

JAQUES REVERDIN, THE FIRST SKIN GRAFT? HISTORY OF A SURGICAL INNOVATION

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Gentlemen! Anyone who has — at any time — studied the process of wound healing will always remain interested in this topic. Therefore, the beautiful invention of Reverdin's seemed to me an invitation to take up again my earlier researches in the healing process of wounds. —Carl Thiersch, 1874

This acknowledgment of Reverdin's invention was published five years after the first skin graft presentation by the Swiss surgeon, Jaques-Louis Reverdin, at the Imperial Surgical Society of Paris. During these five years, skin grafting had become a routine procedure all over Europe for treating and accelerating the healing process of granulating wounds.

Who was Jaques-Louis Reverdin?

Born in Geneva in 1842, Jaques Reverdin, like most of his French-Swiss colleagues, studied medicine in Paris because there was no medical faculty in his city at that time. Already "Interne des Hôpitaux" in 1865, he was working at the Hôpital Necker in 1869, under the direction of Félix Guyon, a young chief-surgeon who became in 1876 the first professor of urology at the Faculty of Paris. During the Franco-Prussian war in 1870, Reverdin, although Swiss by nationality, collaborated with the French army, at the head of the "Swiss Ambulance" in Paris, treating many wounded soldiers.

Back in Geneva two years later, he became chief-surgeon at the Hôpital Cantonal de Genève and the second professor of surgery in the newly created Faculty of Medicine at the University. He was the first Swiss surgeon to recognize the importance of Lister's antiseptic method and introduced it in the Geneva hospital. In 1884, he wrote a book on surgical antisepsis and asepsis and in 1910 a book on war surgery. During his 34 years of professorship, he published many papers, mainly on surgery of goiters, in which he had acquired a large experience. He is



Professor Gosselin and his interns at the Charité in 1870

credited to be the first to have noticed, before Theodor Kocher, another Swiss surgeon from Bern, the symptoms of hypothyroidism after extensive thyroidectomy and gave it the name of myxedema, suspecting an endocrine function of the gland. In 1908, he was invited to present his experience and observations on this subject in a major surgical meeting in Chicago. But in 1909, it was Kocher who received the Nobel price for his work on thyroid!

For cleft palate surgery, Reverdin created a needle for sutures which bears his name and is still commonly used in Europe. In 1881, with two other colleagues, he founded the *Revue Médicale de la Suisse Romande*,* which he then edited for 38 years. He retired from the University and the practice of surgery in 1910 and started a new career as a lepidopterologist (the study of butterflies), founding the Swiss Society of Lepidopterology and publishing 49 papers on this subject until his death in 1928.

* In 2014, the *Revue Médicale de la Suisse Romande* remains the most widely read journal by general practitioners in French-speaking Switzerland.



Reverdin showing his collection of butterflies to a colleague in 1920

it was never presented and published in a well-known medical academy. On another hand, the interesting experimental studies published by Giuseppe Baronio in 1804 and by Paul Bert in 1863 were performed only on animals. Johann Friedrich Dieffenbach had stimulated the latter to study skin grafting following a visit to Claude Bernard in Paris. The renowned Berlin surgeon had written his doctoral thesis on skin transplantation in 1822, but admitted that he failed to succeed in performing a free graft in humans. In 1869, the young Reverdin apparently had not read these publications. As he explained later on, the idea came to him from another German surgeon: "I had read in the surgical lessons of Billroth that sometimes islets of cicatrization can develop at a distance from the wound borders in burns or varicose ulcers. The apparition of these islets arose in spots where the deep dermis layers had been spared. The idea to imitate such a process surged in my mind briskly one night; I told myself: could we not, by placing small fragments of living epidermis on the surface of a granulating wound, stimulate the creation of islets of cicatrization? Would these small pieces of epidermis adhere? There was only one means to know; it was to attempt the experiment. I made this attempt the next

morning. I detached with a lancet on my own leg two to three fragments of skin as thin as possible and placed them on a granulating wound of one of my patients. I secured it with tape and a dressing and waited for the result with anxiety. After a few days, my previsions had been totally confirmed; not only the small pieces had taken and were solidly adherent, but around them new skin was forming, growing day after day at a distance from the borders of the wound."

This case report would have remained unnoticed if Félix Guyon, Reverdin's chief, had not decided that it should be reported as soon as possible to the Imperial Academy of Surgery in order to *prendre date* (a means of fixing a date). This was done the 8th of December 1869 and published three months later in the *Bulletin of the Society* with the commentaries of the eminent surgeons who had attended the presentation.

Grefe epidermique— expérience faite dans le service de M. le Docteur Guyon, à l'hôpital Necker.

Gentlemen: The communication, which I have the honor to make to the Society of Surgery, pertains to a very common question of pathology, apparently well understood, but which still presents some obscure and interesting points for elucidation. I refer to the cicatrization of wounds by second intention . . .

A detailed description of the case report and the result obtained was then produced:

November 24, I tried the following experiment: I removed with the point of a lancet from the right arm of the patient three small slivers of epidermis. I placed my epidermic slivers in the middle of the wound, their deep surface in contact with the granulations and I supported them with some dichalon bandelettes.

