

From Lab to Leg

The importance of correlating *in-vitro* and *in-vivo* test systems to clinical experience

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Abstract

One of the toughest challenges in the development of a new wound care dressing is ensuring that the way in which dressings are evaluated in the lab, and the systems used to test them, produce data that is clinically relevant.

During the development of a non-adherent silver alginate dressing, an *in-vitro* measurement system was developed to assess adherence. The test method was based upon the adherence of a wound dressing to a fibrin clot. The clot provides an adherent, biological matrix simulating the wound bed surface and is applied between two pieces of dressing. The force required to peel the dressing apart after a 24hr incubation period was measured; the greater the force required, the higher the potential adherent properties of the dressing. Dressing concepts that displayed high adherence to the fibrin matrix were eliminated from further evaluations.

The final concept was evaluated in a porcine partial thickness excisional wound model to assess dressing wound adherence and any potential associated tissue reactions. Data generated in this *in-vivo* study showed a high correlation with the results observed in the *in-vitro* fibrin clot test system. The non-adherent silver alginate dressing showed a much lower level of adherence than a commercially available fibrous dressing tested under the same conditions (*in-vitro* 133g versus 542g; *in-vivo* 2.3 versus 1.0 p=0.021).

Data generated in the early stages of a product development form the foundations on which the subsequent development is built. It is therefore essential that the data produced by the lab *in-vitro* systems, and *in-vivo* wound models can be translated to the clinical situation. Case studies presented in this study have demonstrated that the clinical results are consistent with the experimental findings; this new non-adherent silver alginate dressing effectively managed wound exudate and no significant adherence to the wound was observed.

Laboratory based data

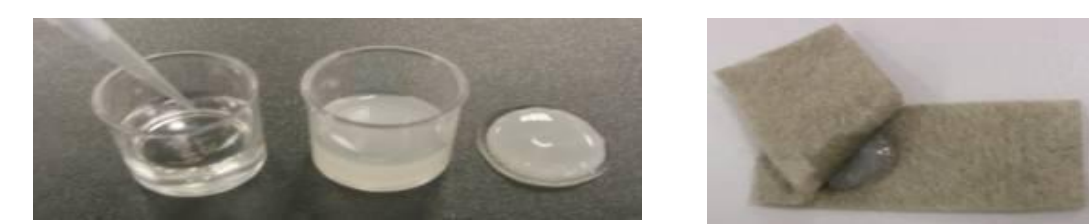
In vitro

Novel Adherence Model

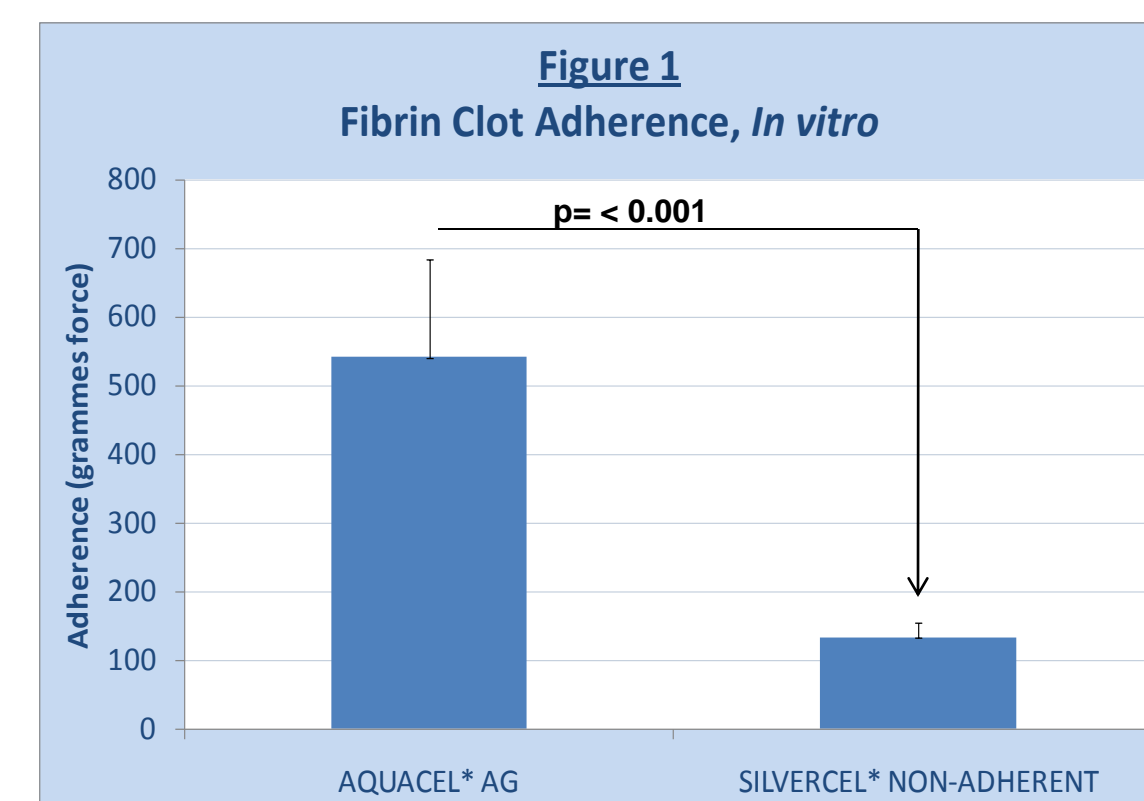
Sandwich a fibrin clot between two pieces of dressing material. Incubate for 24 hours at 37°C.

