Prevention of HAI in Burns Patients

Issues of Infection in Burns Patients

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Introduction

• Burn
  • Severe trauma
  • Fourth most common trauma type in the world, getting behind traffic accidents, crashes and interpersonal violence
  • Social, economic and public health repercussions
  • Great complexity
  • Treatment difficult (multidisciplinary)
  • High rates morbimortality
Brazil

- Brazil now has 55 hospitals for burn treatment.
- 20 located in São Paulo.
- 7 located at the county (4 state, 1 municipal, 2 private).
- 13 located outside Brasil. Ministério da Saúde – Hospitais credenciados para atendimento de queimaduras disponível em www.saude.gov.br

Carolina Oliveira de Souza: Characterization of the epidemiological profile of the burn patients in Brazil: systematic review of the literature, 2016

<table>
<thead>
<tr>
<th>Autor (ano)</th>
<th>Região do Brasil</th>
<th>Mês Incidente</th>
<th>Idade</th>
<th>Sexo</th>
<th>SCQ / Profundidade</th>
<th>Agente Etiológico</th>
<th>Área corporal</th>
<th>Intenção/Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leão et al (2011)</td>
<td>SE</td>
<td>-</td>
<td>29 anos</td>
<td>Masc</td>
<td>20,80%</td>
<td>Líquido Inflamatável</td>
<td>Tórax anterior</td>
<td>Acidental</td>
</tr>
<tr>
<td>Biscegli et al (2014)</td>
<td>SE</td>
<td>-</td>
<td>&lt; 6 anos</td>
<td>Masc</td>
<td>18%</td>
<td>Escaldadura</td>
<td>Tórax</td>
<td>Acidental/domicilio</td>
</tr>
<tr>
<td>De-Souza et al (1998)</td>
<td>SE</td>
<td>-</td>
<td>0 a 9 anos</td>
<td>Masc</td>
<td>20%</td>
<td>Chama direta</td>
<td>-</td>
<td>Acidental/domicilio</td>
</tr>
<tr>
<td>Macedo et al (2011)</td>
<td>CO</td>
<td>-</td>
<td>24 anos</td>
<td>Masc</td>
<td>14%</td>
<td>Chama direta</td>
<td>-</td>
<td>Acidental/domicilio</td>
</tr>
<tr>
<td>Silva et al (2009)</td>
<td>NE</td>
<td>-</td>
<td>&lt; 3 anos</td>
<td>Masc</td>
<td>16,63% / 2º grau</td>
<td>Escaldadura</td>
<td>-</td>
<td>Acidental/domicilio</td>
</tr>
<tr>
<td>Cruvinel et al (2005)</td>
<td>NE</td>
<td>-</td>
<td>22,66 anos</td>
<td>Masc</td>
<td>1º grau</td>
<td>Líquido Inflamatável</td>
<td>MMSS</td>
<td></td>
</tr>
<tr>
<td>Marchesan et al (1997)</td>
<td>Brasil</td>
<td>-</td>
<td>&lt; 30 anos</td>
<td>Fem</td>
<td>52,40%</td>
<td>Alcool</td>
<td>-</td>
<td>Suicídio/domicilio</td>
</tr>
<tr>
<td>Rossi et al (1998)</td>
<td>SE</td>
<td>-</td>
<td>&lt; 3 anos</td>
<td>Masc</td>
<td>&gt;40% / 2º e 3º grau</td>
<td>Escaldadura</td>
<td>Cabeça e MMSS</td>
<td>Acidental/domicilio</td>
</tr>
</tbody>
</table>
Brazil

- Mean age = 20 and 30 years for adults and below 9 years for children
- Only 1 study researched incidence according to the month (June more incidence due to parties)
- Areas most affected were thorax and upper limbs
- The most prevalent etiological agents were flammable liquids and scald, but in cases of self-extinction the direct flame was the most predominant.
- The total body surface area (TBSA) range for 14 to 20%
- Depth of the burn more prevalent were 1º and 2º degrees
- Most burns are accidental and occur at home

Classification of Burn Wounds

- **Depth**
  - 1º, 2º, 3º, 4º degrees

- **Extension**
  - Total body surface area (%)

- **Inhalatory injury**

- **Politrauma**

*Fig 1. Classification of burn wounds’ depth. Clinical examples of burn degrees. First-degree burn (a). Second-degree burn (b). Third-degree burn (c). Fourth-degree burn (d). Histologic overview (e).*
Burn Severity

Conditions that classify severe burn:

- Extension greater than 20% TBSA in adults.
- Extension greater than 10% TBSA in children.
- Age less than 3 years or greater than 65 years.
- Presence of inhalation injury.
- Politrauma and associated prior diseases.
- Chemical burn.
- Electrical trauma.
- Noble / special areas (perineum).
- Violence, ill-treatment, self extermination (suicide).

