

Effect of palpation on time required for vessel selection during peripheral intravenous catheter placement using ultrasound

Mari Abe-Doi¹, Toshiaki Takahashi¹, Ryoko Murayama², Hiromi Sanada³, Gojiro Nakagami^{1,4}

1: Department of Gerontological Nursing/Wound Care Management, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

2: Faculty of Nursing, School of health Sciences, Fujita Health University, Aichi, Japan

3: Ishikawa Prefectural Nursing University, Ishikawa, Japan

4: Global Nursing Research Center, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

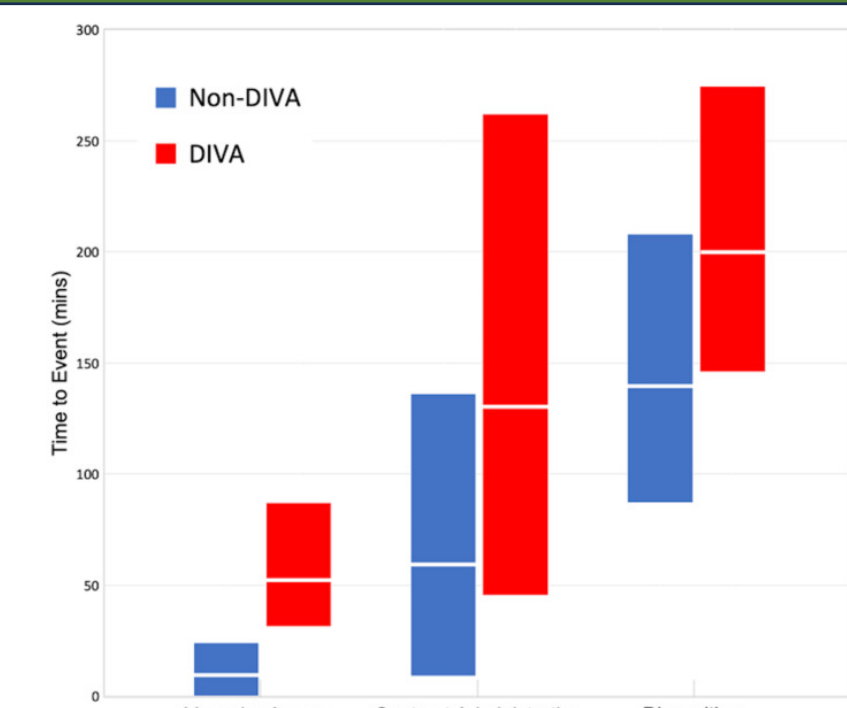


Background

Previous studies

Patients with difficult intravenous access (DIVA) experienced significant delays in IV access, lab results, IV analgesia, and emergency department length of stay compared to those without DIVA. (Davis et al., 2021;

Huang et al., 2023)



The comparison of time to events between non-DIVA and DIVA patients (Huang et al., 2023)

Ultrasound is effective for successful peripheral venous catheter placement, including in patients with DIVA.(Abe-Doi et al.,2021; Ballard et al., 2022)

Ultrasound-guided peripheral intravenous cannulation by emergency nurses improved first-attempt success rates over the standard technique; **however, there was no significant impact on procedure time.** (Álvarez-Morales et al., 2024)

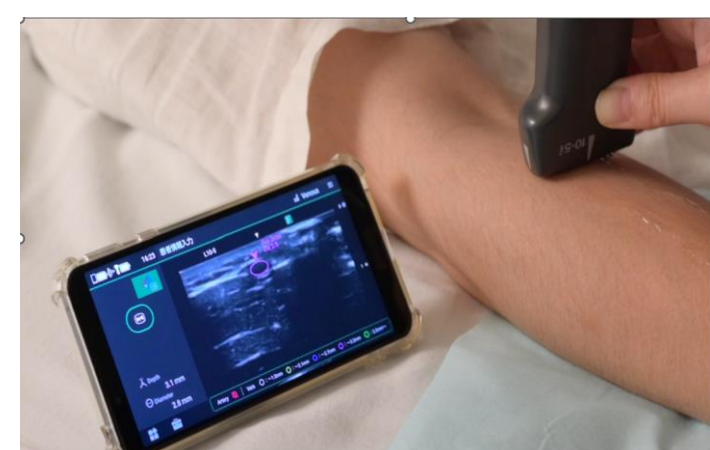
Clinical challenge

Critical situation requires rapid peripheral venous access for quality treatment, driving **the need for methods ensuring the shortest possible access time.**

Previous research suggests that as experience increases, there is a tendency for the time required for ultrasound-guided punctures to decrease (Loon et al., 2023); however, the underlying reasons for this phenomenon remain unclear.

