

Overview of Postoperative Complication

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Abstract

Introduction: Deviations that take place from the normal course of healing post-surgery are termed postoperative complications. Complications can be associated with any minor or major surgeries regardless of the best efforts put in by the surgeon preoperatively and postoperatively. As the number of surgical procedures is increasing over the years, so are the complications and the mental and financial burden posed to the patient, their family, and the surgeon.

Aim of Work: This review aims at overviewing the most common postoperative complications and their management.

Methodology: The review is a comprehensive research of PUBMED and Google scholar from the year 2004 to 2020.

Conclusion: Postoperative complications can be treated by close monitoring of the patient post-surgery. Preoperative preparations for certain risk factors like bleeding disorders, cardiac or respiratory impairment, obesity, etc. also help in reducing the incidence of post-op complications. If the patient shows any signs of complications, he should be immediately taken into observation and aggressive treatment planning should be done at a multidisciplinary level in order to manage the complication at the earliest. Postoperative complications pose a great financial and psychosocial burden on the patient as well as the healthcare system. Early management of such complications leads to a faster healing time for the patient and decreased rate of morbidity and mortality.

Keywords: Surgical Site Infection (SSI); Enhanced Recovery After Surgery (ERAS); Hypovolemic Shock; Atelectasis; Thromboembolism

Deviations that take place from the normal course of healing post-surgery are termed postoperative complications. Complications can be associated with any minor or major surgeries regardless of the best efforts put in by the surgeon preoperatively and postoperatively. The patient can experience both general complications which arise due to the surgical procedure or a specific complication that is related to the particular surgery in question. The time frame after which the complication has occurred can also be used to classify the surgical complication. The complications associated postoperatively pose a morbidity and/or mortality risk, which is stressful not only for the patient but for the surgeon as well. As the number of surgical procedures is increasing over the years, so are the complications and the mental and financial burden posed to the patient, their family, and the surgeon. This review aims at overviewing the most common post-operative complications and their management [1].

Classification of surgical complications

Complications can be classified based on the type of surgery undergone by the patient, the amount of risk associated with the complication, and the time frame after which the complication has occurred. Apart from the generic complications (Table 1) posed by the patient after any surgery, there are other complications associated with the particular surgery that the patient has undergone. Postoperative complications can also be classified on the basis of the time frame after which they have occurred following the surgery (Table 2) [2]. In 2004, Dindo, *et al.* came up with the ClaveinDindo classification for complications which classified complications based on the severity and surgical management. Grading in this classification determines the severity of the complication, the most severe being death. Classifying the complications standardizes the treatment protocols and keeps in check the quality of patient care in hospitals and clinics across the world [3].

1. Bleeding
2. Surgical site infection
3. Post cooperative pain
4. Thrombosis and embolism
5. Cardiovascular issue
6. Respiratory issue
7. Visceral injury
8. The risk associated with anesthesia
9. Death

Table 1: General complications post-surgery [2].

Immediate	Early	Late/Delayed
Complications arising within 24 hours of the surgery	Complications arising within 30 days of the surgery	Complications arising after 30 days of the surgery.

Table 2: Classification based on time [2].

Postoperative pain

Any unpleasant sensory and emotional experience associated with actual or potential tissue damage is termed pain. Postoperative occurrence of pain is the most common complication seen in patients and about 40-80% of patients experience mild to severe pain following surgery [4]. If not treated properly, pain leads to various other complications like increased heart rate, increased blood pressure,

increase in the usage of opioid drugs, and inadequate coughing leading to respiratory compromise, which further causes collapse of the lung (atelectasis) and pneumonia. The development of chronic pain that lasts for more than three months leads to patient dissatisfaction. Managing postoperative pain becomes a difficult task as pain is very subjective and can have a multi-faceted etiology [5].

