



# The history of nasal reconstruction

David A. Shaye<sup>a,b</sup>

## Purpose of review

Total nasal reconstruction is a unique plastic surgery challenge of the highest order. The history of nasal reconstruction dates back to ancient times and it remains a fundamental challenge today. This article reviews the historical context of nasal reconstruction, and highlights how the essential tenets of this art have been conserved over millennia.

## Recent findings

The disfiguring and brutal practice of nasal amputation created a demand for ‘nosemakers’ in India since 1500 BC. In 600 BC, Sushruta described the use of a leaf to make a template of the wound, and a cheek flap to supply tissue. In the 1400–1500s, the Italians relied on similar flap concepts, but employed a pedicled arm flap for soft tissue coverage. Eventually, the forehead flap, or ‘Indian method’ of nasal reconstruction, made its way to Europe in the 1800s. Its use has been a fundamental component of nasal reconstruction to this day.

## Summary

Knowledge of the unique history of nasal reconstruction permits appreciation of this surgical integration of art and science. The story of nasal reconstruction has been one of global contribution and creativity that has stood the test of time.

## Keywords

‘Indian Method’, forehead flap, nasal reconstruction, Rhinoplasty, Sushruta, Tagliacozzi

## INTRODUCTION

Nasal reconstruction represents the oldest form of plastic surgery. The unique idea to use a cheek flap to create a nose was first recorded in India millennia ago. Throughout history, this art was passed down through families, modified, jealously guarded, and at other times recorded and shared. Contributors have spanned the globe from Sushruta in India, to the Brancas and Tagliacozzi in Italy, to modern day refinements. To become a ‘Nosemaker’ one should learn how the art and history are intertwined, a testament to the well-principled techniques developed in antiquity.

## NASAL AMPUTATION

*...cutting off the nose is a special way of manifesting vengeance. Of all the organs of the body, the nose is considered to be the organ of respect and reputation.*

Shah Tribowandas (1889, India) [1\*\*]

The specialty of plastic surgery traces its roots back to the barbaric practice of nasal amputation. As far back as 3000 BC, there is evidence that nasal amputation existed as a form of punishment. The Hindu poem *Ramayana* (1500 BC), depicted on the walls of Angkor Wat, refers to how the Sri Lankan

princess Surpunakha will undergo nasal reconstruction after she suffered nasal amputation [2].

Mass nasal amputations as a war punishment occurred in Nepal in 1767. Kirtipur, a town within the Kathmandu Valley, had repeatedly resisted invasion from the mountain and warlike Ghurka people. When Kirtipur fell, the Ghurka King, frustrated with such a voracious defense, ordered the nasal amputation of all 865 males, sparing only those not yet weaned or those who played wind instruments. The

<sup>a</sup>Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology – Head & Neck Surgery, Massachusetts Eye and Ear, Harvard Medical School, Boston, Massachusetts, USA and <sup>b</sup>Department of Otolaryngology – Head & Neck Surgery, University Teaching Hospital of Kigali, Kigali, Rwanda

Correspondence to David A. Shaye, MD MPH, Assistant Professor, Division of Facial Plastic & Reconstructive Surgery, Department of Otolaryngology – Head & Neck Surgery, Harvard Medical School, 243 Charles Street, Boston, MA 02114, USA. Tel: +1 617 573 3709; e-mail: david\_shaye@meei.harvard.edu

**Curr Opin Otolaryngol Head Neck Surg** 2021, 29:259–264

DOI:10.1097/MOO.0000000000000730

This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

## KEY POINTS

- Nasal reconstruction in ancient India marks the birth of plastic surgery. The practice of nasal amputation at the time created a demand for 'nosemakers'.
- In India in 600 BC, Sushruta used a cheek flap to reconstruct noses and recorded it in the *Sushruta Samhita*. A leaf was used as a template, and hollow reeds were used as nasal stents.
- The Italian Method of nasal reconstruction in the 1400s relied on a pedicled arm flap. Gaspare Tagliacozzi published a detailed description in *De Curtorum Chirurgia* (1597).
- The Indian Method of a forehead flap was introduced to Europe in 1794 and has since been widely adopted as the primary flap for total and subtotal nasal reconstruction.
- History offers a window into the minds of surgeons challenged by nasal reconstruction over millennia.

city was later referred to as Naskatapoor, or the 'city without noses [3].'