Measure the force required to separate the dressing from the clot using the Instron tensile tester (Figure 1).

Fibrin clot preparation



Fibrin clot testing



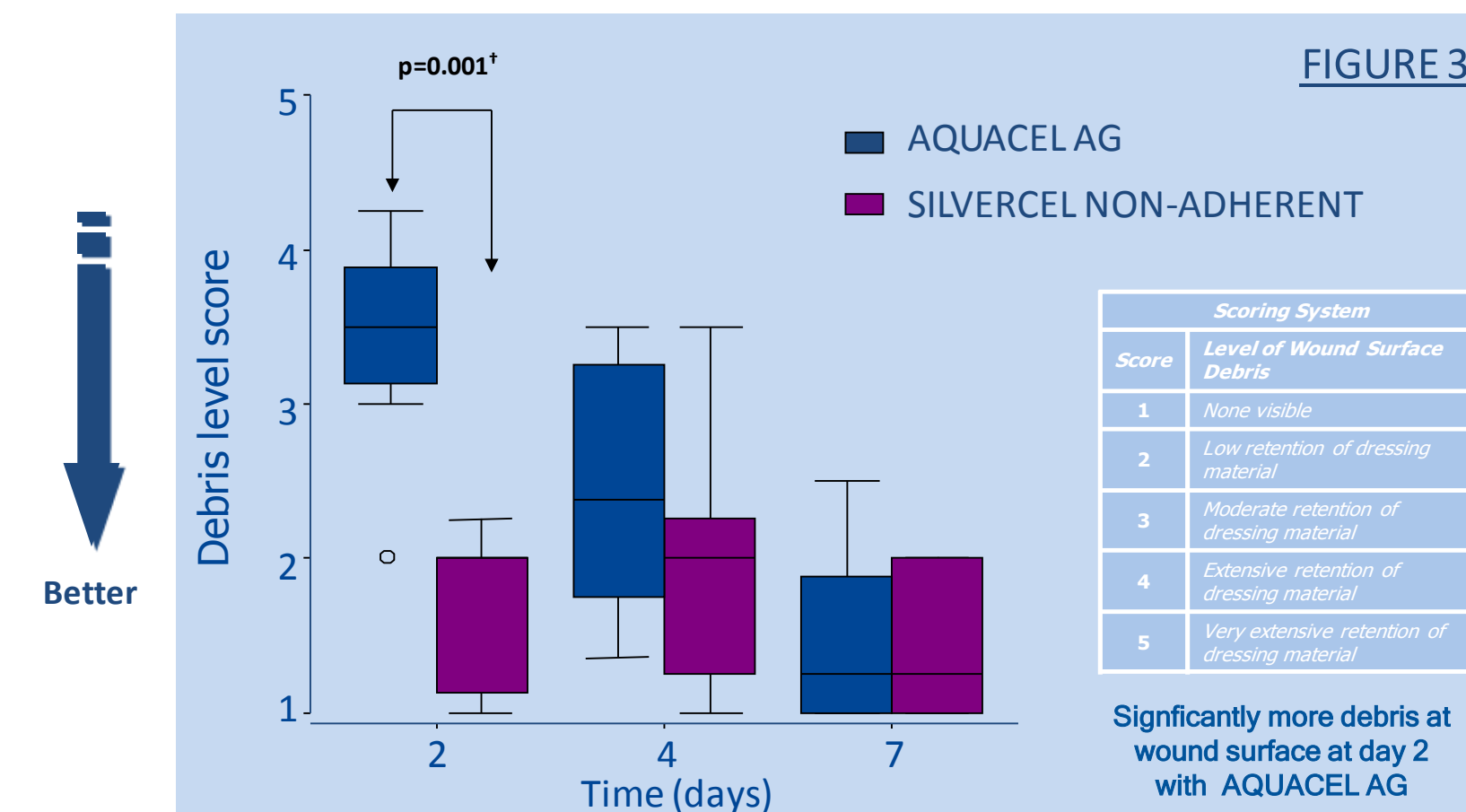
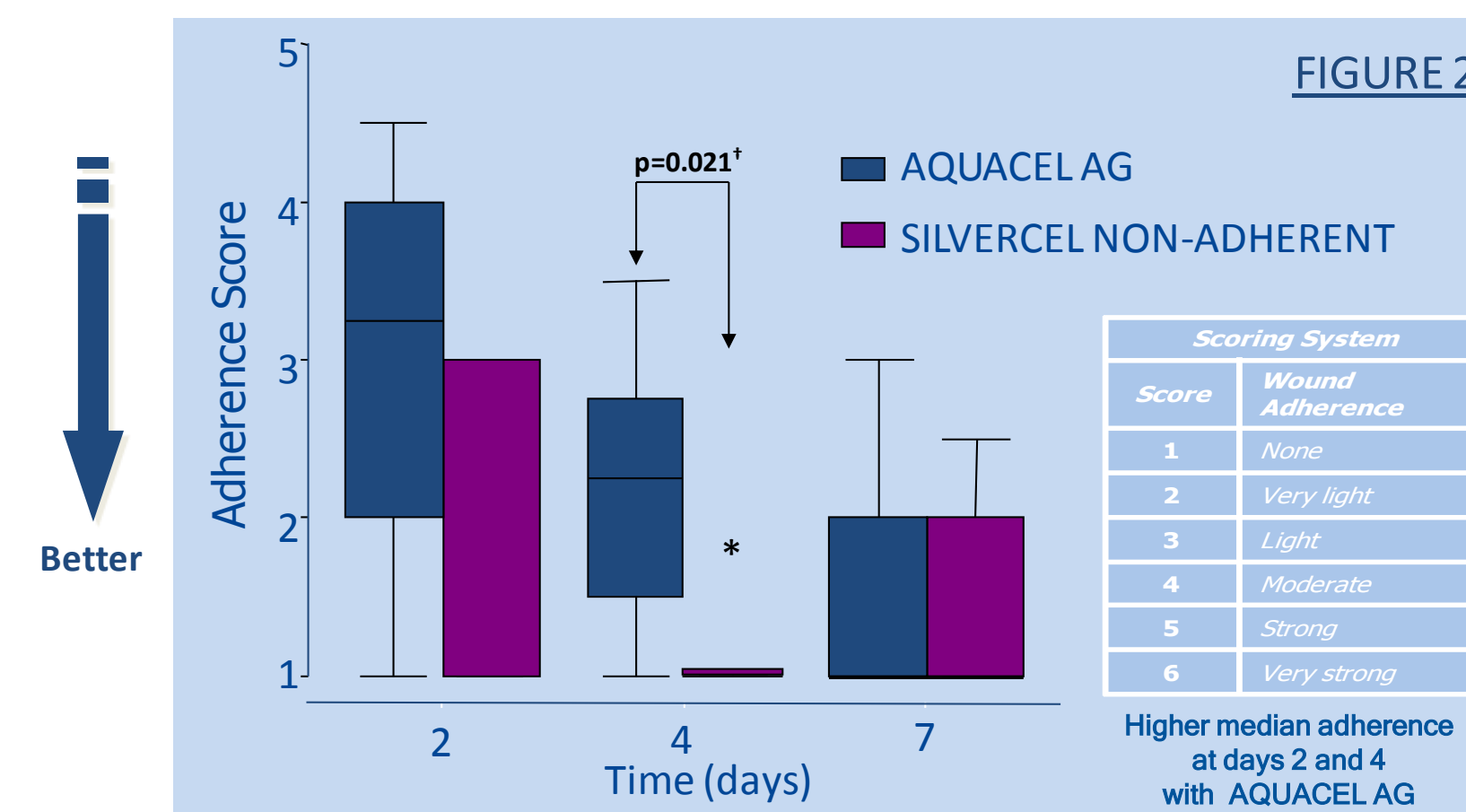
Statistical analysis

In vitro data, significance determined by t-test
In vivo data, significance determined by Mann Whitney U-test,
o depicts outlier

In vivo

Porcine partial-thickness excisional wound model

The dressings were assessed at the macroscopic level for adherence to wound tissues (Figure 2) and wound surface debris (Figure 3).



