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Rashid, Rashid M

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Letter

Follicular unit extraction with the Artas robotic hair transplant system system: an evaluation of FUE yield

Rashid M. Rashid MD PhD

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Mosaic Clinic Hair Transplant Center

Correspondence:

Rashid M. Rashid MD PhD
Mosaic Clinic Hair Transplant Center
2401 Yale St. #2a
Houston, TX 77008

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Abstract

Hair transplants were developed and championed by dermatologists. However, dermatology literature has few contributions from within our specialty. In this manuscript, we present our evaluation of a specific graft harvesting approach for hair transplants referred to as Follicular unit extraction (FUE). In particular, we sought to evaluate the rate of harvest attempts that did not produce an actual hair follicular unit graft.

Introduction

The FUE is a method of individual hair graft harvesting that is an alternative to the traditional scalpel harvesting approach [1]. FUE is increasing in popularity [2] because it does not leave a linear scar. However, this approach presents many hurdles. Until recently, the most common hurdle was the difficult and time consuming nature of the manual approach to FUE. Now, devices like Neograft and Artas have helped overcome these limitations. However, graft quality can suffer dramatically in the hands of an inexperienced team that is not aware of the limitations of the machines. Previously, we described some of these limitations using the Neograft device, and a method to overcome them, in an earlier manuscript [3]. In this manuscript, our center measured graft loss using the Artas harvesting process.



Figure 1. The Artas robotic hair transplant system targeting and punch-coring hair grafts. A technician stands by to remove grafts.

The Artas device automatically selects and harvests the follicular unit grafts and performs the motion without human intervention (Figure 1). The Artas robotic activity involves a punch and core motion that leaves the grafts in the scalp. The grafts remain in the scalp (Figure 2), but are loose and ready for a gentle manual pluck with a forcep to transfer them to a holding medium. However, the device is not able to determine if it has completed a proper harvest and does not assess the quality of the grafts harvested. Grafts could be incompletely punched, improperly cored, transected, or sucked up into the holding chamber (Figure 3) leaving a gap with no graft at the harvest site (Figure 4). Other types of damage can occur in such a way that could affect viability.



Figure 2. The monitoring screen showing blue marks of sites that have been punched and cored. Grafts remain in the scalp ready for removal.

Figure 3. The collection chamber for grafts that are inadvertently suctioned out of the scalp during the robotic motions

