

Assessment of dressing integrity using an Ex-Vivo porcine cavity wound model

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Introduction

Ribbon dressings, when used to pack cavity wounds must be able to be removed in one-piece. Clinicians are presented with laboratory data for ribbon strength, however, there is little evidence to dictate what value is sufficient for one-piece removal from a cavity wound.

To understand the relationship between numerical and practical data, the strength of six commercially available ribbon dressings was assessed quantitatively, using a Tensiometer, and qualitatively, using porcine (pork) cavity models.

Methods

Tensile Strength (wet)

A uniform 10cm long sample was cut from the ribbon. 1ml of Solution A was applied to the sample and left for 5 minutes. The sample was clamped vertically in the jaws of a tensile tester, ensuring that there was no slack in the material. The sample was pulled apart at a rate of 300mm/min until the sample broke. The maximum load at break point was recorded. This test was repeated in triplicate.

Porcine Models

Preparation of porcine models (Figures 1 & 2)

A 2cm diameter corer was used to punch 5cm deep cavity wounds across a piece of porcine middle. A piece of tubing was placed in each cavity to allow fluid in-feed. This was fed to the bottom of the cavity, and remained in place for the entire trial. 3ml of solution A was added to each cavity.

A second model was prepared using wounds of 4cm depth, and 1mm width (Slit wounds). This was to provide an additional clinical challenge to the dressings.

Dressing assessment

Each dressing was cut to 15cm length, and placed in a cavity wound leaving approximately 1.5cm protruding from the cavity for removal. Photographs of the dressings were taken and observations recorded.

Every 24 hours, additional fluid was added to each model (3ml for the large wounds, 1ml for the slit wounds)

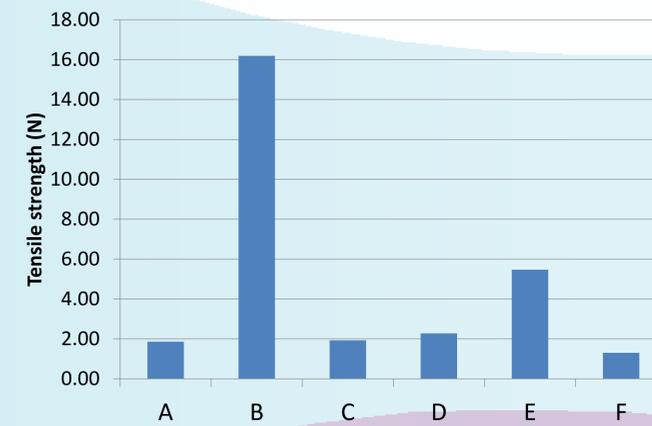
After 72 hours each of the dressings was removed from their respective cavity using forceps. Photographs were taken of the dressings, and notes on product integrity made.

All dressings were tested in triplicate.

Results & Discussion-

Tensile strength (wet)

Dressings showed varying wet tensile strength (graph 1). Dressing B showed a vastly increased wet strength over the other dressings. Dressings A, C & D all performed in an equivalent manner, with Dressing F demonstrating the lowest tensile strength.



Graph 1- Wet tensile strength of each dressing

Porcine Models



Figure 1- Porcine cavity model (large cavity wounds)



Figure 2- Porcine cavity model (slit cavity wounds)

Large cavity model

Dressings showed varying performance over the duration of the large cavity model (figure 3).

- **Dressing A:** All replicates remained fully in-tact on removal with no dripping/leaking.
- **Dressing B:** All replicates remained fully in-tact upon removal, with no dripping/leakage.
- **Dressing C:** Both replicates tore on removal, however not completely through the dressing. (N.B The third replicate could not be counted due to a hole in the base of the model).
- **Dressing D:** One replicate lost fibres on removal, however the remaining two stayed in-tact.
- **Dressing E:** All replicates allowed in-tact removal, however dripping and spillage was noted from each dressing as it was removed from the cavity.
- **Dressing F:** All replicates allowed in-tact removal, however gripping was difficult due to the fibrous nature of the dressing.

Slit cavity model

- In the slit wound model, all dressings were able to handle the fluid added due to the reduced volume.
- One repeat of dressing C tore entirely into separate pieces on removal
- All other dressings were able to be removed in-tact. Many dressings proved difficult to remove due to the thin nature of the wound, however this resistance did not cause breakage.

Conclusion

- Although tensile data is helpful in determining how a dressing may behave upon removal, this data should be supported with clinically relevant models.
- Dressings deemed to have a low tensile strength were able to be removed from the model successfully.
- Excessively high strength values may therefore not be required in order for a product to perform with clinical efficacy.

Large Cavity (2x5cm) Slit cavity (0.1cmx4cm)

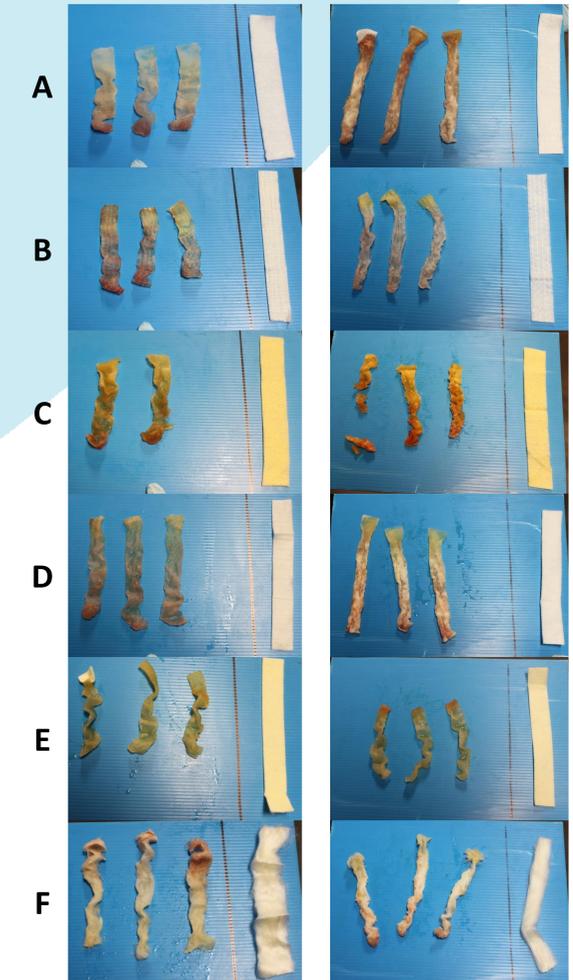


Figure 3- Dressings following removal from each cavity wound. The dressing on the right of each photograph represents each dressing prior to application