

Assessment & Effectiveness of Surgeries in Human Safety

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Abstract

Several abnormalities can be repaired by undergoing a surgery. They can be both prenatal and postnatal. The advances in the field of medicine made impossible as possible. Techniques such as robotic surgery, endoscopic surgery etc. brought a revolutionary change in the field of medicine. Recently maternal-fetal, cosmetic, plastic surgeries had gained importance. According to the context surgeries play a major role in one's life time as is important in treating various disorders.

Keywords: Surgery, endoscopy, heart, Skin, biopsy, Ophthalmology, liver, cosmetic, Nervous system, transplant, lungs, kidney.

Abbreviations: EVH: Endoscopic Vessel Harvesting; MIS: Minimally Invasive Surgery; BMT: Bone Marrow Transplant; GVHD: Graft-Versus-Host Disease; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; PET: Positron Emission Tomography; MEG: Magnetoencephalography.

Introduction

Surgery in medical terms called as "operation" which involves cutting, slicing, sutures, laser etc done by surgeons. This involves cutting of a patient's tissues or closure of a previously sustained wound. Other procedures that do not necessarily fall under this rubric, such as angioplasty or endoscopy, may be considered surgery [1,2] if they involve common surgical procedure or settings such as use of a sterile environment, anesthesia, antiseptic conditions, typical surgical instruments, and suturing or stapling. Every surgery involves planning, preparation, risks, and recovery. Surgery [3] is an alternative for some people whose seizures cannot be controlled by medications [4]. It has been used for more than a century, but its use dramatically increased in the 1980s and '90s, reflecting its effectiveness as an alternative to oral medicines. So, the benefits of surgery [5,6] should be weighed carefully against its risks, however, because there is no guarantee that it will be successful in controlling seizures [7,8].

Types of Surgery

Elective surgery: Elective Surgery [9] is any operation that can be performed with advanced planning. For example, cholecystectomy, hernia repair, colonic resection, coronary artery bypass.

Emergency surgery: A surgical procedure that cannot be delayed, for which there is no alternative therapy or surgeon, and for which a delay could result in death or permanent impairment of health.

Exploratory surgery: it is a diagnostic method used by doctors when trying to find a diagnosis for an ailment. It can be performed in both humans and animals, but it is far more common in animals. It is used most commonly to diagnose or locate cancer [10] in humans, but it can be used for other ailments as well.

Amputation: Removal of part or all of a body part enclosed by skin. Amputation usually takes place during surgery [11] in a hospital operating room. It is performed to prevent the spread of gangrene as a complication of frostbite, injury, diabetes [12], arteriosclerosis (hardening of the arteries), or any other illness that impairs blood circulation. It is also performed to prevent the spread of bone cancer

and to curtail loss of blood and infection in a person who has suffered severe, irreparable damage to a limb.

Replantation: In surgery, the restoration of any part of the body to its original site. Also known as reimplantation.

Reconstructive surgery: surgery [13] which seeks to correct any physical feature which is grossly deformed or abnormal by accepted standards -- either as the result of a birth defect, congenital disorder, illness, or trauma; surgery which addresses not only a deformed appearance, but also seeks to correct or improve some deficiency or abnormality in the function of the body.

Cosmetic surgery: Surgery modifies or improves the appearance of a physical feature, irregularity, or defect.

Transplant: The artificial removal of part of an organism and its replacement in the body of the same or of a different individual. To remove a plant from one location and replant it in another place.

Minimally invasive surgery: surgery [14] done with only a small incision or no incision at all, such as through a cannula with a laparoscope or endoscope.

Laparoscopic surgery or angioplasty: Laparoscopic surgery, also known as minimally invasive surgery, is a technique that allows surgery to be performed without the long traditional incision. By using multiple small incisions, each a few centimeters long, the surgeon inserts instruments including a tiny camera. The camera allows the surgeon to visualize the surgery. Incisions are made through the skin, muscle and other tissue, making laparoscopic surgery safer as less tissue is cut.

Open surgical procedure or laparotomy: Any surgical incision into the abdominal wall, usually performed under general or regional anesthesia, often on an exploratory basis i.e., Surgical incision into the abdominal cavity through the loin or flank.

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Laser surgery: A type of surgery [15,16] that uses the cutting power of a laser beam to make bloodless cuts in tissue or remove a surface lesion such as a skin tumor. There are a number of different types of lasers that differ in emitted light wavelengths and power ranges and in their ability to clot, cut, or vaporize tissue. Among the commonly used lasers are the pulsed-dye laser, the YAG laser, the CO₂ (carbon dioxide) laser, the argon laser, the excimer laser, the KTP laser, and the diode laser.

