

# History of Anaesthesia

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**Abstract:** The topic covers the vast history of anaesthesia from international and Indian point of view. It contains the evolution of anaesthesia over the time and knowledge into some important events that created the world of anaesthesia that we live in today. The study material has been obtained from various textbooks and journals and website and their details are mentioned in the references.

**Keywords:** Indian history, Anaesthesia history.

## INTRODUCTION

Anaesthesia a relatively new dynamic medical speciality has its origins several centuries ago. A review of the same is mentioned below.

## WORLD HISTORY

Although first demonstration of anaesthesia was done in 19<sup>th</sup> century, Bian Que in 300 BC used general anaesthesia for surgical procedures. He gave a toxic drink, which rendered the patient unconscious for 3 days, during which time he performed a gastrotomy upon them [1]. Hua Tuo who was a Chinese surgeon of the 2nd century AD also performed surgery under general anaesthesia. He used a formula he had developed by mixing wine with a mixture of herbal extracts known as mafeisan. It produced signs of unconsciousness and partial neuromuscular blockade [2].

## AGE OF INHALED ANAESTHESIA WITH THE USE OF NARCOTIC-SOAKED SPONGES

In 1000, Abu al-Qasim al-Zahrawi, an Arab physician, published the 30-volume Kitab al-Tasrif, where he wrote about the use of general anaesthesia [3]. Ibn sina described the use of inhaled anaesthesia in The Canon of Medicine. It described the "soporific sponge" which is a sponge imbued with aromatics and narcotics kept under a patient's nose during surgical operations [4]. Al-Taisira, a book by Ibn Zuhr describes the use of general anaesthesia [3]. In 1298, opium and mandragora sponges were used for surgical pain relief. This was practiced by Theodoric of Lucca [5]. In 1525 Parceleus started using ether for the first time in animals. Before introduction of anaesthesia, in 1779, magnets and hypnosis was used to cure various

ailments. This was known as mesmerism known after scientist Franz Anton Mesmer [5]. In eighteenth century, Hanaoka Seishū created a compound tsūsensan, which produces a state of general anaesthesia and skeletal muscle paralysis. It is said to be similar to mafesan. On 13 October 1804, partial mastectomy was done for breast cancer using tsūsensan. It is often regarded as the first reliable documented operation to be performed under general anaesthesia [6].

## THE BEGINNING OF HUMBUG

Henry Hill Hickman made animals insensible, by using CO<sub>2</sub> and amputated their limbs to do the study. He published this research to royal society in a short treatise entitled "Letter on suspended animation: with the view of ascertaining its probable utility in surgical operations on human subjects". In 1826 an article was published in The Lancet titled 'Surgical Humbug' that ruthlessly criticised his work [7, 8]. In 1829 Jules Cloquet amputated a breast from a woman asleep under hypnosis.

## ETHER FROLICS: WHERE IT ALL BEGAN

In the 1830's wandering lecturers conducted ether "frolics" in which they gave audience diethyl ether or nitrous oxide to inhale to demonstrate the mind altering properties. Four important persons attended these frolics. They were William Edward Clarke, William T G Morton, Horace Wells and Crawford Long [7, 8].

## THE BATTLE FOR ULTIMATE PLACE IN HISTORY

In 1842, at New York, Miss Hobbie was administered ether from towel by Physician William E. Clarke for removal of a tooth by dentist Elijah Pope. Clarke chose neither to publish nor to pursue this technique any further [5]. On March 30, 1842, in Georgia, Crawford Long, administered ether for the

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removal of a tumour from the neck. It is the first known administration of a gas for surgical pain relief. He did not publish it till 1849 [5].

On December 10 1844, demonstration of nitrous oxide inhalation was attended by Dr. Horace Wells at Union Hall in Hartford, Connecticut. Wells thought of the notion of pain relief by gas inhalation. Wells quickly put the idea into practice [5].

