

KSN 2017 Abstract

KSN-17-P096

Development of an ultrasonography-guided puncture simulator: second report

*Hiroshi SAKURAI¹, Takashi SATO¹, Takayuki SEIRIKI², Kyuuichirou MASUNAGA²,
Toshikazu ISSHIKI³

¹Vascular Access Treatment Center, Nagoya Kyoritsu Hospital, Japan,
²Turmhoch Meditech Co., Ltd., Japan, ³TANAC Co., Ltd., Japan

Objectives : Vascular access (VA) that is difficult to puncture can be safely and accurately punctured under ultrasonography guidance. In our preceding report, we introduced a newly developed simulator that allows for easy training for ultrasonography-guided puncture procedures. However, the simulator did not reach commercialization at the final stage owing to problems with stability of the product fabrication, feasibility of mass production, and costs. This paper reports the development of a new simulator to overcome these problems.

Methods : The simulator was fabricated on the basis of the following considerations:

- Selection of materials that can be stably produced at a large scale and provide realistic simulation of blood vessel images
- A structure that enables repeated punctures at two or more sites
- A structure that provides a more realistic touch similar to that of the arm
- Inexpensive fabrication

Results : The simulator was fabricated by pouring a glycerin-based special soft material (Tanac Co., Ltd.), which is proven to enable generation of realistic ultrasonography images, into a ready-made plastic container to which a silicone tube was secured in advance. However, simulated blood within the tube was lost in a single puncture, precluding further punctures. In addition, realistic touch similar to that of an arm could not be achieved because of the flat surface of the container. Thus, injection of the same special soft material into a crystal gel bag (Tanac Co., Ltd.) assembled with a looped silicone tube enabled both the front and back sides of the bag to be used, and the curved surface of the bag simulated the touch of a real arm. In addition, backflow valves were installed on both ends of the silicone tube so that simulated blood within the tube could be reinjected when it ran low. Any pump attached to the injection port allowed simulated blood to be circulated, thereby allowing more-realistic training for puncture and flow rate measurement.

Conclusions : An assembly composed of a bag and tube enabled stable product fabrication. A special soft material placed in the bag provided us with a

KSN 2017 Abstract

realistic touch of an arm and highly reproducible ultrasonography images. Although various problems are expected when using the simulator in the future, we will further improve it so that more staffs could perform an ultrasonography-guided puncture and improve the puncture technique because ultrasonography-guided puncture is also effective in protecting the VA.

Keywords : vascular access, VA, ultrasonography, guided puncture, simulator