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śuśṛta's CONTRIBUTION TO SURGERY WITH SPECIAL REFERENCE TO PLASTIC SURGERY

Ala Narayana* & Varanasi Subhose**

ABSTRACT

śuśṛta, a great ancient Indian Surgeon, who is regarded as father of the surgery, designed surgical equipment with innovative vision, which laid basis for many advanced technologies in this field. He described many surgical procedures, out of which the *Karṇa Sandhānavidhi* (reconstruction of auricular defects)- Otoplasty, *Nāsika Sandhānavidhi* (reconstruction of an amputated nose) -Rhinoplasty and *ōṣṭa Sandhānavidhi* (Lip repair)- Cleft-lip with a pedicle flap from the cheek, are regarded as master innovations by the world. This technique of reconstruction was practiced since centuries, when this technique was noted by the English physician of 17-18th century it was known as "Indian method of reconstructive surgery".

Many modern plastic surgical procedures have their roots in the ancient times with early practitioners of India and developed the surgical procedures of Plastic Surgery, Reconstructive Surgery and Aesthetic Surgery.

Introduction

śuśṛta (600 B.C) a great ancient Indian Surgeon, who is regarded as " father of the surgery" of the world and whose mastery work '*śuśṛta saṁhita*' was written before 700 B.C. The most outstanding achievement of Indian Surgery is described vividly on Lithotomy, Laporotomy, and Plastic Surgery. The practice of piercing custom of ear & nose and punishing many even slight offences by the amputation of Nose and Ears during ancient times. All though the question of reciprocal influences of Indian and Western medicine in general has never been completely answered, it is an established fact that Indian plastic surgery provided the Basic pattern for western efforts in this direction.

* Asst. Director-in-Charge, ** Research Officer (Ay), Indian Institute of History of Medicine, OMC Building, Putlibowli, Hyderabad- 500 095

THE PLASTIC SURGERY

śuśṛta, supposed to be the father of plastic surgery, described *Kskidya Karṇa Sandhānavidhi* (reconstruction of auricular defects)- Otoplasty, *Vāsya Nāsika Sandanavidi* (reconstruction of an amputated nose) -Rhinoplasty and *Vinaustya Sandanavidi* (Lip repair)-Clift-lip with a pedicle flap from the cheek. This technique of reconstruction was practiced since centuries, this technique noted by the English physician of 17-18th century it was known as the Indian method of reconstructive surgery.

The word 'plastickos' (plastic) derives from Greek meaning "to mold". The term plastic Surgery appeared sporadically in a number of surgical texts through 18th & 19th Centuries. It was firmly established with publication of plastic Surgery – its principles and practice in 1919 by John Staige Devis. The operation on mouth and nose were described by Aurelius comelius celsus Roman in his great work on Medicine – De Medicina that is a classical textbook in medicine up to the middle of 18th century. Little attempt was made at plastic surgery in the medieval period but in the 15th century Branca's in this type of Surgery made a considerable reputation in Italy. During the following century Gas para Taglia Cozzi (1545-1599) of Bologna introduced a method of Skin grafting in the plastic Surgery of the face especially the nose using an arm flap. Which was tied up to the head until the transplant had taken. He published De Curtorum Chirurgia per Unsiteonem in 1597, which is believed by many to be the first modern plastic Surgery text. After Tashia Cozz this type of operations created opposition and was prohibited by the authorities. Baronia described the successful grafting of skin in sheep in 1804. Techniques for human Skin grafting reintroduced by Dieffenbach in 1822, and perfected by Reverdin in France, as well as by Ollier and Thiersh in a serier of publication during the latter part of 19th century[7,8].