Ministério da Saúde
Cartilha para tratamento de emergência das queimaduras, 2012
Besides the loss of skin function, burn injury provokes an inflammatory response leading to a state of immunologic dysfunction.

**As a consequence, burn patients are at high risk of infection**
Infection x Mortality

- Patients with TBSA > 40%
- 75% die due to infection

- Mortality => has been decreasing
  - New technologies
  - Early surgical procedures
  - Medicines/Treatments

- Challenges?
Challenges

• Diagnosis of burn infection
  • Clinical criteria
  • Microbiological criteria
• Use of antiseptics / antimicrobials
  • Topic
  • Systemic (prophylactic)
• Contact Precautions
• Therapeutic drug monitoring of antimicrobials
• Selective digestive decontamination (SDD)
Clinical Criteria – Wound Burn

Signs and Symptoms of Burn Infection:

- Change in the color of the lesion.
- Edema of edges of the wounds or the affected body segment.
- Deepening of the lesions.
- Change of odor (foul smell).
- Early dipping of dry eschar and transformation into damp eschar.
- Bleeding under the eschar.
- Cellulitis around the lesion.
- Vascular spots inside the lesion (reddish spots).
- Increased or modified painful complaint.
Sometimes difficult!
How about Microbiological Criteria?

Rational

- Use of burn wound biopsies for histological and quantitative assessment of the burn wound originates from Teplitz et al (1964 !!!)
- Using a rat model, he found that increasing numbers of *Pseudomonas aeruginosa* on a burn wound were followed by invasion of the underlying viable tissue and clinical infection.
- A clinical method for quantitative biopsy in burns patients was first described by Loebl et al. and subsequently modified (1974 !)
- Consequently, exist a variety of quantitative methods, but no universally accepted as a ‘gold standard’.

Microbiological Criteria

1) More than one quantitative microbiology sample is required to obtain reliable estimates of bacterial load;
2) Biopsies are more sensitive than swabs in diagnosing or predicting sepsis;
3) High bacterial loads may predict worse clinical outcomes;
4) Both quantitative and semi-quantitative culture reports need to be interpreted with caution and in the context of other clinical risk factors.

- 26 studies
- 12 investigated clinical outcomes
- Great heterogeneity
  - Patients
  - Samples collection and processing
  - Methods

26 studies
12 investigated clinical outcomes
Great heterogeneity
- Patients
- Samples collection and processing
- Methods
Antiseptics Use

Rational = topic agents => prevent growth of microorganisms => prevent infection => promoting healing of burn wounds

Antiseptics for burns (Review)


DOI: 10.1002/14651858.CD011821.pub2.
www.cochranelibrary.com
Antiseptic Use

- 56 RCTs with 5807 randomised participants. Almost all trials had poorly reported methodology.
- In many cases the primary review outcomes, wound healing and infection, were not reported or were reported incompletely.
- Most trials enrolled people with recent burns, described as second-degree and less than 40% TBSA; most participants were adults.
- Antiseptic agents assessed were: silver-based, honey, Aloe Vera, iodine-based, chlorhexidine or polyhexanide (biguanides), sodium hypochlorite, merbromin, ethacridine lactate, cerium nitrate and Arnebia euchroma.
- Most studies compared antiseptic with a topical antibiotic - silver sulfadiazine (SSD); others compared antiseptic with a non-antibacterial treatment or another antiseptic.
Antiseptic Use

• Compared with the **topical antibiotic – SSD** - there is no clear difference in the hazard of healing

• There is moderate certainty evidence that, on average, burns treated with honey are probably more likely to heal over time compared with topical antibiotics (HR 2.45, 95% CI 1.71 to 3.52; I² = 66%; 5 studies; 140 participants).

