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### *Sandhan Karma - Base of Ayurveda and Modern Sciences - A Review*

Pankaj Potalia,<sup>1</sup> Rajesh Kumar Gupta,<sup>2</sup> Vishnu Dutt sharma<sup>3</sup>

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- 1.P.G. Scholar, PG Department Of Shalya Tantra, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurveda University Jodhpur.
- 2.Professor & H.O.D. PG Department of Shalya Tantra, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurveda University Jodhpur.
- 3.Associate professor, PG Department Of Shalya Tantra, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurveda University Jodhpur.

**Corresponding Author :-** Dr. Pankaj Potalia, P.G. Scholar, PG Department Of Shalya Tantra, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurveda University Jodhpur.

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#### **ABSTRACT: -**

As shown by *Acharya Sushruta*, "*Sandhan karma*" is a very old technology that can be equated to plastic surgery or reconstructive surgery in modern times. However, pinpointing the exact date of the first reconstructive surgery on humans is difficult. Plastic surgery is one of the leading super speciality surgery fields. Many of the current science techniques are well established and yet adding greater precision is an ongoing endeavor to obtain perfection. If we compare these processes with those detailed by the *Sushruta* we know that most of them are followed the same way as *Sushruta* described them. *Sushruta* also acknowledges the modern literature on plastic surgery, which is a pioneer in plastic surgery for many operations. Autoplastic surgery, Cleft Lip procedures nowadays, had a direct origin from *Sushruta Samhita*, ranged from the fundamentals of plastic surgery to difficult procedures like rhino plastic. The evolution of cosmetic surgery is inextricably linked to ancient Indian surgical procedures. A serious endeavor has been made in this study to collect all accessible facts regarding *Sandhan Karma* and its relationship to the history and current age of plastic and reconstructive surgery. This article emphasizes a comparison of some of *Sushruta Samhita* and contemporary science fundamental concepts and practices of plastic surgery.

**Key words:** *Sushruta's* plastic surgical principles, reconstruction surgery, Ayurvedic rhinoplasty, Auroplasty in the *Ayurveda* area.



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## INTRODUCTION

The ancient Indian civilization was the first to discover surgery. The *Charaka* and *Sushruta Samhita* are two of the earliest known treatises on *Ayurveda*, or Indian medicine. *Charaka Samhita* is thought to be an older book in terms of chronology, and it deals with medicine in general, with a few chapters on surgery. The *Sushruta Samhita*, a treatise from the early Christian era, is primarily concerned with surgical considerations.

The '*Sushruta Samhita*<sup>[1]</sup>' (*Sushruta's* compendium), which covers India's ancient surgical history, is regarded as one of the most dazzling gems of Indian medical literature. This work offers thorough accounts of the famous ancient surgeon *Aacharya Sushruta's* teachings and practice, which provides significant surgical information that is still relevant today. The 'father of surgery,' '*Sushruta*,' emphasized the precise description of surgical illnesses, particularly wounds<sup>[2]</sup>.

*Sushruta Samhita* discusses the causes, causes, patterns, treatment, prognosis, and everything else related to wounds in great detail. *Sushruta's* foundational pillars, or *Siddhanta*, lie at the heart of modern surgery. *Sandhanupakrama* is one of the sixty methods of wound care described in *Sushruta's Shashti Upakrama*<sup>[3]</sup> The term "*Sandhan*" was defined by *Aacharya Dalhana*,<sup>[4]</sup> a well-known commentator on the *Sushruta*

*Samhita*, as "the unification of organs that have been divided owing to trauma".

According To Modern<sup>[5]</sup>

### Graft

A skin graft is a tissue composed of epidermis and various quantities of dermis that has been separated from its own blood supply and transplanted to a new location with a new blood supply.

### Flap

Any tissue that keeps all or part of its original blood flow after being transplanted to the recipient region and is utilised for reconstruction or wound closure.

## AIMS AND OBJECTIVES

Advances in plastic surgery and reconstructive surgery were used as a case study in this research piece, and key references from relevant historical and *Ayurvedic* compendia that hint to a preliminary grasp of the core notion of plastic surgery were examined. The study's goal is to look at the *Sandhan Upakram* in ancient and ayurvedic books and compare it to cosmetic and reconstructive surgery in the present day. The basic idea and goal of this evaluation is to document and recognise *Ayurvedic* contributions.