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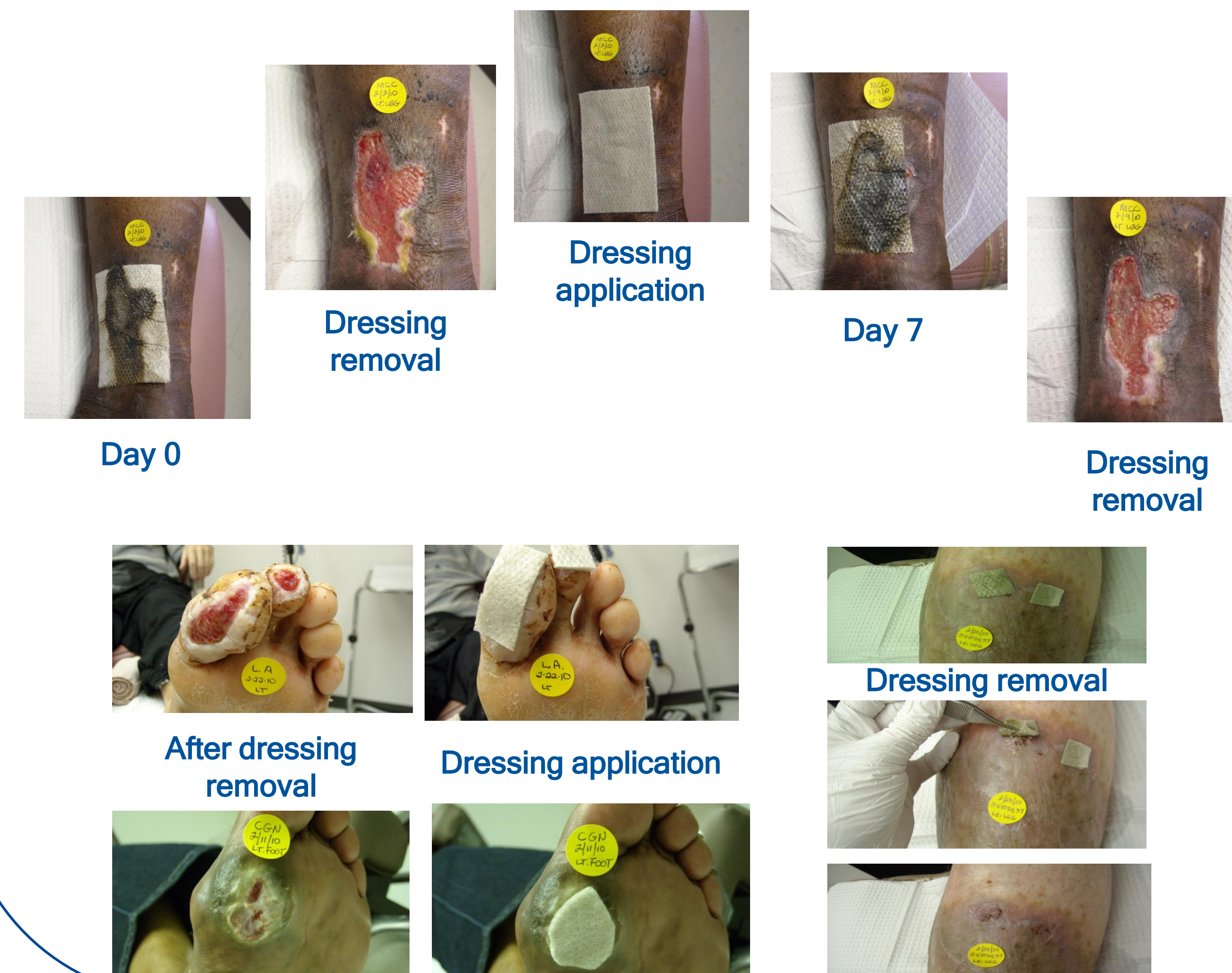
In practice

20 patient study, 10 patients in the SILVERCEL* NON-ADHERENT group; 4 venous leg ulcers (VLU), 4 diabetic foot ulcers (DFU) and 2 Trauma patients.