śuśṛta'S INNOVATIVE SKILLS OF PLASTIC SURGERY

I. Karṇa Sandhānavidhi [5] *(RECONSTRUCTION OF AURICULAR DEFECTS)- OTOPLASTY*

The human ear during the process of dilatation may get bifurcated either by vitiation of the dosas or due to trauma; and described fifteen patterns (techniques) of

the repair of the ear. They are as follows:

1. *Nēmisandhnaka* (Rim join) Out of them the *nēmi* repair technique is indicated when both flaps of the divided ear are thick, wide and equal.
2. *Utpalabhēdyaka* (lotus splitable) repair technique is indicated when both flaps of the divided ear lobule are circular, wide and equal.
3. *Vallūraka* (Jungle) repair technique is indicated when both flaps of the divided ear lobule are short, circular and equal.
4. *Asnīmā* (fastening) repair technique is indicated when the inner flap of the divided ear lobule is long (and the outer flap is almost negligible).
5. *Gandhakarṇa* (cheek-ear): repair technique is indicated when the outer flap of the divided ear lobule is long (and the inner flap is almost negligible).
6. *āhārya* (take–away): repair technique is indicated when both flaps of the divided ear lobule are absent.
7. *Nirvēdhima* (ready-split) repair technique is indicated when both flaps of the divided ear lobule are absent up to the root of the ear and it is repaired with the tragus as the base.
8. *Vyāyōjima* (multi-joins) repair technique is indicated when one of the flaps of the divided ear lobule is thick, (the other) thin or when one is regular and the other irregular.
9. *Kapaṭasandhika* (door hinge) repair technique is indicated when the inner division is long and the outer one is short.
10. *Ardhakapaṭasandhika* (half door-hinge) repair technique is indicated when the outer division is long and the inner is short.

These techniques of ear repair are the successful ones. Their very nomenclature is given after the problem involved.

11. *Saṅkṣipta:* (compressed) repair technique is indicated when the pinna is atrophied, and one flap of the divided ear lobule is absent and the other one is very small.
12. *Hīnakarṇa* (reduced ear) repair technique is indicated when both flaps of the split

ear lobule are devoid of a base and little musculature is present in and around the cheek.

13. *Vallikarṇa* (creeper ear) repair technique is indicated when the ear lobule flaps are thin, unequal and short.

14. *Yāṣṭikarṇa* (stick–ear) technique is indicated when both flaps of the split lobule have keloids, are a vascular and very small.

15. *Ḳākauṣṭa* (crow's lip) repair technique is indicated when the flaps of the split ear are devoid of musculature, have abridged ends and an insignificant blood supply.

These techniques are attempted, if inflammation, burning sensation, redness, suppuration, abscess formation and discharge occur they (the repair techniques) are not likely to succeed.

Special procedures[11] in difficult cases

One in who's both flaps of the split ear lobule are absent, the central even portion of the pinna may be punctured and dilated (for cosmetic purposes).

If the outer flap (of the split ear lobule) is bigger, it should be approximated to the inner one and if the inner flap is bigger it should be approximated to the outer one.

If there remains only one flap of the split ear lobule and if it is thick, wide and fixed, it may be bifurcated trimmed and joined with the upper portion.

Operative Technique

In the absence of the ear lobule, the expert (plastic surgeon) should elevate a living flap from the cheek connected at its base and should reconstruct the ear lobule after scraping by rotation of pedicled skin flap.

One, who is desirous of performing any of these repair techniques, should collect the equipments described in (the chapter on) "Preoperative Arrangements" specially alcohol, milk, water, vinegar and earthenware powder. Then, the hair of the patient, should be tied; feed with a light diet, and held properly by reliable assistants, the pattern (technique) of the repair decided upon and excision, incision, scraping and puncturing done as necessary. The blood coming out of the ear should be examined

and its normalcy or otherwise ascertained; when it is found to be vitiated by *Vāta,* the ear should be washed with vinegar and lukewarm water; when it is vitiated by *pitta* it should be washed with cold water and milk; when it is vitiated by *kapha* it should be washed with alcohol and lukewarm water. Further, the area should be made raw and approximation done so that the ear is neither elevated nor devoid of a portion or irregular. After adequate haemostasis, suturing should be done.

Post Operative Precautions

Proper post-operative care should be taken and by avoid rubbing (the ears), day sleep, physical exertion, heavy meals, sexual indulgence, exposure to (dry hear of) fire, and the strain of talking.