## MATERIALS AND METHOD-

This paper is based on an examination of *Ayurvedic* writings<sup>[6]</sup>. Materials about *Sandhan karma* and other connected subjects have been gathered. *Sushruta Samhita*, *Charaka Samhita*, and *Ashtanghridaya*<sup>[7]</sup> are the key *Ayurvedic* literature utilized in this research. Also texts such as the *Atharva-Veda*, World Vedic Heritage, *Manusmriti*, and *Kautilyaarthashastra*. Also consulted modern texts and explored other websites to gather knowledge on the necessary themes.

### Indian History Of Sandhana Karma

Even before *Aacharya Sushruta*, the first allusions to *Sandhan karma* may be found in Vedic times. *Sandhan karma* science was also extensively established during the *Vedik*<sup>[8]</sup> era. The most famous case of this is the replanting of the head of a '*daksh prajapati*,' whose head was removed by Lord Rudra.

Ashwini Kumara's allusions to *Sandhan Upakrama* are the following:

1. In the *Deva – Asura Sangrama*, "*Daddhya*," the son of "*Atharva*," had lost his head. *Ashwini Kumara* kept his head and had a horse head grafted over his body. After a few days, his original head reappeared.

In replace of the horse's head, it was transplanted.

2. Lord *Rudra* removed the head of "*Daksh*" and performed a head plasty on him.
3. An elephant's head was grafted into Lord *Ganesha's* body.
4. *Prajapati's* eye transplant is recorded in

*Jaiminiya Brahman*.

5. *Indra's* testicular plasty, according to the *Valmiki Ramayana*.

6. *Paravruja* eye transplant

The British Archeologist Sir Alexander Cunningham (1814-93) wrote about the *Kangra* plastic surgery tradition. A *Vaidya* named '*Bidha*' used to do plastic surgery in *Kangra* during Akbar's rule. Plastic surgeons were well-known in Himachal Pradesh's '*Kangra*' (properly pronounced Kangada) district. According to some experts, the name Kangada is derived from Kana + Gadha, which means "ear repair."

After acquiring further information on "Indian nose reconstruction surgery," young English physician J. C. Carpue performed two identical surgeries in 1814 with satisfactory results. Following Carpue's publication, Graefe, a German surgeon, did similar nose surgeries using skin from the arm. Plastic surgery became widespread in Europe as a result of this. Indian plastic surgery refers to any restoration procedure that uses a flap of skin from the area where the loss occurred.

*Sandhan* has progressed to the point that it can now do plastic and reconstructive surgery. However, it all started with *Sushruta's Nasasandhan* or rhinoplasty procedure. *Sushruta* has also conducted *Karna Sandhan* (lobuloplasty or ear surgery) and *Oshtha Sandhan* or oroplasty. *Sushruta's* competence in intestine anastomosis is demonstrated in the *Sushruta Samhita's Antrasandhan*

*Sandhan karma* by *Aacharya Sushruta* in different contexts:

1. In Wounds: - The healing of wounds is referred to as *Sandhan karma* here. *Susruta*

*Samhita* mentions many sorts of measures for various sorts of wounds. These methods range from applying various types of herbs locally to suturing with various materials. Wound healing qualities are known to exist in the formulations like *Lodhradi*, *Panchvalkaladi*, and *Haritakyadi*. Cotton threads, silk threads, muscle fibres, hairs, hemp bark, fibres, and other suturing materials are described by *Sushruta*.

2. In Fractures: - In *Asthi Sandhan*, *Sushruta* has described the essential principles of therapy for the healing of fractures. He has recommended immobilization under essential reduction of displaced fractures. He has described unique splints fashioned from various trees such as *Madhuka*, *Udumbara*, *Ashwattha*, *Palash*, *Kakubha*, *Vansha*, *shala*, and *Vata* for immobilization. “*Kapatshayana*” is a specific splint described by *Acharya Sushruta* for the fracture of the femur or tibia and fibula. For immobilisation, it features five nails.