The best way to treat or avoid postoperative pain is the diagnosis of pain and anxiety and their correlation with the surgical procedure preoperatively. The administration of analgesics should be multimodal in order to target all pain pathways, including the biochemical and psychological pathways. Pain assessment should be done verbally and visually, even preoperatively, and the dosage of the analgesics should be managed accordingly. The analgesic ladder proposed by WHO should be used as a foundation for pain management, starting with simple analgesics like paracetamol and NSAIDs and moving on to more complex opioids in a dose titration manner [6].

The administrative route for analgesics is also important. As in the initial postoperative stages, oral painkillers won't be as effective as intravenous opioids. Dose titration should be followed and the adverse effects should be closely monitored, as with higher doses of opioids, the chances of respiratory suppression increase. Subcutaneous administration is also generally well tolerated in patients and is more prevalent than the intramuscular route. Regional and local anesthetics can also be given in severely painful cases after consulting the anesthetist. In severe cases, pain-controlled analgesics (PCA) can also be given at the earliest after consulting a pain specialist. Such cases should be enrolled for ERAS (enhanced recovery after surgery) as it has shown promising recovery following a multidisciplinary approach [2,7].

Postoperative bleeding

According to the time frame of occurrence, postoperative bleeding can be classified into three categories, namely:

- (a) **Immediate bleeding:** Which occurs either intraoperatively or just at the end, is seen in the recovery room, immediate bleeding mostly results due to inadequate hemostasis during the surgery, and the patient has to be taken for surgery again in most cases [8].
- (b) **Reactionary bleeding:** Which occurs within the first 24 hours post-surgery as a result of the patient returning to a normal blood pressure value or vasodilatation that takes place postoperatively [8].
- (c) **Secondary bleeding:** Which occurs 7 - 14 days post-surgery as a result of infections on the surgical site (Figure 1) [8].

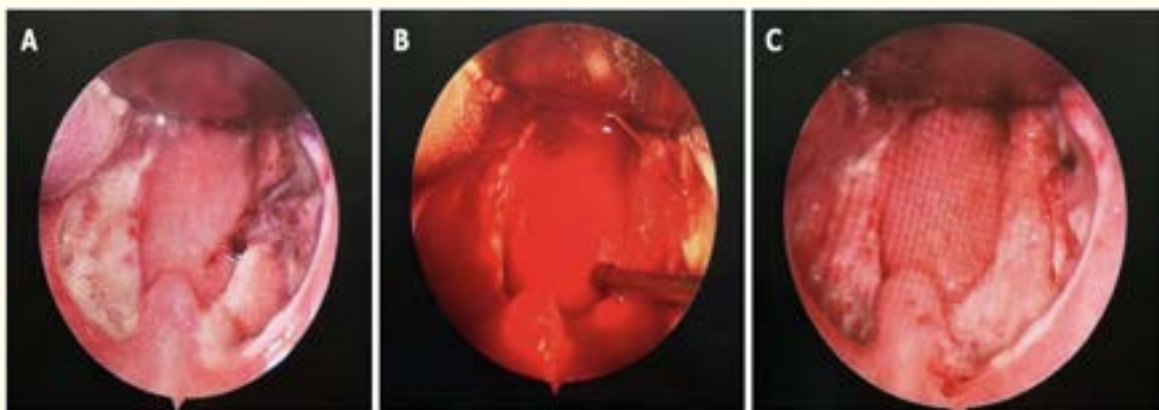


Figure 1: A: Preoperative image of tonsillectomy. B: Secondary bleeding was seen in a patient after tonsillectomy after 6 days. C: Electrocoagulation done [8].

In order to avoid bleeding complications, the blood profile of the patients should be studied closely before the surgery, and any blood disorders reported by the patient should be taken into account. INR index and coagulation time of the patient should be studied, and appropriate measures should be taken to correct any underlying disorder. Anemic patients should be administered cross-matched blood and iron in order to maintain the normal hemoglobin level. Cell salvage machines should be used during the surgery in order to minimize bleeding complications [9].