Cardiac Surgery

Cardiovascular Surgery

It is surgery on the heart or great vessels performed by cardiac [17,18] surgeons. Frequently, cardiovascular [19,20] surgeries are done to treat complications of ischemic heart disease (for example, coronary artery bypass grafting), correct congenital heart disease, or treat valvular heart disease from various causes including endocarditis, rheumatic heart disease and atherosclerosis. It also includes heart transplantation.

Open Heart Surgery

Open heart surgery [21] is any surgery where the chest is opened and surgery is done on the heart muscle, valves, arteries, or other parts of the heart as aorta. The term “open” means that the chest is “cut” open. Some new procedures are being done with the heart still beating. A heart-lung machine is usually used during open heart surgery [22,23]. While the surgeon works on the heart, the machine helps send oxygen-rich blood to the brain and other organs. Heart surgeon will make a 2-inch to 5-inch-long surgical cut in the chest wall. Muscles in the area will be divided so your surgeon can reach the heart. During surgery the surgeon sees a three-dimensional view of the surgery on the computer. In cardiac [24-26] surgeries generally Heart rate will be slowed with medicine or a mechanical device [27].

Modern Beating-Heart Surgery

This is also called as “off-pump bypass surgery” – coronary artery bypass surgery without the fore mentioned cardiopulmonary bypass. In these operations, the heart is beating during surgery [28], but is stabilized to provide an almost still work area in which to connect the conduit vessel that bypasses the blockage. Most conduit vessels are harvested endoscopically, using a technique known as endoscopic vessel harvesting (EVH) [29].

Minimally Invasive Surgery

Minimally Invasive Surgery (MIS) is a new kind of surgery which gets more and more common nowadays. Another well-known expression is ‘endoscopic surgery’. With this method, a surgical operation is performed by the help of a small endoscopic camera, several long, thin, rigid instruments through natural body openings or small artificial incisions commonly known as keyhole surgery [30]. The advantages of MIS in comparison to open surgery are: less pain, less strain of the organism, faster recovery, small injuries (aesthetic reasons), economic gain (shorter illness time) [31].

Pediatric Cardiovascular Surgery

Heart surgery in children is done to repair heart defects a child is born with several defects [32] such as (congenital heart defects) and cardiac [33,34] diseases a child gets after birth that need surgery. The surgery is needed for the child’s well-being. Some heart defects may need surgery right after the baby is born. Phrenic nerve paralysis was

diagnosed during cardiac [35] surgical procedures in infants and children. The incidence was for both open heart and closed heart operations [36].

Risks Involved in Cardiac Surgery

The development of cardiac surgery and cardiopulmonary bypass techniques has reduced the mortality rates to relatively lower levels. For instance, repairs of congenital heart defects are currently estimated to have very mortality rates. The development of cardiac [37] surgery and cardiopulmonary bypass techniques has reduced the mortality rates of these surgeries to relatively low ranks. For instance, repairs of congenital heart defects are currently estimated to have very few mortality rates. A more subtle constellation of neurocognitive deficits attributed to cardiopulmonary bypass is known as postperfusion syndrome. The additional risk factors related to the individual undergoing surgery are age, sex, and index of obesity (weight/height), and presence of diabetes mellitus [38].

Plastic Surgery

Plastic surgery is a special type of surgery [39,40] that can involve both a person’s appearance and ability to function. Plastic surgeons strive to improve patient’s appearance and self-image through both reconstructive and cosmetic procedures. Reconstructive procedures or surgeries [41] correct defects on the face or body. These include physical birth defects like cleft lips and palates and ear deformities, traumatic injuries like those from dog bites or burns, or the aftermath of disease treatments like rebuilding a woman’s breast after surgery for breast cancer. Cosmetic also called aesthetic procedures alter a part of the body that the person is not satisfied with. Common cosmetic procedures include making the breasts larger (augmentation mammoplasty) or smaller (reduction mammoplasty), reshaping the nose (rhinoplasty), and removing pockets of fat from specific spots on the body (liposuction). Some cosmetic procedures aren’t even surgical in the way that most people think of surgery — that is, cutting and stitching. For example, the use of special lasers to remove unwanted hair and sanding skin to improve severe scarring are two such treatments [42].

