

Wound Challenges in Colorectal Surgery

Techniques to reduce SSI in colorectal Surgery

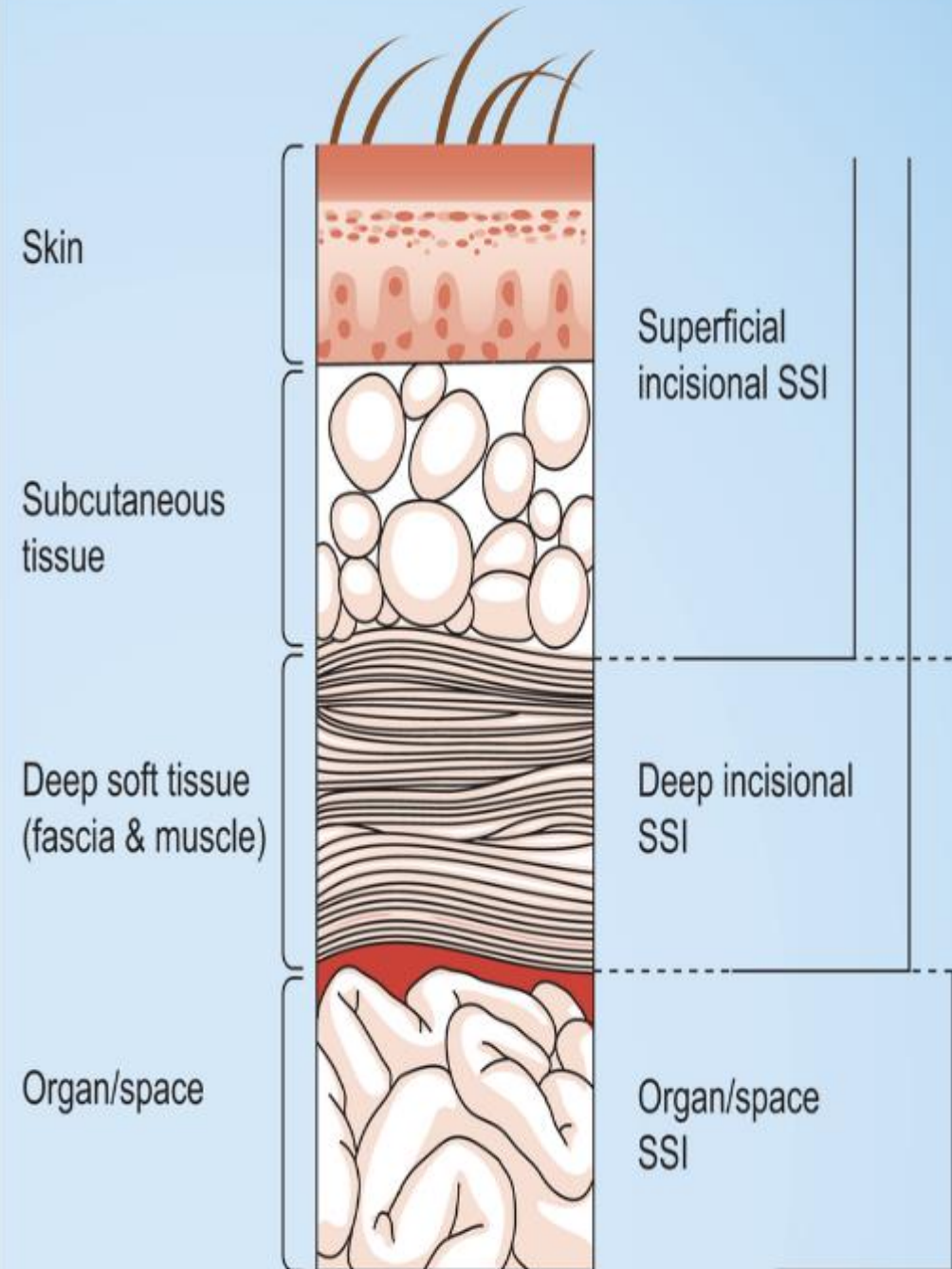
Overview

- Introduction to SSI
 - Definitions
 - Causes
- Three ways to reduce SSI in colorectal surgery
 - Prophylactic antibiotics
 - Wound protectors
 - Bowel preparation

