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Short Report

Syringe Grip Assembly with Self Locking Negative Pressure Mechanism to Assist in Transabdominal Percutaneous Chorionic Villus Sampling and Other Aspirations

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Introduction

A needle-and-syringe assembly is often used to collect/ aspirate various quantities of material from within the body using ultrasound or computed tomography (CT). The procedure is sufficiently safe to be performed in an office setting[1,2] and is very useful for diagnosing congenital conditions by aspirating placental tissue (villi) or for drainage, diagnosis and therapeutic purposes

Chorionic villus sampling (CVS) was first done in 1968 [3] and has since then become a procedure of choice for invasive prenatal diagnosis. It is often done trans-abdominally,[4] under real time ultrasound guidance, using a wide gauge (18G) needle and negative pressure onto a disposable 20ml syringe. Negative pressure can be applied intermittently or continuously, however, no significant difference in the yield of tissue has been found using either of the two methods.[5] To maintain a constant negative pressure either a two hand technique is used, or more commonly single hand technique is used. With single hand technique, the hand holding the syringe pulls the plunger to maintain a negative pressure of about 10ml while simultaneously the needle is inserted into the placenta several times. This needs to be done under real-time ultrasound guidance and the probe-needle geometry needs to be maintained under exacting limits. If a two hand technique is used a second operator is needed to hold the ultrasound probe. Though single handed technique offers more accurate needle visualization but constantly pulling the needle plunger to maintain the negative pressure while manipulating the needle often becomes difficult and fatigue soon sets in (Figure-1).

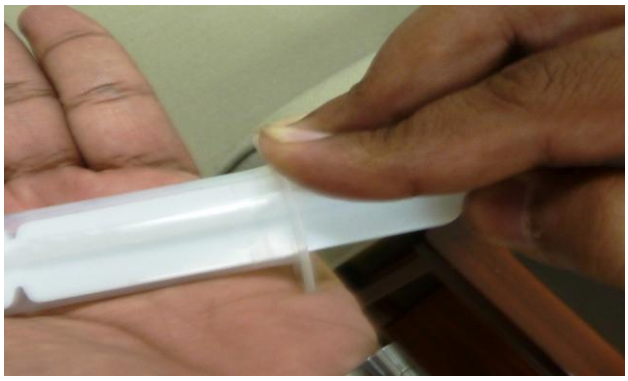

Figure 1: Conventional method of pulling the syringe, note the first interphalyngial joint is hyperextended by the pressure used to create a vacuum in the syringe.

We have developed a device which is based on an existing patented syringe pistol grip[6] (US Patent 3819091), but differs in that a self locking mechanism is incorporated.

Patients, Methods and Results

The study was done at Multan Institute of Nuclear Medicine and Radiotherapy (MINAR), Multan for a period of three years on more than 1200 patients. The improvised device (standard pistol grip) was mounted onto the syringe which was being used to aspirate chorionic villus samples or other large volume aspirations. The device was used after initial review and approval by the ethics committee of the institute.

A standard pistol grip was modified to hold a standard disposable syringe of 10ml or 20 ml capacity and also maintain negative pressure. This device is simple and light weight (100g). The holder is modified to enable a constant negative pressure by a self locking

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ratchet and lever mechanism (Figure-2). This allows the negative pressure to be maintained automatically by holding the syringe plunger in place, leaving the hand free to manipulate the needle tip into the appropriate location. In addition to the self locking mechanism, the grip also has a "zero" positioner, which ensures that the empty syringe can be easily and rapidly fitted into the slot without manipulating the plunger to ensure alignment of the syringe cylinder flange with the slots. The rotating lock assembly has two settings allowing the instrument to be used in two modes, lock engaged or lock disengaged.

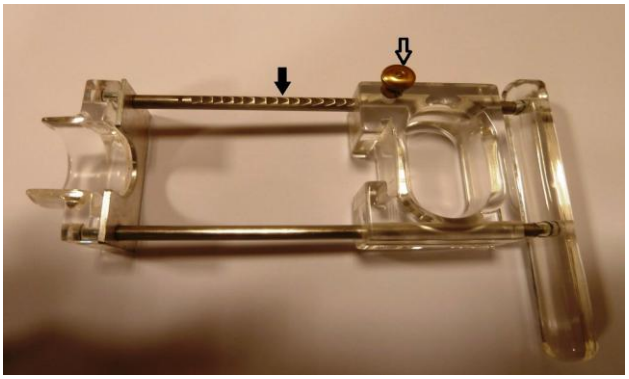

Figure 2: The syringe pistol grip, the ratchet mechanism allows the syringe plunger to be held back once withdrawn to the required level (closed arrow). Open arrow marks the lock-unlock control.

With the locking mechanism engaged, the plunger assembly locks with an audible click. Progressive withdrawal is allowed freely by the mechanism but once withdrawn to the desired negative volume, it is held at this negative pressure by the ratchet mechanism. The locking mechanism can be disabled to enable free aspiration of large volumes and to expel the material withdrawn during the aspiration procedure.

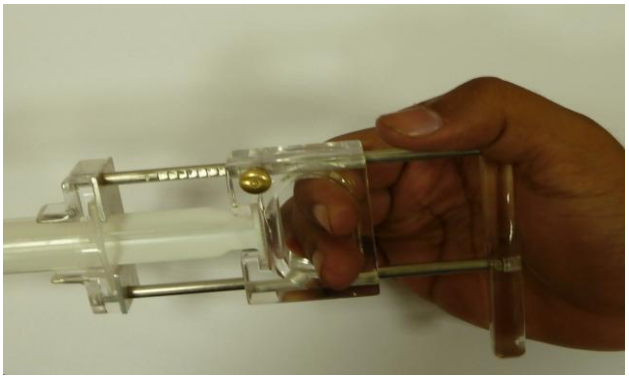

Figure 3: Aspirating with the syringe grip, note the natural position of the fingers when pulling the syringe plunger. With the mechanism activate, this pressure is created only initially and then the plunger is held in place and suction becomes automatic until the syringe is filled.

The device has been used in aspirating over 1200 CVS procedures and other large volume aspirations. Multiple operators have used this device and are of the opinion that this makes the procedure much easier than without the device (Figure-3). There were no complications reported due to use of this device.

Comments

True to the original design objective, the aspiration procedure became almost effortless when this device is used. The assembly adds some bulk to the syringe but the device is light (~100g) and the whole assembly can be held in a pen-like grip to allow very precise needle tip placement. The syringe holding components are fashioned in a half circle with slots for the flanges of the syringe cylinder and piston, enabling rapid loading and removing the syringe from the assembly.

The assembly as currently designed can accommodate a standard 10 or 20 ml syringe; it makes the application of negative pressure almost effortless enabling more procedures to be done in a day as the limiting factor of muscle sprain is no longer a consideration. Although designed with the CVS procedure in mind, the device can be used for syringe aspiration for any material.

Conflict of interest: None declared.

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