General types of plastic surgery’s [43] are abdominoplasty or tummy tuck to make the abdomen more firm, blepharoplasty to reshape the upper or lower eyelid, breast augmentation, breast reduction and breast lift to enlarge, reduce and reshape the breasts, buttock augmentation is performed either to lift or to enlarge the buttocks through insertion of implants, chemical peel to improve and smooth the facial skin that is affected by acne, pock, scars or wrinkles face lift to minimize the wrinkles by removal of excess facial skin, liposuction to remove the fat from different parts of the body, typically from the abdomen, buttock and thighs, rhinoplasty to reshape the nose, otoplasty to reshape the ear, mostly to bring the ears closer to the head, chin augmentation to reshape the chin using an implant, cheek augmentation to reshape the cheekbones using an implant [44].

Risks involved in plastic surgery include Bleeding which is pretty regular phenomenon for few hours following surgery [45] and can sometimes results into complications. Blood clotting and its accumulation under the skin can result in a condition called hematoma. Scarring which is one of the most common risks in these kinds of surgery’s [46] so, one should be aware of it. It is closely related to suture reactions and wound healing capability. During the process of healing, a thickening of skin edge and formation of granular tissue can occur. Necrosis [47] is a death of tissues due to insufficient

supply of oxygen to the operated area. The risk is very rare in normal cosmetic surgeries but in plastic surgeries involving face lifts, breast reductions, tummy tucks, there is a possibility of Necrosis. It increases with sudden inflammation. Nerve Damage is very rare, extreme cases nerve damage can occur characterized by numbness and tingling sensation. Generally the nerve damage can last not more than 1 year. Weakness or paralysis of certain muscles may be experienced if a nerve related to muscle movement is impaired. It can be treated with reconstructive surgery. Adverse Reactions to Anesthesia are the risks which are caused due to use of anesthesia are very rare but nevertheless its hazards if occur are still there. The risks depend on the factors like healthiness and seriousness of surgery. Nausea is a common feature. The value of plastic surgery in carefully selected cases as an adjunct to psychotherapy is indicated. Several cases are described in which the surgery was esthetically successful but in which the emotional response was either negative or revealed greater intrapsychic conflict [48].

Transplant Surgery

Generally transplant surgery [49] includes organ transplantation is the moving of an organ from one body to another or from a donor site on the patient's own body, for the purpose of replacing the recipient's damaged or absent organ. Organs such as Thoracic and abdominal organs, Tissues, cells, fluids can be transplanted. Thoracic organs include Heart, Lung and abdominal organs include Kidney, Liver, Pancreas, Intestine, Stomach and Testis. Tissues, cells, fluids are as Hand, Cornea, Skin, Islets of Langerhans, Bone marrow/Adult stem cell etc.

Thoracic Organs Transplantation

Heart Transplantation: A heart transplant is surgery to remove a person's diseased heart and replace it with a healthy heart from a deceased donor. Generally heart transplants are done on patients who have end-stage heart failure. Heart failure is a condition in which the heart is damaged or weakened and can't pump enough blood to meet the body's needs. "End-stage" means the condition has become so severe that all treatments, other than heart transplant, have failed. Generally heart transplant is preferred in Coronary artery disease, Cardiomyopathy [50,51], Heart valve disease, multiple congenital heart defects and in several cardiovascular diseases [52].

Lung transplantation: Lung transplantation is now a generally accepted therapy for the management of a wide range of severe lung disorders, with evidence supporting quality of life and survival benefit for lung transplant recipients. The new lung or lungs are usually donated by someone under age 65 who is brain-dead but is still on life-support [53]. The donor tissue must be matched as closely as possible to your tissue type to reduce the odds that your body will reject the transplanted lung. Lungs can also be given by living donors. Two or more people are needed. Each person donates a segment (lobe) of their lung to form an entire lung for the person who is receiving it. 2006. This surgery [54,55] is done with the use of a heart-lung machine, which does the work of your heart while your heart is stopped for the surgery. For single lung transplants, the cut is made on the side of your chest where the lung will be transplanted. The operation takes 4 - 8 hours. For double lung transplants, the cut is made below the breast and reaches to both sides of the chest. Surgery takes 6 - 12 hours. Tubes are used to send blood to a heart-lung bypass machine to provide oxygen and move blood through the body during the surgery.