Definitions and Causes

Definition of SSI

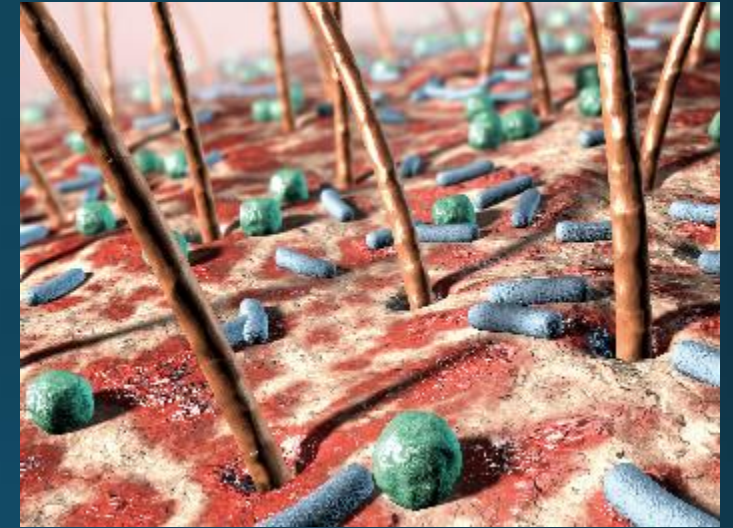
- Surgical site infection:
Defined by CDC in 1992
- SSI includes three 'diagnoses'
 - Incisional infection
 - Superficial incisional SSI
 - Deep incisional SSI
 - Space infection
 - Peritoneal cavity:
Intraperitoneal infection (with
or without AL)





Microbiology of SSI

- In comparison to most other operations, in colorectal surgery there are two sources of contamination
- SKIN
 - Staphylococcus (STA), Streptococcus (STE)
- COLON: Polymicrobial...
 1. Gram negatives
 - E coli, Klebsiella, Proteus
 - Pseudomonas
 2. Anaerobes: Bacteroides fragilis
 3. Enterococcus faecalis



Microbiology of SSI

❑ Incisional:

- If skin source: STA or STE
- If colon source: Polymicrobial
- Both: STA, Gram negatives, anaerobes



❑ Space: Polymicrobial

- Anaerobes: Abscesses
- Gram negative bacteria: Septicaemia



Risk factors for SSI - Microbiology

- All about the bacteria
 - Contamination of the wound ($>10^5$ organisms)
 - Bacterial Virulence
 - Resistance of bacteria within the hospital
 - Number of days in hospital before surgery
 - [wound classification]



Risk factors for SSI – the Patient

- All about the immune system
 - How well is the patient: ASA grade (I-V)
 - Reduced blood supply: Obesity, diabetes, smoking
 - Reduced immunity:
 - Medical conditions: Metastatic cancer, diabetes, malnutrition, renal failure, liver failure, Haematological malignancy
 - Medications: Steroids, chemotherapy, immune modulators

Risk factors for SSI – Surgical factors

- All about the surgery
 - Urgency of surgery
 - Skin preparation
 - Minimising contamination (wound classification)
 - Duration of surgery
 - Tissue handling (keeping tissue healthy, Haemostasis...)



