History of Reconstructive Rhinoplasty

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Abstract

Amputation of the nose was practiced as a sign of humiliation to adulterers, thieves, and prisoners of war by certain ancient populations. To erase this disfigurement, numerous techniques were invented over the centuries. In India, where this injury was common, advancement cheek flaps were performed (around 600 BC). The forehead flap was introduced much later, probably around the 16th century. The Venetian adventurer Manuzzi, in writing a report about the Mughal Empire in the second half of the 17th century gave the description of the forehead rhinoplasty. Detailed information concerning the Indian forehead flap reached the Western world in 1794, thanks to a letter to the editor that appeared in the Gentleman’s Magazine. From this episode, one can date the beginning of a widespread interest in rhinoplasty and in plastic surgery in general. In Europe, nasal reconstruction started in the 15th century in Sicily with the Brancas, initially with cheek flaps and then with arm flaps. At the beginning of the 16th century, rhinoplasty developed in Calabria (Southern Italy) with the Vianeos. In 1597, Gaspare Tagliacozzi, Professor of Surgery at Bologna, improved the arm flap technique and published a book entirely devoted to this art. He is considered the founder of plastic surgery.

Keywords
- history of nasal reconstruction
- nasal reconstruction
- forehead flap
- arm flap

Earliest Traces of the Art of Reconstructing Noses

In the Oriental World: India

In India, this injury was more common than elsewhere and the repair of amputated nose was performed by the Koomas, a low caste of priests, or, according to others, a guild of potters. Details of the reconstructive procedure, using local turnover or advancement flaps from the cheek, are reported in Chapter 16 of the Samhita, a Sanskrit text on surgery attributed to Sushruta, that records the Ayurvedic system of Medicine.1

"Now I shall describe the technique of repairing a missing nose. The surgeon takes a fresh leaf of the exact size of the nose, cuts from the cheek an equal shape of skin, so that it is still attached by one part, and quickly inserts it into position after having scarified the margins and secures it with accurate bandage, in which two little tubes are fixed, lifts it up and dusts it with red sandal, liquorice root and antimony. He

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applies a soft cloth and sprinkles it frequently with sesame oil. The patient should receive ghee (a kind of clarified butter) to drink (…). When the reconstructed nose is united, the pedicle is divided. If the nose is too small one should try to enlarge it; if it has too much flesh it should be thinned to its natural size.

An accurate description of blunt (yantra) and sharp (sastra) instruments necessary to perform surgical operations in general and rhinoplasty in particular follows.₂ None was able to establish the exact date of the work (possibly ~ 600 BC), or to prove that Sushruta was a single author. On the contrary, someone believes that the procedure reported in the book is the contribution of different Indian surgeons over the centuries.

When was forehead skin used? Probably in the 16th century, but there is no trace about it. In the second half of the 17th century, the Venetian adventurer Nicolò Manuzzi (1639–1717) wrote an article about the Mughal Empire in which an account of the forehead rhinoplasty is supplied. Regrettably the article, kept in the Marciana Library at Venice, was published in 1907 only.³ Information on the forehead flap for nasal reconstruction, successfully practiced in India for many centuries, reached the Western world at the end of the 18th century, thanks to a letter signed B.L., addressed to Mr. Urban, editor of the Gentleman’s Magazine, and published in October 1794 (→Fig. 1).

“A friend of mine has transmitted to me, from the East Indies, the following very curious and, in Europe, I believe unknown chirurgical operation, which has long been practiced in India with success; namely, affixing a new nose on a man’s face (…).”