The very next day, Colton administers nitrous oxide to Wells while another dentist, Dr. John M. Riggs, extracted one of Well's teeth painlessly [5, 8]. On March 12 1844 Francis Rynd gave first subcutaneous injection using a hypodermic syringe [5]. On 1846 September 30 Boston dentist, William Thomas Green Morton anaesthetized his patient Eben H. Frost and successfully removed an ulcerated tooth. Frost had requested that Morton mesmerize (hypnotize) him, but the dentist, who had been searching for pain relieving agent, tried sulfuric ether instead [5].

On October 16 1846, "Gentlemen, This Is No Humbug" were the exact words of Dr. Warren, who operated upon jaw tumour of Gilbert Abbott, using ether given by Dr. William Morton. Later on November 21, Oliver Wendell Holmes suggests the word 'anaesthesia' to describe the mental state produced by the inhalation of the ether vapour. On January 19 1847, James Young Simpson first used ether for relief of pain in labour [5] and on January 28 John Snow administered ether for major surgeries at St. George's Hospital, London [5]. On November 8 James Young Simpson introduced chloroform into clinical practice [5].

Hannah Greener was the first reported fatality due to chloroform anaesthesia on 1848 January 28 [5]. In 1853 April 7 John Snow administered chloroform to Queen Victoria for the birth of Prince Leopold. In 1871 Friedrich Trendelenberg performed the first successful elective human tracheotomy [10]. In 1873 February 1, The Lancet reported the first documented death from nitrous oxide inhalation [5]. On 1874 February 9, Ore administered first intravenous general anaesthesia in humans in modern times [5].

In 1880 Scottish surgeon William Macewen reported use of orotracheal intubation as an alternative to tracheotomy [11].

In 1884 September 15, Dr. Carl Koller's reported the use of cocaine as a local anaesthesia [5]. On 3 April 1895, Alfred Kirstein of Germany first described direct

visualization of the vocal cords [12]. On 1897 August 16, German surgeon Dr August Bier administered the first spinal anaesthetic [5]. Barbiturate was introduced in the same year [13].

## 1900-1950 ERAS

### Airway

In 1917 Henry 'Cocky' Boyle designed his first anaesthetic machine. Chevalier Jackson used direct laryngoscopy as a means to intubate the trachea [14]. In 1919 Magill developed the technique of awake blind nasotracheal intubation. He devised a new type of angulated forceps (the Magill forceps) to facilitate nasotracheal intubation [15]. In 1931 cuffed endotracheal tubes were introduced into clinical practice [5]. In 1937 Thomas Philip Ayre invented a simple metal T-piece to which he attached 6-10 inches of open-ended red rubber tubing to the distal end as a reservoir for fresh gas flow [5]. In 1943 Sir Robert Reynolds Macintosh introduced his new curved laryngoscope blade [16].

### Pharmacological Agents

In 1932 Suxamethonium was first used by Dr Ranyard West to treat tetanus and patients with muscle spasticity. Pethidine was introduced in same year [5]. On 8th March 1934, first use of thiopental in man was administered by Ralph M. Waters in Wisconsin [5]. 1942 Curare is introduced into anaesthetic practice by Canadian anaesthetist Harold Griffiths [5].

In 1923 The British Journal of Anaesthesia was founded [5]. On 7th April 1923, first brain tumour operation under local anaesthesia was performed by Dr. K. Winfield Ney at Beth Israel Hospital in New York City [5]. In 1935 Diploma in Anaesthetics (DA) examinations were introduced in Great Britain [5]. 13th February 1936 American Society of Anaesthesiologists was founded [5]. In 1945 the Tuohy epidural needle was introduced into clinical practice [5]. In 1947 Faculty of Anaesthetists of the Royal College of Surgeons of England was founded [5].

### 1950- Modern Times

William Wellesley Mapleson published his theoretical analysis of five semi-closed breathing systems. Since he knew nothing of the origins of the systems, Mapleson simply applied the labels A, B, C, D and E. Dr Henning Ruben designed the first prototype

Ambu Bag using sprung bicycle spokes to aid automatic re-expansion [5]. World Federation of Societies of Anaesthesiologists was founded in 1955 [5]. Halothane was first used clinically by Dr. M. Johnstone in Manchester in 1956 [5]. In 1961 Brian Arthur Sellick published his seminal paper describing 'cricoid pressure to control regurgitation of stomach contents during induction of anaesthesia' in the *Lancet* [5]. In mid 1965 Philip Raikes Bromage published his scoring system to assess the intensity of lower limb motor blockade after extradural analgesia/anaesthesia [5]. Melzack and Wall proposed the gate control theory of pain in 1965. Bupivacaine was first marketed by AstraZeneca in 1965 [5]. In 1967 fibre optic endoscope for tracheal intubation was introduced by Peter Murphy [17].

