Enzymatic Debridement of Wounds

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# Targets of Debridement

<table>
<thead>
<tr>
<th>Target</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove</td>
<td>Necrosis/ Slough/ Eschar</td>
</tr>
<tr>
<td>Impaired Tissue</td>
<td></td>
</tr>
<tr>
<td>Source of inflammation/ infection</td>
<td></td>
</tr>
<tr>
<td>Exudate/ Pus</td>
<td></td>
</tr>
<tr>
<td>Hyperkeratosis</td>
<td></td>
</tr>
<tr>
<td>Hematoma/ Foreign bodies</td>
<td></td>
</tr>
<tr>
<td>Debris/ Bone fragments</td>
<td></td>
</tr>
<tr>
<td>Other type of bioburden and barriers</td>
<td></td>
</tr>
<tr>
<td>Decrease</td>
<td>Odour/ moisture/ risk of infection</td>
</tr>
<tr>
<td>Stimulate</td>
<td>Wound edges/ epithelisation</td>
</tr>
<tr>
<td>Improve</td>
<td>Quality of life</td>
</tr>
</tbody>
</table>
Purpose of Debridement

• Decrease bacteria within the wound bed, decreasing risk of infection
• Increase the effect of topical antimicrobials
• Improve the effect of inflammatory cells
• Decrease the length of the inflammatory phase
• Decrease the metabolic expense for healing
• Decrease the physical barrier to healing
• Decrease odor of the wound
Consequences of not debriding a wound

1. Increased risk of infection
2. Imposition of additional metabolic load
3. Psychological stress
4. Ongoing inflammation
5. Compromised restoration of skin function
6. Abscess formation
7. Odour
8. Inability to fully assess the wound depth
9. Nutritional loss through exudate
10. Sub-optimal clinical and cosmetic outcome
11. Delayed healing
• **Five major debridement methods**

• **BEAMS—**
  
  – **Selective methods**
    
    • **Biological/Biosurgical, Enzymatic, and Autolytic debridement.**
  
  – **Nonselective methods**
    
    • **Mechanical and Sharp debridement.**
Parameters influencing the decision for debridement and the choice of technique

- Pain
- Skill of the care giver
- Resources of the care giver
- Patients choice
- Consent Regulations
- Comorbidities Guidelines
- Quality of life
Sharp DEBRIDEMENT

While effective, surgical debridement has several major disadvantages. It can be non-selective and may sacrifice healthy surrounding tissues.

Furthermore, surgical excision is painful and exposes patients to the risks of repeated anaesthesia and significant bleeding.
Enzymatic debridement

- Enzymatic debridement is a specific wound-debridement option using proteolytic enzymes in gels or ointments, which should work synergistically with endogenous enzymes
### Proteolytic enzymes for wound treatment

<table>
<thead>
<tr>
<th>Origin</th>
<th>Enzyme</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal</td>
<td>Fibrinolysin</td>
<td>Bovine plasma</td>
</tr>
<tr>
<td></td>
<td>Desoxyribonuclease</td>
<td>Bovines pancreas</td>
</tr>
<tr>
<td></td>
<td>Krill multienzyme complex</td>
<td>Antarctic krill</td>
</tr>
<tr>
<td></td>
<td>Collagenase</td>
<td>Paralithodes camtschatica</td>
</tr>
<tr>
<td></td>
<td>Catalase</td>
<td>Equine liver</td>
</tr>
<tr>
<td>Plant</td>
<td>Papain</td>
<td>Carica papaya</td>
</tr>
<tr>
<td></td>
<td>Bromelain enzyme complex</td>
<td>Pineapple</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Collagenase</td>
<td><em>Clostridium histolyticum</em></td>
</tr>
<tr>
<td></td>
<td>Streptokinase</td>
<td><em>Streptococcus haemolyticus</em></td>
</tr>
<tr>
<td></td>
<td>Streptodornase</td>
<td><em>Streptococcus haemolyticus</em></td>
</tr>
<tr>
<td></td>
<td>Sutilain</td>
<td><em>Bacillus subtilis</em></td>
</tr>
</tbody>
</table>

Brett D. *A Historical Review of Topical Enzymatic Debridement.*
Enzymatic debridement

- **Types:**
  - Bacterial collagenase,
  - Papain/urea,
  - Fibrinolysin/DNAse,
  - Trypsin,
  - Streptokinase-streptodornase combination,
  - Subtilisin.
Mechanism

- Enzymatic debridement is accomplished by the topical (surface) application of an exogenous (not self-produced) enzyme that works with endogenous enzymes to digest necrotic tissue discriminantly.