Then follows the description of the procedure performed on Cowasjee, a bullock driver of the English army, who fell under the disfavor of Tipu’Pultan and had his nose amputated:

“A thin plate of wax is fitted to the stump of the nose, so as to make a nose of good appearance. It is then flattened, and laid on the forehead. A line is drawn round the wax, and the operator dissects off as much skin as it covered, leaving undivided a small slip between the eyes. This slip preserves the circulation till an union has taken place between the new and old parts. The cicatrix of the stump of the nose is next pared off, and immediately behind this raw part an incision is made through the skin, which passes around both alae and goes along the upper lip. The skin is now brought down from the forehead and, being twisted half round, its edge is inserted into this incision so that a nose is formed with a double hold above and with its alae and septum below fixed in the incision. A little Terra Japonica is softened with water, and being spread on slips of cloth, five or six of these are placed over each other to secure the joining. No other dressing but this cement is used for four days. It is then removed and cloths dipped in ghee (a kind of butter) are applied. The connecting slips of skin are divided about the 25th day, when a little more dissection is necessary to improve the appearance of the new nose (…).”

This exhaustive account demonstrates the high level of surgical technology reached by the Indians in carrying out an operation in a way not much different from what we perform nowadays: two-stage procedure, accurate planning of the flap, reconstruction of the lining and cover, flap inset with restoration of the missing alae and columella, trimming of the flap, severing of the pedicle at 3 weeks interval, stabilization achieved by Terra Japonica, and an equivalent of plaster of Paris. The main variation is that no anesthesia was used.

The letter to the editor of the Gentleman’s Magazine, without doubt one of the most famous in the history of medicine, holds a key position in the development of plastic surgery. In fact, the English surgeon Joseph Constantine Carpue (1764–1846) read it and made practical and successful use of the procedure described. In 1814, he performed at St. Bartholomew’s Hospital, London, the first rhinoplasty of modern time using the forehead flap on an officer of His Majesty’s Army who had the nose amputated during a battle in Spain. The operation lasted for 35 minutes, “it was no child’s play - extremely painful – but it was no use complaining”—the officer said, but at the end he exclaimed: “my God, there is a nose!” In 1816, Carpue, having performed two cases, published an account on nasal reconstruction, which marks the prelude to the rebirth of modern plastic surgery⁵ (→Fig. 2).

In the Western World: Italy

In the Western world, the first attempt to restore the nasal pyramid dates back to the first half of the 15th century and was accomplished by members of the Branca’s family from Catania (Sicily). Gustavo (fl. first half of the 15th century) developed the procedure using skin outlined in the cheek.

The question as to whether this technique was independently conceived by Gustavo or reached Italy from India, is still open to debate. It is possible that some traveler, adventurer, or monk could have brought the information back from India to the Middle East and from here to Sicily at the time of the Crusades. But this is a mere hypothesis, there is no trace about this potential connection in any writing.

Gustavo’s son, Antonio, already famous as reconstructive surgeon in the mid of the 15th century, made considerable improvements to the operation. Worried about the disfigurement that remained on the face, he selected another donor site, esthetically less important, that is to say the arm.

The impact on the population was enormous, and within the space of a few years (from 1442 onward) contemporary writers, reported the operation in nonmedical texts, amazed by the miraculous results obtained so far. Pietro Ranzano (1420–1492), Bishop of Lucera (Sicily) mentioned the surgeon Branca and its art of restoring noses in Annales Mundi, a chronicle of events occurred until 1442. However, the work remained hidden in the manuscript form in the Palmerton library and was quoted only 250 years later by the Sicilian historian Vincenzo Auria.⁶

The first printed account appeared in a letter written around 1450 by the Apulian poet Elisio Calenzio (fl. mid-15th century) to his friend Orpiano⁷:

“If you want your nose repaired, come here to me. People believe it is a miracle. The Sicilian Branca, a talented man, has learned how to engrave a nose, which he either replaces from the arm, or he fixes on one borrowed from a servant (…). If you come, be sure that you will return home with a nose as splendid as you wish. Fly.”
The historian Bartolomeo Fazio (~1400–1457) mentioned the Brancas in a pamphlet *De Viris Illustribus*, written about 1455, but it was published three centuries later:

“Branca, the father, discovered the method of remaking and replacing noses that had been excised and mutilated – all with great skill. His son Antonio, made considerable improvements to his father’s brilliant invention (…). The flesh outlined by his father from the face of the injured man to build up a nose, he himself used to prepare from the man’s arm, to avoid leaving any deformity on the face.”