Abdominal Organs Transplantation

Kidney Transplant: A kidney transplant is surgery to place a

healthy kidney into a person with kidney failure. One donated kidney is needed to replace the work previously done by your kidneys. The donated kidney may be from living related donor i.e. related to the person receiving the organ transplant [56,57], such as a parent, sibling, or child, living unrelated donor such as a friend or spouse, deceased donor is a person who has recently died and who has no known chronic kidney disease. In these kinds of surgeries [58] the surgeon places the new kidney inside your lower belly. The artery and vein of the new kidney are connected to the artery and vein in your pelvis. Blood flows through the new kidney, which makes urine just like your own kidneys did when they were healthy. The tube that carries urine (ureter) is then attached to the bladder. The major disadvantage of a living donor transplant is the risk to the donor, including preoperative morbidity and mortality, plus the long-term risk of living with a single kidney. Morbidity and mortality after open nephrectomy was described several years ago [59].

Liver transplantation: Liver transplantation [60,61] is the replacement of a diseased liver with a healthy liver allograft. The most commonly used technique is orthotopic transplantation, in which the native liver is removed and replaced by the donor organ in the same anatomic location as the original liver. The liver is the second most commonly transplanted major organ, after the kidney [62]. Liver transplantation is potentially applicable to any acute or chronic condition resulting in irreversible liver dysfunction, provided that the recipient does not have other conditions that will preclude a successful transplant. Uncontrolled metastatic cancer outside liver, active drug or alcohol abuse and active septic infections are absolute contraindications. Most liver transplants [63] are performed for chronic liver diseases that lead to irreversible scarring of the liver, or cirrhosis of the liver. People who have transplants must take drugs for the rest of their lives to keep their bodies from rejecting their new liver. After liver transplantation, there are three types of graft rejection that may occur. They are as hyper acute rejection, acute rejection and chronic rejection. One of the major reasons for initial liver graft dysfunction is ischemic injury [64].

Tissue Transplantation-Bone Marrow Transplant

A bone marrow transplant [65] is a procedure to replace damaged or destroyed bone marrow with healthy bone marrow stem cells. Bone marrow is the soft, fatty tissue inside your bones. Stem cells are immature cells in the bone marrow that give rise to all of your blood cells. So, surgery [66] is done for a bone marrow transplant. Bone Marrow Transplant (BMT) is used for the treatment of leukemia; depletion of T cells from the donor BM to avoid graft-versus-host disease (GVHD) may be accompanied by persistence of host cells and post-transplant relapse [67].

Generally there are three kinds of bone marrow transplants. They are autologous bone marrow transplant, allogeneic bone marrow transplant and Umbilical cord blood transplant. In autologous bone marrow transplant the Stem cells are removed from you before you receive high-dose chemotherapy or radiation treatment. After these treatments are done, your stem cells are put back in your body. This is called a "rescue" transplant. In allogeneic bone marrow transplant the Stem cells are removed from another person, called a donor. Most times, the donor must have the same genetic makeup as the patient, so that their blood is a "match" to yours. A brother or sister is most likely to be a good match. However, sometimes parents, children, and other relatives may be good matches and finally in Umbilical cord blood transplant the Stem cells are removed from a newborn baby's umbilical cord immediately after being born and the stem cells are stored until they are needed for a transplant. Umbilical cord blood cells are so immature there is less of a concern that they will not match [68].

Risks of Transplant Surgeries

Risks from any anesthesia include Breathing problems and Reactions to the medications. Risks from surgery include Bleeding and Infection. Other risks of transplant include Blood clots, Diabetes, bone thinning, or high cholesterol levels from the medications given after a transplant, increased risk for infections due to anti-rejection (immunosuppression) medications, Damage to your kidneys, liver, or other organs from anti-rejection medications and Future risk of certain cancers.

Breast Surgery

Breast surgery is a form of surgery performed on the breast. Generally Types of breast surgery include Breast reduction surgery, Augmentation mammoplasty, Mastectomy, Lumpectomy [69,70], Breast-conserving surgery. The type of surgery in breast cancer [71,72] depends on the size of the cancer in your breast, whether it has spread to any other part of your body, the size of your breasts, and your personal wishes. Some times in breast cancer [73,74] patient may need to have the whole breast removed, only the lump removed (lumpectomy or wide local excision), or part of the breast removed.

The general surgical procedures include Primary reconstruction where the replacement of breast tissues damaged by trauma, disease and failed anatomic development takes place and revision and Reconstruction where in the outcome of a previous breast reconstruction surgery takes place and the last one is Primary augmentation where aesthetically augment the size, form, and feel of the breasts [75]. Open surgical biopsy means that a large mass or lump is removed during a surgical procedure. Surgical biopsy requires an approximately 3 to 5 centimeters incision and is normally performed in an operating room in sterile conditions. Open surgical biopsy in some cases can be performed with local anesthesia but in most cases general anesthesia may be necessary. Ten years ago, most breast biopsies were open surgical procedures. Breast implant emplacement is performed with five types of surgical incisions.

