Summary: Ultralong Versus Standard Long Peripheral Intravenous Catheters: A Randomized Controlled Trial of Ultrasonographically Guided Catheter Survival

Amit Bahl, MD, MPH; Mahmoud Hijazi, BA; Nai-Wei Chen, PhD; Ludovic Lachapelle-Clavette, BA; Jacob Price, MD. (2020). Ultralong Versus Standard Long Peripheral Intravenous Catheters: A Randomized Controlled Trial of Ultrasonographically Guided Catheter Survival. Ann Emerg Med. pii S0196-0644(19)31383-6. doi: 10.1016/j.annemergemed.2019.11.013.

Highlights of this valuable study have been excerpted from the publication:

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Background Information

- Although ultrasound guided intravenous peripheral catheter placement is successful in 76%-100% of difficult vascular access patients, the catheter survival rate is only between 46%-56%.

Critical Elements

- Published January 2020 in Annals of Emergency Medicine, the peer-reviewed official journal of the American College of Emergency Physicians.
- Two catheters were compared
  - **Standard long** 20 ga, 4.78-cm (1.88 inch) **BD Insyte™ Autoguard™ Shielded IV Catheter**
  - **Ultralong** 20 ga, 6.35-cm (2.5 inch) **B. Braun Introcan Safety® Deep Access IV Catheters**
- This study supports the use of ultralong catheters over standard long options for upper arm insertions because these catheters have a favorable survival profile for difficult access patients.
- B. Braun Deep Access Introcan Safety Intravenous catheter (Ultralong catheters) had a significantly longer median survival time of 5.7 compared with 3.9 days for Becton Dickinson Insyte Autoguard Shielded IV cathether (standard long catheters).

Study Purpose

To compare the survival of ultrasound-guided, B. Braun ultralong, peripheral catheter vs. a Becton Dickinson standard long peripheral catheter, when inserted into the upper arm of an adult, difficult venous access patient.

Study Methods

- This was a single-site, prospective, 2-arm, non-blinded, randomized controlled trial of catheter survival.
- Two catheters were used in the comparison: a standard long, 20-gauge, 4.78-cm, (1.88 inch) Becton Dickinson Insyte Autoguard intravenous catheter and an ultralong, 20-gauge, 6.35-cm, (2.5 inch) B. Braun Introcan Safety Deep Access IV catheter.
- The study was conducted in the United States at a large, academic, suburban tertiary care center with 1,100 hospital beds and 130,000 annual emergency department (ED) visits.
- The home institutional review board approved the study.
- 270 Adult patients presenting to the emergency department with self-reported, difficult vascular access were recruited and randomized to each of the two study groups (BD standard long catheter vs. B. Braun ultralong catheter). In total, data from 257 patients were analyzed and reported.

- A cohort of trained ED attending physicians, resident physicians, advance practice providers, nurses, and technicians who were proficient in ultrasound-guided intravenous line placement using the single-user technique performed all insertions.
- All inserters had previous experience with the BD standard long catheter and no inserters had experience with the B. Braun ultralong catheter.

Study Results

- There was a significant catheter survival benefit in the ultralong group compared with the standard long group (unadjusted hazard ratio 0.54; 95% CI0.35 to 0.82).
- The median ultralong survival duration was 136 hours (5.7 days) (95% CI 116 to 311 hours) and median standard long duration was 92 hours (3.9 days) (95% CI 71 to 120 hours), for a difference of 44 hours (1.8 days).
- The optimal length in the vein to maximize catheter survival was calculated at greater than or equal to 2.75 cm (1.08 inches) (unadjusted hazard ratio 0.52; 95% CI 0.32 to 0.83).
- Catheters with > 2.75 cm in the vein had a median survival of 129 hours (5.4 days) (95% CI 102 to 202 hours) compared with 75 hours (3.1 days) (95% CI 52 to 116 hours), for a median difference of 54 hours (2.3 days).
- Ninety patients (68.7%) in the ultralong group reached completion of therapy compared with 73 (57.9%) in the standard long group (95% CI for the difference –0.9% to 22.5%).
- On average, the ultralong group required a mean 0.48 rescue catheters to reach completion of therapy compared with 0.91 in the standard long group (95% CI for the mean difference (–0.83 to –0.03).
- Although vesicant and irritant medications appeared similar, patients in the standard long group had 11 cases of phlebitis and 16 infiltrations, whereas the ultralong group had 3 cases and 6 infiltrations.

Study Limitations

- Single center study
- Non-blinded
- Reported results were for catheters placed proximal to the antecubital fossa. Therefore, the results may be challenging to extrapolate to other veins.
- The cause and time of failure were abstracted from nursing documentation in the electronic medical record; the true timing and reason for catheter failure may be misrepresented.

Study Conclusions

- In patients with difficult venous access, ultralong Introcan Safety® Deep Access IV catheters have longer in-dwell times compared to standard long Becton Dickinson Insyte Autoguard® IV catheters.
- Unlike mid-line or extended dwell catheters, ultralong Introcan Safety® Deep Access IV catheters require no specialized training beyond ultrasound placement.
- Increased length of the catheter in the vein, sometimes referred to as vein purchase, is strongly associated with enhanced catheter survival. The 6.35cm (2.5 inch) ultralong Introcan Safety® Deep Access IV catheter may be more suitable for achieving optimal catheter length in deeper veins.

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