• Most comparisons did not report data on infection. Based on the available data we cannot be certain if antiseptic treatments increase or reduce the risk of infection compared with topical antibiotics (very low certainty evidence).
Antiseptic Use

• There may be some reduction in mean time to healing for wounds treated with povidone iodine compared with chlorhexidine (MD - 2.21 days, 95% CI 0.34 to 4.08).

• It is also uncertain whether infection rates differ for SSD plus cerium nitrate, compared with SSD alone (low certainty evidence).

• There may be fewer deaths in groups treated with cerium nitrate plus SSD compared with SSD alone (RR 0.22, 95% CI 0.05 to 0.99; I² = 0%, 2 studies, 214 participants) (low certainty evidence).
What is surprising!!

Despite SSD continue to be the topical antibiotic more used........

Put in check the necessity of nitrate serum

More than this: use of honey with benefits! Number of trials

And so PVP-I better than clorexidine
Rational

• Burn wounds provide an ideal medium for bacterial proliferation and a portal of entry into the bloodstream.
• As nosocomial infections in burn patients are prevalent and dangerous, systemic antibiotic prophylaxis is often considered, alongside other infection prevention and control interventions.
• However, the use of prophylaxis => controversy
  • Risk-benefit => benefits of prophylaxis X drug toxicity and development of multi-drug resistance
Antimicrobial prophilaxys

• Two meta-analysis
  1. One showed clearly that the use of systemic antibiotic prophylaxis after burn injury was beneficial, lessening pneumonia mortality and burn wound infections
  2. A Cochrane review concluded that the benefits of prophylaxis in preventing burn wound infections was unclear

Antimicrobial prophilaxys

- 53 publications
- Between 1982 and 2016
- 12 randomized prospective trials
- 4 retrospective studies
- 12 trials assessed early postburn prophylaxis
- 6 trials assessed perioperative prophylaxis
- 1 trial assessed both.
Antimicrobial prophylaxis

- Systemic antibiotic prophylaxis during the early post-burn period is not indicated in most burn patients (Grade 1C), but could be useful in patients with severe burns and the requirement for mechanical ventilation (Grade 2B).

- Perioperative prophylaxis during resection of devitalized tissue is not indicated in most burn patients (Grade 2B), but there is insufficient evidence for a recommendation for extensive burns, and it could be useful for the prevention of split-thickness skin graft infection in selected procedures (Grade 2B).
Contact Precautions

Rational

- Center for Disease Control and Prevention (CDC) widely implemented contact precautions in modern burn care to prevent transmission of microorganisms.

- However, the use of isolation rooms is labour intensive and expensive, while these techniques are only based on a scarce number of scientific studies for evaluating their effectiveness.
Contact Precautions

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Review

Protective isolation precautions for the prevention of nosocomial colonization and infection in burn patients: A systematic review and meta-analysis

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b Faculty of Education, Health and Social Work, University College Ghent, Ghent, Belgium
c Burn Trauma and Critical Care Research Centre, The University of Queensland, Brisbane, Australia

ARTICLE INFO

Abstract

Objectives: To assess the impact of protective isolation precautions on nosocomial colonization and infection rates in burn patients.

Research methodology: A systematic review and meta-analysis were performed of studies identified through PubMed and Web of Science. Only articles in English were considered. The Downs and Black tool was used to evaluate their methodological quality. Random-effects meta-analysis obtained pooled risk ratios (RRs) and 95% confidence intervals (CIs) of nosocomial colonization and infection rates.

Results: Five eligible before–after studies were identified, encompassing a total of 3033 patients (1152 in the experimental group; 1881 in the control group). Varying protective isolation precautions were investigated, resulting in high clinical heterogeneity. Quality assessment revealed overall poor methodological quality. Protective isolation significantly reduces combined colonization and infection rates compared to baseline care (RR 0.52, 95% CI 0.40–0.66; P < 0.0001). Subgroup analyses indicated significant reductions in both nosocomial colonization (RR 0.65, 95% CI 0.51–0.83; P = 0.02) and infection rates (RR 0.52, 95% CI 0.40–0.65; P < 0.0001).