Nasal amputation persists to this day. In 2010, Time Magazine featured Bibi Aisha, a young Afghan girl who in an attempt to escape her husband was captured, only to have her nose and ears amputated [4] (Fig. 1).

With the historical frequency of this practice, a demand grew in India for a solution. The human barbarity of nasal amputation was to be met with human ingenuity.

## INDIAN METHOD

*First the leaf of a creeper, long and broad enough to fully cover the whole of the severed or clipped off part, should be gathered, and a patch of living flesh, equal in dimension to the leaf should be sliced off from down upward, from the region of the cheek and after scarifying [the margins] with a knife, swiftly adhered to the severed nose.*

Sushruta (600 BC)

Sushruta recorded the Ayurveda (Science of Life) in the Samhitas sometime between 1000 and 600 BC [5,6]. He focused on the surgical arts, describing surgical instruments, preparation, indications, postoperative care, and techniques. Sushruta writes, 'Surgery has the superior advantage of producing instantaneous effects by means of surgical instruments and appliances. Hence, it is the highest in value of all the medical tantras.' [5]. As the first to describe nasal reconstruction, he is referred to as the 'Father of Plastic Surgery.'



**FIGURE 1.** Bibi Aisha in Afghanistan. Photographed by Jodi Bieber, Institute for TIME. (reprinted from Shaye *et al.* *Advances in nasal reconstruction.* *Curr Opin Otolaryngol Head Neck Surg.* 2011 Aug;19(4):251-6.).

Sushruta described many principles of nasal reconstruction still in use today. He emphasized the importance of a template, in this case a leaf, to appropriately size the defect. Preparation of the recipient wound bed is highlighted so as to accept the flap. Stenting of the nostrils with hollow tubes or reeds will 'facilitate respiration and prevent the adhesions from hanging down', reiterating the difficulty of managing circumferential cicatricial forces. Sushruta focused on the importance of nasal proportion, writing, 'the adhesions nose should be tried to be elongated where it would fall short of its natural and previous length or it should be surgically restored to its natural size in the case of the abnormal growth of its newly formed flesh.' [5]. In the 600s, Vagbhata described folding the flap to provide nasal lining [7].

The art of nasal reconstruction was secretly passed down through generations of three families in the region of India and Nepal. They were among a caste of potters and bricklayers. The Kanghiari family of Khanga (in Punjab) was known to practice the art since AD 1440, keeping a patient registry and requiring signed consent. Sons were taught along with daughters-in-law, but unmarried daughters were not permitted to learn so that if they married, the craft would not escape the family. The precise

timing of the transition to the forehead flap as the predominate Indian Method of rhinoplasty remains obscure [8,9<sup>\*</sup>].

## ITALIAN METHOD

*We restore, rebuild, and make whole those parts which nature hath given, but which fortune has taken away. Not so much that it may delight the eye, but that it might buoy up the spirit, and help the mind of the afflicted.*

Gaspare Tagliacozzi (1597)

Translation of the *Sushruta Samhita* into Arabic in the 8<sup>th</sup> century is theorized to be the way the Indian Method was introduced to Italy.[8] In Sicily in the 1400s the Branca family practiced the Indian Method, but secrecy prevailed as they recorded nothing of their technique. Bartolomeo Fazio, the historian for the King of Naples, writes:

*Branca, the elder, was the originator of an admirable and almost incredible procedure. He conceived how to repair and replace noses that had been mutilated or cut off and developed his ideas into a marvelous art. And the son Antonius added to his father's wonderful discovery. For he conceived how mutilated lips, ears and noses might be restored. Whereas his father had taken the flesh for the repair from the mutilated man's face, Antonius took it from the muscles of his arm, so that no distortion of the face should be caused [10].*

And so the Italian Method, a delayed pedicled arm flap, was born. Despite attempts at secrecy the technique spread. In 1502, Alessandro Benedetti first recorded the procedure in the medical literature, likely by piecing it together by examining Antonia Branca's patients. He wrote that the new appendages do not tolerate severe winters and would sometimes grow hair, two details that are only known to surgeons who perform nasal reconstruction [11]. The Viano family of Calabria continued the craft in secrecy like those before them [7].