The first anaesthesia simulator, SIM1, was described in 1969 by Denson and Abrahamson. It consisted of a mannequin comprising an intubatable airway and upper torso and arms. In 1986, a team at Stanford, headed by Gaba and DeAnda, developed a full-scale simulator called the Comprehensive Anesthesia Simulation Environment (CASE) specifically to study the decision-making processes of anaesthetists during critical events [18].

In 1985 Seshagiri Rao Mallampati introduced Mallampati scale with 3 grades. In 1987 Samsom and Young in Portsmouth, UK, added a fourth class [5]. Clinical use of Desflurane began in 1987 [5]. During 1988 in Canada, David Gambling and colleagues introduced Patient Controlled Epidural Anaesthesia (PCEA) [5]. In 1993 Drs EP McCoy and RK Mirakhur introduced the McCoy laryngoscope blade [5]. During 1994 Aspect Medical Industries developed Bispectral Index (BIS) Monitoring as a guide to depth of anaesthesia [5]. In 1996 Remifentanil was approved by the FDA for clinical purpose [5]. Same year Ropivacaine was first marketed [5]. In 2001 The Glidescope became the first commercially available video-laryngoscope [19]. In 2003 Datex-Ohmeda developed Spectral Entropy Monitoring as a guide to depth of anaesthesia [5]. On 2nd April 2007 Faculty of Pain Medicine of the Royal college of Anaesthetists was founded [5]. On 29th July 2008 the first selective relaxant binding agent, Sugammadex was approved for use in the European Union [5]. Xenon was introduced as a general anaesthetic agent in clinical practice in 1898 but wide usage began in recent years [20].

In table 1, discovery and use of various anaesthetic agents in chronological order is depicted.

## ANAESTHESIA JOURNAL

The first edition of Anesthesia and Analgesia is published under the auspices of the International Anesthesia Research Society in 1922. It was the first journal in the speciality.

## HISTORY OF INDIAN ANAESTHESIA [27]

In 500 B C. Operations were performed using opium, wine, Indian hemp by Susruta. Bhoj Prabhand mentioned used of "Sammohini" for induction and "sanjivani" for recovery. A cranial operation was performed on raja BHOJ in 527 AD. In 1843, Esdaile started Mesmerism at the Imambarah Hospital Hooghly.

## PRE INDEPENDENCE (1847–1947)

On Monday 22nd March, 1847, in the Medical College Hospitals, Calcutta first administration of ether anaesthesia in India was done. The first chloroform anaesthesia was administered on January 12th 1848.

## CHLOROFORM COMMISSION

In 1888 Edward Lawrie formed the "First Hyderabad Chloroform Commission". 141 animal experiments were done and it was concluded "Chloroform may be given with perfect safety and without any fear of accidental death, if only respiration is carefully attended to". England rejected this and so the "Second Hyderabad Chloroform Commission" was formed. Experiments were carried out on 430 animals and a clinical study on 54 humans. It concluded that chloroform was not directly injurious to the heart and it killed only by its effect on respiration.

The first woman anaesthetist in the world, Roopabai Ferdunji was working under Edward Lawrie in Hyderabad in 1889.

J. Frayer reported the first case of delayed chloroform poisoning in the world in 1869 in a 27 year old man treated for compound fracture of the leg. He started vomiting, developed jaundice, coma, and anuria within 24 hours and died on fourth post operative day. this report on chloroform poisoning was published in *Lancet* in England in 1894 [28].