Enzymatic Debridement

• Useful in wounds where mechanical debridement options are not available or are contraindicated (with bleeding problems).

• Indicated for infected & uninfected wounds with necrotic tissue
  – In infected wounds, enzymes may be used with topical antimicrobial therapy (ex. Polymoxin B with Collagenase)

• Contraindicated
  – Wounds with exposed deep tissues (ligament, tendon, capsule, bone, nerve, muscle, blood vessels)
Collagenase

- Derived from *Clostridium histolyticum*,
- Specifically digests all triple helical collagen
- Will not degrade any other proteins lacking the triple helix.
- Clinical advantages,
  - selectively removing dead tissue,
  - being painless,
  - Cause the least amount of blood loss.
Papain

- From papaw tree (Carica papaya).
- Breaks down fibrinous material in necrotic tissue.
- Requires specific activators that are present in necrotic tissue in order to be stimulated.
Papain – Urea

• Combination Twice as effective
• Urea denatures proteins, making them more susceptible to proteolysis by papain.
• Papain - inflammatory response so considerable pain.
• Chlorophyllin, an anti-agglutinin, added to reduce the pain.
• Especially useful for paraplegic pressure sores.
Contraindications of ED

• Dry wounds (Enzymes need moist environment)

• Antiseptics or soaps should be avoided (enzymes become ineffective)

• Acute wound (For streptokinase increased risk of bleeding).
Side effects of ED

• Irritation of the peri-wound skin, with clinical signs of inflammation or discomfort

• Therapy with streptodornase can cause fever, chills, and leucocytosis, due to the absorption of split purines and pyrimidines.

• Clinically-relevant contact sensitisation, with allergic contact dermatitis,

Out of 30 patients, only two patients (3.33%) could complete the study. The rest of the recruited patients either had high fever (63.33%), excruciating pain (13.33%) or both (16.66%), which brought an end to enzymatic debridement.
Conclusions

• No doubt sharp debridement is best but it has limitation
• In such cases enzymatic debridement is useful
• Associated with side effects.
THANKS

VAICON 2017

Organising Chairman
Ajay K Khanna

Organising Secretary
Seema Khanna

Topics to be included:
- Relevant Anatomy of Venous System
- Images in vete
- Severity staging in venous Disease
- How I do it:
  - Trendelenberg op
  - Microsurgery
  - Radiofrequency ablation
  - Foam sclerotherapy
  - Endovenous LAAER ablation
  - Mechanical ablation
  - Compressive therapy
- New Strategies in venous ulcer
- Venous Malformation
- Lymphoedema
- Deep Vein Thrombosis

REGISTRATION FEE

<table>
<thead>
<tr>
<th>Early</th>
<th>Late</th>
<th>On spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>(before 30th Sep, 2016)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Members     | 8,000 INR | 10,000 INR | 15,000 INR |
Non Members | 10,000 INR | 12,000 INR | 17,000 INR |
Paramedics  | 2000 INR  | 2,500 INR  | 3,500 INR  |
(Technician/Nurses) |
International Members | 400 USD | 500 USD | 600 USD |
Spouse     | 8,000 INR | 10,000 INR | 12,000 INR |
PG students | 4,000 INR  | 5,000 INR  | 6,000 INR  |
(affidavit by Head) |

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- Free entry to exhibition
- Lunch for all days
- Dinner for all days
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23rd - 25th March 2017

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10th ANNUAL CONFERENCE OF VENOUS ASSOCIATION OF INDIA
23-25 March 2017
Varanasi, Uttar Pradesh

WELCOME TO VARANASI

Varanasi also known as Benares or Kashi is a North Indian city on the banks of the Ganges in Uttar Pradesh. Varanasi is one of the oldest continuously inhabited cities in the world. Varanasi grew as an important industrial centre, famous for its muslin and silk fabrics, perfumes, ivory works, and sculpture. Buddha is believed to have founded Buddhism here around 528 BC when he gave his first sermon.

Varanasi is well-connected by air, rail, and road. Varanasi is served by Lal Bahadur Shastri International Airport, which is approximately 26 km (16 mi) from the city centre in Babatpur. Air India, Air Vistara, Buddha Air, Jet Airways, Jet Konekt, IndiGo, and SpiceJet operate flights from Varanasi to Delhi, Gaya, Kathmandu, Khajuraho, Sharjah, Lucknow, Mumbai, Hyderabad, Bangalore, and Coimbatore. Varanasi has main two Railway stations, Varanasi Railway Cantt station and Mughal Sarai. The mean temperature in February ranges from 26 degrees high to 13 degree low. Varanasi has all hotel chains viz Taj, Raddison, Ramada, Clarks,