3. In case of a haemorrhage: - Blood is an extremely important component of the human body. A significant loss of blood from the body can be deadly or life-threatening. In fact, in classical writings, blood is referred to as "life." Some wounds in wartime generate serious hemorrhagic disorders that must be treated right once. Bloodletting, which is one of the modalities of therapy indicated in the *Sushrut Samhita*, can also result in a large amount of blood loss. *Sushruta* mentions four sorts of measurements to stop the bleeding: *Sandhan*, *Skandan*, *Dahan*, and *Pachan*. As a result, *Sandhan* is one of the strategies for stopping the bleeding.

4. In the case of intestinal anastomosis, *Acharya Sushruta* has provided a unique procedure for colon anastomosis. To hold the

chopped edges together, large ants with large pincers near their mouth were utilised as clips. Their heads are cut off when they have a strong grasp, and their bodies are removed and discarded. This was a unique approach and brilliant idea that was put into effect on the battlefield when appropriate instruments were unavailable. The usage of huge ant pincers can be regarded a forerunner to the absorbable sutures utilised by current surgeons.

5. In ear and nose reconstruction: - Lobuloplasty and rhinoplasty have been thoroughly detailed by *Acharya Sushruta*. *Sushruta* states while detailing the procedure of Rhinoplasty (*Nasikasandhana*), the area of the nose to be covered should first be measured with a leaf. The skin should then be dissected from the live skin of the forehead or cheek and turned back to cover the nose, leaving a little pedicle connected to the cheek. By cutting the nasal stump with a knife, the section of the nose to which the skin will be connected should be made raw. The surgeon should then quickly stitch the two sections together, keeping the skin suitably raised by putting two tubes of *Eranda* in the location of the nostrils, so that the new nose acquires a good fit. After the skin has been correctly regulated, it should be dusted with Liquorice, Red Sandalwood, and Barberry plant powder. Finally, cotton should be used to cover it, and clean sesame oil should be administered on a regular basis. If the nose is too short or too long after the skin has joined and granulated, the middle of the flap should be split and an attempt made to enlarge or shorten it.” This approach is still known as the Indian approach of Rhinoplasty in current surgery.

## Two World Wars And Plastic Surgery Innovations

In the history of plastic surgery, war has had a crucial impact. Heads and necks were particularly susceptible during the First World War, and pilots and passengers in the new and deadly warplanes frequently suffered significant face injuries. Shattered jaws, blown-off noses, and gaping head wounds stimulated the development of cosmetic surgery methods and experiments. Despite medical advancements following World War I, there were no universally accepted standards for doing plastic surgery. Patients frequently endure serious problems such as amputation. The establishment of the 'American Association of Plastic Surgeons' by practitioners who had fought in WWI essentially signified the end of unregulated plastic surgery (Haiken 1999). The American Society of Plastic and Reconstructive Surgeons (later renamed American Society of Plastic Surgeons) joined this inaugural organisation in 1931. Finally, plastic surgery has gained recognized as a distinct specialty with roots in Ayurveda, an Indian medical tradition.

The *Sushruta Samhita* was also composed during a time when battles were widespread. As a result, *Sushruta*, who is a "*Shalya Pradhan*," or surgeon, detailed several procedures that are similar to those performed today. Plastic surgery, such as *Nasa Sandhan* (Nasal Reconstruction), *Karna Sandhan* (Ear Reconstruction), and *Ostha Sandhan* (Lip construction), has been discussed by *Sushruta* in the context of "*Sandhan Karma*".

After the First World War, modern procedures were established, particularly with Sir "Harold Grille's work in rebuilding face injuries, which

was made possible by new safe anesthetic regimens. Later in the twentieth century, improved knowledge of soft tissue anatomy led to an explosion of new flaps, which, when combined with microsurgical techniques, craniofacial surgery, and tissue expansion, resulted in an altogether new set of procedures for recreating parts. In 1839, French surgeon Velpéau published the first text book that included a complete explanation of plastic and reconstructive surgical techniques. The New Zealander Grille's work was among the forefathers of contemporary plastic surgery who emerged from the First World War.

### Plastic Surgery Basic Principles <sup>[8]</sup>

The following issues should be considered while considering broad concepts of plastic surgery.