The Italian Method (Fig. 2) is most often associated with anatomist and surgeon Gaspar Tagliacozzi of Bologna. Tagliacozzi writes:

*An incision is made in the skin of one of the arms, right or left, down to the flesh, right down to the surface of the muscle; in other words, simple and solid skin is taken from the anterior brachial region. . . But when one observes a good union of the wound and a good nourishment of the skin, then one may cut the arm from the face [12].*



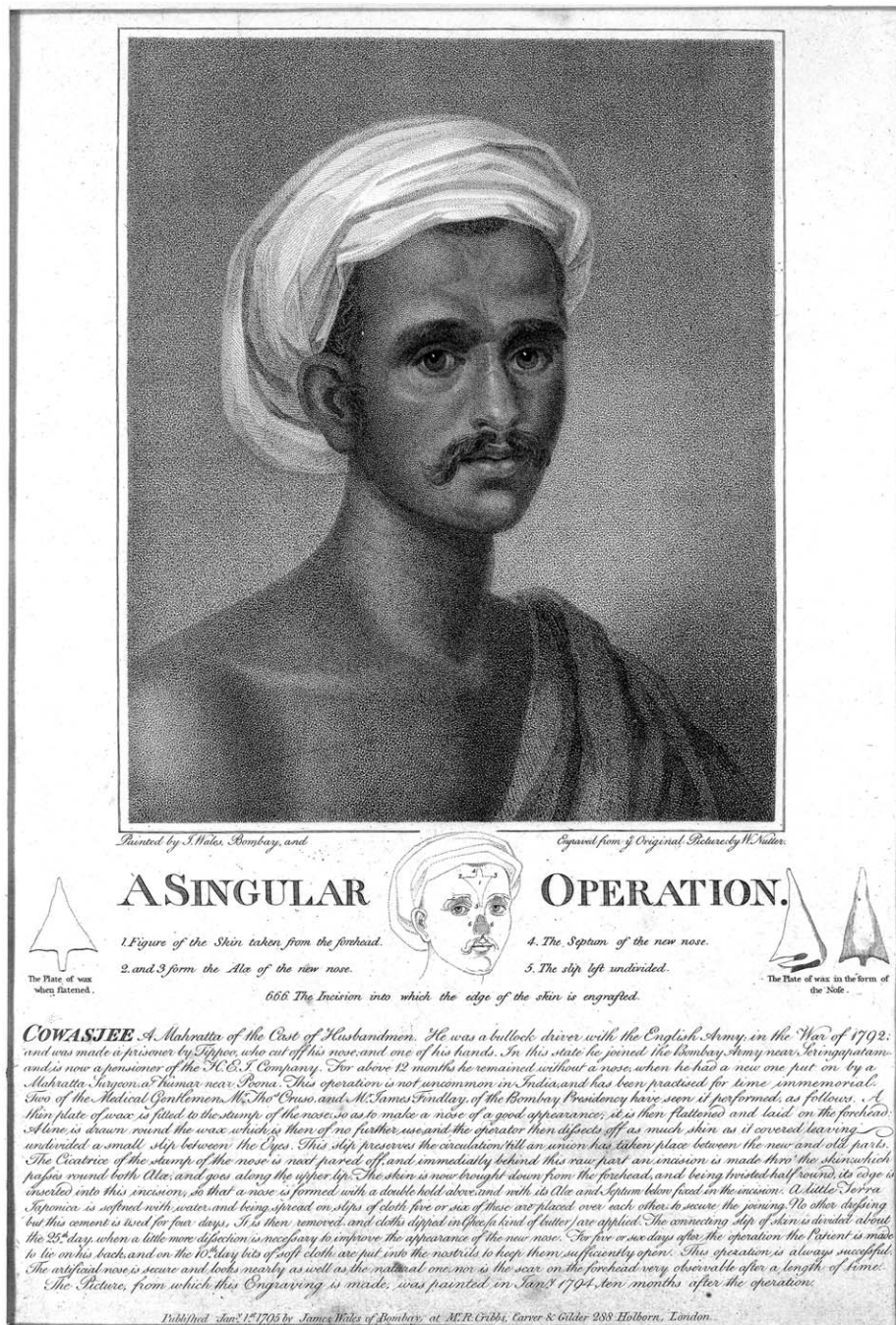
**FIGURE 2.** The 'Italian Method' of nasal reconstruction, a pedicled arm flap. Reproduced from: Gaspar Tagliacozzi, *De Curtorum Chirurgia*, 1597. (Harvard Medical Library in the Francis A. Countway Library of Medicine, Rare Book Collection. Photographed by D. Shaye).