Conclusions: Protective isolation precautions appear to decrease the risk of colonization and infection in burn patients. Because of the absence of higher quality study designs, clinical heterogeneity and the small number of studies involved, these results must be interpreted cautiously.

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• 5 estudos

• Nenhum randomizado
### Contact Precautions

**Fig. 1.** PRISMA flowchart.

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Isolation Events</th>
<th>Isolation Total</th>
<th>Control Events</th>
<th>Control Total</th>
<th>Weight</th>
<th>Risk Ratio M-H, Random, 95% CI</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Lee et al., 1990</td>
<td>28</td>
<td>38</td>
<td>42</td>
<td>43</td>
<td>10.2%</td>
<td>0.75 [0.62, 0.92]</td>
<td>1990</td>
</tr>
<tr>
<td>McManus et al., 1994</td>
<td>342</td>
<td>914</td>
<td>1117</td>
<td>1605</td>
<td>34.3%</td>
<td>0.54 [0.49, 0.59]</td>
<td>1994</td>
</tr>
<tr>
<td>Matsumura et al., 1996</td>
<td>23</td>
<td>116</td>
<td>57</td>
<td>115</td>
<td>19.9%</td>
<td>0.40 [0.27, 0.60]</td>
<td>1996</td>
</tr>
<tr>
<td>Thompson et al., 2002</td>
<td>9</td>
<td>58</td>
<td>8</td>
<td>17</td>
<td>9.1%</td>
<td>0.33 [0.15, 0.72]</td>
<td>2002</td>
</tr>
<tr>
<td>Weber et al., 2002</td>
<td>5</td>
<td>66</td>
<td>13</td>
<td>61</td>
<td>6.5%</td>
<td>0.36 [0.13, 0.94]</td>
<td>2002</td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>1192</strong></td>
<td></td>
<td><strong>1841</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>0.52</strong></td>
<td><strong>[0.40, 0.69]</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Total events** 407 1237

Heterogeneity: Tau² = 0.06; Chi² = 16.16, df = 4 (P = 0.003); I² = 75%

Test for overall effect: Z = 4.63 (P < 0.00001)

**Fig. 2.** Meta-analysis Forest plot summarizing the preventive effect of isolation precautions on nosocomial colonization and infection rates in burn patients.

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Isolation Events</th>
<th>Isolation Total</th>
<th>no Isolation Events</th>
<th>no Isolation Total</th>
<th>Weight</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Colonization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee et al., 1990</td>
<td>28</td>
<td>38</td>
<td>42</td>
<td>43</td>
<td>4.5%</td>
<td>0.75 [0.62, 0.92]</td>
<td>1990</td>
</tr>
<tr>
<td>Weber et al., 2002</td>
<td>5</td>
<td>66</td>
<td>13</td>
<td>61</td>
<td>1.5%</td>
<td>0.36 [0.13, 0.94]</td>
<td>2002</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>104</td>
<td></td>
<td>104</td>
<td></td>
<td>6.0%</td>
<td>0.65 [0.51, 0.83]</td>
<td></td>
</tr>
<tr>
<td><strong>Total events</strong></td>
<td><strong>33</strong></td>
<td></td>
<td><strong>55</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Chi² = 3.62, df = 1 (P = 0.06); I² = 72%

Test for overall effect: Z = 3.47 (P = 0.0005)

| **2. Infection** |                 |                     |                     |                   |        |                                |      |
| McManus et al., 1994 | 342          | 914                | 1117                | 1605             | 92.5%  | 0.54 [0.49, 0.59]               | 1994 |
| Thompson et al., 2002 | 9              | 58                 | 8                   | 17               | 1.4%   | 0.33 [0.15, 0.72]               | 2002 |
| Subtotal (95% CI)      | 972            |                 | 1622                |                   | 94.0%  | 0.53 [0.49, 0.58]               |      |
| **Total events**       | **351**        |                 | **1125**            |                   |        |                                |      |

Heterogeneity: Chi² = 1.47, df = 1 (P = 0.22); I² = 32%

Test for overall effect: Z = 13.76 (P < 0.00001)

**Fig. 3.** Meta-analysis Forest plot summarizing the preventive effect of isolation precautions on respectively nosocomial colonization and infection rates in burn patients.

