Ultrasound – Guided Punctures: Improved Hygiene using a Novel Disinfectant Ultrasound Couplant Spray

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Background

The use of conventional ultrasound gel during venous interventions goes along with several problems: Gel requires intense wiping for removal, color markings will not stick on gel covered skin, gel deposits will delay punctions and catheter handling, and even sterile gel will be contaminated with bacteria mobilized from skin pores and wrinkles.

We evaluated a new disinfectant ultrasound couplant spray (DUCS) containing Octenidin and Phenoxyethanol, which was composed to provide aerosol-free application (Fig. 1) and formation of a thin but long-lasting gliding layer.

Fig. 1: DUCS without aerosols

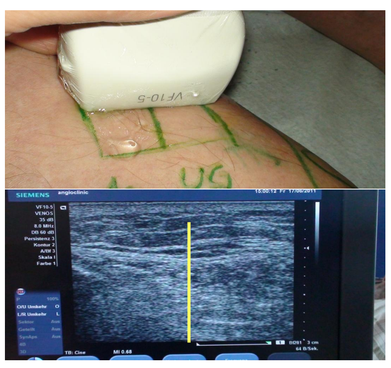


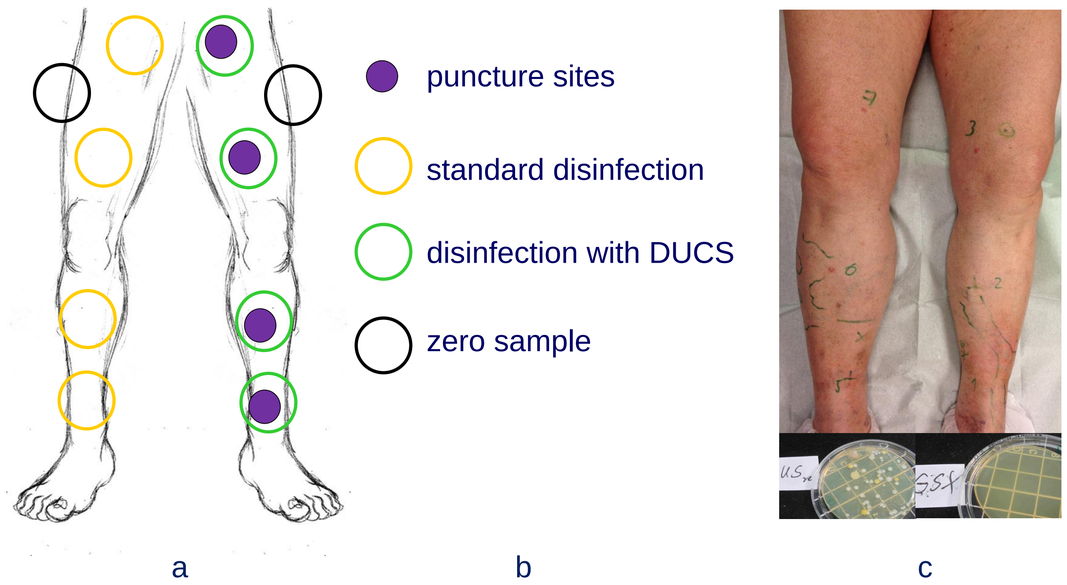
Fig. 2: ultrasound quality

Methods

The study included 20 patients, 32 - 73 yrs., with symmetric saphenous insufficiency and > 30 cm of superficial varicosities (Fig. 3). Legs were randomized to (A): Mapping using conventional ultrasound gel (Aquagel, Parker Inc.), intervention using sterile ultrasound gel (Sterile Aquasonic 100, Parker Inc.); or (B): Mapping using DUCS (> 3 min. contact time), intervention using DUCS (> 4 min. contact time).

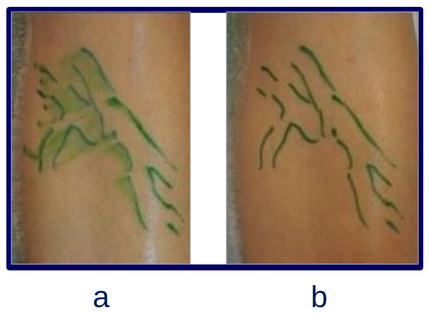
Prior to puncture and after intervention samples were taken at puncture sites using RODAC contact plates and e-swabs containing inhibitors to the disinfectant.