Internal bleeding becomes a more complex situation to handle post-surgery as there is no clear indication of any bleeding. The drain should be checked frequently, and if the drain is found to be full post-surgery, it is indicative of reactionary bleeding. In rare cases, when the drain is found empty, patients should be checked for increased heart rate, decreased blood pressure and acute onset of anemia, suggesting that internal bleeding is taking place in the form of clots that result in the blockage of the drain. In severe cases of bleeding, the patient might go into a state of hypovolemic shock. Cases of hypovolemic shock should be treated by the ABCDE approach as given by the Resuscitation council. When the bleeding is related to a wound, the best way to treat it is the application of pressure on the wounded area for a minimum of five minutes. Surgical site bleeding may be treated with adhesive tapes, multiple gauzes, silver nitrate cautery, etc. In severe cases of hemorrhage, the application of tranexamic acid and blood transfusion are immediately required in association with a second surgery [9].

Infections

Surgical site infections represent about 1/5th of the postoperative infections, and around 5% of the patients develop some sort of infection post-surgery. Patients in the secondary care unit have a greater tendency towards infections, and they can present in the form of urinary tract infections, pneumonia, diarrhea, etc [10]. An increased rate of surgical site infections poses a greater financial burden on healthcare [11].

By definition, Surgical site infections (SSI) are treated as any infection that occurs within 30 days of surgery in case of no implants and foreign bodies and one year in case of surgeries with implants and foreign bodies being left inside. SSI leads to increased hospitalization, more financial burden, and a five times higher chance of readmission of the patient to the hospital. ^[12] SSI presents with cardinal inflammation signs, namely rubor, tumor, calor, dolor, and loss of function. These cardinal signs can sometimes also be associated with increased discharge from the wound, splitting open of the wounded site, increase in the reading of inflammatory markers, and systemic changes like increased heart rate, high fever, etc [12] (Figure 2).



Figure 2: Surgical site infection is seen around a midline wound showing the cardinal signs of inflammation [13].

The best principle for managing surgical site infection is the practice of decreasing risk factors associated with the infection. The responsibility of decreasing the potential risk factors lies equally in the hands of all the health professionals involved with primary and secondary care, as well as the patient himself. Table 3 highlights the various risk factors and their avoidance by healthcare workers and patients [13].

Patient factors	Healthcare management factors
1. A controlled diet with improved nutritional status	1. Making the procedure as aseptic and sterile as possible
2. Weight loss	2. Decreasing the surgical time
3. Patient should stop smoking	3. Prophylactically starting antibiotics before the procedure
4. Improvement of any underlying immunocompromised conditions	4. Reviewing the wound regularly
5. Controlled blood sugar levels	5. Early removal of sutures and drains
6. Bacterial decolonization	6. Maintaining a normal temperature during the surgical procedure

Table 3: Risk factor reductions in order to avoid surgical site infections [2].

According to the WHO guidelines, prophylactic use of antibiotics before surgery is a must and has proven to reduce the risk of infections by 50%. Guidelines of the national institute of health and care excellence suggest using negative pressure dressings on closed wounds [2]. Increased usage of antiseptics helps to decrease the occurrence of SSI, especially in cases resistant to antibiotics. A clinical trial showed a significant decrease in the rate of SSI after using chlorhexidine gluconate in alcohol during preoperative skin preparation [14].

Management of SSI depends on the microbiological culture of the pus swab and blood cultures, patients are started on broad-spectrum antibiotics at the earliest, and once the culture reports are out, they are shifted to narrow-spectrum antibiotics in order to avoid antibiotic resistance. Superficial wounds are drained at the earliest, and deeper wounds are treated surgically. Chronically infected wounds are treated using silver or iodine dressings which reduce the bacterial load. Respiratory infections arising postoperatively should be treated by early mobilization of the patient, deep breaths, and chest physiotherapy [14].

