



History of Surgery

The first surgical procedures were performed in the Neolithic Age (about 10,000 to 6000 BC). Trepanning, a procedure in which a hole is drilled in the skull to relieve pressure on the brain, may have been performed as early as 8000 BC. In Egypt, carvings dating to 2500 BC describe surgical circumcision—the removal of foreskin from the penis and the clitoris from female genitalia. Operations such as castration (the removal of a male's testicles); lithotomy (the removal of stones from the bladder); and amputation (the surgical removal of a limb or other body part) are also believed to have been performed by the Egyptians. Ancient Egyptian medical texts have been found that provide instructions for many surgical procedures including repairing a broken bone and mending a serious wound. In ancient India, the Hindus surgically treated bone fractures and removed bladder stones, tumors, and infected tonsils. They are also credited with having developed plastic surgery as early as 2000 BC in response to the punishment of cutting off a person's nose or ears for certain criminal offenses. Using skin flaps from the forehead, Hindu surgeons shaped new noses and ears for the punished criminals. In the 4th century BC, the Greek physician Hippocrates published descriptions of various surgical procedures, such as the treatment of fractures and skull injuries, with directions for the proper placement of the surgeon's hands during these operations.

During most of the Middle Ages (5th century to 14th century AD), the practice of surgery declined. It was viewed as inferior to medicine, and its practice was left to barbers who traveled from town to town cutting hair, removing tumors, pulling teeth, stitching wounds, and bloodletting, the practice of draining blood from the body, then thought to cure illness. The red-and-white striped pole that today identifies barbershops derived its design from this practice. The red stripes symbolize blood and the white stripes signify bandages.

In 1316 the French surgeon Guy de Chauliac published *Chirurgia magna* (Great Surgery). This massive text describes how to remove growths, repair hernias (protrusion of an organ through surrounding structures), and treat fractures using slings and weights. The text helped surgery gain respect as a serious science. At this time a new order of surgeons arose in France. They were called surgeons of the long robe, distinguished from the barber surgeons who were known as surgeons of the short robe. The barber surgeons had little medical training, while the surgeons of the long robe were studied physicians and considered such practices as bloodletting primitive. Corporations, or guilds, of surgeons of the long robe were formed in several countries.

During the 16th, 17th, and 18th centuries, many discoveries in surgical practice took place. Much credit belongs to the French surgeon Ambroise Paré, often called the father of modern surgery. Paré successfully employed the method of ligating, or tying off, arteries to control bleeding, thus eliminating the old method of cauterizing, or searing, the bleeding part with a red-hot iron or boiling oil. Discoveries about functions of the human body also helped make surgery a more accurate science during this period. For example, the English physician and anatomist William Harvey discovered the process of blood circulation and Italian anatomist Marcello Malpighi identified the existence of tiny blood vessels called capillaries that carry blood from the major blood vessels to the cells of the body. John Hunter, a British anatomist and

surgeon, stressed the close relationship between medicine and surgery and performed many experimental operations that advanced the practice of surgery. Most surgery, however, continued to be restricted to less critical areas of the body or to operations that did not penetrate the skin too deeply. Surgeons rarely opened the abdomen, chest, or skull because of the pain it caused the patient and the risk of infection. This changed in 1846 when anesthesia was used as a way to mask pain during surgery by American dentist William Morton. Although Morton is often credited with the discovery of surgical anesthesia, American surgeon Crawford W. Long used anesthesia in 1842 during the removal of tumors but did not publish his results until 1849.

Post-surgical infections remained a serious complication of surgery until the mid-19th century when the French chemist Louis Pasteur discovered that fermentation or putrefaction, the decay and death of body tissue, is caused by bacteria in the air. In 1865 the British surgeon Joseph Lister applied Pasteur's work to surgery, developing antiseptic (germ-killing) techniques including the use of a carbolic acid spray to kill germs in the operating room before surgery. These antiseptic procedures helped eliminate postoperative infection. Other physicians, including Austrian Ignaz Semmelweiss and American Oliver Wendell Holmes, determined that bacteria are also carried on the hands and clothing and transferred from patient to patient as a physician attends one after another. These physicians pioneered techniques such as washing hands and changing into clean clothing before surgery that prevent wounds from being contaminated during surgery.

In the late 1800s, having solved the problems of pain and infection, surgeons began performing new types of surgery including procedures on the abdomen, brain, and spinal cord. At the turn of the 20th century, improved diagnostic abilities and methods of treatment helped surgery become even more effective. When the German physicist Wilhelm Conrad Roentgen invented X rays in 1895 to "photograph" the inside of the body he changed the way surgery was performed. The discovery of the blood groups A, B, and O by Austrian pathologist Karl Landsteiner enabled surgeons to give patients transfusions of their own blood type to ensure survival during surgery. The need for a readily available supply of blood for transfusions led to the creation of blood banks in 1937.

Other technological advances permitted surgeons to perform increasingly complex and difficult operations. The introduction of antibiotics in the 1940s further minimized the risk of postoperative infection. The development of the heart-lung machine in 1953 by American surgeon John H. Gibbon allowed surgeons to more easily and successfully perform surgery on these organs. It also marked the beginning of modern clinical heart surgery. The operating microscope, developed in the 1950s, provided surgeons with a way to perform delicate operations on minute body structures like the inner ear and the eye, and more recently, enabled surgeons to reattach the tiny blood vessels from severed limbs to the body (Microsurgery). The first kidney transplants were performed in the 1950s, and the first heart transplant, in 1967, was performed by South African physician Christiaan Barnard.