The only medical text about Branca’s rhinoplasty was the *Buch der Bündth-Ertznei* (*The Book on Bandages*), written in 1460 by the German Heinrich von Pfolspeundt (fl. 15th century), a knight of the Teutonic Order and army surgeon. The description of the procedure is technically very accurate, but it was not useful for contemporaries, as the manuscript...
Fig. 2 Pre- and postoperative appearance of the first nasal reconstruction of modern times performed by the English surgeon J.C. Carpue, and published in 1816\(^5\) (Mazzola collection).

Fig. 3 (A) Leonardo Fioravanti portrait; (B) Title page of Fioravanti’s book Il Tesoro della Vita Humana (1570),\(^{13}\) containing the description of Vianeo’s procedure for nasal repair (Mazzola collection).
remained concealed in a German library for over 400 years and published in 1868.\(^9\)

Fortunately for us, information concerning the operation, came a few years later, in 1502, when Alessandro Benedetti (~1445–1525), Professor of Anatomy and Surgery at Padua University published a textbook on anatomy *Anatomice, sive Historia Corporis Humani* (*Anatomy, or the History of Human Body*). In describing the nose from an anatomical standpoint, he explains with a great deal of details, almost 100 years before Tagliacozzi, how it is possible to repair it in case of amputation using a pedicled flap outlined on the arm. Although he never performed the operation and did not name the surgeons, Benedetti was presumably referring to the Brancas.\(^{10,11}\)

Around 1460, at Antonio’s death, Branca’s method, kept as family secret and passed on only by word of mouth, was discontinued in Sicily.

Only after a delay of some years was nasal reconstruction performed again, on the other coast of the Messina strait, at Maida, a picturesque village in Calabria (Southern Italy) by members of Vianoe’s family. Starting with Vincenzo (fl. second half of the 15th century), rhinoplasty continued with his nephew Bernardino (fl. first half of the 16th century). But most of all, it were Bernardino’s sons, Pietro (~1510–1571) and Paolo (~1505–1560) who established a flourishing and well-attended clinic in Tropea, a village on the Northern coast of Calabria. Pietro’s fame was so widespread in Italy for more than 20 years (1545–1565) that the Neapolitan historian Camillo Porzio (1530–1580), who suffered a severe nasal injury, went to Tropea for having his nose fixed. At completion of the operation, performed with a skin flap taken from his left arm and held into position for 15 days, he wrote a letter dated July 1561 to his friend Cardinal

![Wood statue of Gaspare Tagliacozzi, holding a nose in his left hand, preserved at Bologna Archiginnasio.](image-url)
Seripando, informing him about the successful outcome of the repair.\textsuperscript{12}

Apart from this episode, evidence of Vianeo family and their reconstructive work comes from the Bolognese Leonardo Fioravanti (1517–1588) (\textit{\textbf{Fig. 3A}}). Physician and army surgeon, he travelled extensively in Italy and on board of the Spanish fleet he reached the coasts of the Northern Africa. In 1549, on the way back to Naples, he disembarked at Tropea (Calabria) with the precise plan to visit the Vianeos and to assist to their operation.

\textbf{Fig. 5} Nasal reconstruction according to Tagliacozzi. (A) Preoperative view of the patient, the amputated nose and the flap outlined on his left arm; (B) the arm flap sutured into position; (C) the final result. Reproduced from G. Tagliacozzi. \textit{De Curtorum Chirurgia per Insitionem}\textsuperscript{16} (Mazzola collection).
“I moved to Tropea where at that time there were two brothers Pietro and Paolo, who made a nose for anyone who had lost his by some accident (…).”