SSI poses a grave financial burden on the healthcare system and is one of the most prevalent postoperative complications. Wound and cavity lavage, antiseptic preparation of the hand and skin preoperatively, and new antiseptics like polyhexamethylene biguanide with increased efficiency help to decrease the occurrence of surgical site infection [10,15].

Cardiac complications

Atrial fibrillations and sinus tachycardia are the most commonly occurring cardiac complications. Infection and sepsis at the surgical site can present with atrial fibrillations. Cases with hemorrhage cause extreme fluid depletion leading to hypovolemic shock that can cause sinus tachycardia. Preoperative assessment of cardiac functions and close monitoring of the cardiac signs postoperatively help in reducing cardiac complications [16].

Respiratory compromise

During the administration of anesthesia, there are chances that the patient may have an increased retention of carbon dioxide and decreased oxygen in the blood. Atelectasis and pneumonia are the most commonly occurring respiratory complications seen. Atelectasis refers to the collapse of lung tissue (Figure 3) due to lung collapse, there is a chance of nidus formation, which gives way to further pulmonary issues. Respiratory infections arising postoperatively should be treated by early mobilization of the patient, deep breaths, and chest physiotherapy [17].

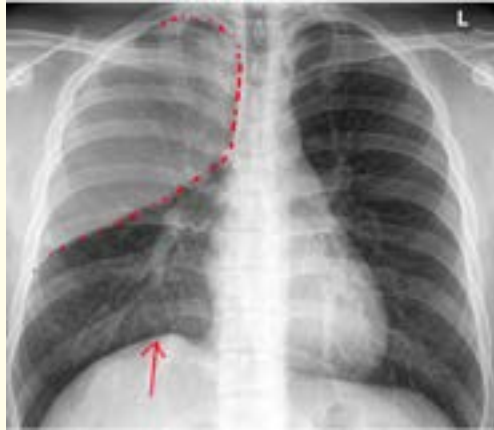


Figure 3: Atelectasis seen post-surgery [17].

Venous thromboembolism

The United Kingdom reported 25000 deaths due to venous thromboembolism and deep vein thrombosis. Venous thromboembolism acquired in the hospital accounts for more than half the cases of VTE. Surgeries, mainly orthopedic surgeries, pose a major risk factor for thrombosis. Thromboprophylaxis is the primary treatment protocol used to treat patients with VTE and PE. Preoperative elimination of risk factors like smoking decreased mobility, history of thrombosis, malignancy, and obesity further reduces the chances of thromboembolic events and increases surgical time. Pneumatic compression devices and anti-embolism stockings are the most important mechanical methods used prophylactically to avoid VTE. Heparin infusion or subcutaneous administration has also proven very successful as a pharmacological prophylactic treatment. Thrombectomy and embolectomy can be performed in adjunction to inferior vena cava filters to avoid the propagation of deep vein thrombosis in the pulmonary arteries [18].

Postoperative complications related to particular surgeries

Anastomotic leak, ileus, and intra-abdominal collection are the most common complications related to colorectal surgeries. Postoperatively bariatric surgery patients may show band slippage and anastomotic leak. Urinary retention and sexual dysfunction blood in the urine is seen after urological surgeries. Sometimes after ENT surgeries, patients may end up losing the sense of taste and smell, and reversible or irreversible facial nerve and vocal cord injury can occur during the surgery. Neuropathy, seizures, and intracerebral hemorrhage are most commonly seen after neurological surgeries [18].

Conclusion

Postoperative complications can be treated by close monitoring of the patient post-surgery. Preoperative preparations for certain risk factors like bleeding disorders, cardiac or respiratory impairment, obesity, etc., also help in reducing the incidence of post-op complications. If the patient shows any signs of complications, he should be immediately taken into observation, and aggressive treatment planning should be done at a multidisciplinary level in order to manage the complication at the earliest. Postoperative complications pose a great financial and psychosocial burden on the patient as well as the healthcare system. Early management of such complications leads to a faster healing time for the patient and decreased rate of morbidity and mortality.

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