The number of colony forming units (CFU) was determined, furthermore the procedural time.



a b c

Fig. 3: a) scheme of sample acquisition, b) legend, c) case example



a b

Fig. 4: colour markings dissolving after alcoholic disinfectant (a) but not after DUCS (b)

Results

The evaluation of 20 cases (40 legs, 168 samples) showed these results:

	CFU prior to puncture		CFU after treatment	
A) standard	11.6	(0 – 74)	17.5	(2 – 180)
B) DUCS	2.6	(0 – 19)	2.1	(0 – 8)

Comparing corresponding locations, areas treated with DUCS were superior or equal to standard in 92.8 % of the samples (78/84 sample pairs, fig. 5). DUCS-accompanied cases has significantly less bacterial growth at the end of intervention. The detected species of resident and transient bacteria did not show any gap in the spectrum of efficacy.

Mean procedural time was 18:20 min. for standard and 12:40 for DUCS procedures. Gel consumption was 32 – 71 ml (mean: 51) for standard and 4 – 8 ml (5.4 ml) for DUCS. Evaporation time of DUCS was > 15 min..

Ultrasound quality was equal in both groups (Fig. 2) according to video analysis performed by independent technicians.

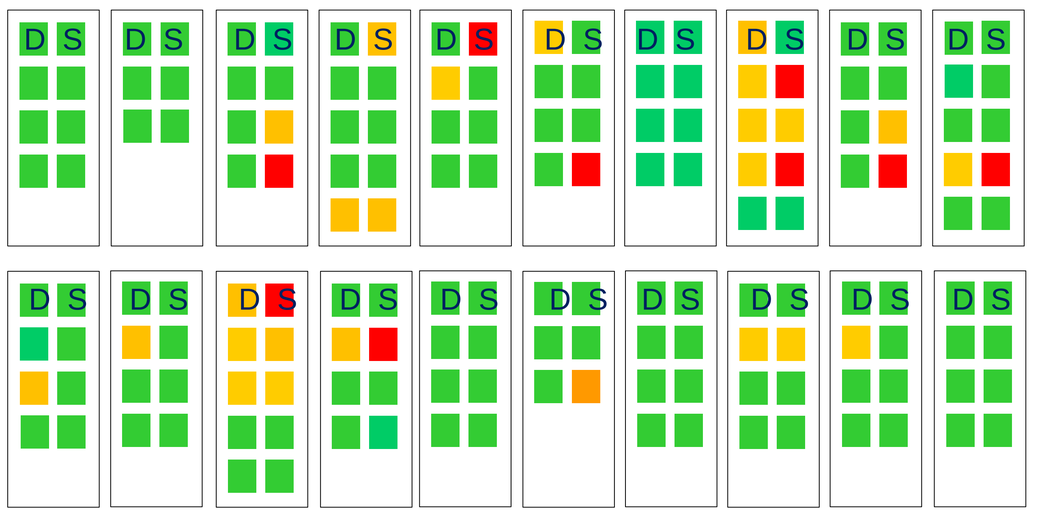


Fig. 5: Bacterial growth (CFU) in samples taken after disinfection prior to vein treatment: One block corresponds to one patient. DUCS (D, left row). Standard disinfectant (S, right row); Maximum bacterial growth per sample site (contact plate or e-swab): green: 0, orange: 1 - 20, red: 21 – 200 CFU

Discussion

Some of well-known nonalcoholic disinfectants, like those for use on mucous membranes, are not approved for skin disinfection as effective contact time is too long. However, these substances may perform well (no burning on freshly shaved skin, no dissolution of colour markings, Fig. 4) when allowed to stay for several minutes, or even be rubbed into wrinkels by transducer movements.

Conclusions

The novel gel spray, if applied with a residence time of > 7 min., seems to provide similar or even better suppression of bacterial growth than standard alcoholic disinfection.
The modality may help to simplify endovenous procedures and to reduce intervention time.
Further applications, e.g. as glide gel for per-surgical shaving will be evaluated.

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