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Okayama University research: Plates and belts — a toolkit to prevent accidental falls during invasive vascular procedures

(Okayama, 22 January) **In a study reported in *Acta Medica Okayama*, researchers at Okayama University describe an innovative plate that confines patients to their beds while undergoing vascular procedures thereby preventing unforeseen falls**

Patients undergoing hemodialysis (which requires the regular withdrawal of blood) often need to undergo interventional procedures that keep the blood vessels of the forearm dilated. Percutaneous transluminal angioplasty (PTA), the most common of these procedures, requires a surgeon to visualize microvessels within the arm using an X-ray while the patient lays supine on a motorized bed. Unfortunately, a complication that arises during PTA is the enhanced risk of falls from these elevated beds. Now, Assistant Professor OHARA Toshiaki from Okayama University and colleagues have developed a simple plate-like contraption which secures patients firmly onto their bed while providing the surgeon adequate space for the procedure.

The vascular-access intervention assistance plate—as the innovators named it—is constructed from a durable and cost-effective polymer called polypropylene. The plate is structured to fit under the bed mattress, with a slit for inserting a thick belt that firmly tethers the patient to the bed, at the waist. Additionally, the plate has a lateral protrusion to accommodate and fasten the patient's arm using a strap. Adjacent to this, a space for placing surgical tools is also provided.

To first calculate the strength of this contraption, plates of varying thickness were simulated to hold loads representative of standard patient weights. The penetration of X-rays through the plates was also verified to confirm that the polymeric material does not interfere with the imaging. Based on the simulations, the thickness of the plate was set at 7 millimeters. The team then looked at real-life patient data to check the device's effectiveness.

Two groups of patients with similar profiles undergoing angioplasties were analyzed: one group that underwent PTAs without the plate (401 patients) and one with the plate (683 patients). Indeed, the former group had three patients fall, while the latter had none. The researchers also found that signs of dementia, a common cause of accidents and falls, were similar between the two groups. The incidence of falls was thus attributable to the set-up of the procedure and in fact preventable after securing patients to their beds with the plate.

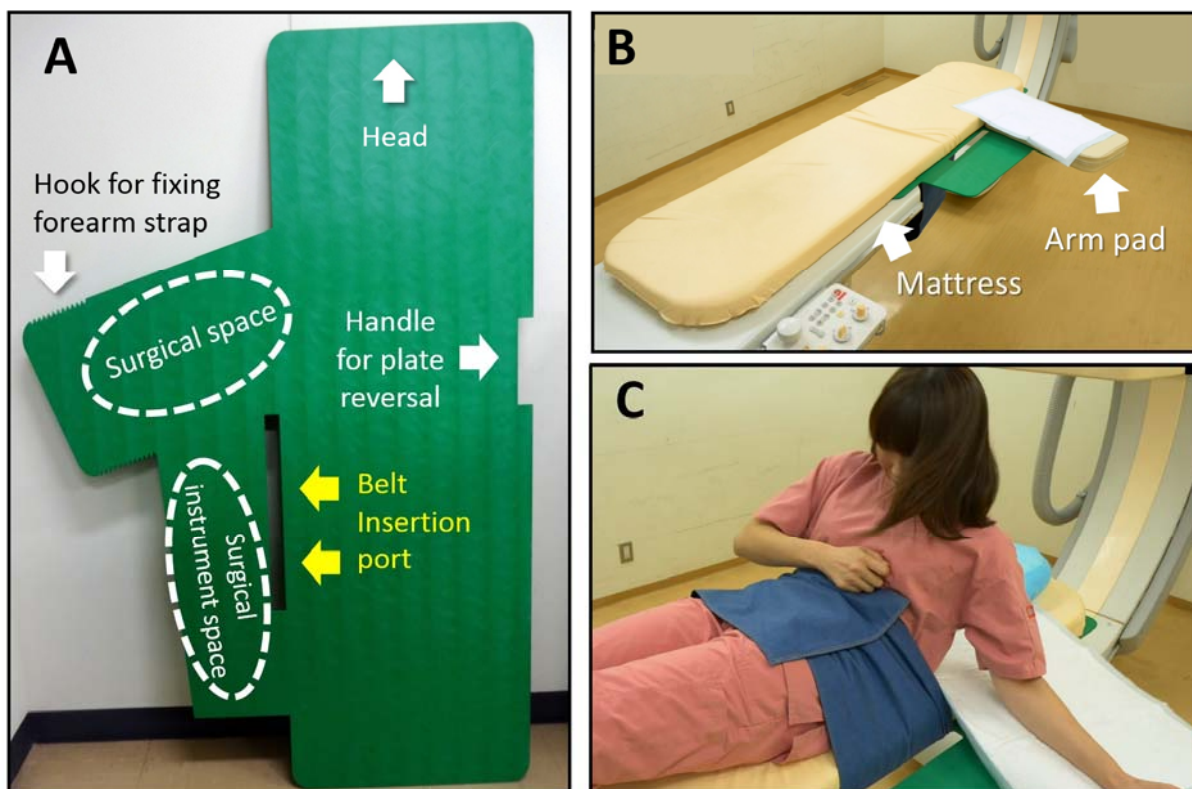
“The vascular-access intervention assistance plate provides good operability and safety, preventing accidental falls in patients undergoing hemodialysis or other procedures,” summarizes the research team. Containing accidental falls is key to preventing further