Skin Surgery

Skin protects the internal organs of the body. Skin is structured in three layers, the epidermis, Dermis and subcutaneous tissue. Skin [76,77] acts as a protector against parasites and bacteria. It produces vitamin D, shows the signs of drug, alcohol and stress abuse, leaves marks and shows symptoms of diseases like jaundice and chickenpox. Skin surgery is often required to reconstruct deformities caused by burns or injury. Skin grafts [78] are also done to hide the aging effects that tell on skin. Types of skin surgery include: Skin biopsy (punch biopsy, shave biopsy, incision biopsy and excision biopsy) ,Electrosurgery ,Excision of skin lesions ,Curettage & cautery ,Skin grafting [79,80] ,Flaps ,Mohs microscopically controlled excision, Cryotherapy. Dermabrasion is a surgery performed most commonly to improve scars due to acne, chicken pox, small pox. Skin grafting involves the transfer of skin from a healthy part of the body (the donor site) to cover the injured area. Generally most grafts from a person's own skin are successful, sometimes the graft doesn't take. In addition, all grafts [81] leave some scarring at the donor and recipient sites. Flap surgery [82, 83] is a complex procedure in which skin, along with the underlying fat, blood vessels, and sometimes the muscle, is moved from a healthy part of the body to the injured site [84]. Patients' perceptions generally differ from objective measures taken by professionals as observed by surgeons [85].

Ophthalmic Surgery

Ophthalmology deals with the anatomy, physiology and diseases of the eye. An ophthalmologist is a specialist in medical and surgical eye problems. Generally ophthalmologists perform operations on eyes [86,87]. So, they are considered to be both surgical and medical specialists. In general ophthalmic surgery includes the following sub-specialities. Anterior segment surgery, cataract surgery, Cornea, ocular surface, and external disease, Glaucoma, Medical retina, Neuro-ophthalmology, Ocular oncology, Oculoplastics & Orbit surgery, Ophthalmic pathology, Pediatric ophthalmology/Strabismus, Refractive surgery, Uveitis/Immunology, veterinary ophthalmology, Vitreo-retinal surgery, Medical retina and vitreo-retinal surgery. Silicone rubber is widely used as an implant material in plastic surgery and in retinal detachment procedures [88]. When cataract surgery is performed solely under inpatient conditions, the use of systemic antibiotics as well as the periocular injection of antibiotics at the end of the operation were associated (although not significantly) with a trend toward reducing the incidence of postoperative infection [89].

Neurosurgery

Neurosurgery is concerned with the prevention, diagnosis, treatment, and rehabilitation of disorders which affect any portion of the nervous system [90]. Nervous system includes brain, spine, spinal cord, peripheral nerves, and extra-cranial cerebrovascular system. Neuroradiology methods are used in modern neurosurgical diagnosis [91] and treatment, including computer assisted imaging computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), magnetoencephalography (MEG), and the stereotactic surgery [92,93]. Some neurosurgical procedures involve the use of MRI and functional MRI intraoperatively. Microsurgery is utilized in many aspects of neurological surgery [94,95]. The clipping of aneurysms is performed using a microscope. Procedures such as microdissection, laminectomy, and artificial discs rely on microsurgery. The common neurological surgeries are done for Spinal disc herniation, cervical spinal stenosis and Lumbar spinal stenosis, Hydrocephalus, Head trauma (brain hemorrhages, skull fractures, etc.) Spinal cord trauma, Traumatic injuries of peripheral nerves, Tumours of the spine, spinal cord and peripheral nerves, Intracerebral hemorrhage such as subarachnoid hemorrhage, intraparenchymal, and intraventricular hemorrhages, Some forms of drug-resistant epilepsy, Some forms of movement disorders like advanced Parkinson's disease, chorea and this involves the use of specially developed minimally invasive stereotactic techniques (functional, stereotactic neurosurgery) such as ablative surgery and deep brain stimulation surgery, Moyamoya disease etc [96].

Conclusion

Surgery a field with a fascinating history is now widespread and includes a number of different techniques to enhance appearance. We cannot even think of the proportion of patients benefited by these surgeries. Recent developments in surgeries like cosmetic surgery raise a number of ethical and policy questions related to body modification. Health professionals have an important and constructive role to play in supporting safe and healthy behaviors and in promoting realistic ideals. Plastic surgery has generated interest and excitement since the earliest days, when pioneering surgeons began to explore this new frontier. Finally, Surgery made impossible as possible.

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