Contraindications of Suturing

Sutures should not be applied in cases having impure blood, excessive bleeding or little bleeding. When the blood is vitiated by *vata*, the condition known as *Pariputana* (loss of skin) occurs even after healing. When the blood is vitiated by *pitta*, there would be burning sensation, inflammation, redness and pain. And when the blood is vitiated by *ślēṣma* stiffness and itching occurs. When there is excessive hemorrhage, there would be discoloration (bruising) and edema. And when there is very little bleeding, muscular tissue does not regenerate.

Post Operative Care:

It (the ear lobule) should be drenched with fresh (seasamum) oil for three days, and dressing should be changed after every three days. If one does otherwise, inflammation, burning sensation, suppuration, redness and pain may occur or it (the lobule) may again disrupt. When (the ear lobule) has completely healed without any complication and has attained normal color, it should be elongated very gradually (by the method described below).

Elongation of the Ear Lobule

Now, a massage is advocated to elongate the uncomplicated (healed ear lobule). It (the recipe of massage) is as follows. Fat as well as bone marrow from godha, peckers, scatters, swampy and aquatic animals along with milk, *Ghṛta*, seasamum oil

and yellow mustard oil or as many of these as are available should be collected and cooked with *Arka, Alarka, Bala, Atibala, Ananta, Apāmārga,* Aśvagandha, *Vidarigandha, Kṣīraśukla, Jalaśuka,* sweep group of drugs and *payasya* or else sesamum oil only should be cooked with these (*arka* etc) drugs and then preserved at a protected place.

Oil should be applied to the ear, which has been properly fomented and massaged; thus an increase in its size occurs without any complications and its appropriate firmness is obtained.

Applications of the pastes of barley, Aśvagandha, *Madhuka* and sesamum seeds are also beneficial.

Massage by an oil processed with *śatavari,* Aśvagandha, *Payasya, Eraṇḍa* and the *Jīvani* group of drugs along with milk helps to elongate the ear lobules.

Counter Irritation by Scraping

In case the ear lobule does not elongate even after fomentation and (repeated) application of massage oils, scratching should be resorted to on its temporal side. Scratching of the distal (mastoid) side (of the ear lobule) should not be done, as complications are sure to occur.

Elongation of the Repaired Ear Lobule

If an attempt to elongate the ear lobule which has just healed is suddenly made it becomes edematous and breaks off very soon because of the immature union.

That ear lobule only should be gradually elongated which has obtained appropriate growth of hairs, proper (size of the) hole, strong union and evenness, has become firm, healed completely and is devoid of pain.

Final Advice to the Plastic Surgeon

As the techniques for the repair of the ear lobule are many, the wise (plastic) surgeon should use that one which is appropriate in the circumstances.

II. *Nāsika Sandānavidhi (RECONSTRUCTION OF AN AMPUTATED NOSE) RHINOPLASTY*

śuśṛta describes[12], when the nose has been cut off it can be reconstruct by the pedicle flap from the cheek.

Taking a tree leaf of the size of the nose and placing it (on the cheek), a flap should be raised of the same size from the side of the cheek maintaining its continuity; it should then be approximated to the front part of the nose after (making the nose raw) and then the vigilant surgeon should quickly suture the same by the correct technique.

The portion of the nose to be covered over, is to be measured (exactly) with a leaf; and a flap of the required size is to be taken from the "*ganda*" (goiter or the cheek), to be grafted there, and to support it a metallic frame is to be inserted with two tubes in the nostrils to hold it in position, and then scraping the border (to which the grafting is to be joined), and making the surface fresh (to make the grafting successful), the flap is to be carefully sutured. When the grafting has been properly made, a powder made out of Ptercarpus santalinus, Glycyrrhiza glabra and sulphate of antimony should be sprinkled over the part, and then it should be covered with a lint, which is to be kept moistened with oleum sesamum (until the complete grafting has taken place.

The modern method of Rhinoplasty is almost the same, except the two tubes inserted in the nostrils; to hold the metallic frame in position, the metallic frame is made to fit tight the scraped pocked in the nasal bone, and it is provided with a few nodules which are inserted into the nasal bony frame. As to the grafting, the English method consists in taking a flap from the cheek, as devised by Syme, who borrowed it from India; the Italian and the German methods consist of taking the flap from the arm; in Osteoplastic Rhinoplasty, there is a transplantation of a cartilaginous flap to replace the septum nasi.