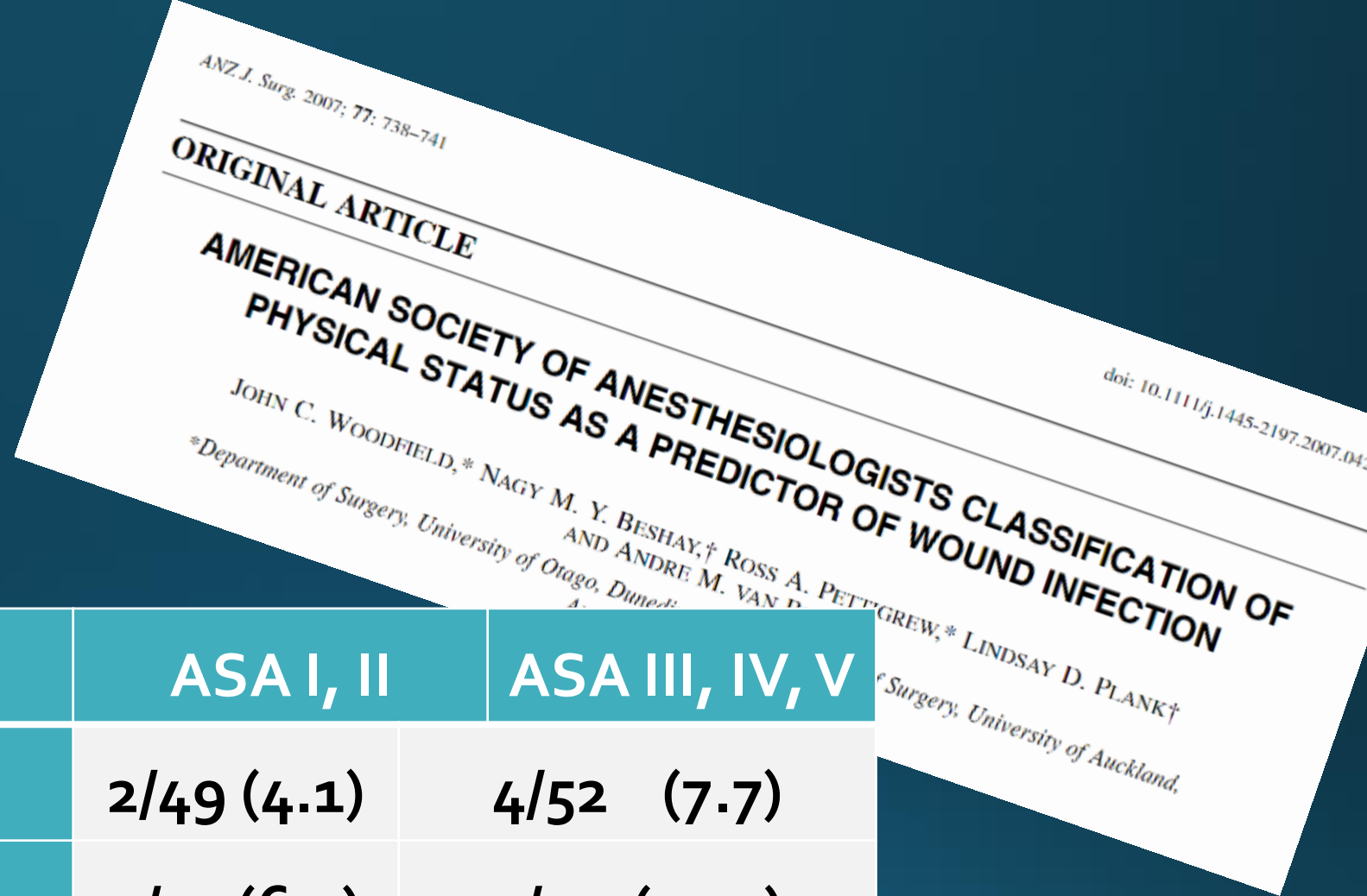
Classification of surgical wounds

Category	Criteria	Infection rate
Clean		1-5%
Clean-Contaminated	Hollow viscus entered	5-8%
	No inflammation	
Contaminated	Spillage from viscus	15-25%
	Inflammation present	
Dirty	Established infection (Pus)	40%
	Severe inflammation	

Example

- 483 patients at Dunedin Hospital
- Wound infection rate approximately 9%

Wound Classification	ASA I, II	ASA III, IV, V
Clean	2/49 (4.1)	4/52 (7.7)
Clean-contaminated	5/75 (6.7)	5/37 (13.5)
Contaminated	7/95 (7.4)	7/48 (14.6)
Dirty	2/17 (11.8)	4/9 (44.4)



SSI Risk Score

SSI Risk Score (AUC 0.80) is generated from the following information

- Smoker
- BMI
- History of PVD, metastatic cancer
- Sepsis in last 2 days
- Steroids in last 10 days
- Acute of elective surgery
- Wound type: Clean, clean/contaminated, contaminated, dirty
- ASA grade
- Operation code
- More than one procedure
- Duration of surgery

[http://www.ohri.ca/SSI_risk_index/Default.aspx]