- a) Excision and incision of the skin
- b) Irrigation and the Role of Debridement
- c) The significance of suturing procedures
- d) Wound care for big wounds
- a) Excision and incision of the skin

In "*Chedan Karma*", *Sushruta* has clearly stated the various sorts of incisions should be made on various areas of the body (Incision). "*Triyaka chedan*," or oblique incision, on the head, eyelid, cheek, frontal area, lips, gums, axilla, and hip joint. Over the upper and lower limbs, a "*Chandramandal*" (circular) incision should be made, and over the anal area and penis, a "*Ardhchandrakruti*" incision should be made (Semicircular).

*Sushruta* explicitly states that if these incision criteria are not followed, essential tissues may be intersected, wound healing may be delayed

(*Chirad Vranasanroho*), and keloid development (*Mamsakandi*) may develop. In the context of breast abscess (*StanaVidradhi*), incision should be made in such a way that it avoids Papillary duct and areola, else sinus (*Nandivrama*) may develop.

**Modern Perspective:** Incision is also valued highly in modern science. Skin incisions are meticulously arranged to avoid a visible scar. For example, face incisions can be disguised in the pretragal crease, subciliary crease, or nasolabial fold, while breast incisions can be hidden in the periareolar skin, the inframammary crease, or the axilla.

Tension should not be applied across skin incisions since it will result in a broad and ugly distribution of skin, and human skin is less distensible in the direction of tension lines than in the opposite way. These "larger lines" can be utilised to create a skin incision and reduce strain across it. When feasible, the incision should be made perpendicular to the underlying muscle's long axis. Relaxed skin tension lines (RSTLS) are minimally tense lines that resemble wrinkles or natural skin lines. Transverse wrinkling of the forehead, which is perpendicular to the underlying vertically oriented frontal muscle, is an illustration of this concept.

## b) Irrigation and the Role of Debridement

*Sushruta's* point of view: In his description of wound management (*Vranachikitsa*), *Sushruta* mentions sixty different forms of therapy (*Shashthiupokrama*). Scraping (*Lekhana*) is the sixteenth *Upakrama*, according to *Sushruta*. Scrape hard, big, and round-margined wounds that gape often, as well as wounds with hard fatty bulk. Scraping should be done so that the

wound's edges are all at the same level.

Also, according to *Sushruta*, the wound should be completely cleansed before suturing, else there is a risk of pus forming in the wound.

(*Sushruta SutraSthan, Ashtavidha shastrakarmiya Adhyay, 25/18-19,*)

**Modern perspective:** Although theoretically simple, good wound debridement necessitates sound surgical judgement and thorough examination. Debridement refers to the removal of devitalized and contaminated tissue while leaving vital structures including nerves, blood arteries, tendons, and bones intact. Following debridement, regular saline or sterile water should be used to keep the site moist.

Chronic wounds with granulation tissues that have been allowed to form and remain for an extended period of time are notoriously difficult to heal. Pathophysiologically, granulation tissue is a mixture of capillaries, fibroblasts, and bacteria. Of these three elements, only the capillaries are useful to the surgeon. As a result, if the incision is filled with granulation tissue, it is critical to resect surgically in a tangential manner until all granulation tissue is removed and the face is clean. Following this type of tangential excision, the surgeon can use grafts.

## c) The significance of suturing procedures

*Sushruta's view:*

*Sushruta* has provided a detailed description of various suturing techniques. *Sushruta* describes four different ways of suturing. *Vellitaka*, *Gofanika*, *Tunnasevani*, and *Rujugranthi* that should be utilised for various sections of the body. *Sushruta* also advised caution while suturing, indicating that sutures should not be placed too close or too far apart. If sutures are

placed too near, the wound edges may burst through, and if they are placed too far apart, severe discomfort may result.

*Sushruta* has described the many sorts of needles and their uses in different locations. Roundbody two finger long needle (*Vrultanguladwgyam*) should be used for wound closure over regions with less fatty nature and over joints, while three figure long (*Ayatatryangulatrastra*) needle should be used in regions with more facts cutting body, and curved (*Dhanurvakra*) needle should be used in situations where critical organs are nearby.