Using ultrasound devices equipped with automatic vessel detection apps reduces selection time at challenging sites, **albeit limited to a specific device.**

(Abe-Doi et al., 2023)



Utilizing ultrasound with automatic vessel detection

Desirable conditions

- Accessible to anyone, anytime
- Cost-free

Palpation

Hypothesis

When using ultrasound for selecting peripheral venous catheter insertion sites, palpating nurses decide on puncture points faster than non-palpating nurses.

Aim

To investigate how palpation affects ultrasound-guided vessel selection time for peripheral venous catheter placement.

Methods

This study was the secondary analysis of prior study (PMID 36895159).

Summary of methods

The study compared the time taken to select the thickest vein of a simulated patient using ultrasound, with a distinction made between cases where nurses were allowed to conduct palpation and those where they were not.

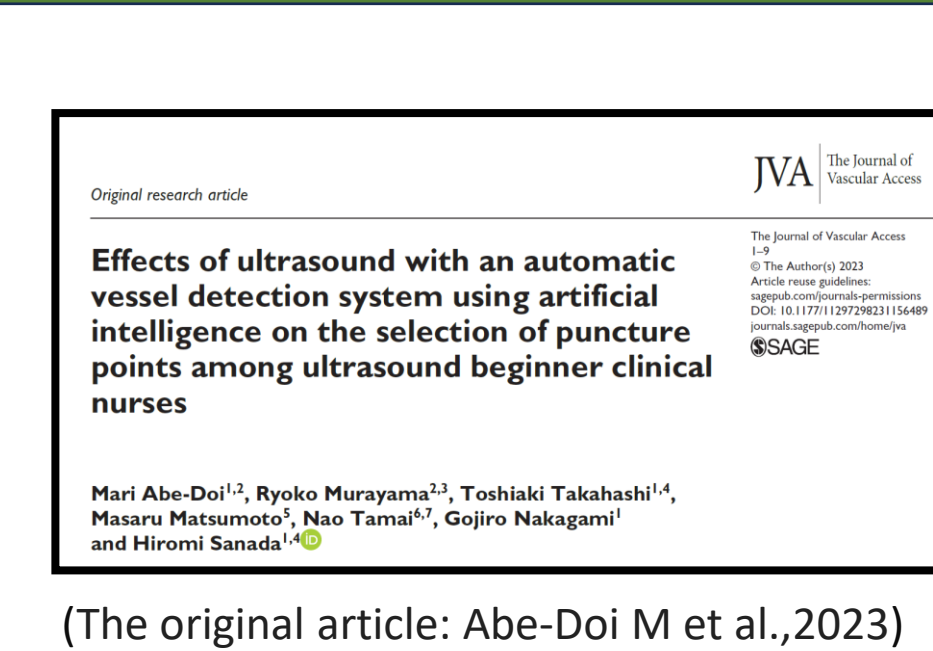
Protocol

1. Ten clinical nurses were recruited and instructed to select the maximum venous diameter in the forearm of a simulated patient using ultrasound (without utilizing an automatic vessel detection system).
2. The sites were limited to areas **where visual examination was challenging** for the purpose of the experiment. (To prevent anticipation of vessel course, veins near the wrist were covered and not visible)
3. Palpation performed at **nurses' discretion**, and presence was confirmed via video recordings.
4. Time for vessel selection was compared between **palpation and non-palpation groups** using t-test.

- ✂ Prior to the survey, nurses lacking clinical ultrasound experience received brief, individualized tutorials and hands- on training, lasting approximately 15 – 20 minutes each, from experts on probe manipulation and image interpretation.
- ✂ To verify catheter-accessible vessels at the target site, an expert measured the largest diameter within the target area of the simulated patient within one hour before and after each examination.

Ethical consideration

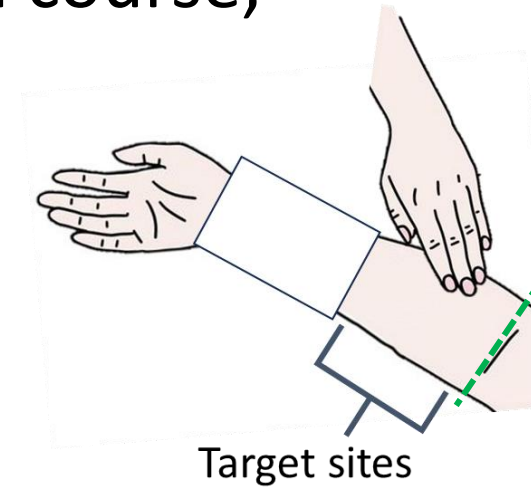
This protocol was approved by the Research Ethics Committee of the University of Tokyo (No. 2021188NI-(1))



