T-Fast Multi-Implanter

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ABSTRACT

Introduction: Implanters are becoming more popular for implantation of follicular unit excision (FUE) grafts due to their relatively short learning curve and the inherent protection against trauma they provide the graft. However, the reluctance of staff to embrace a new technique, coupled with the per-patient cost of implanters and the number of personnel required to load them, may have slowed the adoption of implanters by clinics. Our T-Fast multi-implanter was designed to address these issues.

Methods: We describe the novel T-Fast multi-implanter that we developed and detail the design and benefits of sharp-tip implanters.

Results: The T-Fast implanter has two needles and can implant two grafts simultaneously. The design is highly ergonomic and allows multiple implanters to be held with one hand, further simplifying the procedure.

Discussion: The T-Fast implanter reduces operating costs by reducing surgical time and the implanter cost per patient, which may persuade clinics to embrace this new technique. By saving time and costs, this implanter has the potential to increase adoption of implanters to place FUE grafts.

Keywords: follicular unit excision (FUE), implanter, multiple needle implanter, reduced surgery time, sharp implanter, T-Fast

INTRODUCTION

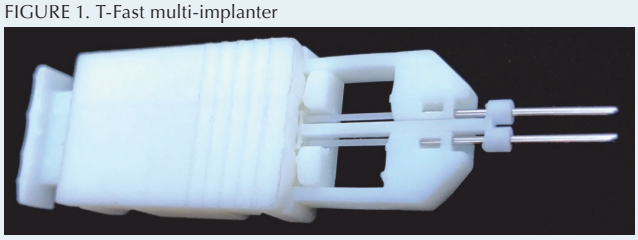
The fragile nature of the grafts produced by follicular unit excision (FUE) has generated great interest in implanters, mainly due to the advantage over forceps of causing less damage to the graft during placement.[1,2] However, for many surgeons, impediments to the adoption of implanters into their practices include the cost per patient due to their disposable nature (at least with sharp implanters), the additional surgery time that they can incur as assistants learn to use them, and the reluctance of assistants to switch from forceps. We have pursued an implanter design that reduces surgery time (without sacrificing quality) to ultimately reduce operating costs, making the implanters worth the investment. In addition, the reduction of surgical time offers other advantages to the team and the patient, such as more rest for doctors and assistants, less fatigue for patients, greater integration of grafts, and fewer drugs used, making it safer for the patient.

Here, we describe the development of the T-Fast multi-implanter, which was presented at the VII Brazilian Congress of Hair Restoration in 2018 (Foz do Iguaçu),[3] and share our experiences that will help surgeons achieve what they usually do in less time while preserving the quality of the hair transplant.

T-FAST MULTI-IMPLANTER: DESIGN AND TECHNIQUE

The T-Fast multi-implanter contains two sharp needles that allow for twice as many units to be implanted simultaneously, reducing surgical time (Figure 1). In the initial designs, we tested 3- and 4-needle implanters to assess their viability. However, after several tests, it was concluded that only 1- and 2-needle implanters could be used successfully with a sharp edge, while 3- and 4-needle implanters could be used with previous incisions. Because the goal was to reduce the implantation time, the 3- and 4-needle implanters were discarded since losing time to make previous incisions was not congruent with the objective.

FIGURE 1. T-Fast multi-implanter



Sharp implanters have advantages over blunt implanters. Those who defend dull implanters argue the advantage is that once the doctor finishes making the pre-incisions, they can leave the room and delegate the placement of the grafts to another doctor or their assistants. Another defense of the dull method is that smaller incisions can be made with straight blades and the graft inserted using the larger diameter dull implanter. We would argue that the size of the incision of a sharp needle is the most suitable for the diameter of the graft it contains. Let's analyze this in more detail. When we make incisions with flat blades, for example, 0.8mm, then introduce a blunt implanter of 1mm in diameter, we are doing exactly the same as if we introduce a sharp implanter with a 1mm-diameter edge; the size of the incision is practically the same in both cases. Those who have ever observed the point of a needle in detail will have noticed that the edge of the needle corresponds only to a part of the point (Figure 2). Thus, the needle only cuts with the edge of the point and the cut it makes is, depending on the angle of the edge, practically straight. If we draw a line between two points equidistant from the needle tip on the edge, we can clearly see this: the length of the incision in the widest part almost always corresponds to three-fourths of the diameter of the needle. Therefore, the rest of the needle only dilates the incision through which it penetrates.

