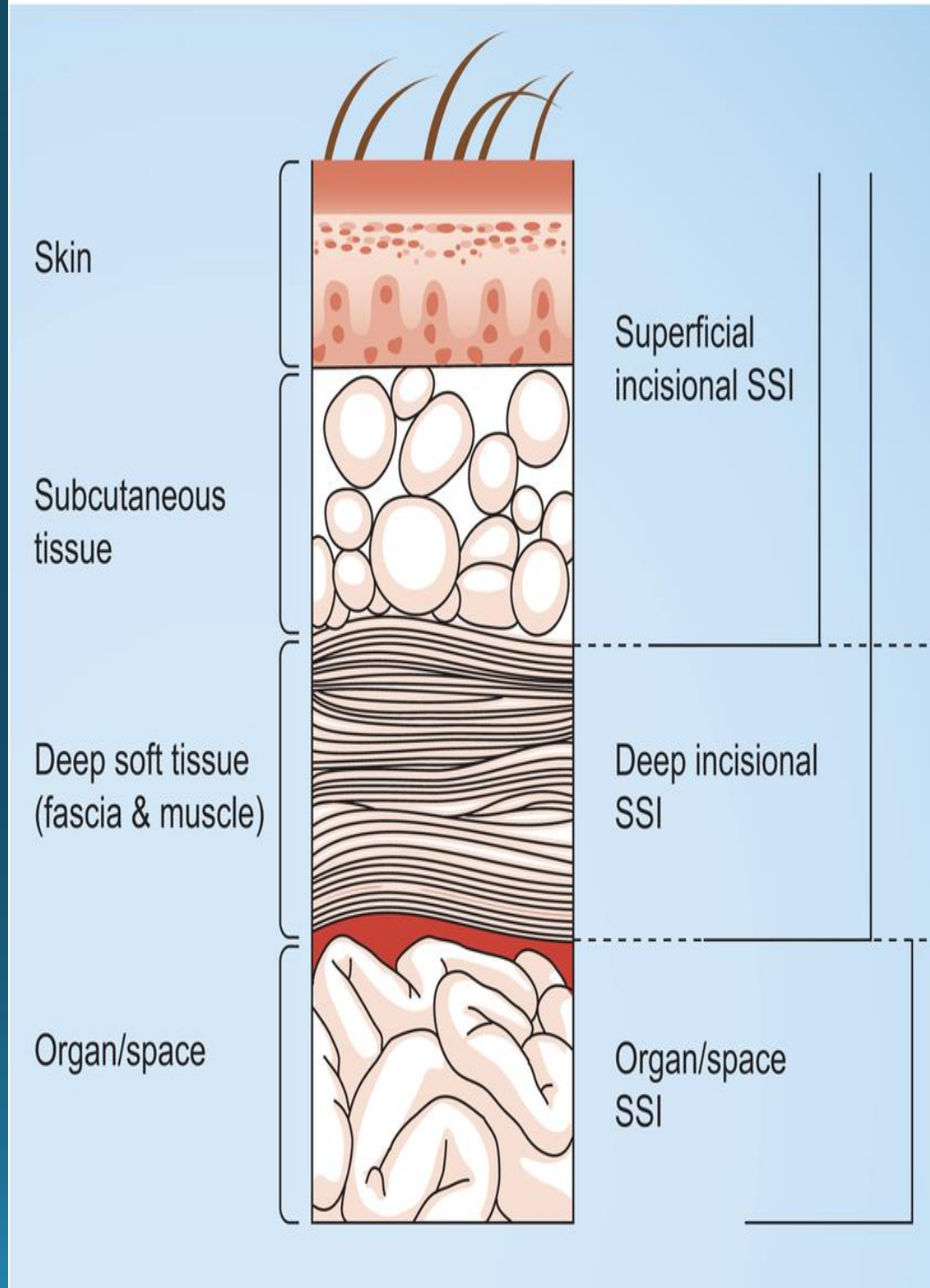
SSI in colorectal Surgery

Microbiology and definitions

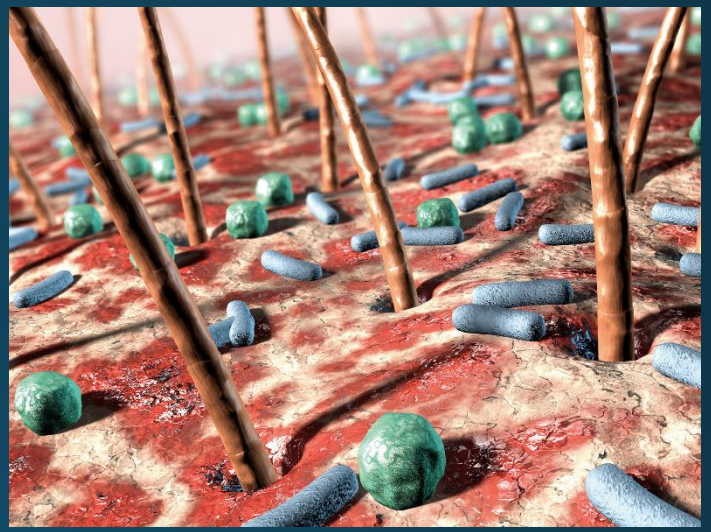
Definition of SSI

- Surgical site infection: Defined by CDC in 1992
- SSI includes three 'diagnoses'
  - Incisional infection
    - Superficial incisional SSI
    - Deep incisional SSI
  - Space infection
    - 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…
- Gram negatives
  - E coli, Klebsiella, Proteus
  - Pseudomonas
- Anaerobes
- Enterococcus faecalis



Microbiology of SSI

- Incisional:
  - If skin source: STA or STE
  - If colon source: Polymicrobial
  - Both: STA, ECO, anaerobes

- Space: polymicrobial
  - Anaerobes: Deep abscesses
  - Gram negative bacteria: Septicaemia

Risk factors for SSI

- Microbiology: Bacteria
  - Contamination of the wound (>10^5 organisms), virulence and resistance, days in hospital before surgery
- Patient factors: Host defence
  - How well is the patient: ASA grade (I-V)
  - Other risk factors: Obesity, diabetes, smoking, metastatic cancer, medical conditions and medications causing immunosuppression, malnutrition, age
- Surgical factors
  - Urgency of surgery, duration of surgery, Skin preparation, infective pathology, minimising contamination, handling of tissue (keeping tissue healthy), good haemostasis, (sutures)

Risk factors for SSI

- Likely one slide for each of the three ‘contributors’ to infection

Risk factors for SSI