The first documented report of premedication in world was by Alexander Crombie of the Presidency General Hospital, Calcutta. He used hypodermic morphine in 1880 for smoother course of chloroform

**Table 1: Discovery and Use of Various Anaesthetic Agents in Chronological Order**

Year	Scientist	Discovery
1773	Joseph Priestly [21]	Prepared Nitrous Oxide
1800	Humphry Davy	Described Properties Of Nitrous Oxide
1803	Friedrich A W Sertuner [22]	Isolated Morphine
1831	Von Leibig [23] Guthrie, Souberian	Prepared Chloroform
1842	Crawford Long	Used Ether As Anaesthetic
1844	Gardner Colton, Horace Wells	First Used Nitrous Oxide As Anaesthetic
1846	William Thomas Green Morton	Published About Ether As Anaesthetic
1853	John Snow [24]	Administers Chloroform To Queen Victoria For Birth Of Prince Leopold
1864	Adolf Von Bayer [25]	Discovered Barbiturate
1872	Pierre Cyprien Ore	First Successful Attempt In Intravenous Anaesthesia
1884	William Halsted	Use Curare For In Transdermal Infiltration
1884	Carl Kohler	Use Cocaine As Local Anaesthetic
1885	Leonard Corning	Coined The Term "Spinal Anaesthesia"
1898	August Bier	Administered First Spinal Anaesthetic
1908	August Bier	Described Intravenous Regional Anaesthesia( Bier Block)
1901	Ferdinand Cathelin Jean Sicard	Introduce Caudal Epidural Anaesthesia
1911	Hirchill	Performs Percutaneous Brachial Plexus Block By Axillary Approach
1911	Kullenkampff	Introduce Supraclavicular Block
1926	Lundy	Introduce Concept Of Balanced Anaesthesia
1932	Volwiler, Tabern	Synthesized Thiopental
1934	John Lundy, Ralph Waters	Use Thiopental Clinically
1942	Harold Griffith, Enid Johnson	Use Curare For Intra Abdominal Surgery
1949	Bovet	Synthesized Succinylcholine
1951	Suckling [26]	Introduced Halothane For Clinical Use
1960	Paul Janseen	Synthesized: Fentanyl
1961	Paul Janseen	Synthesized: Droperidol
1964	Paul Janseen	Synthesized: Etomidate
1962	Calvin Stevens	Synthesized Ketamine
1966	Glaxo Well	Synthesized Remifentanil

anaesthesia; this was confirmed by Gwathmey and Rene F. Miller of USA [29].

Chloroform and ether were used in mid – fifties. Trilene was introduced in 1940's and Halothane in 1960. Halothane hepatitis first case was reported in KEM, Mumbai in 1972. Enflurane was introduced in 1975 & Isoflurane in 1992.

### REGIONAL ANAESTHESIA

Cocaine 4% was used for removal of a facial tumour as a local anaesthetic in 1894. hyperbaric stovaine was

used for Spinal anaesthesia by Capt. A Chalmers . The first spinal anaesthesia related mortality was reported by W. Gabbett of Madras, solution contained 3 ml of distilled water including 1 mg strychnine and 1 dg of Novocaine at T11 and T12. The patient developed dyspnoea and died [30].

In 1915, Spinal analgesia in children was introduced by Rutter Williamson in Chennai. He used stovaine from Saidapet Madras [31]. Stovaine was discarded in 1933. Later a report on herniorrhaphies using spinocaine by J. C. Drummond was published [32].

Dr. G. R. Kokatnur reported Lumbar and caudal extradural analgesia using 40- 60 ml 1% novocaine in over 400 cases [33]. Dr Hari Rao of Vishakhapatnam conducted a study on caudal extradural anaesthesia on 970 patients and on lumbar epidurals in 6 patients [34].

Dr. G. S. Ambardekar introduced Total spinal for controlled hypotension in 1954. Nupercaine 1% heavy and 1:1500 hypobaric were used. Labour analgesia was popular in some centres.

### **INTRAVENOUS ANAESTHESIA**

Dr. M. M. Desai and Dr. B. N. Sircar (Bombay) at the G. S. Medical College, Mumbai introduced thiopentone in 1940. Dr. Desai had the misfortune of being the first and perhaps the only anaesthetists to die in a dental chair following thiopentone, given by his own resident!