(The original article: Abe-Doi M et al.,2023)



The ultrasound used in the research; iViz air, FUW-1 (Fujifilm, Minato City, Tokyo, Japan)



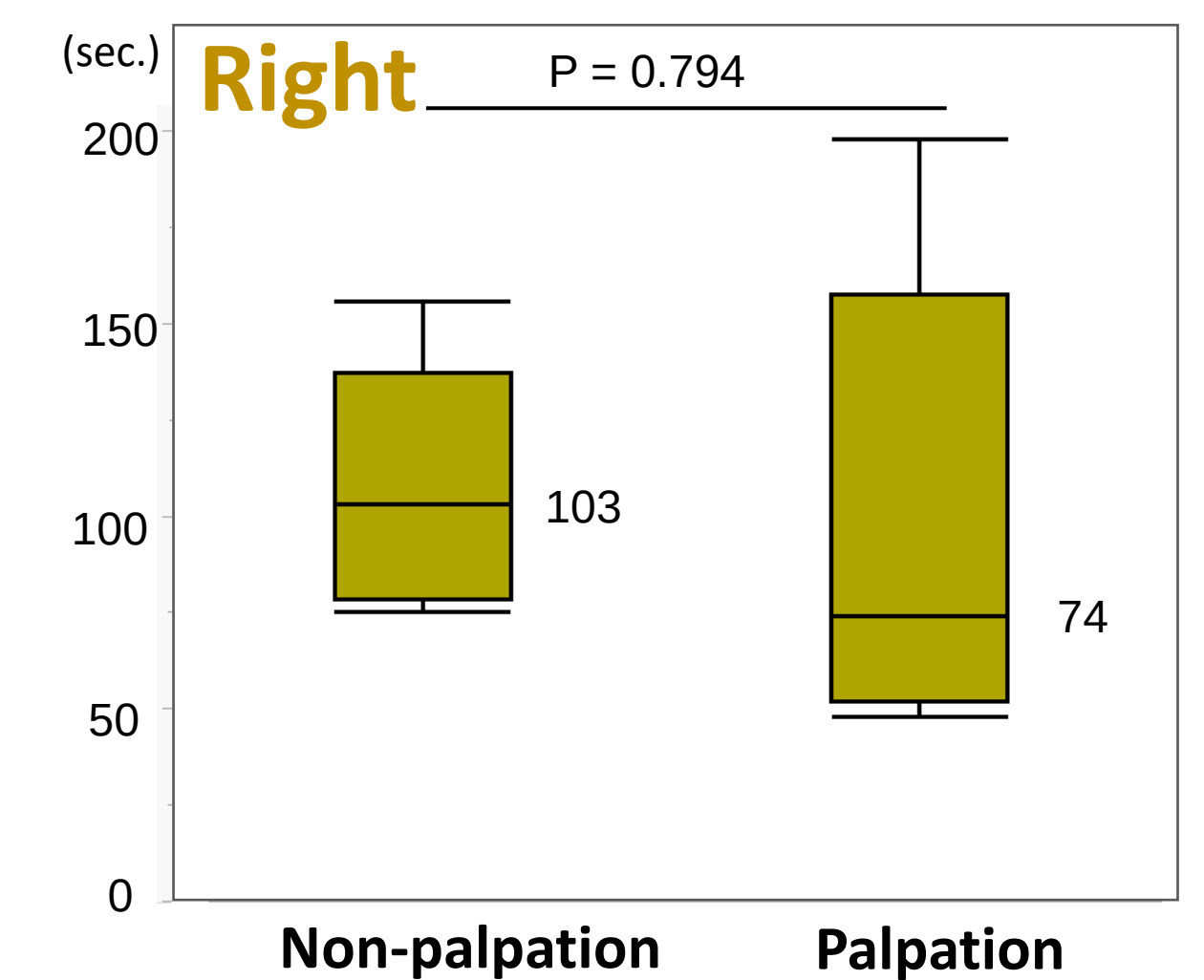
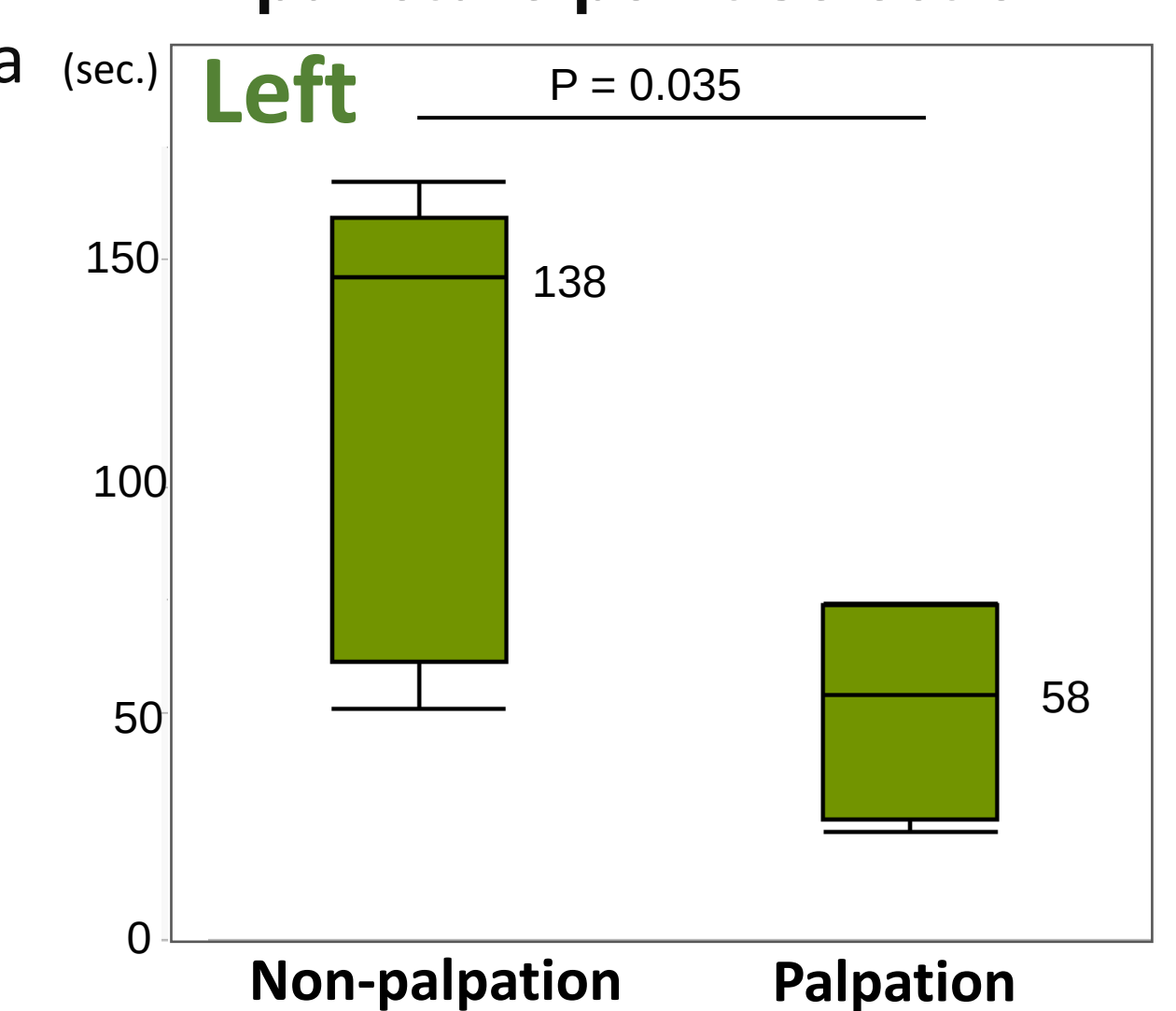
Results