- Study on ASA v Wound contamination

Table 15-3 -- Classification of Surgical Wounds

CATEGORY	CRITERIA	INFECTION RATE
Clean	No hollow viscus entered	1%-3%
	Primary wound closure	
	No inflammation	
	No breaks in aseptic technique	
	Elective procedure	
Clean-contaminated	Hollow viscus entered but controlled	5%-8%
	No inflammation	
	Primary wound closure	
	Minor break in aseptic technique	
	Mechanical drain used	
	Bowel preparation preoperatively	
Contaminated	Uncontrolled spillage from viscus	20%-25%
	Inflammation apparent	
	Open, traumatic wound	
	Major break in aseptic technique	
Dirty	Untreated, uncontrolled spillage from viscus	30%-40%
	Pus in operative wound	
	Open suppurative wound	
	Severe inflammation	

Classification of surgical wounds

- Likely a couple of slides + pictures

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

- Antibiotic cover: MIC 90
- Penetration: Achieving high doses of antibiotic into the wound
- Timing of antibiotic administration

Antibiotic cover

- Empirical cover against expected pathogens
- MIC90 = the concentration of antibiotic that inhibits 90% of the relevant bacteria
- In colorectal surgery good this includes providing good cover for aerobic and anaerobic bacteria
  - 33 RCT performed in 1980's which proved this 'time and time again'
  - Usually this will include metronidazole to cover anaerobes and another antibiotic to cover aerobic bacteria (1^{s} or 2nd generation cephalosporin often used)

