Safe and Controlled Application of Platelet-rich Plasma, Stem Cells, and Other Serums to Wounded Skin using a Novel, New Patent-pending Applicator

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Abstract

In clinical practice, serums such as platelet-rich plasma, stem cells, or peptides are often applied to wounded skin to enhance healing. This is commonly performed with an open-ended syringe which hovers over the tissue while the product is dripped onto the surface. Serums can also be applied from the needle attached to the syringe, which poses an unwanted risk of needle stick to the patient or practitioner. Although a few companies have developed applicator tips, practical limitations exits. This article describes a simple, novel, patent-pending applicator that when attached to any universal Luer lock syringe allows for the safe, controlled, sterile application of PRP, stem cells, peptides, or other serums to wounded tissue.

Introduction

Cutaneous wounds occur as the result from injury, burns, trauma, or underlying illness from diseases such diabetes mellitus and peripheral vascular disease. Controlled wounds are often created in clinical practice with procedures such as microneedling and fractional laser resurfacing for skin rejuvenation. Platelet-rich plasma (PRP), stem cells, peptides, and other serums are frequently applied to wounded skin to enhance wound healing. Often these serums are applied to wounded tissue via an open-ended syringe which does not allow for controlled application and can create splatter of the product. Particularly with blood borne products, such as PRP, splatter of product poses an infectious disease risk if the product comes in contact with the eyes or mucous membrane of the clinician. With this method the serum is often spread by the clinician over the tissue with a non-sterile, gloved hand which could contaminate or affect the viability of the product. Another common method for applying serum or fluids involves expressing the product through a needle attached to a syringe. This frequently used method carries a significant risk of unwanted needle stick to the patient and practitioner. This article describes a simple, novel, patent-pending applicator that when attached to any universal Luer lock syringe allows for the safe, controlled, sterile application of PRP, stem cells, peptides, or other serums to wounded tissue.

Methods and Materials

An applicator with a circular, smooth interface perforated with multiple micropores on a universal Luer lock base which attaches to a Luer lock syringe was designed. This single use, sterile device when attached to a syringe allows the clinician to control the application of the serum by controlling the pressure applied. The practitioner can hover the disc slightly above the wound while controlling the pressure to release the serum. Additionally, direct contact between the wounded skin and the smooth, medical grade polymer interface on the device can be employed to apply serum in a gliding motion directly on wounded tissue. In both application methods, the applicator allows the practitioner to have safe, controlled application of serum without risks of splatter, contamination, or needle-sticks as compared to other methods.

Results

The prototype for the device was tested by two dermatologists and two plastic surgeons who frequently perform microneedling, laser resurfacing, and treatments for wounded skin in their clinical practices using PRP, stem cells, and peptides. Each practitioner tested the prototype device for ease of use and control of application when compared to the method of open-ended syringe and needle capped syringe application of fluid. All four clinicians agreed that the applicator was easy to use, allowed for more control of the serum onto the tissue, and was significantly safer than the other two methods. The clinicians agreed that this would be a device that they could easily incorporate into their clinical practices.

Discussion

Many studies and articles describe the use of platelet-rich plasma, stem cells, peptides, and other serums to wounded skin and other tissues to enhance wound healing.[1,2,3] In clinical practice, these serums are typically applied in an uncontrolled, non-sterile manner by expressing the product from an open-ended syringe onto the tissue, then using a non-sterile gloved hand to spread the serum over the wounded tissue. Limitations of this method include risk of splatter when the serum is expressed from the open-ended syringe, contamination of the product of spread with non-sterile gloved hands, and lack of control of application of the product. Another commonly used method for applying serum to wounded skin is the expression of the serum from a needle attached to the syringe containing the product. Although this allows for more control of the speed and more precision in the application of the serum as it is expressed from the syringe, this method poses a high risk for unwanted needle-stick for the patient and the provider, making it a high-risk application technique.

To address these limitations and issues, two companies have developed kits comprised of applicator tips. SteriTip is a patent pending applicator to allow for sterile application of products or PRP. This applicator is designed with non-absorbent medical grade thermoplastic resin projections in a convex array. This product is distributed in a kit composed of the applicator tip mounted on a stand, a 14-gauge cannula with cap attached to a removable Luer lock connector, as well as, two sterile SteriConnectors for mixing products together.[4] A second kit that is commercially available is the CoAxial Spray Kit manufactured by BIOMET, Biologics. This kit provides a spray applicator specifically indicated for the application of PRP onto graft material. The kit is composed of 2 applicator syringes and two tips. The tip is designed to provide a fine mist spray of PRP onto tissue.[5] Concern with this application method is the risk of infection transmission of an aerosol mist of a blood borne particles with inhalation or contact on mucosal surfaces and eyes.

Discussion

A similar method was also reported in an article discussing use of a novel 3D-printed spraying head applicator for PRP. This article describes a self-contained spray applicator for PRP. The results of the study show that the device could be used to evenly spray a film of vital platelets on treatment areas and could be a promising tool for applying evenly distributed PRP blood derivatives to treatment sites.[6] However, the risk of exposure of the clinician to a mist of blood borne particles via inhalation or contact is a concern.

To address these limitations and for the practical use in our clinical settings, a safer, simple, sterile applicator was designed that could easily be used for the controlled application of PRP, stem cells, peptides, or other serums onto wounded skin. No special kits or additional equipment, other than standard Luer lock syringes are needed to use the novel, new applicator. The device is a circular disc perforated with multiple micropores with a Luer lock base. Different sized disc can be manufactured for a variety of sizes to accommodate different size surface areas being treated. The applicator is made from a disposable, medical grade polymer packaged as a sterile, single use device. The clinician can choose from or combine two methods of application using the device. The first is to hover over the wounded tissue while applying controlled pressure on the syringe to apply serum without contact to the tissue. The second method is gentle contact of the smooth interface of the applicator disc touching the tissue to spread serum while being expressed from the applicator with light pressure on the syringe. In both methods, the serum is safely applied to the wounded tissue.

The benefits of the applicator include ease of use, safe application without risk of needle-sticks, and controlled application methods without risk of aerosol inhalation or uncontrolled splatter. It is compatible with standard Luer lock syringes and requires no further purchase of specialty products.

Conclusions

Safe, sterile, controlled application of serum to wounded skin can be achieved using a simple, novel, patent-pending applicator that attaches to standard Luer lock syringes currently used in practices performing these procedures or clinics treating wounds. Clinicians who tested the prototype agreed that the applicator was easy to use, allowed for more control of the serum onto the tissue, and was significantly safer than the other two methods. The applicator is practical and requires no additional supplies or training. This device meets an unmet need for application of serums or other products to wounded tissue.

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