**Fig. Legend** Studies reporting colonization rates (Lee et al. and Weber et al.) and studies reporting infection rates (McManus et al. and Thompson et al.) were separately pooled to assess the effect of protective isolation on colonization and infection rates distinctly. The study by Matsumura et al. is not considered in this subgroup analysis as it only focused on methicillin-resistant Staphylococcus aureus (MRSA) colonization.
Contact Precautions

• Implementation of protective isolation precautions does lead to a reduction in both colonization and infection rates in burn patients.

• Isolation precautions can be recommended for the treatment of burn patients, although the evidence is rather weak
  • lack of high quality study designs
  • limited number of studies available
  • clinical heterogeneity between studies.
Therapeutic drug monitoring

Rational

• A large number of factors may affect the pharmacokinetics (PK) of drugs in burn patients
  • TBSA and depth, sepsis, hydration, serum protein concentrations, age, creatinine clearance and time after injury.
• These factors lead to changes in antimicrobial plasma concentrations and, consequently, antimicrobial killing activity may be altered
• The PK/PD relationship => may improve patient outcome
Clinical Outcome and Antimicrobial Therapeutic Drug Monitoring for the Treatment of Infections in Acute Burn Patients

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Retrospective, observational study comparing 2 groups of patients: 1) the conventional treatment group (May 2005 to October 2008) and 2) the monitored treatment group (November 2008 to June 2011) whose dosing regimen was determined by plasma drug monitoring.
TDM of antimicrobial treatment, focused especially on dose adjustment to optimize PK/PD parameters, did not alter the prognosis of burn patients.
Selective digestive decontamination (SDD)

Rational

• It is well known that infections in burn patients are caused by potentially pathogenic microorganisms concomitantly isolated in digestive tract

• The effects of SDD have been evaluated in 67 different randomized clinical trials (RCT) in different critically ill patient populations and in 12 meta-analyses (ICU)

• Burns: Two different approaches have been used to prevent infections and decrease mortality and infection incidence - SDD and only the enteral administration of antibiotics (EA)
# Selective digestive decontamination (SDD)

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Type of study</th>
<th>Intervention</th>
<th>Patients (n)</th>
<th>Age (years)</th>
<th>TBSA (%)</th>
<th>Inhalation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarret et al. [8]</td>
<td>1978</td>
<td>Observational</td>
<td>EA (neomycin, erythromycin, nystatin) No treatment</td>
<td>20</td>
<td>25</td>
<td>44</td>
<td>NA</td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>1990</td>
<td>RCT</td>
<td>EA (neomycin, erythromycin, nystatin) Placebo</td>
<td>15</td>
<td>45</td>
<td>50</td>
<td>27</td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>1992</td>
<td>Observational</td>
<td>SDD</td>
<td>31</td>
<td>38</td>
<td>46</td>
<td>32</td>
</tr>
<tr>
<td>Mackie et al. [32]</td>
<td>1994</td>
<td>Observational</td>
<td>SDD + nasal mupirocin SDD</td>
<td>33</td>
<td>34</td>
<td>48</td>
<td>13</td>
</tr>
<tr>
<td>Shalaby et al. [28]</td>
<td>1998</td>
<td>RCT</td>
<td>EA (colistin, co-trimoxazole, nystatin) No treatment</td>
<td>162</td>
<td>NA</td>
<td>Adults ≥25</td>
<td>NA</td>
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<tr>
<td>Abdel-Razek et al. [29]</td>
<td>2000</td>
<td>RCT</td>
<td>EA (colistin, co-trimoxazole, nystatin) No treatment</td>
<td>85</td>
<td>NA</td>
<td>Adults ≥25</td>
<td>NA</td>
</tr>
<tr>
<td>De la Cal et al. [21]</td>
<td>2005</td>
<td>RCT</td>
<td>SDD</td>
<td>58</td>
<td>41</td>
<td>34</td>
<td>64</td>
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<tr>
<td>Cerdá et al. [22]</td>
<td>2007</td>
<td>Observational</td>
<td>SDD + vancomycin</td>
<td>59</td>
<td>48</td>
<td>38</td>
<td>67</td>
</tr>
<tr>
<td>Aboelatta et al. [33]</td>
<td>2013</td>
<td>Observational</td>
<td>EA (colistin, amikacin, miconazole) + ciprofloxacin</td>
<td>402</td>
<td>46</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No treatment or SDD (54 patients)</td>
<td>375</td>
<td>46</td>
<td>26</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No treatment</td>
<td>15</td>
<td>33</td>
<td>30-50</td>
<td>Excluded</td>
</tr>
</tbody>
</table>