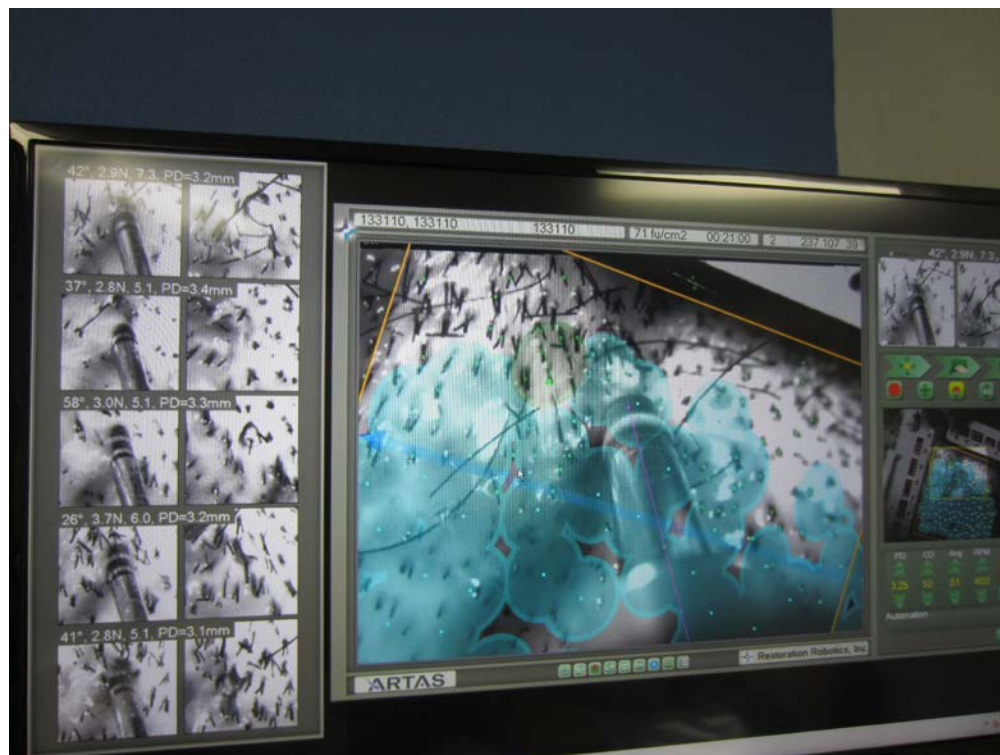


Figure 4. The Monitoring screen showing a site that has been punched and cored, but has no graft. This is noted by the hole seen as a round black gap.

Despite the limitations, the Artas produces an automated motion that relieves the physician of the physical strain and repetitive motion injury that can occur from manual FUE. As a result of this time and strain relieving motion, the Artas device is a pay-per-attempt device that charges the clinic (and thus the patient) per attempt/motion to harvest and not per actual successful harvest.

Owing to the lack of graft evaluation capability, the Artas FUE process still requires careful physician monitoring to evaluate the harvesting process. The difficulties in monitoring the procedure and improper harvests can further be augmented in situations that involve poor patient candidates. These candidates include patients too large to sit in the Artas chair (Figure 5), patients unable to hold still for long periods of time, patients with prior hair transplant scars, or patients with scalp dermatitis or other scalp deformities. It is because of the above that we chose to evaluate harvest attempts in relation to actual yield.



Figure 5. The Artas robot chair.

We selected 3 consecutive patients considered more ideal candidates based on excluding the aforementioned scalp issues. We looked at the first 3 harvesting grids for each patient. The number of graft harvest attempts per grid ranged from 128-151 attempts. On visual evaluation of the screen, we determined how many grafts remained in the scalp and stood ready to be extracted after the Artas harvest attempt. We found that gaps occurred in an average of 5.8% of harvest attempt sites. A gap was defined as a harvest attempt site that had no visible graft. The Artas has a collection chamber for possible grafts that have been over-harvested and suctioned into the system, thus designed to resolve the lost grafts and gap issue. In this chamber, we found approximately 40% of the gaps had a recoverable graft. After recovering these grafts from the chamber, we found the true missing number of grafts to be an average of 2.4%. This true missing number represents gaps that had no recoverable graft.

The relevance of this is multi-fold. Most FUE devices are manually controlled. Therefore, if you have a hair transplant case of 1000 grafts, and during the counts you find only 900 quality grafts, then you extract 100 more. The only cost is the extra time. This time adds stress on the team and also increased time out of body for the initially harvested grafts. However, the Artas is pay per use and per harvest attempt. It is not clear what the quality and survival is for the grafts in the chamber. So if the targeted transplant grafts harvested are lower than promised, it is not clear where the difference comes from. With these advanced devices, doing 100 extra grafts to cover gaps or quality issues adds both time and cost to the case. To overcome such issues, some centers choose to offer services based on area transplanted, allowing for a margin of safety in time and costs. However, many centers charge by the graft. When charging by the graft, centers sometimes charge by the attempt, whereas others charge by the actual grafts collected. It is clear that one dramatic improvement would be the ability to determine actual graft viability instantly during the procedure. This would assessment of the grafts collected in the chamber permit nearly 100% collection rates, improving outcomes and reducing costs.

With robotics, the potential to produce high quality FUE based hair transplants is now on the horizon. The Artas device is a dramatic leap forward in FUE and further studies are needed to determine the limitations of the device.

The author has no financial conflict of interests with the device or its parent company.

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