Using Pork Skin as a Practice Medium for Learning Hair Transplantation Techniques

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Abstract A simple technique using pork skin and excess hair and epidermis harvested from anti-wrinkle surgeries was used to practice hair transplantation techniques. This allows inexperienced physicians to practice and perform the traditional steps of hair transplantation without involving an actual patient in the early stages of perfecting technique. The technique uses pork skin during the procedure, while performing real-time hair transplantation simulation. The surgical result of the procedure can then be visualized, and the training process can be repeated at will; peer evaluation is performed after completion. Results showed that residents that practiced this technique scored consistently better than those without the same training background. Every score increased with practice, and the length of time needed to complete the hair transplantation process decreased. A simple technique using pork skin for practicing hair transplantation technique is a valuable training tool, and gives residents a way to practice sound techniques along with more precise anatomical familiarity for hair transplantation surgery, without the risks associated with training on live patients.

Keywords Hair transplantation · Surgical simulation · Continuing education · Alopecia · Training tool

Alopecia and loss of eyebrow hair cause social discomfort for the patient. Alopecia and bald brow present a particular set of challenges for dermatologists. Hair transplantation occurs in many commonly used surgeries. Therefore, many surgeons have focused on those techniques. Hair transplantation was the first intervention for alopecia and bald brow. Later, this procedure was used for other purposes, like hiding scars. Hair transplantation is a kind of ancillary technique in these cases; additional incisions are generally not necessary [1].

Hair transplantation techniques were first attempted by Dr. Orentreich in the 1950s. His technique is considered pioneer work. Surgeons then developed the techniques such as micrografts; this produced even better results. Single-hair, two-hair, and three-hair grafts produced crucial steps toward achieving an improved and natural appearance. Micrografts usually yielded good results. Many transplantation methods are available; Some use a 21-G needle with stick, some use implanters, and other physicians create premade incisions with a tiny microblade, then place the grafts inside the tiny incisions (Fig. 1). Robotic techniques for follicular extraction are also possible [2]. The success of reconstruction depends on the surgeon's skill, and the angle and direction of single-hair grafts are very important [3, 4].

In surgery teaching clinics, the trainee may have no chance to practice by themselves while following the process as performed by the senior doctor on the patient. The trainee and teacher only discuss specific options; the trainee's role is limited.

Until now, only cadavers allowed residents to practice realistic hair transplantation. However, cadavers are expensive and cannot always be incorporated into daily teaching. Here, we describe a simple technique using pork and excess hair from anti-wrinkle operation surgeries for hair transplantation practice (Fig. 2).

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Fig. 1 The surgical instruments used in graft preparation. Prepared equipment: pigskin, scalp, blade, and needle. The scalp is divided into hair units, ready for transplant

The authors of this article have used a simple technique using pork skin and harvested human hair and epidermis tissues (from anti-wrinkle operations) to practice hair transplantation. This is the cheapest and the most effective way we have found to study hair transplants. The technique is easy to master. After training, the beginner can quickly and easily perform complete hair transplants. Successful hair transplantation has followed training in all cases. After training, 20 patients with alopecia or eyebrow defects were successfully treated.

Method

Excess hair and skin from forehead lift procedures—or tissue expander scalp flaps—were used as the teaching appliance (Fig. 3). Dermatologic surgery or plastic surgery practices have adequate sources of both, free every day. After surgery, excess scalp tissues are discarded as medical wastes.

Tissues used for practice transplant techniques were cleansed with chlorhexidine liquid.

Grafts were first irrigated with normal saline; the strips were divided into discrete follicles by no. 10 blades. The follicles were stored on a piece of wet gauze. Hair follicles were then implanted into the pork skin recipient sites created by 21-

Fig. 2 For hair transplantation in pigskin, trainees can adjust the angle and can exercise speed

Fig. 3 The operation was done using expanded scalp flap and excess scalp which were part of the eyebrow reconstruction

G needles. [5] We can simulate and recreate various methods of transplantation, grafts of different size, different angles, and different depths, satisfying a kind of training “Grand Slam.” This kind of comprehensive training just is not possible with actual patients, where one technique or method is favored or required.

Sixteen plastic surgery residents were trained in the simulated operation. They were given a brief lecture describing how to properly perform the simulated operation. Under the teacher’s guidance, each of the plastic surgery residents ran through the program and planted approximately 50 hair units in pigskin.

The trainees participated in three training sessions. Each time, they plant 50 hair units in pigskin.

If the trainees can remove and transplant 10 hairs within 10 min, they are qualified to perform the real operation. After three training sessions, all of them are qualified.

Case Report 1

A 12-year-old child was referred to our hospital in 2012 with 6-year history of partial loss of left eyebrow and scalp scarring caused by fire.

The patient was initially treated with tissue expanders on scalp. In the second operation, the tissue expander flaps created some excess skin with hair, to be available for grafting. The original plan—to use the expanded excess scalp tissue for reconstruction—was discarded. Our team chose to utilize the newer, more modern techniques. After discussion and informed consent, the patient and family members agreed.