EA: enteral antibiotic. iv: intravenous. SDD: selective digestive decontamination. (Four days of intravenous cefotaxime and tobramycin, polymyxin and amphotericin in oral paste and digestive solution.) TBSA: total body surface area.
Selective digestive decontamination (SDD)

Outcomes

- Mortality
- Incidence of BSI and Pneumonia
- Colonization of wound burn infection
- Adverse effects (diarrhea but not C. difficile)

<table>
<thead>
<tr>
<th>Author</th>
<th>Non absorbable enteral antibiotics</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarret et al. [8]</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>8/15 (53)</td>
<td>4/12 (33)</td>
</tr>
<tr>
<td>Shalaby et al. [28]</td>
<td>14/171 (8)</td>
<td>13/85 (15)</td>
</tr>
<tr>
<td>Abdel-Razek et al. [29]</td>
<td>9/225 (4)</td>
<td>16/85 (12)</td>
</tr>
<tr>
<td>Barret et al. [30]</td>
<td>2/11 (18)</td>
<td>1/12 (8)</td>
</tr>
<tr>
<td>Aboelatta et al. [33]</td>
<td>4/15 (27)</td>
<td>8/15 (53)</td>
</tr>
</tbody>
</table>

EA = OR: 0.62 (95% CI: 0.20–1.94)
High heterogeneity (I²=71%)

<table>
<thead>
<tr>
<th>Author</th>
<th>Selective digestive decontamination</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mackie et al. [31]</td>
<td>1/33 (3)</td>
<td>7/31(23)</td>
</tr>
<tr>
<td>De la Cal et al. [20]</td>
<td>5/53 (9)</td>
<td>15/54 (28)</td>
</tr>
</tbody>
</table>

SDD

RCT = OR: 0.27 (95% CI 0.09–0.81)
Obs = OR: 0.11 (95% CI 0.01–0.93)
Selective digestive decontamination (SDD)

- The incidence of *Enterobacteriaceae* bloodstream infection (BSI) was consistently reduced in 4 studies.
  - In the two studies using SDD, the reduction was more marked:
    - 0% vs. 13%
    - 2% vs. 11%
- A reduction in *Pseudomonas spp.* bloodstream infections was observed in one study.
- **MRSA bloodstream infection**
  - 13 of 53 patients treated with SDD
  - 5 of 54 receiving placebo
- **Candidemia** = 0 in the SDD group and 7% in the control group.