In *De Curtorum Chirurgia*, the first treatise devoted to plastic surgery, Tagliacozzi credits his predecessors but criticizes their secrecy. Despite the book's acceptance, detailed drawings, and even pirated copies, dissemination of the technique remained limited, in part due to the rigid medical establishment of the time. Although the Age of Enlightenment flourished in other disciplines, antagonism and envy among surgeons and constraints by the church superseded scientific objectivity in medicine; thus, nasal reconstruction stagnated in Europe for centuries, waiting for a spark to be reignited.

## REVIVAL PERIOD

The spark that rekindled interest in nasal reconstruction came from India in the year 1794. Cowasjee (Fig. 3) was an Indian bullock driver for the English during the 3<sup>rd</sup> Mysore War, who was





**FIGURE 3.** Cowasjee, an Indian bullock driver for the British captured during the 3<sup>rd</sup> Mysore War, sustained a nasal amputation, and underwent the ‘Indian Method’ of nasal reconstruction with a forehead flap. Stipple engraving by W. Nutter, 1795, after J. Wales. Wellcome Library no. 23414i. (<https://catalogue.wellcomelibrary.org/record=b1181270>).

captured and suffered amputation of his nose and hand by order of Tipu Sultan. An unknown Maharatti healer reconstructed his nose with a forehead flap, and this was witnessed by two English physicians of the East India Company, Mr. Thomas Cruso and Mr. James Frindlay. They described this remarkable surgery in 1793, in the *Madras Gazette* newspaper in Bombay [13].

Within a year, the news about this procedure arrived in London. In a letter to the editor of the *Gentlemen’s Magazine*, author ‘B.L.’ described Cowasjee’s reconstruction, how wax was used as a template and forehead skin was transposed. . . ‘leaving undivided a small slit between the eyes. This slit preserves the circulation until a union has taken place between the new and the old parts [14].’

Although the European medical community took notice, it was Joseph Constantine Carpue who pursued the Indian Method with vigor. Carpue studied the reports, interviewed army personnel from India, and practiced on cadavers. In 1814, he became the first European to perform the Indian Method on a patient who had lost his nose to syphilis. After removing the dressings three days later he exclaimed 'My God, there's a nose!' Carpue's text in 1816 helped to spread the technique through Europe and America [15].

## MODERN ERA

The 19<sup>th</sup> and 20<sup>th</sup> centuries saw the longstanding principles of nasal reconstruction enhanced. A greater respect for the importance of nasal lining flaps developed, and the necessity of lining to avoid contraction and distortion. Surgeons experimented with turn down flaps, local flaps, nasal mucosal flaps, and (more recently) free tissue to provide nasal lining [16].

In the 19<sup>th</sup> century, the benefits of nasal framework to control nasal form were realized. Surgeons trialed the use of calvarial bone attached to the forehead flap [17], iliac bone graft [18], and costal cartilage [19]. The latter has become the mainstay of structure in total nasal reconstruction. A future of bio-engineered autologous cartilage, cultured from sample chondrocytes of the patient, may one day offer unlimited cartilage stock with the possibility of stereolithography frameworks [20].

In 1985 Burget and Menick described that by visualizing the nose as a series of subunits, these components could guide reconstruction for optimal outcomes [21<sup>■</sup>]. Menick's lifetime work in nasal reconstruction is a testament to nasal reconstruction of modern times [22<sup>■</sup>]. Modern nasal reconstruction has incorporated how we 'see' the nose and its complex array of curves and shadows. We are left wondering how the innovative surgeons of centuries past visualized the noses they were reconstructing?

Nasal prostheses have been an alternative to reconstructive surgery for centuries. The development of modern silicones and osseointegration in the 20<sup>th</sup> century served as a breakthrough for prosthetics. Nasal prosthesis permit oncologic surveillance and offer a temporary or permanent alternative to surgery. Patient satisfaction research has examined the health utility of the rhinectomy defect, and how prosthetics and reconstructive surgery may address the psychological effects on well-being [23]. Quality of life after nasal prostheses equals that of total nasal reconstruction [24], thus surgeons must tailor an individual plan based on each patient and setting. Some settings may not have any prosthetic options or the patient cannot afford prosthetic replacements costs.

The choice to embark on total nasal reconstruction is therefore up to the surgeon as much as the patient. As the history of nasal reconstruction has demonstrated, it is a challenging journey of unknown outcomes, but holds the exciting promise of great restorative value.