Reducing SSI

Prophylactic antibiotics

Principles of prophylactic antibiotic use

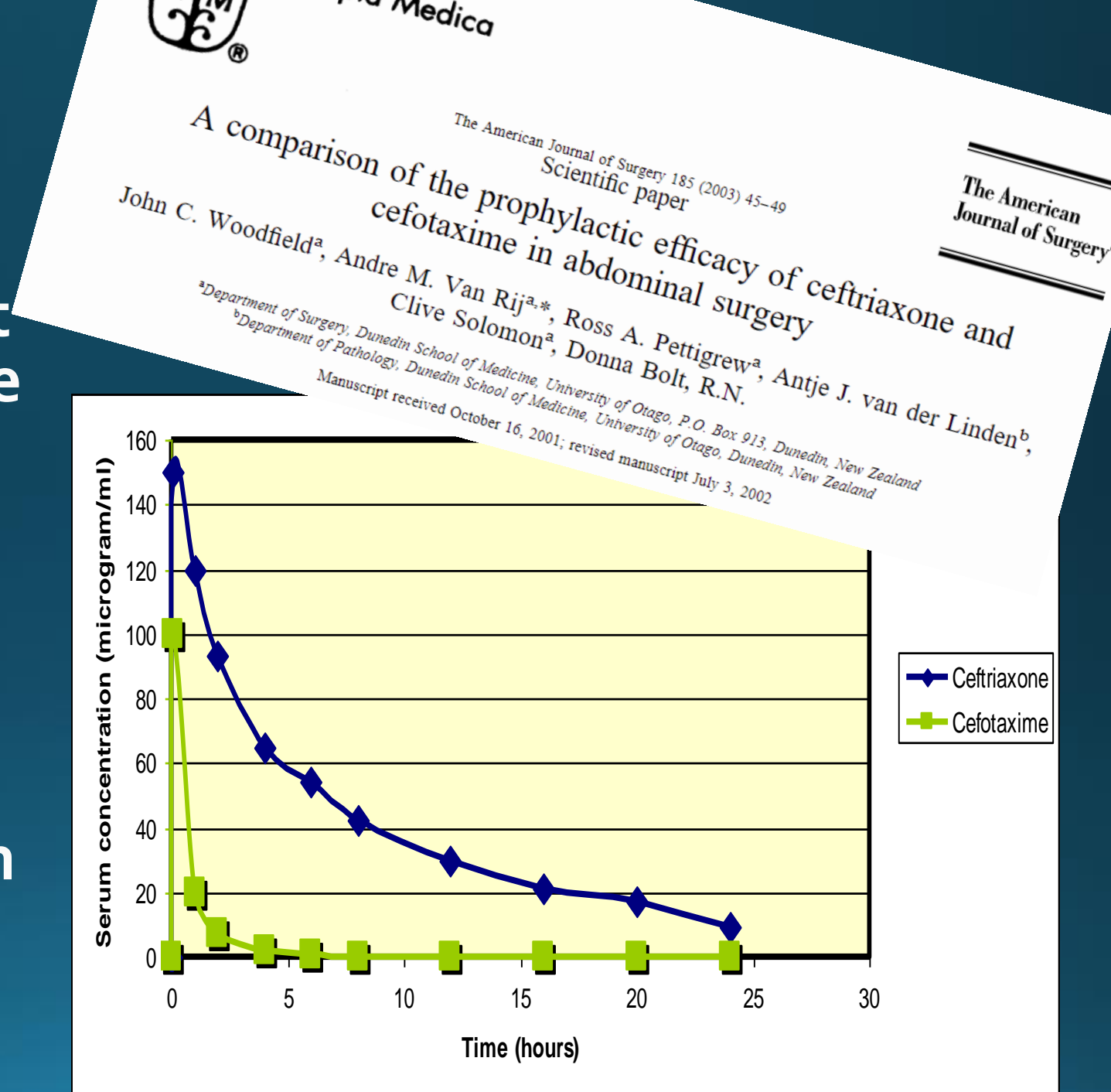
- When 'prophylactic' antibiotics were first given to prevent infection after surgery they didn't seem to work. This was because they were not given the correct way...
- Important principles
 - Timing of antibiotic administration
 - Correct antibiotic cover: MIC 90
 - Penetration (TPI): Achieving high doses of antibiotic into the wound

Antibiotic cover

- ❑ Empirical cover against expected pathogens
 - MIC₉₀ = the concentration of antibiotic that inhibits 90% of the relevant bacteria
- ❑ In colorectal surgery this means providing good cover for both gram negative and anaerobic bacteria
 - 33 RCT were performed in the 1980's to confirm this!
 - Usually this will include metronidazole to cover anaerobes and another antibiotic to cover aerobic bacteria (for example a 2nd generation cephalosporin)

Penetration

- The antibiotic needs to get into the wound to treat the contamination
- In a RCT at Dunedin comparing two antibiotics with a similar MIC 90 against bacterial pathogens, the one with the best tissue penetration had better outcomes.



Timing

- Burke & Classen
- There needs to be an effective concentration of antibiotic in the wound **when contamination** occurs and when the wound is **closed/sealed**

Time of administration	% with SSI	Odds Ratio
Early (>2hrs before incision)	3.8	1.8-10.4
Preoperative (<2 hrs before incision)	0.6	
Perioperative (<2 hours after incision)	1.4	0.6-7.4
Postoperative (>2 hours after incision)	3.3	2.4-13.8

Timing

- Usually give IV antibiotic at induction of anaesthesia
- Extra dose for long procedures (>2 to 3 hours)
- In colorectal surgery doses starting the day before surgery, or prolonged antibiotics after surgery do not prevent SSI
- Longer courses of antibiotics are only given to treat established infection

Impact of Prophylactic antibiotics

Category	SSI Without AB's	SSI With AB's
Clean	1-5%	2%
Clean-Contaminated	5-8%	4%
Contaminated	15-25%	6%
Dirty	40%	8%

- Similar methods of diagnosing infection...