Small hairs and supportive epithelial tissues were used to graft on the left eyebrow. The patient received a left eyebrow partial transplantation procedure, consisting of single-round grafts inserted into recipient sites. Trimming of the grafts was precise and methodical to preserve the hair follicle papillae. Transplants were oriented in the direction of natural hair growth, then carefully cleaned, prepared, and trimmed with direct pressure.

Twelve months after transplantation, hair growth was noted at the site of the procedure. The patient reported being satisfied with the results. We considered the results as positive. Before the new training and resultant improvements, hair transplantation was conducted by a special doctor; surplus scalp hair had been previously discarded. This scenario seems to be quite common. At this time, total cases for the new transplantation training and surgery number 20, with excellent results.

Discussion

Hair transplantation surgery has various component parts which must be managed; that includes harvest of hair and skin, hair follicle separation, the district processing, and implanting procedures. Teaching hair transplantation to dermatology and plastic surgery specialists has relied primarily on surgical education. Residents usually learn hair transplantation surgical skills by observing, assisting, and performing surgery on real patients. Difficulties are experienced for obtaining standardization of training, relying on a larger number of procedures performed on real patients.

Our surgical simulator appears to be a valid model of the typical hair graft patient. The residents scored higher on testing after training, which demonstrated that residents were able to apply their recent experiences in training. Residents increased their accuracy and decreased their procedure times after practicing on the pork skin.

After running through on the pigskin simulation operation several times, the residents stated that they could understand better. Beginners often simply tried to memorize technological process involved, as opposed to real understanding. Beginner's scores improved, and they gained a better understanding of the need for precise and accurate placement. They often discussed the intricacies of the practice; the two key points of discussion for this procedure are depth and angle.

The donor hair strip is the excess scalp from face lift operation, with large number of hair bulbs. Each hair graft is transplanted into an incision prepared by 21-G needle. The angle between the hair stem and the skin is very important. The angle transition and some hairs need to lay nearly flat to the skin. Practice to decrease surgery time is vital—if the operation takes too long, it may cause the hair bulb to decay. Fast and correct placement of single-hair grafts may cause improved results and with a very low complication rate.

This training model also allows users to experience more than one technique in a single session. Different surgical techniques require discrete feeling and touch skills. Surgical techniques for hair grafts divided into several types. Harvest methods for hair follicles, and transplant methods may vary. We generally use the scalp strip and single-hair transplant technology. Such a grown hair has a more natural appearance;

the degree of exploitation is the highest for harvested hair; the survival rate is the highest.

Through training, we can teach new practitioners how to position the hair follicle to affect the depth and direction of the hair. Some aesthetic and even artistic expressions are possible through controlling the direction of the hair follicle and depth. The skin of the pork provided a useful training medium that accelerates skill acquisition.

Each trainee needs 0.2 kg of pigskin (costs \$1), two separating blades (cost \$0.5), and five syringe needles (cost \$1). The total cost per person is approximately \$3. The hairs used in the simulated operation come from the forehead lift surgery, so that the cost is saved.

Pigskin is thicker than the human's skin. The trainees usually pierce into the pigskin for 0.5 mm, which can be measured by the length of the needle outside of the skin. When the length of needle outside of the skin is subtracted from the overall length of the needle, the depth of penetration, i.e., the depth of the placement of the follicle, is easily calculated or estimated. The pigskin and human skin feel almost the same in the operation. By practicing on the pigskin, the trainees can gain more experience on the hair angle and the actual feeling of the hair transplantation. With this experience they can operate on the real patients smoothly and swiftly.

Advantages

1. Learning to properly angle transplanted follicles—the angle of hair transplantation is very important, and must comply with the surrounding hair and anatomy. Direction of the hair follicles is particularly important in the eyebrow transplants. Learners can experience variations in technique with the pork skin, before attempting to help actual patients.
2. Pigskin is inexpensive, and the hair harvest from the anti-wrinkle surgery is plentiful and free.
3. Hair follicle depth can easily be adjusted.
4. Speed and accuracy of the procedure are improved with practice. Delays in implantation may result in failure of the follicle to grow healthy hair later.
5. Inexperienced surgeons are not paired with anxious patients.
6. Pigskin thickness and hardness are quite similar to human skin; practice with pork skin accelerates skill and learning needed to treat actual human patients.

Disadvantages

1. No bleeding. Real hair transplant patients will bleed. Sometimes, this results in the implanted follicle being pushed out. New practitioners must be aware of the differences.

2. Donor hair may be infected. In turn, this may pass infection on to the implant site, or even to the doctor. Protective gloves and aseptic technique remain essential at each step.
3. Pigskin is inert and no hair growth is seen post-transplant. Technique success feedback must be postponed for real living human patients.

Conclusion

Pork skin provided a simplistic way to train, evaluate, and examine new doctors' transplant techniques. Material costs are minimal. The results of our method are beautiful and contoured.

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Compliance of Ethical Standards

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