Modern view:

Regardless of the suture material used, maintaining wound closure and preventing excessive scar formation requires reducing strain. Sutures are put 2mm from the skin edge and 7–10mm apart, depending on the necessity, through the epidermis and into the deep dermis. A little eversion of the skin's borders allows for precise closure without causing scar depression.

Vertical mattress sutures are also utilised for eversion, but they grab and draw the skin together at different sites along the skin edge, posing a higher theoretical risk for ischemia tissue healing inhibition. Simple sutures, also known as mattress sutures, are made of non-absorbable material and should be removed as soon as possible to avoid scarring. A large percentage of the strength of a suture wound should be provided by buried dermal or face suture.

Subcuticular sutures are superficial dermal sutures that run underneath the skin's surface, avoiding the visible scar left by interrupted sutures. They should not be used as the closure's strength component. Continuous over and over

sutures enable for fast tissue closure while maintaining some degree of hemostasis. Staples have also been utilised to close the skin's and soft tissue's superficial components.

To avoid an unsightly scar, they may need to be paired with deeper sutures to increase the closure's strength. They should be left in for no more than one week. When utilised appropriately and in a context where somewhat tensionless closure has previously been achieved with deeper sutures, tissue adhesive substances, particularly cyanoacrylate-based ones, can be beneficial. When simple apposition of surface skin is required but suture tension is lacking due to anatomy or pre-existing deeper structure, steri-strips or other tapes can be utilised in the same way.

#### d) Wound care for big wounds

*Sushruta's* view: While explaining the treatment of *Vrana* (wounds), *Sushruta* described *Shashitiuparamas* (Sixty Methods), in which he outlined sixty various forms of wound remedies. He detailed these therapies. Treatments for big wounds include *Nirvapan*, *Vtkarika*, *Utsadan*, and *Avasadan*.

Modern view:

The use of a flap is the most appropriate approach in the management of big wounds when the wound cannot be closed principally or when a skin transplant will not be sufficient.

FLAPS: It is transfer of donor tissue with its blood supply to the recipient area. Some examples ---

#### a) Defects of nose:

*Sushruta's* view - In the sixteenth chapter of *Sutrasthana*, *Sushruta* describes the restoration of nose deformities in great detail. According to

*Sushruta*, one should pick a leaf the same size of the defect and stitch the same size piece of skin and subcutaneous fat from the forehead over the flaw appropriately. After inserting this transplant, *Erandnala* should be placed to maintain the airway (nostrils) open (stick of *Ricinus Communis*- Castor). The pedicle of this transplant should be connected to its original location and clipped after the incision has healed fully.

#### Modern view-

Basal cell carcinoma on the dorsum or tip of the nose frequently need flap covering for acceptable outcomes. The surrounding nasal skin should be used to cover the flap since it has the same colour, texture, and thickness, and the scar is nearly unnoticeable in senior individuals. Skin grafts, on the other hand, may leave noticeable concavity and a patchy look due to the surrounding skin.

#### b) Defects of Ear: *Sushruta's* View-

In *Sustrasthan*, *Sushruta* has a special chapter on ear deformities and their therapy called *Karnabahavidhi Adhyaya*. When piercing the ear, *Sushruta* has suggested to avoid three vessels to avoid difficulties. In this chapter, *Sushruta* discusses fifteen different forms of ear abnormalities and how to treat them.

#### Techniques of *karna-sandhan-vidhi* (Rhinoplasty)

##### 1 *Nemisandhanaka*

##### 2 *Utpalbhedha*

##### 3 *Valluraka*

##### 4 *Asangima*

##### 5 *Aaharya*

##### 6 *Nirvedham*

##### 7 *Vyayojinam*

##### 8 *Kapatsandinam*

##### 9 *Ardhakaapatsandinam*

##### 10 *Sankhipta*

##### 11 *Hinakarna*

##### 12 *Vallikarna*

##### 13 *Yashtikarna*

##### 14 *kakoshataka*

##### 15 *gandakarna*

If a patient's ear lobule is thick and broad, it should be clipped and attached upward. In the lack of a lobule, *Sushruta* recommended reconstructing the lobule with tissue from the forehead that had a good blood supply (*Sanubandhenajivita*)

#### Types of Ear Reconstruction Surgery Otoplasty

Cosmetic surgery on the outer, visible regions of the ear is known as otoplasty. Ear pinning, for example, can surgically bend the ears closer to the head to reduce their prominence.