## CONCLUSION

Out of the barbarity of nasal amputation sprang the ingenuity for nasal reconstruction, exemplified by masters from India and Italy. For millennia, the fundamental principles of nasal reconstruction, such as pedicled flaps and wound templates, have been practiced relatively unchanged. Understanding nasal reconstruction's past is essential to becoming a 'Nose-maker,' for both the art and history are intertwined.

## Acknowledgements

None.

## Financial support and sponsorship

Disclosures: None

Funding: None

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

1. Tribhovandas Motichand Shah LM. Rhinoplasty – A Short Description of One Hundred Cases. India: Junagadh Sarkari Press; 1889.
  2. Atkins AG. Ramayana of Tulsidas, vol 2. New Delhi: Hindustan Times; 1954.
  3. Whelpton John. A History of Nepal. Cambridge: Cambridge University Press; 2005.
  4. Jodi Bieber/Institute for TIME. Bibi Aisha in Afghanistan. Premier Award at World Press Photo 2010.
  5. Sushruta. Bhishagratna KKL. An English Translation of the Sushruta Samhita. Calcutta, India: K.K. Bhishagratna; 1918.
  6. Johnston-Saint P. An outline of the history of medicine in India. Journal of the Royal Society of Arts 1929; 49:289.
  7. Santoni-Rugiu P, Sykes PJ. A History of Plastic Surgery. New York: Springer; 2007.
  8. Almast SC. History and Evolution of the Indian Method of Rhinoplasty. Rome: Transactions of 4th International Congress of Plastic and Reconstructive Surgery; 1967.
  9. Antia N, Daver B. *Reconstructive surgery for nasal defects*. In: Blair R (ed) ■ Reconstruction of the nose. Clin Plast Surg 8:535, 1981.
- An impressive synopsis of complex nasal reconstruction problems and solutions.
10. Fazio Bartolomeo. *De Viris Illustribus*. Giovannetti, Firenze. 1745.
  11. Furlan S, Mazzola R. Alessandro Benedetti a fifteenth century anatomist and surgeon: his role in the history of nasal reconstruction. Plast Reconstr Surg 1995; 96:739–743.
  12. Thomas JH, Goldwyn RM. Gaspare Tagliacozzi. De Curtorum Chirurgia (with English translation). New York: Gryphons; 1996.
  13. Brain DJ. The Indian contribution to rhinoplasty. J of Laryng and Otol 1988; 102:689–693.
  14. 'B.L.' Letter to Editor. Gentleman's Magazine, p.891. London. October, 1794.
  15. Carpue JC. An account of two successful operations for restoring a lost nose including description of the Indian and Italian methods. Longman, London, 1816.

16. Walton RL, Burget GC, Beahm EK. Microsurgical reconstruction of the nasal lining. *Plast Reconstr Surg* 2005; 115:1813e29.
17. Ollier. Ostéoplastie appliquée à la restauration du nez. *Soc Imper de Med de Lyon*; 1863.
18. König F. Eine neue methode der aufrichtung eingesenkener nasen durch bildung des nasenrückens aus einem haut-periost-knochenlappen der stirn. *Verh Dtsch Ges Chir (Berl)*. 1886;15:41.
19. von Mangoldt. Correction of saddle nose by cartilage transplantation. *McDowell F Trans Plast Reconstr Surg* 1970; 46:495.
20. Ruifang Jiang, Guo Wang, Jing Zhang, *et al*. Three-dimensional bioprinting of auricular cartilage: A review. *Med Drug Discov* 2019; 27:151–161.
21. Burget GC, Menick FJ. The subunit principle in nasal reconstruction. *Plast Reconstr Surg* 1985; 76:239–247.  
The seminal work on light, shadow and how they contribute to nasal subunits, a critical concept for modern nasal reconstructive surgeons.
22. Menick. Frederick. *Nasal reconstruction: art and practice*. 1st Edition. ■■ Saunders; 2009.  
A stunning, 2 volume textbook, replete with photos, reflecting a lifetime of nasal reconstructive surgery.
23. Faris C, Heiser A, Quatela O, *et al*. Health utility of rhinectomy, surgical nasal reconstruction, and prosthetic rehabilitation. *Laryngoscope* 2020; 130:1674–1679.
24. Zaoui K, Thielen HM, Plath M, *et al*. Quality of life after nasal cancer resection - surgical versus prosthetic rehabilitation. *Rhinology* 2018; 56:400–406.