Premade incisions that are disproportionate in size to the diameter of the implanter needle increase the chance that a complication called popping will occur; it is the balance of

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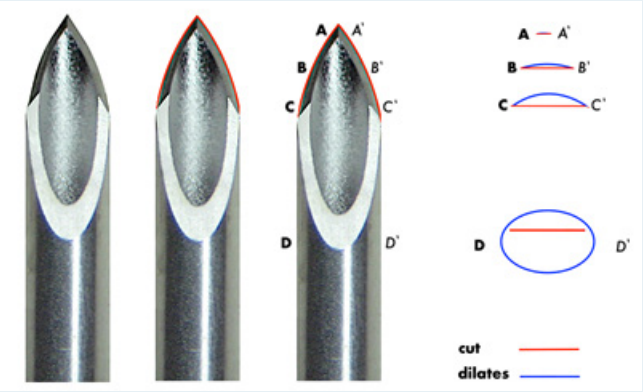
FIGURE 2. Needle tip



two components—premade incision and dull needle implanting—that is needed to avoid the genesis of this phenomenon.

There is a stage of the cut in which the tip of the needle, due to the mechanical load, applies pressure on the upper layers of the skin to generate the cut, and there is a sliding stage in which the needle is introduced into the tissue through the cut previously made, causing friction between its outer wall and the tissue. In the cutting stage, the maximum normal load is generated on the skin and consequently the maximum tension during the penetration of the needle. While in the sliding stage, the loads decrease but the tension on the skin is maintained. This was the reason why we stopped using implanters with three or more needles. Even introducing two needles simultaneously our contact surface increases, so we must increase the applied force. To introduce one sharp needle, we must exert a force of 1.2 Newtons (N) to overcome the shear stress. Within the range of 1.6-1.8N, it is possible to insert the needle more or less easily. Entering two needles simultaneously brings the necessary force to almost 2.5N. To reduce the force and to keep it within reasonable limits, we placed one of the needles a few tenths of a millimeter longer than the other on the T-Fast implanter; in this way, the needles contact the skin in a staggered manner.

Popping is also related to the distance between the point of application of the force and its scope, something similar to what happens in the epicenter of an earthquake from where the energy dissipates as we move away from it. To use implanters with two needles, we must establish a different placement strategy than single implanters to avoid popping. We start by making a first pass through the entire receiving area, inserting the needles with a distance of 3-4 mm between them. This first implantation is the fastest and allows us to implant at a rate of 40 units per minute.

Once this first stage is completed, we go back to where we started and make a second pass between the newly placed grafts. This second stage is a little slower than the first since we have to place the grafts looking for enough spaces to insert the two needles. Finally, to achieve the planned density, we make a third pass with single-needle implanters, filling the empty spaces between the grafts and designing the hairline.

Implanting two grafts each time we introduce the implanter into the scalp allows us to achieve a high rate of grafted unit placement without increasing our normal implanting rate; rather, we simply have to maintain it as usual. An assistant can typically load 6 single implanters per minute, so at least 4 assistants loading implanters is needed to allow an implantation rate of 40-50 grafts per minute, at least in the first pass. To give assistants a load margin, we start with 20 double and 5 single implanters already loaded. (See video: https://www.youtube.com/watch?v=WqypgA5x0e4.) This is the main problem that we face with multi-implanters, which we are working on with the objective of bringing this to the ideal formula—one assistant loading and one assistant implanting with one implanter—which would thereby result in lower costs.

Although an advantage of using blunt implanters is that they can be reused, our T-Fast multi-implanter is small, light, has few parts, does not need maintenance or cleaning, creates the exact space to accommodate the graft (which decreases popping of the graft), allows the grafts to be easily accommodated in the right direction and angle, and is economical and disposable (Figure 1). The T-Fast multi-implanter cannot be sterilized in an autoclave because the mechanism would be rendered useless, and the needles cannot be changed. A unique characteristic of our implanter is the use of a plastic material to move the follicular unit inside the needle and deposit it in the bed created by the needle; this material adapts more precisely to the internal diameter of the needle, avoiding pinching the epidermis when implanting. Pushing the unit with a softer material is more friendly to the delicate tissue of the follicular unit.

CONCLUSION

The use of implanters is gaining momentum as even experienced teams find it difficult to place delicate FUE grafts with forceps. Implanters help protect the graft and prevent crushing and snagging.[1,4,5] Another attractive feature of implanters is the relatively short learning curve compared to forceps, so little training is needed to master the technique.[1] However, teams are often reluctant to adopt a new technique into practice. Additionally, the cost associated with sharp implanters due to their disposable nature has been a deterrent.[1] By creating an implanter that increases surgical efficiency by reducing surgery time, we have opened the door to lower operating costs, which may more than offset the expense of implanters. This cost savings may be the impetus needed for some clinics to switch from forceps to implanters.

The innovative T-Fast sharp multi-implanter results in less resistance, less trauma, less popping, less bleeding, less fatigue for the clinician, and reduced surgical time.

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