complications in patients undergoing hemodialysis, who are often severely ill and/or old. Introducing the plate into procedures can also enable minimal monitoring of the patient thereby allow medical staff to concentrate primarily on the surgery.

Background

Hemodialysis and angioplasties: Hemodialysis is a procedure that patients with kidney failure undergo wherein blood is drawn from the forearm and cleared of toxins outside the body. Given the frequency and invasiveness of this procedure, blood vessels at the site of withdrawal often start constricting and make the process difficult. Thus, intrusive procedures such as percutaneous transluminal angioplasties or the introduction of a stent are usually performed which help dilate such blood vessels.

An X-ray is employed to locate the site of constriction with precision. However, this makes the procedure cumbersome and requires minimal movement from the patient. Ancillary tools such as the vascular-access intervention assistance plate are, therefore, warranted to reduce unwanted complications like falls and aid with stillness during the procedure.



Caption

(A) Overview of the vascular-access intervention assisted plate. The plate is designed to have the indicated functions. (B) The plate is set on the bed of the X-ray system. The mattress and arm stand are set on the plate. (C) Falls are prevented by fixing the belt at the height of the ilium.

Movie (YouTube)

- [New fall prevention plate for vascular access surgery](#) (3min38sec)
- [New fall prevention plate for X-ray fluoroscopic cardiac catheterization](#) (3min55sec)

Reference

Toshiaki Ohara, Kazufumi Sakurama, Satoshi Hiramatsu. New Vascular-Access Intervention Assistance Plate Provides Good Operability and Safety by Preventing Accidental Falls: First Experience of 1,872 Cases. *Acta Medica Okayama*, 2020, Vol.74, No.6, pp.505-511.

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Reference (Okayama University e-Bulletin & OU-MRU) : Assistant Professor OHARA's team

OU-MRU Vol.22 : [Medical supportive device for hemodialysis catheter puncture](#)

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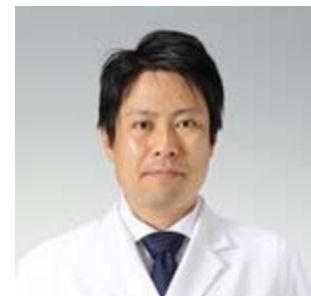
OU-MRU Vol.56 : [New device for assisting accurate hemodialysis catheter placement](#)

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Okayama University is located in the heart of Japan approximately 3 hours west of Tokyo by Shinkansen.

Website: http://www.okayama-u.ac.jp/index_e.html



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