At that time, surgeons were extremely jealous about their art and there was no chance for any visiting physician to be admitted in the operating room. Let us see how he shrewdly solved the problem:

“Being therefore in Tropea, excellently horsed and with a servant, I went to the house of those two physicians, explaining them that I was a Bolognese gentleman and had come there to talk with them, because I had a relative who had his nose amputated on the road to Serravalle in Lombardy, while fighting against the enemies and he wished to know whether he should come or not (…). In the meantime, I went every day to the house of these surgeons, who had five noses scheduled for repair and when they wanted to carry out these operations they called me to watch and I, pretending I had not the courage to look at, I turned my face away, yet my eyes saw perfectly. Thus, I saw the whole secret from top to toe, and learned it. The procedure is as follows: the first thing they did to a patient scheduled for the operation was to give him a purgative; then in the left arm, between the shoulder and the elbow, they took hold of the skin with pincers and passed a large scalpel between the pincers and the flesh of the muscle (…). They cut the nose stump similarly and then they cut the skin flap at one end and sutured it to the nose and bound it with such skill that there was no way to move the arm until the skin had grown into the nose, and when it had grown they cut the other end and freshened the lip of the mouth and sewed there the skin of the arm and trimmed it until it was joined to the lip and applied there a metal template in which the new nose could grow to the right proportions and remain well shaped, although somewhat whiter than the rest of the face. And this is the procedure they used in restoring noses (…).”

The earlier mentioned account appears in Fioravanti’s book Il Tesoro della vita Humana (Treasure of Human life) published at Venice in 157013,14 (∎ Fig. 3B). In the same work, Fioravanti supplies one of the earliest reports about the healing of a completely separated nose:

“During the time I was in Africa (…) a Spanish gentleman Andrés Gutièrro was strolling through the camp one day and came to words with a soldier. They drew weapons and with a backhand stroke the soldier cut off Andrés’ nose, which fell in the sand and I saw it as we were together. The quarrel ended and the poor gentlemen remained without his nose. And I, who had it into my hand, all full of sand, urinated on it, and having washed it with my urine, I attached it and sewed it on very firmly (…). And I had him remain thus for eight days. When I untied it, I found it was well attached once again (…). And this was indeed the truth, and Andrés can tell about it because he is still alive and healthy.”

Gaspare Tagliacozzi (1544–1599)

It is very possible that Fioravanti’s book, containing the fascinating stories about nasal repair, came under the eyes of the Bolognese Gaspare Tagliacozzi (1544–1599), at that time newly appointed professor of surgery at Bologna University (∎ Fig. 4). He immediately understood the importance of the message, becoming interested in facial repair. He successfully applied the arm flap procedure for nasal reconstruction on some patients. In 1586, he wrote a letter to his friend Gerolamo Mercuriale (1530–1606), professor of medicine at Padua University, describing the technique in detail, the modifications he had done to the Vianeos’ original procedure, the different indications, the account of the cases he had already operated on and finally the preliminary announcement of the future publication of a book on the subject.15 Eleven years elapsed before the revolutionary work, De Curtorum Chirurgia per Insitionem (On the Surgery of Injuries by Grafting) appeared at Venice in 1597.16 So much time required the careful preparation of the plates, the accuracy in showing every detail useful to guide the reader in nasal reconstruction. In the dedication of his book, Tagliacozzi acknowledges the Vianeos by saying that “I heard that

Fig. 6 Nasal epithesis made by wood or silver to replace the missing nose. Reproduced from Paré19 (Mazzola collection).
there were certain Calabrians who practiced this art, if art can be named, in an inconsistent and empirical way. Thus, I devoted myself to this art with much care and diligence as I could...” The operation for nasal reconstruction is presented step by step, beginning with the illustration of the instruments necessary for carrying out the procedure, followed by the indications of the technique, the outlining of the flap on the arm (Fig. 5A), the flap inset, the type of bandage to secure the arm into position (Fig. 5B), the flap severing and trimming, the final outcome (Fig. 5C), and the clinical applications for areas other than the nose, that is, upper and lower lip. The last two plates of the volume are devoted to the repair upper and lower auricular defects with local folded flaps designed on the mastoid area. The book was well...
received and had a great success. The following year, in 1598, it was reprinted at Frankfurt in a pocket edition to fit in the military surgeons’ knapsack, so they could find solution to their problems of repair of facial defects, directly on the battlefield.

