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Syringe Size: Does It Matter in Physician-Performed Procedures Including Arthrocentesis?

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PURPOSE: Arthrocentesis and joint injections are critical outpatient procedures in rheumatology and orthopedic surgery. We hypothesized that the size of the syringe was also important in physician-performed syringe and needle procedures.

METHODS: 20 individuals were tested for their ability to control a syringe and needle during a typical aspiration procedure with the 1, 3, 5, 10, and 20 ml traditional syringe and the new safety technology, the reciprocating procedure device (RPD), using the validated quantitative needle-based displacement procedure model. Unintended forward penetration (loss of control of the needle in the forward direction), unintended retraction (loss of control of the needle in the reverse direction), and the ability to generate vacuum were measured using the validated quantitative needle-based displacement procedure model. To determine whether the syringe size:control relationship had corresponding effects in real-life syringe procedures 84 arthrocenteses with each the 10 ml conventional syringe, 3 ml conventional syringe and 10 ml RPD were performed in a double-paired study that exactly matched joint and procedure. Patient pain and physician satisfaction were measured with the relevant validated visual analogue scales (VAS).

RESULTS: The traditional syringe demonstrated a significant unintended forward penetration of 13.9 ± 2.3 mm (one-handed) and 9.02 ± 3.11 mm (two-handed), but each smaller syringe (1, 3, 5, 10, and 20 ml) was better controlled than the next larger size. The RPD was superior the traditional syringe in terms of unintended forward penetration and retraction at all syringe sizes (1, 3, 5, 10, and 20 ml). The RPD reduced unintended forward penetration to 7.39 ± 1.83 mm (a reduction of 47%, $p < 0.001$). Similarly, the RPD reduced unintended retraction by 64% ($p < 0.001$). The RPD at all sizes was also superior to the traditional syringe in generating vacuum ($p < 0.001$). In the corresponding clinical trials, compared o the 10 ml syringe, the 3 ml conventional syringe reduced patient pain by 25% (VAPS Score: 3 ml: 4.65 ± 3.31 ; 10 ml: 5.261 ± 3.15 , $p < 0.001$) and improved physician satisfaction by 20% (VASS Score: 3 ml: 6.31 ± 0.74 ; 10 ml: 5.36 ± 1.26 , $p < 0.004$). Similarly, compared the 3 ml conventional syringe, the 10 ml RPD reduced patient pain by an additional 40% (VAPS Score: 10 ml RPD: 2.93 ± 2.89 ; 3 ml syringe: 4.65 ± 3.31 , $p < 0.001$) and improved physician satisfaction by 40% (VASS Score: 10 ml RPD: 5.36 ± 1.26 ; 3 ml syringe: 6.31 ± 0.74 ; $p < 0.004$).

CONCLUSIONS: If greater control of the needle is required and less pain in patients is desired, smaller syringe sizes should be used. Size by size, the safety device, the RPD, is superior to, better controlled than, and less painful than the corresponding conventional syringe for physician-performed syringe procedures, including arthrocentesis.