10 control patients treated with Calcium Alginate dressing (generic).

Qualitative assessment measuring adherence to wound, (Figure 4), pain at dressing change using the Wong-Baker pain FACES rating scale, (Figure 5), requirement for saline soak prior to removal (Figure 6), and macroscopic fibres visible on wound bed (Figure 7).

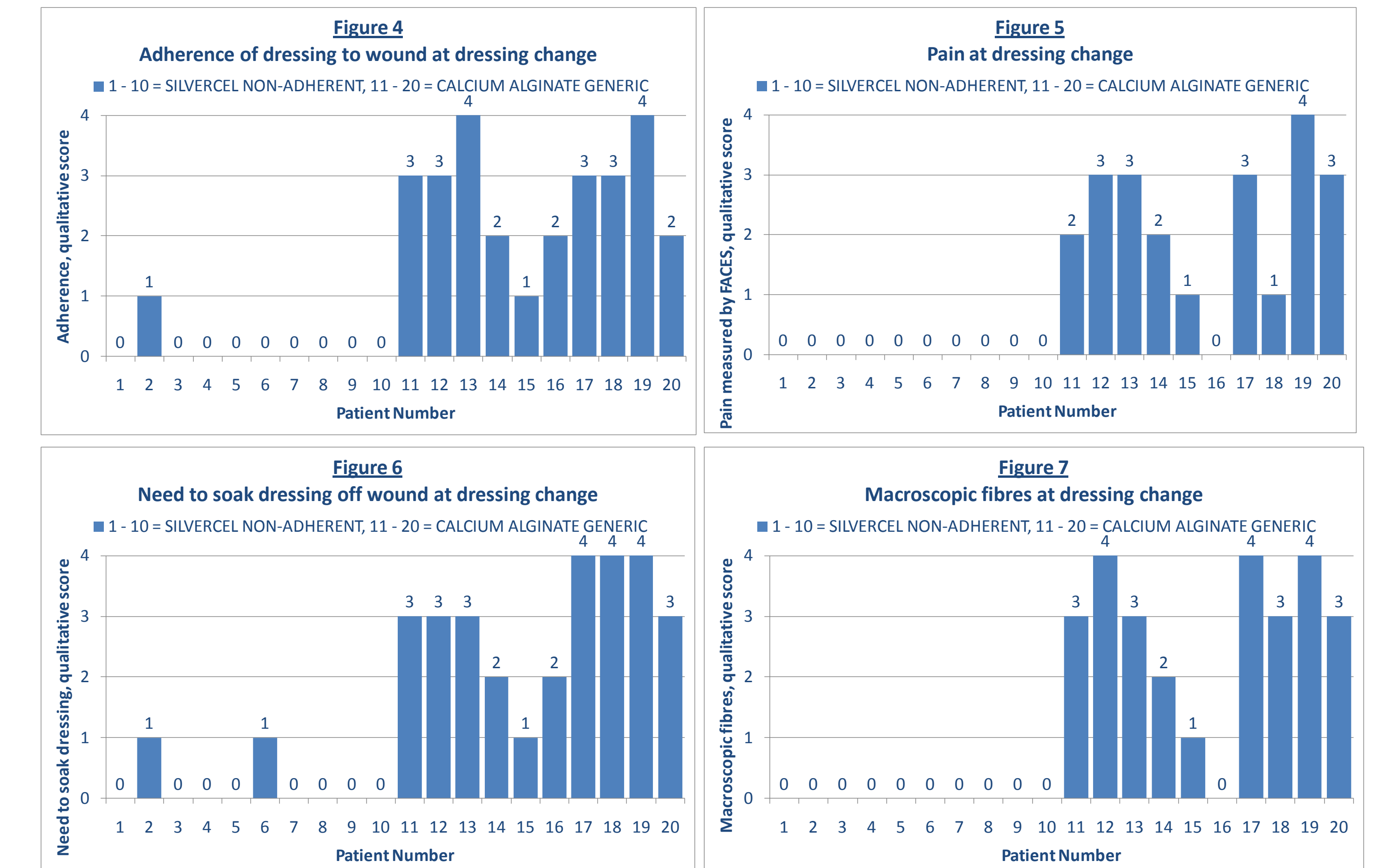
Examples of wounds treated with SILVERCEL NON-ADHERENT



Measurements taken

Qualitative scoring system:

0= none, 1= mild, 2= moderate, 3= severe, 4= very severe



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