill sheets throughout the Armed Forces.

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