The very recent method in nasal prosthesis consists of subcutaneous injection of a mixture of solid and liquid paraffin, as introduced by Gersuny in 1910. But as it might partially melt in the body temperature, and thus emigrate and provoke embolism, it has been improved upon by Eckstein who uses pure paraffin, which melts only at 60

degree centigrade and solidifies after injection, which can be easily performed by Brockaert or Lermoyer's syringe[4].

The famous Indian Rhinoplasty operation took place in March, 1793 in Poona on a Maratha named Cowasjee, who had been a bullock-cart driver in the English army in the war of 1792 was captured by the forces of tip Sultan and had his nose and one hand cut off and it was ultimately to change the course of plastic surgery in Europe and the world. The technique used on Cowasjee's is different from *śuśṛta's* technique because here the skin flaps taken from his forehead[6].

Post- Operative Care

Having examined the nose that has been properly sutured and correctly shaped, the same should be fixed by two tubes and elevated. Then, the powder of red sandalwood *Madhūka* and *Rasāñjana* should be sprinkled on the nose after elevating it. It should be dressed properly with white cotton and should be soaked repeatedly with sesamum oil; *Ghṛta* should be administered to the patient after the previous meal has been properly digested and a purgative should be prescribed as instructed.

Final Appearance

When the graft has properly taken up, base of the same should be snapped. The short graft should be elongated and the long graft should be made uniform.

III. *OSTA SANDANAVIDI*[1,13] *(LIP REPAIR)-CLIFT-LIP*

Plastic surgery of the harelip should be done similar to that of Rhinoplasty but without the use of two tubes. Only he who knows these (techniques) is entitled to be the royal physician.

IV. *vṛṇa CIKISTA (WOUND MANAGEMENT)*

śuśṛta' scientifically classified traumatic wounds, their prognostic evaluation and management, insistence on primary suturing in clean wounds, avoidance of sepsis and excision of extruded omentum and careful suturing of intestinal perforations in the management of perforating abdominal wounds, etc are remarkable for their modern outlook. He conceived of a total management of the disease from the earliest stage of vitiation of humours to total recovery in which he insisted on bringing back the site of

the lesion to normalcy in all respects by adopting necessary methodology i.e. *Saṣṭiupakarmās*[14] (sixty kinds of method of management) of ulcerative lesions.

Saṣṭiupakarmās

1. *Apātarpaṇa* (Abstinence from food)
2. *Alēpa* (Application of paste)
3. *Pariśēka* (Spraying)
4. *Abhyanga Anointing*
5. *Svēda* (sudation)-Fomentation therapy
6. *Vimlapana* (Gentle massage)- local rubbing with medicinal powder or oil by the fingers
7. *Upanāha* (Application of poultice)
8. *Pacana* (Induction of suppuration)
9. *Viśravaṇa* (Blood-letting)
10. *Snēha-pāna* (Internal oleation)
11. *Vamana* (Emesis)
12. *Virecana* (Purgation)
13. *Chedana* (Excision)
14. *Bhēdana* (Incision)
15. *Dāraṇa* (Bursting by medication)
16. *Lēkhana* (Scraping)
17. *ēsana* (Probing)
18. *Hāraṇa* (Extraction)
19. *Vyādhana Viśravaṇa* (Drainage by puncturing)
20. *Sīvana* (Suturing)
21. *Sandhana* (Approximation of wound edges)
22. *Pīḍana* (Squeezing out by application of drugs/pastes)
23. *Sōnitasthapana* (Haemostasis)
24. *Nirvāpaṇa* (Cooling applications)
25. *Utkārika* (Warming applications)