December 1, the skin slivers have united and form a little pale white plaque; there has evidently grown a small epidermic zone around each of them. In the days

that followed, this pale border extended more and more to form a little pale and thin islet quite analogous to the epidermic border which has formed along the edges of the wound.

Today, December 8, it is observed, that the islet is notably enlarged and the wound practically healed.

The 28-year-old Reverdin then concludes:

Such are the facts that I have the honor to submit to the Society of Surgery. I report them now as a matter of record, but I pledge myself to pursue these researches. I will have to study as closely as possible the histological process: Is it a simple result of contact, of environment? Is there proliferation of the transplanted elements? Here are many questions, which deserve some researches that I intend to undertake.

No wonder, several questions and commentaries were very critical and would have discouraged many young surgeons from pursuing further research.

■ **M. Trélat**: M. Reverdin believes that epidermic proliferation must be attributed to the graft. In order for this experiment to have a real value, it would be necessary for it to be repeated a great many times, and that it nearly always succeeded. It is necessary, in fact, to exercise on this point a very great amount of reserve.

■ **M. Blot**: From the practical point of view the question of the epidermic graft, or that of the Malpighian or mucous layer, appears to me to be of no importance. To remove a piece of dermis from the arm or elsewhere to unite it to the surface of a suppurating wound which is slowly cicatrizing, just to save a little healing time, is to expose the patient, above all in our hospitals, to the danger of erysipelas.

■ **M. Léon le Fort**: I share completely the opinion of M. Blot. The recent wounds borne by the patient from which the epidermis had been taken were re-covered by a reddened crust showing that at least a bloody discharge had followed. Therefore, the epidermis alone had not been

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removed; a fragment had been taken comprising capillaries and a door opened for erysipelas. As to the utility of the method, it is without importance, even granting that one can cast here and there a sort of seed, which by germination on the spot will result in cicatricial islets. This cicatrix will have, like all others, a tendency to contraction, and this autoplasty cannot replace that to which, for example, one has recourse to prevent the scar retraction of an eyelid which could result in ectropion, or one of the face causing a deformity.

The same Léon Lefort published two years later a case of eyelid ectropion's correction using a skin graft harvested from the arm!

As he promised, Reverdin undertook a series of researches performing more than fifty skin grafts in humans and studying experimental grafting in animals in the same laboratory as Paul Bert, the medical experimental lab of the *Collège de France*, directed by Claude Bernard, the founder of experimental and scientific medicine. For his memoir of 69 pages, published in the *Archives générales de Médecine*, Reverdin received the *Prix Amussat* of the Academy and, in November 1872, Claude Bernard himself presented Reverdin's memoir at the Academy of Science.

During the same two years, Reverdin, who was not yet thirty, started visiting other surgeons who had tried to perform skin grafts: Billroth in Vienna, Pacchiotti in Milano, and Pollock in London where even in a journal his visit had been announced: "to flatter my pride, they had imagined to announce in a medical journal the presence of my noble person in London. Noblesse oblige!"

What were the mistakes of Reverdin?

Considering nowadays the publications of Reverdin on skin grafting, one must conclude that he made two mistakes: 1) Even though he called it *epidermic graft*, he was transplanting pieces of epidermis with some dermis. 2) He pretended that he took skin from his own leg to cover the wound of his patient, and later on claimed successful grafts from Negroes to Whites, from rabbits to men, to cats, from man to sheep and to other species, while we know that these allografts could never have survived.

The first mistake is mainly a matter of language that the surgeons attending his first presentation had immediately noticed. He admitted that he could not harvest only epidermis, "it is almost impossible to do otherwise," but insisted on the importance of the epidermal cells for the healing of wounds. This wrong appellation gave the opportunity for others to claim new inventions or innovations (Pollock 1870, Lawson 1870, Ollier 1872, Lefort 1872, Thiersch 1874, Wolfe 1875, Krause 1893 and many others). Already in 1884, Emil Bock, an ophthalmologist, had collected more than 200 published articles describing var-

ious skin grafts.

The second mistake is more striking. How can we explain that he never realized that long-term all his allografts would fail? "I often took the skin fragments on myself, to graft them on patients who would refuse the operation, thinking that it was painful. In our first grafts, I had taken the tegument on the subject himself, but I became soon assured that the result was the same when transplanting grafts from one subject to another; this fact has been abundantly demonstrated . . ."

In fact, for decades, almost every surgeon believed that a skin transplant could be harvested on another person or even on animals. The use of cadavers or amputated limbs as donor sites was common and was almost never questioned until the nineteen twenties. Winston Churchill recorded a famous homograft in his memoirs. To replace a nurse who was fainting when asked to give a piece of her skin for a wounded officer during the battle of Omburmann in 1898, heroic Churchill offered himself: "The doctor then proceeded to cut a piece of skin and some flesh about the size of a shilling from the inside of my forearm. I managed to hold out until he had cut a beautiful piece of skin with a thin layer of flesh attached to it. This precious fragment was then grafted on to my friend's wound. It remains to this day and did him lasting good in many ways. I for my part keep the scar as a souvenir."

