

# Robotic Hair Restoration

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## KEYWORDS

- Follicular unit extraction • Follicular isolation technique • Robotic hair transplantation
- Follicular units • Transection • Strip harvesting

## KEY POINTS

- The robotic system of hair restoration is an important addition to the techniques used for hair restoration surgery.
- Robotic hair restoration is based on the follicular unit extraction/follicular isolation technique (FUE/FIT) harvesting process and provides the means to obtain such grafts in a reliable and efficient manner while maintaining low transection rates.
- The advantages and disadvantages associated with the robotic device are similar to those of manual or mechanized FUE/FIT harvesting.
- Using the robotic system a physician can more easily add hair replacement to his or her practice and not have to markedly increase staffing.

## INTRODUCTION

The use of robotic mechanisms that assist in surgery have been available for more than two decades. The most prominent system is the Da Vinci system (Intuitive, Sunnyvale, CA) whereby a physician directs the movement of the robotic apparatus in various surgical procedures.

An advantage of a robotic system is that it can perform repetitive maneuvers with great precision. This ability to perform repetitive movement lends itself particularly well to the performance of hair restoration procedures when follicular unit extraction/follicular isolation technique (FUE/FIT) is used. The robot assumes some of the tasks that would require several assistants if a strip harvesting procedure is undertaken. The system also requires less time to be proficient with FUE/FIT compared with learning to do manual FUE/FIT surgery.

The ARTAS system (Restoration Robotics, Sunnyvale, CA) is a robotic device developed specifically for the FUE/FIT procedure. It is cleared by the Food and Drug Administration (FDA) and

approved for use only in men for the purpose of hair transplantation.

FUE/FIT is a form of follicular unit grafting<sup>1</sup> and is a technique for removing hair grafts based on obtaining intact follicular units<sup>2</sup> or intact parts of a follicular unit from the donor area of a patient's scalp and then implanting the grafts into appropriate recipient sites (Figs. 1 and 2). The technique is essentially the old fashioned punch-graft procedure<sup>3</sup> but performed with small punches, usually 0.7 to 1.2 mm in size. Whereas the 4- or 5-mm punches used in the older punch technique harvested multiple follicular units, which may or may not have been totally intact, the FUE/FIT process is designed to remove single follicular units or intact parts of a follicular unit.<sup>4-6</sup>

The primary attraction for patients who seek FUE/FIT is that it is considered to be a less invasive or minimally invasive procedure compared with strip harvesting and most importantly, a linear scar is avoided. The patient may be able to wear his hair shorter than if a strip harvest was performed but there is a limitation to this, because

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Disclosures: Dr Rose has been a consultant to Restoration Robotics; Dr Rose owns stock in Restoration Robotics; Drs Rose and Nusbaum have an ARTAS system in their office.

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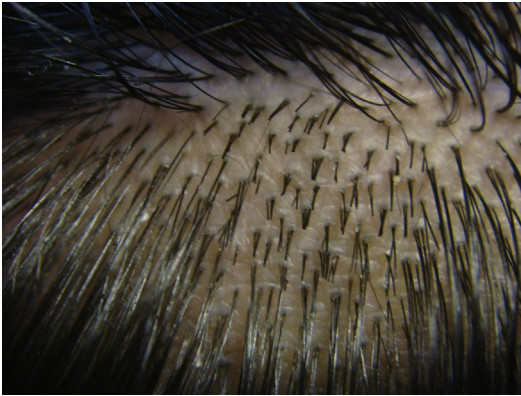
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**Fig. 1.** Normal appearance of hairs in the scalp. It is important to notice that the hairs generally occur in groupings, referred to as "follicular units."

the wounds from FUE can be visible if the head is closely shaved. The appearance of the scar from strip harvesting depends on multiple factors, such as donor density, strip width, tension on closure, scalp laxity, surgical technique, and the patient's healing characteristics.

Some advocates of FUE/FIT believe that the recovery time is shorter and patients can assume strenuous activities sooner.<sup>7</sup> They also suggest that the procedure is less painful than with strip harvesting. The wounds from FUE do tend to appear closed in 4 to 5 days, whereas a strip harvest patient has sutures or staples in place for 7 to 14 days.

The FUE/FIT procedure is considered well suited for a young patient who is uncertain as to whether he will ever want to shave his scalp or proceed with additional hair transplants. If he were to have a strip harvest, concealing the resultant scar



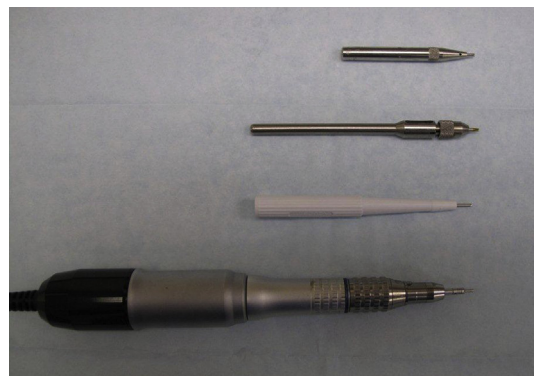
**Fig. 2.** Follicular unit grafts are depicted. Typically the grafts contain one hair, two hairs, or three hairs. On occasion follicular units with greater numbers of hairs in the unit occur.

could be a possible concern. Thus, the FUE technique gives the patient more flexibility in the future as to whether to have more procedures. FUE is also very helpful when the scalp is tight in the donor area after strip harvesting and therefore the number of grafts that can be obtained with further strip procedures is limited. FUE/FIT can also be very useful in obtaining grafts for insertion into existing linear strip harvest scars. FUE/FIT can also be used to harvest body hairs.<sup>8</sup>

In regard to postoperative pain, the authors have found that with strip harvesting pain is well controlled with medication, such as oxycodone. Furthermore, with the use of liposomal-encapsulated bupivacaine (Exparel; Pacira Pharmaceuticals, Parsippany, NJ) postoperative pain is less commonly an issue with strip harvesting. The liposomal-encapsulated bupivacaine lasts up to 72 hours.

For the physician, an advantage to performing FUE is that fewer personnel are required compared with strip harvesting. This is because large strip harvest cases require several assistants to dissect the follicular unit grafts from the harvested donor strip tissue. With FUE, the procedure can be done with only one or two additional assistants whose role is to simply clean the grafts and sort them into follicular unit groups containing one, two, or three or more hairs.

The manual technique involves using a biopsy punch of some type and manually harvesting the follicular unit grafts. Many physicians use a sharp punch, whereas some use a combination of a sharp punch to enter the epidermis and then a dull punch to go into the dermis and fat.<sup>6,9</sup> Some physicians use a motorized drill with a punch attachment for this type of harvesting.<sup>10</sup> There are several variations of a motorized drill on the market (**Fig. 3**). The use of a motorized drill



**Fig. 3.** Different types of punches used to harvest FUE/FIT grafts. A motorized drill with a punch is also shown.

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