26. Kaśya (Medicinal decoction)
27. Varti (External use of wicks)
28. Kalka (External use of pastes)
29. Sarpi (External use of medicated clarified butter)
30. Taila (external use of oils medicated)
31. Rasakriya (External use of thickened extracts like ointments)
32. Avacurnana (External use of fine powders)
33. Vraṇadhūpana (Fumigation of the ulcer)
34. Utsadana (Procedures for elevating (encouraging granulation tissue formation)
35. Avasadana (Procedures for depressing-granulation tissue removal)
36. Mrdukarma (Softening procedures)
37. Darunakarma (Hardening procedures)
38. Kṣārakarma (Application of caustics)
39. Agnikarma (Thermal cauterization)
40. Kṛṣṇakarma (Pigmenting procedures)
41. Pāṇḍukarma (Depigmenting procedures)
42. Pratisāraṇa (Restoration of normal skin & its color)
43. Rōmasañjana (Encouraging re-growth of the hair)
44. Lōmapaharana (Depilation)
45. Bastikarma (Enema therapy)
46. Uttarabastikarma (Douching and irrigation procedures)
47. Bandha (Bandaging)
48. Patradana (Covering the wound surface by leaves to heal)
49. Krmighna (Disinfections)
50. Brmhana (Restorative measures)
51. Viśaghna (Neutralization of poisons)
52. śirōvirēcana (Use of errhines)
53. Nasya (Nasal medication)
54. Kavaladhārna (Gargling)

55. dhūma (Smoking)
56. Madhu (Internal use of honey)
57. Sarpi (Internal use of medicated clarified butter)
58. Yantra (Instrumentation)
59. āhāra (Dietary regimen)
60. Rakṣāvidhāna (Protective / prophylactic measures)

śuśṛta has advised to the Plastic Surgeon regarding the quality of the blade of the knife, which were used in surgery that it has been made so sharp that it can slice the hair in to two; the different parts of instrument have been fixed properly. The adjustments regarding measurements have been done correctly and the instrument has been held in the proper way, only then should it be used in surgical operation.

Today the wound is said to have healed when epithelization is completed but *śuśṛta* employed "*Saṣṭi Upakrama*" which will bring back the normal color, surface hairs etc and bring back normal appearance. Thus he can be rightfully called the originator of plastic surgery.

The art of Surgery gradually declined in India owing to a variety of causes, the chief among them being the aversion of the *Brāhmaṇa*, who had the monopoly of teaching the various sciences, to animal food and to the sacrificial offerings which were too common in the pre-Buddhist period. This aversion made them shrink from touching the carcass necessary for anatomical demonstrations. They also shrank from coming in contract with blood, pus, and other matter, which cannot be avoided in performing surgical operations. Surgery being neglected by the priestly caste, passed into the hands of the lower classes, whose practice was purely empirical. Even these people, for want of encouragement, allowed it to decline, until, as Mr. Elphinstone rightly remarks, bleeding was left to the barber, bone-setting to the herdsman, and the application of blisters to every man.

THE MODERN PLASTIC SURGERY

Many modern plastic surgical procedures have their roots in the ancient times with early practitioners of India and developed the surgical procedures of Plastic Surgery (head and neck surgeries viz., Cleft Lip, Cleft palate, Craniofacial surgery, Facial fractures,

Ear Reconstruction, Lip Reconstruction, Eyelid reconstruction, Skull and Scalp reconstruction, Facial Reanimation, Reconstruction After Tumor Extirpation & Hemangiomas and Vascular Malformations); Reconstructive Surgery (Breast, Trunk, Lower Extremity); Aesthetic Surgery (Facial Aging, Eyelid, Nasal Deformity, Abdomen, Thighs and Buttocks)[9].

Dr. Hirschberg of Berlin says that the plastic surgery in Europe had taken its new flight when we knew these cunning devices of Indian workmen. The transplanting of sensible skin flaps is also an entirely Indian method. The same writer also gives credit to the Indians for discovering the art of cataract couching, which was entirely unknown to the Greeks, the Egyptians, or any other nation. It is said that the Indian practitioners performed cataract operations with great success. The ancient surgeons were also experts in performing amputations and abdominal section. They could set fractures and dislocations in men and beasts, reduce hernia, cure piles and fistula-in-ano, and extract foreign bodies. The ancient medical scholars knew human anatomy, physiology and used to practice the dissection of the human body, and taught it to their disciples[1].