Even more surprising is the fact that many surgeons, particularly ophthalmologists, claimed to practice successful xenografts, using frog skin for eyelid repairs. Reverdin himself recorded the use of rabbit's periosteum in a case of partial nasal plasty. In the 16th century, Tagliacozzi was already doubtful in this matter: *An ex alieno corpore, an vero ex proprio tradux eligendus fix?**

Ollier, the father of bone and periosteal grafts, was in favor of allografts, but against the use of xenografts. One had to wait for Lexer's publication in 1914 to put serious doubts on the permanent viability of allografts or between different species. But even at that time, Alexis Carrel, Nobel Prize winner in 1912 for his research on organ transplantation, claimed that he had grafted successfully skin from a black dog to a white one!

Why has this so-called "invention" become a landmark in the practice of surgery?

The state of art of our profession is a compendium of surgical methods, which have been selected among thousands of innovations brought throughout the ages. According to Riskin

* Is it possible to take skin from another person, and if this is possible, will it be more successful and advantageous ? No: the single character of each individual speaks against the harvesting on another one.

and Longaker, "innovation is a broad term defined as the act of introducing something new or the use of a new idea or method. In some instances, it is used synonymously with invention, although innovation is more precisely defined as something thought up or mentally fabricated. Importantly, no technology or its application is entirely new, as no inventor works within a vacuum. The discoverer has often proceeded by analogy." Reverdin followed the observations of Billroth on the healing of wounds of unequal depths, where islands of epidermis are growing from the remaining skin adnexae. He did not care about theory; he just wanted to improve the healing of his patient. Once it had been published, he realized that his idea could lead much further.

Surgical innovations may be *incremental*, meaning that it marginally improves upon currently available technology, or *enabling*, leading to further development of new procedures within a field. Reverdin's needle is an example of incremental innovation, whereas the idea of skin grafting wounds belongs definitely within the field of enabling innovations, opening not only on the field of the various methods of skin grafting, but also on other tissues and organ transplantations. During his experiments, Reverdin was also particularly concerned with the observations that the transplanted islets of skin were growing and the epidermal cells spreading to cover the wound: "The grafts, once adherent, the islands continue to grow, depending on the general state of the patient and the local status."

The concept of cell culture was born.

References

1. Lexer Erich: "Free transplantation." *Ann Surg* 60 :166-194, 1914
2. Mazzola Ricardo: "Giuseppe Baronio and the origins of free Skin grafting." *ISAPS News* 10/30/2013
3. Montandon Denys: "Jaques Reverdin, la première greffe de peau." *Edilivre*, Paris 2014
4. Reverdin JL: "Greffes épidermiques. Expérience faite dans le service de M. le docteur Guyon à l'hôpital Necker." *Bulletin de la Société Impériale de Chirurgie de Paris pendant l'année* 1869, 10: 511-515, 1870
5. Riskin DJ, Longaker MT, Gertner M, Krummel TM: "Innovation in surgery. A historical perspective." *Ann Surg.* 244 :686-693, 1996



I WANT TO BE THIS WAY: a new book dedicated to our patients


Gianluca Campiglio, MD, PhD

A plastic surgeon in Milan (Italy) and ISAPS Secretary, recently edited a book dedicated to aesthetic surgery patients. Written with an Italian journalist in a simple, clear, but at the same time very scientific way, it is 150 pages long and contains many pictures of clinical cases.



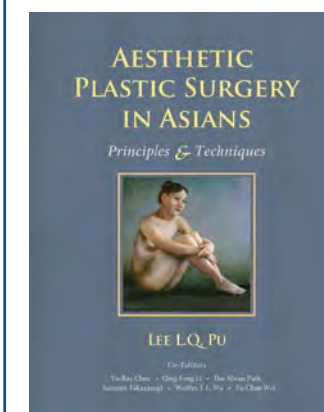
A preface by a professor of sociology describing the evolution of the concepts of beauty and attractiveness during the centuries enriches the book. The first part analyzes eight common myths about aesthetic surgery such as the risk of explosion of breast implants during flights or of poisoning after Botox injections. In each case, the origin and reasons why the information is incorrect is scientifically explained.

The second part refers to important practical suggestions on how to approach aesthetic surgery including the choice of a properly trained surgeon, limits of medical procedures, and typical categories of patients who consult a plastic surgeon's office. Another myth is that our patients are only actresses or aristocrats while most of them are normal, mentally healthy persons of every age and social background.

The third part lists the main surgical and non-surgical treatments currently available for aesthetic improvements of facial and corporal defects. The book concludes with data from several research studies about the positive effect of aesthetic surgery on the self-esteem and sexual life of patients and with a report of the personal experience of a psychologist who has also been a breast augmentation patient. The book is written in Italian and is currently available in libraries and on line. 

Aesthetic Plastic Surgery in Asians: Principles & Techniques

Lee L.Q. Pu



- Focuses on the differences in surgical techniques when treating Asian patients, as well as procedures specific to this group
- Contributors from Asian regions share their signature procedures
- Over 2500 drawings and photos
- Includes four DVDs showing surgical techniques
- Includes searchable e-version 