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**Improved Control and Reduced Perforation Rates with the Reciprocating Procedure Syringe.**

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Authors: W.L. Sibbitt, Jr., R.R. Sibbitt

Institution: University of New Mexico Health Sciences Center, Albuquerque, NM, USA

**Purpose:**

To determine the stability, force vectors, finger position, aspiration, and injection characteristics of procedure syringes during syringe procedures.

**Materials & Methods:**

10 physicians tested the above syringes in syringe maneuvers including aspiration, injection, injection-aspiration, and generation of vacuum to a defined level using conventional, reverse-aspiration, three-ringed, or reciprocating procedure syringes (AVANCA Medical Devices, Inc, Albuquerque, NM; AVANCAMedical.com). Instability and loss of control of the syringes were measured by the number and depth of needle penetrations through an organ model simulating 1) the intended point of control and 2) unintentional perforations of deep structures. Positive and negative pressures generated by the syringes were measured with a digital manometer, and overall operator difficulty with each syringe was measured with an analogue scale.

**Results:**

Instability (complete perforations per 10 injection-aspiration cycles) was as follows: reverse aspiration syringe  $9.0 \pm 1.2$ , conventional syringe one-handed  $5.5 \pm 1.2$ , conventional syringe two-handed  $2.0 \pm 1.5$ , the 3-ringed syringe  $2.6 \pm 2.2$ , and the reciprocating syringe  $0.8 \pm 0.9$  ( $p < 0.005$ ). The finger position the barrel flanges and the direction of the vector force on the syringe barrel accurately predicted the stability of each syringe ( $r = .93$ ,  $p < 0.005$ ). All tested syringes were similar in terms of pressure generation, but generation of a defined level of vacuum was much easier with the reciprocating procedure syringe than the other syringes ( $p < 0.001$ ).

**Conclusion:**

Procedure syringes are highly unstable and dangerous with very high perforation rates. One-handed use of the conventional syringe is especially unstable and should be avoided in syringe procedures. The reciprocating procedure syringe demonstrates markedly superior stability, ease of use, vacuum generation, and injection-aspiration characteristics than other procedure syringes, including the conventional syringe used with two hands. The reciprocating procedure syringe should markedly reduce the complications of syringe procedures, including unintended perforation of deep organs.