The selected vessel diameters (range) were: Left: 2.79 – 4.30 mm / Right: 2.59 – 4.20 mm. The expert was able to select sites within the target area with a vessel diameter of 3.0 mm or larger on all examination days.

Nurse information, presence of palpation, and time for vein selection

ID	Age	Sex	Clinical practice experiences	Experience with using ultrasound on patients(No.)	Palpation time (sec.)		Required time for puncture point selection (sec.)		Selected vein diameter (mm)	
					Left forearm	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm
1	22	F	8 months	0	—	—	167	75	4.3	3.37
2	23	F	8 months	0	—	—	138	82	3.68	3.62
3	23	F	8 months	0	7	6	74	48	3.77	3.97
4	22	F	8 months	0	2	25	35	56	2.79	3.45
5	22	F	8 months	0	—	—	51	103	3.97	2.59
6	25	F	3 years	20	7	38	24	117	3.17	3.42
7	26	F	3 years	20	14	11	73	74	2.97	3.57
8	26	F	4 years	10	—	—	157	119	4.3	4.2
9	43	F	15 years	20	—	2	154	198	3.17	3.4
10	53	F	30 years	20	—	—	65	156	3.36	3.63

Time required for puncture point selection



Conclusion

- ◆ **Even when ultrasound is used for vessel selection, palpation can help shorten the vessel selection time**, resulting in rapid vascular access and prompt treatment initiation.
- ◆ This finding highlights the significance of **combining ultrasound with palpation**, even among nurses with less than one year of clinical experience.

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Conflict of Interest: None