#### Ear Defect Repair

Tissue loss can occur as a result of trauma or cancer treatment, necessitating cosmetic surgery to restore the outer ear's structure and function.

#### c) Defects of Lips:

*Sushruta's* view *Sushruta* recommends reconstructing the lips in the same way as the nose, but without the use of *Erandanala*

## Modern Review

There are three steps to this operation.

The first stage involves adequate lip mobilisation lateral to the cleft; the second step involves making the borders rough by cutting the whole thickness of the lip.

Third stage: skin flaps are sutured together in such a way that the red edge of the lip maintains its continuity. First, a rubber tube of the correct size is inserted into the nose, and then the mending process begins.

## DISCUSSION

In the realm of surgery, plastic surgery is one of the most significant fields. It is currently regarded a super speciality field of surgery. Despite the fact that it is a well-established part of Modern Sciences, this discipline is always evolving and introducing novel approaches in order to reach greater accuracy and accuracy. When we go through the literature on Plastic Surgery, we discover that Modern Sciences has also said that the earliest references for Plastic Surgery may be found in the *Sushruta Samhita*. And, if we look at the operations in Plastic Surgery, we can find that many of them are similar to the techniques outlined in the *Sushruta Samhitas*.

Some of the basic principles outlined in the *Sushruta Samhita* are likewise characterised in modern sciences as fundamental principles for Plastic Principles, according to the review research. Some essential rules to follow in plastic surgery for skin incisions, excision, debridement, suturing techniques, and graft closure of major wounds.

*Sushruta* has clearly stated different forms of incisions should be taken on various body areas

when it comes to skin incision and excision. If these criteria are not followed, there is a risk of wound non-healing or the creation of hard tissue (*Mamsakandi*), which is linked to Keloid. Incisions should be made in the direction of skin creases and without strain on the incision line to avoid a large and ugly scar, according to modern research. Carl Langer has identified several lines on the body termed "Langer's Line" that are to be utilised to construct skin incisions for these purposes. When these lines are compared to *Sushruta's* description of different incisions on various regions of the body, we can see that these incisions likewise follow the precise concept of Modern Sciences.

Debridement and Irrigation are now being considered. When explaining *Ashtavidha Shastra karma* and the Sixty techniques of wound therapy, *Sushruta* emphasised the necessity of wound cleanliness, removal of hard borders, and scraping of the lesion. Modern science has also highlighted the need of Debridement and Irrigation in achieving a healthy capillary bed for graft acceptance; otherwise, there is a risk of graft rejection.

When we look at *Sushruta's* suturing procedures, we observe a thorough explanation of numerous forms of suturing, body areas where certain types are to be employed, and different sorts of suture materials. Suturing method is also mentioned in *Sushruta*, much as it is in modern sciences, such as appropriate approximation of borders, correct strength to knotting, and period of removal of sutures on various regions of the body. The only distinction is that *Sushruta* has described many suture materials that are either of plant or animal origin.

Modern science, on the other hand, mostly uses artificially manufactured suture materials.

However, it is possible that the suture materials listed by *Sushruta* have medicinal characteristics that facilitate wound healing, such as *Guduchi* (*Tinospora Cordifolia*), which has anti-inflammatory and antibacterial qualities.

## CONCLUSION

The following research study shows that *Sushruta's* expertise of Plastic Surgery was highly established, and many of the treatments that Modern Sciences execute now are *Sushruta's* followers. More research into *Sushruta's* procedures is needed, and when combined with contemporary technology, there is a lot to be gained in the field of plastic surgery. When we look at some of the references for large wound management, such as Reconstruction of the Nose, Reconstruction of the Ear, and Reconstruction of the Lips, we can see that the methods described in *Sushruta* are the pioneers in Modern Sciences as well, as these procedures are followed exactly as *Sushruta* described them. When it comes to nose reconstruction, *Sushruta* recommends taking grafts from the frontal area while keeping the blood supply intact. This method is being followed today. *Sushruta* also documented fourteen procedures for re-creating the ear, only a handful of which are still used by modern science.<sup>[9]</sup>

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