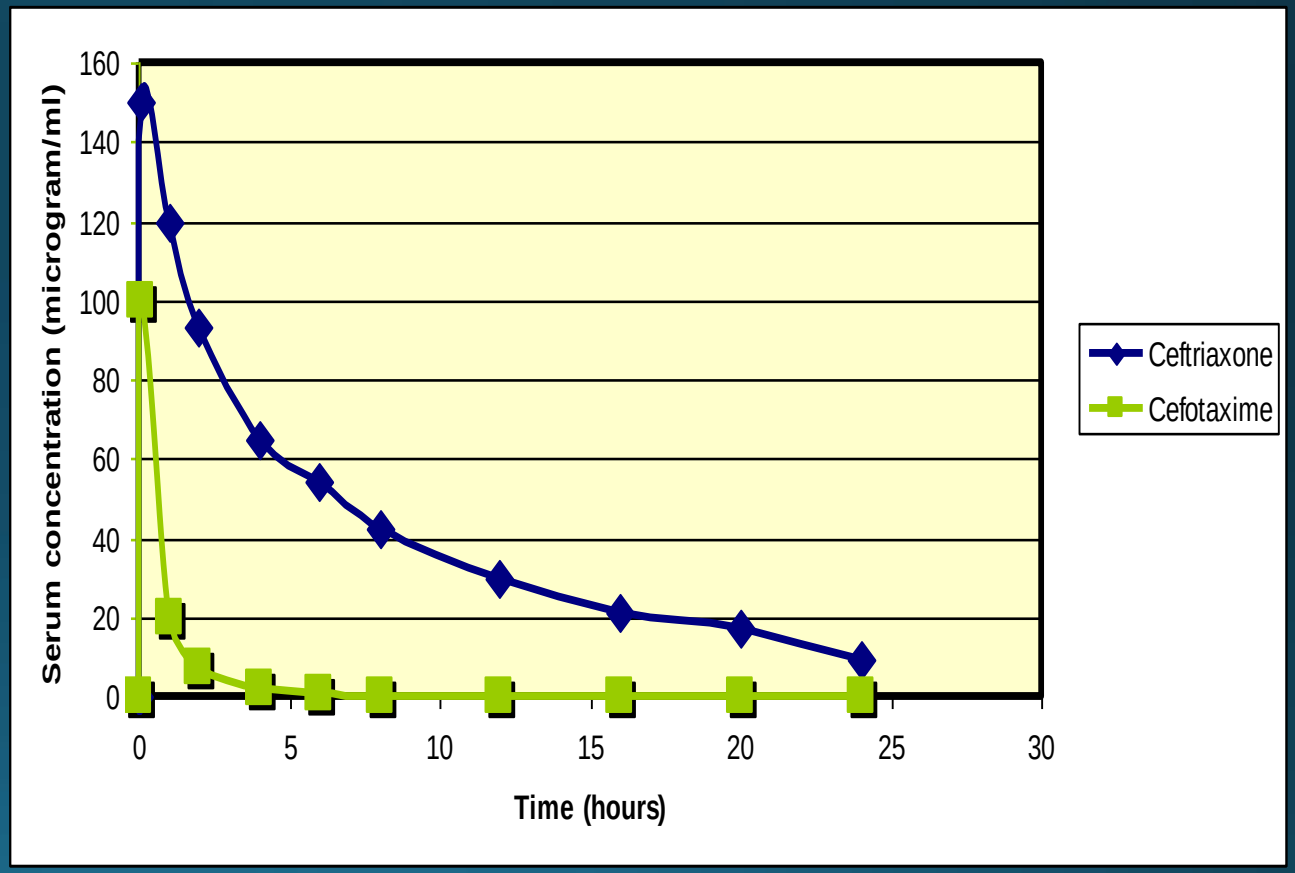
Penetration

- The antibiotic needs to be in the wound to treat the contamination
- RCT ceftriaxone + Met and cefotaxime + Met

➢ MIC 90 very similar

➢ Penetration different

➢ Different 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)
- Doses starting the day before surgery, or prolonged antibiotics after surgery do not prevent infection
- Longer courses of antibiotics are usually in the setting of preoperative infection (such as complicated diverticulitis)