### Table 3 - Cumulative incidence of patients with bloodstream infection.

<table>
<thead>
<tr>
<th>Study</th>
<th>Treated (%)</th>
<th>Control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarret et al. [8]</td>
<td>3/20 (15)</td>
<td>3/10 (30)</td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>1/33 (3)</td>
<td>8/31 (26)</td>
</tr>
<tr>
<td>Shalaby et al. [28]</td>
<td>15/171 (9)</td>
<td>41/85 (48)</td>
</tr>
<tr>
<td>De la Cal et al. [20]</td>
<td>19/53 (36)</td>
<td>17/54 (31)</td>
</tr>
<tr>
<td>Aboelatta et al. [33]</td>
<td>4/15 (27)</td>
<td>12/15 (80)</td>
</tr>
<tr>
<td><strong>Enterobacteriaceae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>4/15 (40)</td>
<td>6/12 (50)</td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>0/33 (0)</td>
<td>4/33 (12)</td>
</tr>
<tr>
<td>Shalaby et al. [28]</td>
<td>4/171 (2)</td>
<td>9/85 (11)</td>
</tr>
<tr>
<td>De la Cal et al. [20]</td>
<td>1/53 (2)</td>
<td>8/54 (15)</td>
</tr>
<tr>
<td><strong>Pseudomonas sp.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>4/15 (27)</td>
<td>4/12 (33)</td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>0/33 (0)</td>
<td>4/31 (13)</td>
</tr>
<tr>
<td>De la Cal et al. [20]</td>
<td>9/53 (17)</td>
<td>7/54 (13)</td>
</tr>
<tr>
<td><strong>S. aureus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarret et al. [8]</td>
<td>1/20 (5)</td>
<td>2/10 (20)</td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>8/15 (53)</td>
<td>9/12 (75)</td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>1/33 (3)</td>
<td>7/31 (23)</td>
</tr>
<tr>
<td><strong>Methicillin-resistant S. aureus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De la Cal et al. [32]</td>
<td>13/53 (25)</td>
<td>5/54 (9)</td>
</tr>
<tr>
<td><strong>Enterococcus sp.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarret et al. [8]</td>
<td>1/20 (5)</td>
<td>1/10 (10)</td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>6/15 (40)</td>
<td>1/12 (8)</td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>0/33 (0)</td>
<td>4/31 (13)</td>
</tr>
<tr>
<td>De la Cal et al. [18]</td>
<td>3/53 (6)</td>
<td>5/54 (9)</td>
</tr>
<tr>
<td><strong>Coagulase-negative Staphylococcus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarret et al. [8]</td>
<td>2/20 (10)</td>
<td>1/10 (10)</td>
</tr>
<tr>
<td>Deutsch et al. [9]</td>
<td>10/15 (67)</td>
<td>10/12 (83)</td>
</tr>
<tr>
<td>De la Cal et al. [32]</td>
<td>13/53 (25)</td>
<td>5/54 (9)</td>
</tr>
</tbody>
</table>
Selective digestive decontamination (SDD)

Table 4 – Cumulative incidence of patients with pneumonia.

<table>
<thead>
<tr>
<th>Study</th>
<th>Treated (%)</th>
<th>Control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enteral antibiotics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarret et al. [8]</td>
<td>1/20 (5)</td>
<td>1/10 (10)</td>
</tr>
<tr>
<td>Barret et al. [30]</td>
<td>1/11(9)</td>
<td>0/11 (0)</td>
</tr>
<tr>
<td>Aboelatta et al. [33]</td>
<td>2/15 (13)</td>
<td>2/15 (13)</td>
</tr>
<tr>
<td>Selective digestive decontamination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackie et al. [31]</td>
<td>2/33 (6)</td>
<td>9/31 (29)</td>
</tr>
<tr>
<td>De la Cal et al. [20]</td>
<td>18/53 (34)</td>
<td>26/54 (48)</td>
</tr>
</tbody>
</table>

- 3 studies using EA = no effect on the incidence of pneumonia
- 2 studies using SDD = a reduction in the incidence of pneumonia was reported in the group treated with SDD versus placebo (23% and 14%, respectively)
Selective digestive decontamination (SDD)

Burn wound colonization
- 3 studies
- no difference in 2
- 1 study = a nonsignificant reduction in the incidence of burn wound colonization noted in the SDD treated group (60% vs 93%; p=0.08)

Adverse Effects
- None of the selected studies showed an increased incidence of bacterial resistance associated with the use of SDD or EA
- 2 studies = high incidence of diarrhea in patients receiving EA
  - Incidence of diarrhea was 33% leading to the interruption of treatment
  - Diarrhea developed in 82% of treated patients versus 17% of the control group
- *Clostridium difficile* toxin was not measured
Selective digestive decontamination (SDD)

Conclusion

SDD seems to improve the survival of severe burn patients and consistently reduces the incidence of infection such as pneumonia and bloodstream infections caused by Enterobacteriaceae as has been consistently found in other critically ill patients.

But ..........need high quality RCTs with low risk of bias
Conclusion

- Diagnosis of burn infection
  - Clinical criteria
  - Microbiological criteria
- Use of antibiotics
  - Topical
  - Systemic
- Contact precautions
- Therapeutic
- Selective digestive decontamination (SDD)

Many papers published recently (in 2017) in different periodicals!

All issues need more research and studies of good quality of evidence

Our attention !!!!!
Thank you!

AGENDE ESTA DATA!

17 a 20 de outubro de 2018
Centro de Convenções FREI CANECA
São Paulo - SP

Aguardamos você. Sua presença é muito importante!

www.infectologiapaulista.org.br