

# KSN 2016 Abstract Submission

## *Dialysis*

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### Development of a puncture simulator under ultrasonographic guidance

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**Background:** Vascular access (VA) is the lifeline of patients undergoing hemodialysis, and damage to the VA caused by wrong puncture needs to be minimized. Difficult-to-puncture VAs (fine, deep, and impalpable) can be punctured safely and accurately under ultrasonographic guidance. However, training is required for operating ultrasonography equipment while puncturing. Thus, we have developed a simulator that allows for ease of training.

**Methods:** The following factors were assessed when the device was developed:

- Selection of materials that can reproduce vascular images in a realistic manner
- Structure that allows repeated puncturing at multiple locations
- Low cost

**Results:** The preparation method was as follows: Polyvinyl alcohol was dissolved in hot water, to which a saturated borax solution was added. Then, it was mixed until slimy consistency was obtained. Next, it was poured into a plastic mold in which a silicon tube (external diameter, 8 mm) filled with water was implanted in order to simulate blood vessels. At this time, three types of samples were prepared by adjusting the amount of water filled in. As the amount of water was increased, permeability by ultrasonography was enhanced and the silicon tube could be better visualized. However, because the surface was too soft, the simulator was deformed owing to compression by the probe.

Therefore, instead of a plastic mold, we implanted a vinyl bag. As a result, deformity due to compression could be avoided while maintaining appropriate elasticity.

At a working session, training under ultrasonographic guidance was conducted by using this simulator, and high appraisal was received. However, it was pointed out that the position of the silicon tube was not stable. Accordingly, both ends of the silicone tube were fixed to the plastic plate to address the issue.

The development of the simulator allowed the reproduction of echogenicity, which provided realistic ultrasonographic images. Consequently, the puncturing skills and techniques of physicians can be improved using the simulator under ultrasonographic guidance.

**Conclusion:** Puncturing under ultrasonographic guidance is effective for preservation of the VA. We will continue to improve the simulator developed currently so that more staff could perform puncturing under ultrasonographic guidance and puncture techniques could be improved.

**Keywords:** None