Outcomes

- Table for wound contamination and ISSI with and without antibiotics

Reducing SSI
Wound protectors

Wound protection

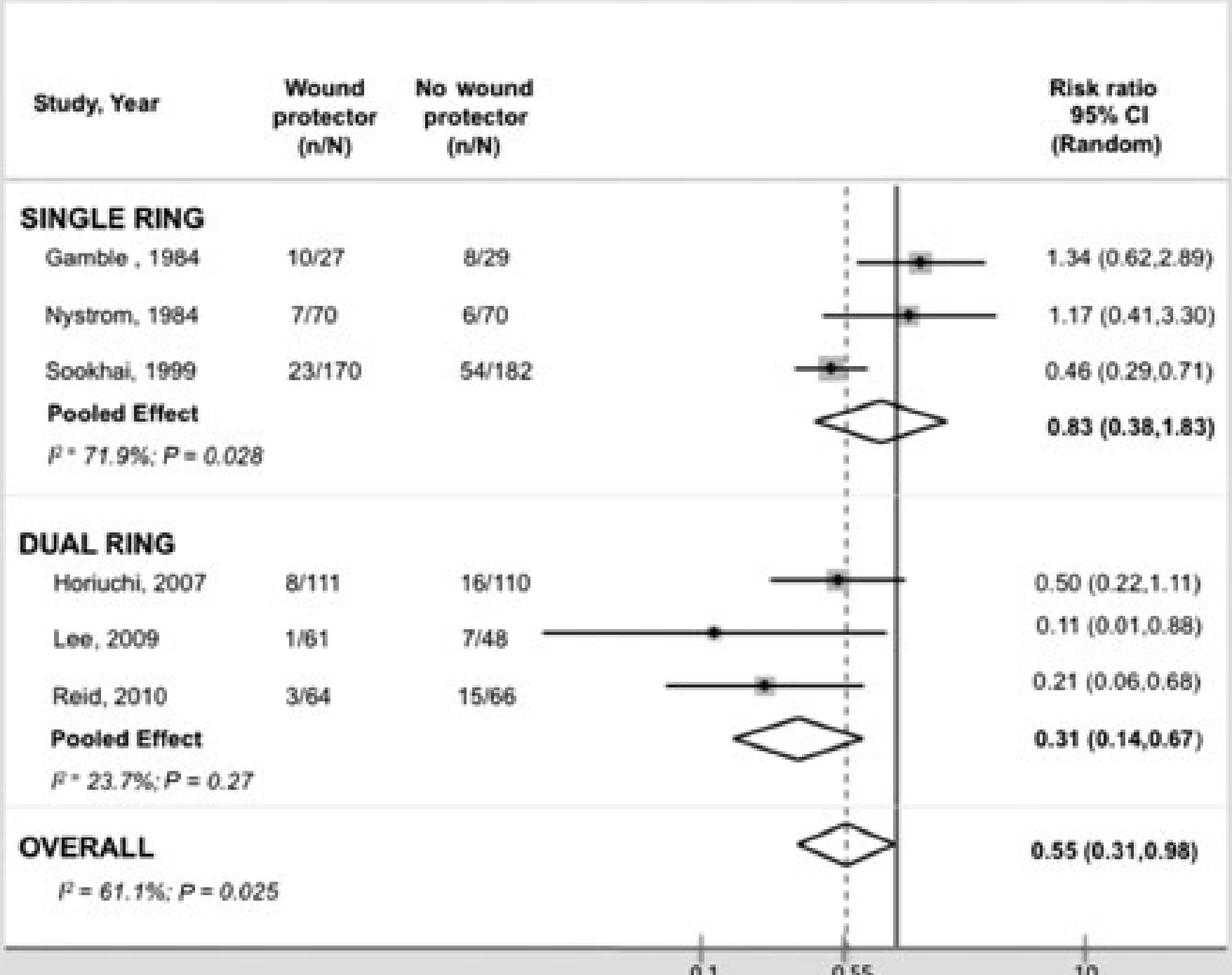
- Protect wound edges from contamination
- Protect wound edges from trauma
- Maintain wound physiology: Keep the wound edges moist/warm

Wound protection: Conflicting data

- Initial design: Single ring
- Initial 'consecutive' studies and unblinded RCT's promising
- High quality RCTs: no difference
- ROSSINI study 2013
  - Blinded RCT in 21 UK hospitals, 760 patients having a laparotomy
  - 24.7% SSI infection with wound protector
  - 25.4% SSI in the control group

Single v Double rings

- Meta-analysis of RCT assessing role of wound protectors to reduce SSI after GI and biliary surgery
- Ann Surg 2012
- Medline, Embase, Cochrance
- 347 studies identified
- 6 RCT's included
- 1008 patients, Risk of SSI 0.55 (0.31-0.98), p=0.04


Study, Year
Wound protector (n/N)
No wound protector (n/N)
Risk ratio 95% CI (Random)
SINGLE RING
Gamble , 1984 10/27 8/29 1.34 (0.62,2.89)
Nystrom, 1984 7/70 6/70 1.17 (0.41,3.30)
Sookhai, 1999 23/170 54/182 0.46 (0.29,0.71)
Pooled Effect 0.83 (0.38,1.83)
I² = 71.9%; P = 0.028
DUAL RING
Horiuchi, 2007 8/111 16/110 0.50 (0.22,1.11)
Lee, 2009 1/61 7/48 0.11 (0.01,0.88)
Reid, 2010 3/64 15/66 0.21 (0.06,0.68)
Pooled Effect 0.31 (0.14,0.67)
I² = 23.7%; P = 0.27
OVERALL 0.55 (0.31,0.98)
I² = 61.1%; P = 0.025
0.1
0.55
10

Double Ring RCT: Colorectal

- RCT in elective open colorectal surgery, Australia
- Randomised to dual ring protector v standard care
- Blinded assessment of ISSI
- 130 patients
- Reduction in ISSI from 22.7%(15/66) to 4.7% (3/64), p=0.004
- 78% of SSI dx after discharge from hospital
- 7 of 8 surgeons found the dual ring to be useful for retraction