Dr. Wise says that the Hindu philosophers, undoubtedly deserve the credit of "the first scientific and successful cultivators of the most important and essential of all the departments of medical knowledge- practical anatomy", though opposed by strong prejudice entertained sound and philosophical views respecting uses of the dead to the living[2].

During 1st & 2nd world war the discipline of Plastic Surgery was well established. In between academic societies of Plastic Surgeons were established and the training of Plastic Surgeons both in the United States and Europe became more formalized. On this subject Dr. Hirschberg of Berlin says – The whole plastic Surgery in Europe has taken its new flight when we knew these cunning devices of Indian workmen. The transplanting of Sensible Skin flap is also an entirely Indian Method".

During 1st & 2nd world war to the present time a unifying theme in the clinical and research work of plastic surgeons has been the transfer of tissue both autologous and allogeneic. The biology of the transplantation and rejection of skin allografts was

studied by Gibson and Medawar, who set the stage for the first successful renal transplantation in monozygomatic twins by Jospeh Murrary and coworkers in 1954 at the Peter Bent Brigham Hospital.

The techniques of moving tissues regionally within a patient were advanced by the development of axial pattern flaps, including the deltopectoral flap by Bakamjian in 1965 and the groin flap by McGregor and Jackson in 1972. Tanzini had described transferring muscle and muscle skin units in the nineteenth century. Lost and forgotten, the work was rediscovered by Mc. Craw, Orticochea, Ger, Vasconez, Bostwick, and others. The period from 1974 to the present led to the rapid development of a great number of muscle and muscle skin flaps[10].

Conclusion

If the physician requires to be perform a surgery says to his patient, "*Atra Dhanvantarinām adhikaras kriyāvidhau*[3]" means "It is for the surgeon to take in hand this case". It reveals that the surgery might be considered as a separate entity of super specialty branch. *śuśṛta* has described many surgical procedures and surgical instruments for ophthalmic, obstetric and other operations and able to perform Plastic surgery, Reconstructive Surgery for ears and noses etc. This operation has been practiced for ages in India. The contribution of the ancients was no doubt very small and meager as compared with advanced technologies in the field of surgery of the twenty-first century. The reason assigned for this fact is that the instruments and procedures they adopted were enough for their requirements and acquaintance with the properties and virtues of drugs was so great since the most of the diseases and injuries were cured with simple medicaments and surgeries with experience of experimental surgery, which now dealt with broad spectrum antibiotics and surgery by the surgeon.

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सारांश

शल्यतन्त्र में सुश्रुत का योगदान, प्लास्टिक सर्जरी का महत्वपूर्ण उल्लेख - एक टिप्पणी

ए. नारायण एवं वी. सुबोस

सुश्रुत प्राचीन काल के गणमान्य शल्य चिकित्सक थे। इन्हें शल्य चिकित्सा का आद्य माना जाता है। इन्होंने शल्य क्रियाओं में उपयुक्त उपकरणों का विकासोन्मुख दृष्टि से आविष्कार किया है। उनमें से सन्धान विधी, कर्ण विज्ञान, नासिका संधान विधी, रैनोप्लास्टी यानी नासा/ओष्ट संधान विधि गले के लटकते हुये भाग के द्वारा किया था। इसे सारे संसार में एक महत्वपूर्ण उपलब्धि मानी जाती है।

कटे हुए अंगों का पुनर्निमाण की यह पद्धति कई शताब्दियों से प्रचलित है और १७ एवं १८ वीं क्षताब्दी में एक अंग्रेजी चिकित्सक के द्वारा इस पद्धति को जानने के बाद इसका प्रचलन इन्डियन मेथड़ आफ़ री-कन्स्ट्रक्टिव सर्जरी के नाम से हुआ।

आज प्रचलित, आधुनिक प्लास्टिक शल्य चिकित्सा री-कन्स्ट्रक्टिव सर्जरी एवं एस्थटिक सर्जरी पद्धतियों का मूल, प्राचीन भारतीय शल्य शास्त्र मे निहित है।