

## Surgical Infections-Antibiotic Prophylaxis Past and Present Status

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Wounds and infections have been important in human life since the beginning of time. Various treatments have been attempted throughout the ages. The concept of antiseptics dates back to ancient Egyptians who used honey as a dressing on wounds. The evidence of its use has been found in Egyptian tombs. Now we know that honey is hypertonic and also contains an antibacterial inhibin secreted by the pharyngeal glands of bees.

Hippocrates described the suturing of wounds and the use of wine dressings on the island of Kos in 460 BC, a method which persisted for centuries thereafter. Resins, Turpentine pitch & oil were also used by him in treating compound fractures. The useful effect of turpentine was recommended later by John Hunter. Purification of resins led to the development of creosote in 1832 and later Carbolic Acid in 1834.(1)

Carbolic acid was popularized by Joseph Lister regarded as the father of antiseptics. The use of Carbolic acid by Lister on a young boy with compound fracture was the first time the germ theory of sepsis was put to test. His historical publication "On the antiseptic principles in the practice of surgery" in 1867 revolutionized the whole concept of surgical infection.

During the same time Semmelweis in Vienna introduced hypochlorite solution to decrease the incidence of septicaemia following parturition. He insisted that every one should wash their hands in hypochlorite solution on entering the maternity wards, which led to his eventual dismissal upon asking the Hospital Administrator to perform this ablution. Maternal mortality, however, was reduced from 11.4% in 1846 to 1.3% in 1848 (1) Hypochlorite solution was extensively used during World War I, and is still in use being the active ingredient of the famous Edinburgh University solution "EUSOL"

Theodore Kocher emphasized the primary importance of contact contamination in the development of infections and this led to the general use of rubber gloves in surgical operation introduced by Halstead in 1890. By 1899 Kocher was able to report a 2.3% infection rate in clean wounds.

Although the incidence of wound infection has decreased considerably since earlier times, wound infections continue to be a problem despite the use of theatre techniques and antibiotic prophylaxis. Infection is still responsible for more post-operative deaths than any other single cause (2).

The use of systemic prophylactic antibiotic continued to be a controversial subject among surgeons mostly because of a lack of understanding of the basic principles involved.

Prophylaxis in surgery means prevention of post op: infections to differentiate it from therapy meaning treatment of established infection. Post op: infections may be 'primary' when the contamination takes place in the operating room or 'secondary' when ward contamination causes infection in a wet wound postoperatively. Bacterial contamination may be exogenous (from hands, skin, instruments, air, etc) or endogenous (from viscera containing germs) Endogenous bacterial contamination is far more common than the exogenous source.

Based on the Microbiological investigations during operation surgical wounds are classified into four categories (Pollock 1979)

- | Category |   |
|----------|---|
| I.       | Clean -- both the visceral and perietal swabs are sterile.                              |
| II.      | Clean contaminated when. Only visceral swab is contaminated, perietal swab are sterile. |
| III.     | Lightly contaminated a single species grown from the perietal swab.                     |
| IV.      | Dirty or Heavily contaminated -- two or more species grown from the perietal swab.      |

The incidence of post-op: wound infection correlates well with these categories. Wound infection is determined by the number and virulence of the contaminating bacteria

on one hand and the adequacy of the host defences on the other. A surgeon's endeavour is therefore, directed toward three goals; Minimize contamination, support host defences and if contamination is inevitable reduce the bacterial burden in the wound by the use of prophylactic antibiotics. The aim of administering antibiotic prophylaxis to at risk patients is to achieve effective antibiotic levels in the blood at the time of minimum bacterial contamination.

Of the four categories of surgical wound mentioned, Category I, (In special cases) & Category II, and III would require antibiotic prophylaxis whereas the last group category IV will require therapy (treatment). (3).

As a result of several clinical trials one can safely conclude that a cephalosporin, (2nd or 3rd generation) is appropriate for the upper abdominal operation whereas a combination of an aminoglycoside (against aerobes) and metronidazole or clindamycin (against anaerobes) would be suitable for colorectal surgery (3-6). An infection rate as low as 2.8% following abdominal surgery has been reported (Krukowski 1964) This is attributed to antibiotic prophylaxis & tetracycline peritoneal lavage.

A survey of various types of surgery in gall bladder disease reveals an infection rate of 10% for elective cholecystectomies and about 30% for choledochotomies (5). The same authors reviewing 10 studies with a total of 1591 patients found that infection rate dropped from 15.4% to 4.6% on the average with the use of prophylactic antibiotics. In their own study, the post op: wound infection rate in the prophylaxis group (single dose ceftriaxone) was 0% compared to 11% in the control group.

In an other extensive review of 131 prophylactic antibiotics trials in the literature, Chodak demonstrates that antibiotic administered at the time of induction of anaesthesia was associated with significant reduction in wound sepsis (Chodak 1977).

As regards the number of doses used, opinions vary, from three perioperative doses (Polk & Lopez Mayor 1979) to a single (Preoperative) dose regimen of appropriate antibiotic (6-7). There is however no justification for continuing prophylactic antibiotics beyond the day of operation. The single dose antibiotic prophylaxis significantly reduces infective complications following trans urethral prostatectomy and is currently practised by 80% of the British Urologists (7).

The current practice at most places and at this hospital (SZH) is to tape the antibiotic or antibiotics on to the chart which goes with the patient to the operating rooms. The antibiotic is administered I/V at the time of induction of anaesthesia so that the incision is made within 20-30 minutes after the first I.V. dose. This may be followed by

one or two doses (In the 3 dose Regiman at S.Z.H). 6 & 12 hours postoperatively. In certain circumstances the use of prophylactic local antibiotic eg. tetra cyclin, lavage or topical Ampicillin or cephradine has been beneficial in patients at a higher risk of developing post-op: infections eg. Perfrated gangrous appendix (8-9).

The host defence mechanism may be assisted by the correction of Hypovolemia, Hypoxia Malnutrition and adherence to strict surgical discipline, the importance of which cannot be over-emphasized

Needless to say the indiscriminate use of antibiotics may lead to secondary or superimposed infection with antibiotic resistant strains, and serious hypersensitivity reactions. Their use may also mask the signs and symptoms of established infection, emergence of resistant strains, with in the hospital environment, and above all the economic burden on the patient and the state.

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