### **MUSCLE RELAXANT**

d-tubo curarine was introduced in 1949 and subsequently gallamine and scoline. Pancuronium in 1975 and Norcuron in 1979.

In 1940's in KEM the first mitral commissurotomy was performed in 1950 blind intubations and hypothermia for heart surgeries were in practice. Neurosurgery as a speciality started in 1941 and open heart surgery (1961) was started at B.Y.L. Nair Hospital, Mumbai, using an indigenous reusable bubble oxygenator! The first kidney transplant was performed at Vellore in the early 70's, heart transplant were attempted at Bombay in late 1960's [27].

### **CRITICAL CARE**

A two-bedded ICU was started in K.E.M. Hospital, Bombay (1962), Followed by Army Hospital, Delhi by Col. Ramarao. It was also set in AIIMS by Dr. Tandon and at Safdarjung Hospital by Dr. Bhattacharya.

### **MACHINES**

In 1929, the FLAGG's CAN was modified into The K.E.M. Bottle. In mid 80's Liquid Oxygen was introduced. The first "Boyle F" rolled out of Indian Oxygen Limited, in 1950. By 1956 it was entirely manufactured in India except the cylinders. During the 1st Indo-Pak war the Porta-Boyle and Air-Trilene apparatus was introduced for inaccessible areas.

Cardioscopes were introduced in 1960. Pulse oximeters in mid-eighties by ohmeda. Neuromuscular monitoring was first introduced in 1968 by Wellcome laboratories.

### **ACADEMICS**

The earliest anaesthesia records in the country were in 1890 in Hyderabad Medical School. Here two students maintained data for all chloroform anaesthesia, one person administered anaesthesia and the other took detailed notes. They were known as "Chloroformists" [35]. The Indian Medical Gazette in 1914 advertised a post of "One Paid Anaesthetist" for the Mayo Hospital, Calcutta and Sassoon Hospital, Poona. The first appointee on a salary of Rs. 50/- per month was Dr. Jyotindranath Mukherjee.

Lectures on anaesthesia for undergraduates were first started officially in 1906 in Calcutta University a long time before Great Britain where they started in 1918. Academics in anaesthesia was conducted in various colleges like in Bombay by Dr. S. G. Talwalkar, Calcutta by M. C. Ganguli, Lucknow by R. Pramanik, Madras by P. V. Francis and T. G. Baganath, Delhi by E. Soundaravalli. Diploma in Anaesthesia was introduced in Bombay in 1946 and D. A. of College of Physicians and Surgeons in 1948. The first degree course, M. S. in Anaesthesia was started in Muzaffarpur and Darbhanga. The first to receive F.F.A.R.C.S. in 1953 were Dr. Bhojraj, Dr. Bhattacharya and Dr. Pramanik [27].

The Indian society of Anaesthesia was conceived On October 16th 1946, a centenary celebration of "Ether – Anaesthesia" was held at the G. S. Medical College in Bombay; it was attended by Dr. S. K. Bakshi (Delhi), Dr. B. N. Sircar, Dr. G. S. Talwalkar, Dr. M. N. Desai (Bombay); Mukteshwar Prasad (Patna) and F. Saher. Dr. B. B. Sircar of Seth G. S. Medical College, Bombay took over and the society was established in 1947. The first meeting of the ISA was held at the Seth G. S. Medical College On 23rd and 24th December, 1949, during the Annual Surgeons Conference. In 1964 the silver jubilee year of the Association of Surgeons of India, the first independent conference of ISA was held in Hyderabad under the Chairmanship of Prof. Venkatrao and Presidentship of DR. R. P. Parulkar of Baroda. Two illustrious anaesthetists, Prof. Macintosh and Prof. Cecil Gray were present on the occasion. In 1956 ISA joined the World Federation of the Societies of Anaesthesiologists (WFSA) as a founder member [27].

Although anaesthesiology is known from the BC era, it is phenomenally jumped from a science subject in the last 160 odd years from a "No Sense" stage during surgery to a more sophisticated and technologically driven medical speciality.

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