Certainly, it is not correct to consider Tagliacozzi as the discoverer of rhinoplasty. However, he deserves credit for being the first to make a work of art out of a surgical practice that was left until then at an empirical state of development.

For this reason, he is considered the founder of Plastic Surgery.

Decline of the Art of Reconstructing Noses

After Tagliacozzi’s death, apart from his pupil G.B. Cortesi (1554–1634), who published a work on medicine and surgery in 1625 with a 50-page chapter devoted to nasal reconstruction, the operation became obsolete for almost two centuries. Sporadic cases are reported in the 17th or 18th century literature.

Why did this occur? Several factors have to be taken into consideration. Tagliacozzi’s procedure was not that easy and if improperly performed may have led the inexperienced surgeon to a complication and an unsuccessful result. Often the pedicled flap to rebuild the nose was harvested from another person, usually a slave. Although Tagliacozzi was against this attitude, popular belief reported that a sympathetic relationship existed between the recipient organ (sympathetic nose) and the man who donated the skin (sympathetic slave). When the slave “donor” died, people were convinced that the reconstructed nose would suffer a similar fate. This superstition certainly did not contribute to the spreading of the method. Finally, the Church was against any modification to the facial appearance.18

Therefore, instead of recommending autologous tissue for restoring a missing nose, talented surgeons such as Fallopio, Heister, Camper, and others advocated the application of an epithesis, similar to the one illustrated by Ambroise Paré (1510–1590) in 156119 (Fig. 6), convinced that noses made out of wood, paste, or silver were far superior to those of skin.

In 1742, Jean-Baptiste Dubois (end of 17th century–1759) physician, surgeon, and Professor at the Royal College, in an attempt to resuscitate the procedure, proposed the following thesis to the Medical Faculty of Paris “An curtae nares ex brachio reficiendae?” (Can defective nostrils be reconstructed from the arm?) Although the answer was positive nobody took care of the provoking message. The thesis had no success among physicians and surgeons and replacement of the missing nose continued using silver or wood prosthesis, demonstrating the decline of reconstructive procedures.20

Rebirth of the Art of Reconstructing Noses

As we have already mentioned, with Carpue’s book An Account of two successful Operations for Restoring a lost Nose (1816), interest for nasal reconstruction and for plastic surgery started again.

His text was so successful that it was translated the following year into German, thus allowing Carl Ferdinand von Gräfe (1787–1840), professor of surgery at Berlin University, considered the founder of modern plastic surgery in Germany, to examine the different available techniques.

In 1818, he published his Rhinoplastik: oder die Kunst den Verlust der Nase organisch zu ersetzen (Rhinoplasty: or the Art of Reconstructing the Nose)21 (Fig. 7A), where he compared the Italian and the Indian procedures. He suggested that the so-called German method, a variation of the classical Tagliacozzi procedure, was far superior to the others. The alae and the septum were prefabricated on the arm after a wax template and then immediately sutured on the nasal stump (Fig. 7B).

Von Gräfe favored the upper arm flap procedure, for he was unhappy about the donor site scar morbidity, produced by the forehead rhinoplasty.

Carpue and von Gräfe works gave rise to a flood of papers and books on nasal reconstruction in Europe and in America, which followed basically the two known methods, the Indian and the Italian. Outstanding contributions to the rediscovered art were given by Dieffenbach22 and Zeis23 in Germany; Delpech24 and Labat25 in France. Signoroni26 and Petrali27 in Italy; Ferguson28 in England; Balassa29 in Hungary; Warren30 and Pancoast31 in the United States.

Historical reviews of the art of nasal reconstruction were published over the years.18,32–35

With the advent of anesthesia and the possibility of closing the donor site primarily, leaving an acceptable scar, the forehead rhinoplasty became the procedure of choice due to its simplicity, good color match, and excellent results. Although the arm flap operation is now rarely performed, we have to be extremely grateful to Gaspare Tagliacozzi for having been the one who systematized and promulgated nasal reconstruction and established plastic surgery as an independent specialty.
Conflict of Interest
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