Reducing Infections in Surgical Practice

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Introduction: How bacteria get in

The Host
Skin PREP

The Surgeon
Prophylactic Antibiotics

The Procedure
Local Antibiotics

The STAFF
Post op care
The HOST

Diabetes (HgbA1c)
smoking
obesity
protein stores
Immune compromise (Rheumatoid meds etc)
renal failure, Liver failure etc

MRSA colonization- screening effective??
Decolonization help??
Mupirocin ?? Chorhexidine??

Hygiene
CONTAMINATION and WOUND HEALING
The Surgeon

Experience
Surgical technique
Hygiene
Dermatitis (eczema, dandruff)
Double glove
Change Gloves after drape?
Hand Prep- Chlorhexidine residual?
MRSA Colonization????
Decolonization???
The Procedure

Size of incision
Duration of procedure
Blood loss
Tissue disruption
Implants
Microscope

Staff scrubbing in and out for breaks, set ups
The Staff

Number of OR STAFF (talking, in and out of room)

Experience and sterile technique

scrub - chlorhexidine residual?

double glove

Hair nets??? Vs hoods??

MRSA colonization?? Decolonization of staff??
Skin PREP

Chlorhexidine vs Iodine
Duraprep
Alcohol
Ioban

combination prep with adherent drape
Antibiotic Prophylaxis

Are we using the right agent for the procedure?

57% of staph resistant to Cefazolin
IV VANCO no better than Cefazolin
Ceftaroline or linezolid for MRSA prophylaxis??

Redosing for longer procedures?

Combination IV Antibiotics?
  Cefazolin + Gent = 80-85% coverage
  Cefazolin + Vancomycin IV ????
Antibiotic Prophylaxis

Role of Local Antimicrobials (not FDA APROVED)

Vancomycin Powder - empiric, dose uncertain

Gentamicin Powder – dose by weight

Dilute Betadine Lavage ????
Post op CARE

Reduce wound contamination

non occlusive dressings

Skin closure – staples or nylon sutures?

Wound vacs?? (negative pressure therapy)
Study Design

Institutional Biologic Resource committee approval

120 adult male Sprague-Dawley Rats (440gms)

PTFE vascular graft - subcutaneous

$10^6$ Staph. Aureus (MSSA) innoculum
Study Design

Preop Intravenous
20 rats  Vancomycin  (15mg/kg)
20 rats  Cefazolin   (15mg/kg)

Intrawound
20 rats  Vancomycin  (15mg/kg)
20 rats  Cefazolin   (15mg/kg)
20 rats  Tobramycin  ( 5mg/kg)
20 rats  0.35% betadine x 3 min
Surgical Procedure

Anesthesia
IP ketamine + diazepam
Lidocaine + Meloxicam

Skin prep
Isopropyl Alcohol + Betadine prep

Iodine adhesive drape
Surgical Procedure

1 cm² PTFE vascular graft
sub-muscular thoracic spine

200ul $10^8$ CFU Staph Aureus inoculum

Antibiotic powder or betadine wash

Wound closure with Nylon suture

Ad lib food and water x 7 days
Bacteriologic Evaluation

Animals sacrificed POD 7

Vascular graft recovered sterile technique

Cultured 5% Sheep Blood Agar Plate × 5 days

All positive cultures detected in 24 hrs
Bacteriologic Evaluation

Negative cultures

Positive cultures
## Results

<table>
<thead>
<tr>
<th>Intravenous</th>
<th>Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin</td>
<td>100%</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intrawound</th>
<th></th>
<th>*P &lt; 0.05%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Tobramycin</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Cefazolin</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>Betadine</td>
<td>100%</td>
<td></td>
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</tbody>
</table>

*Independent Sample T-tests.
Discussion

Intrawound Vanc & Tobra more effective than IV or other local agents

Results corroborate clinical and animal studies
Discussion

IV antibiotic prophylaxis depends on tissue concentrations for effect.

Local antibiotics reach much higher local concentrations than IV.

Reducing IV prophylaxis might reduce prevalence of resistant organisms???
Limitations

7 day incubation – miss chronic infection?

Results cannot extrapolate to other bacteria or other hosts (human)

Further clinical studies warranted
References


