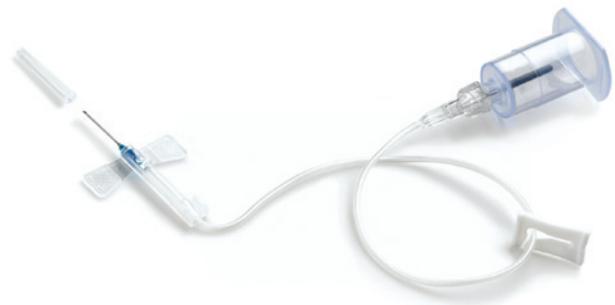


WHITE PAPER

Blood Collection Needle Sharpness: Independent Laboratory Penetration Testing Results

Smiths Medical Saf-T Wing® blood collection needles (either 21G, 23G, or both) demonstrated significantly lower penetration forces, and are therefore sharper, when compared to four of competitors winged blood collection needles.



INTRODUCTION

The pain caused by needle insertion during blood collection procedures can be a source of patient anxiety. The skin surface deforms when blood collection needles are introduced, sharper needles cause less skin deformation resulting in less pain experienced by the patient.² In addition to needle sharpness, insertion pain can also be due to other sources including, needle tip geometry, needle polishing, lubrication,² and tissue interaction.³ Medical device companies have unique manufacturing processes resulting in variable sharpness among brands.

OBJECTIVE

The objective of this study was to measure the penetration force of five (5) commercially available safety blood collection devices with wings from four (4) different manufacturers at two (2) different gauges (21G x 3/4" and 23G x 3/4").

METHODS

Needle penetration testing was performed by an independent testing laboratory (DDL, Inc., Eden Prairie, MN) using the laboratory's penetration testing protocol that was developed and optimized internally. To quantify needle sharpness, the force required for the needle to penetrate a standard polyurethane film was measured with an Instron® (Instron, Norwood, MA) with load cell. Penetration force was measured on 30 new sterile salable needles of each type, and the average peak penetration force to pierce the film was calculated. The least squares means were calculated to determine significant differences for the average peak penetration forces of the needles.

RESULTS

21 Gauge Blood Collection Devices

Smiths Medical Saf-T Wing® performed significantly better by having less penetration force required than the majority of the other competitors. The average peak penetration force for the Smiths Medical Saf-T Wing® ($66.44g \pm 3.68$) was 11.7% lower than the Competitor D ($75.26g \pm 5.26$) and 4.2% and 4.5% lower than the Competitor B ($69.36g \pm 4.04$) and Competitor C ($69.56g \pm 3.12$), respectively (Figure 1).

23 Gauge Blood Collection Devices

Smiths Medical Saf-T Wing® performed significantly better by having less penetration force required than the majority of the other competitors. The average peak penetration force for the Saf-T Wing® was 56.39 ± 3.1 in comparison to 59.4 ± 2.76 , 62.8 ± 3.54 , and 66.19 ± 4.52 for Competitor A, Competitor D, and Competitor B respectively (5.1%, 10.2% and 14.8% better) (Figure 2).

CONCLUSION

The results of this independent testing showed that the blood collection needle sharpness differed by both brand and gauge size. Smiths Medical Saf-T Wing® blood collection device was significantly sharper than the other four blood collection devices presented here in either one or both gauge sizes.

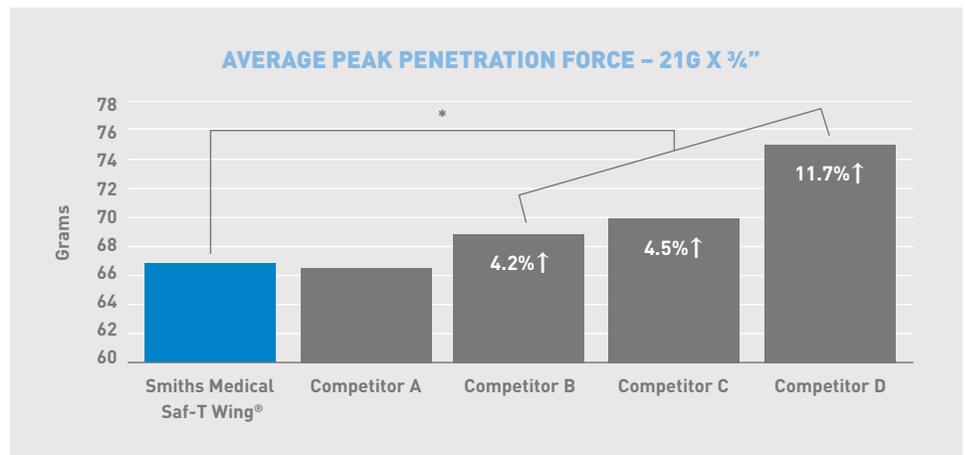


Figure 1: Average peak penetration force (grams) for five tested blood collection needles (*p < 0.005).

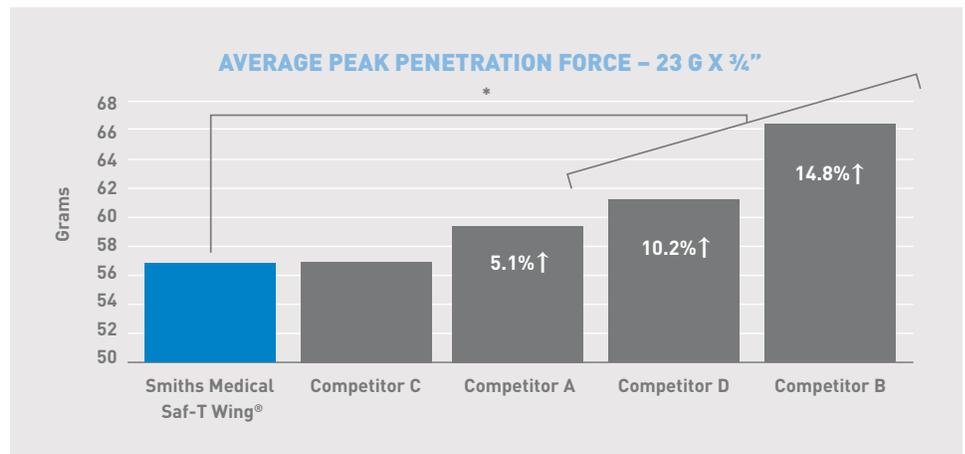


Figure 2: Average peak penetration force (grams) for five tested blood collection needles (*p ≤ 0.005).

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