ER-INF COMBINE CONFERENCE

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DISCUSSION

Necrotizing fasciiatis

- Clinical feature of NF
- Diagnostic image tool
- Classification of NF
- Management of NF
- Vibro vulnificus introduction

Clinical feature of necrotizing fasciitis

- Pain is often out of proportion to PE findings ! (Cellulitis may not have this presentation)
- Crepitus and brawny edema on the painful area
- Skin bronze or brownish discoloration with malodorous sero-sanguineous discharge and bullae
- In Vibro vulnificus infection may have CV collapse and rapid mental change

From Tintinali's text book

Clinical Clues to Diagnosis of Necrotizing Soft Tissue Infection

- **Skin:**
  - Erythema
  - Tense edema
  - Grayish or other discolored wound drainage
  - Vesicles to **bullae**
  - **Necrosis**
  - **Ulcers**
  - Crepitus
- **Pain:**
  - Pain that extends past margin of apparent infection
  - Severe pain that appears disproportionate to physical findings
  - Decreased pain or anesthesia at apparent site of infection
- **General features:**
  - Fever
  - Tactile temperature
  - Diaphoresis
  - Tachycardia
  - Toxic delirium

Table 4. Differential Diagnosis of Necrotizing Soft-Tissue Infection

Disorder	Characteristic
Cellulitis/adiposities (nonnecrotizing)	Erythematous, edematous, indurated tissue with normal appearing subcutaneous fat and fascia
Myonecrosis	
Lymphedema	
Noninfectious f (eosinophilic fasciitis)	
Phlegmasia ceru dolens	
Myxedema	Systemic manifestations of severe hypothyroidism

Pain that extends past margin of apparent infection is important hint in necrotizing fasciitis

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Symptoms and sing of necrotizing fasciitis

Table 3. Symptoms/Signs Associated with Necrotizing Soft-Tissue Infection at the Time of Admission

Finding	Percent of patients[6] (n = 89)	Percent of patients[31] (n = 192)	Percent of patients[32] (n = 22)
Erythema	100	66	95
Pain or tenderness beyond margins of erythema	98	73	95
Swelling	92	75	86
Crepitus or skin necrosis	13	31	0
Induration	12	45	
Bullae	45	23	41
Fluctuance	11		
Fever	53	32	
Hypotension	18	11	

Pain is ofetn out of proportion to PE findings ! (Cellulitis may not have this presentation)

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Image tool

- Imaging studies, such as soft tissue x-rays, CT scan and MRI are most helpful if there is gas in the tissue.
- An emergent non-contrast CT examination to assess for the presence of air along the fascial planes may be the most expedient radiographic approach given the associated morbidity with a delay in diagnosis.
- MRI may not be adequate to delineate findings of air along the fascial planes.

Table 5. Laboratory Risk Indicator for Necrotizing Fasciitis Score

Variable	Score
C-reactive protein	
<150	0
≥150	4
WBC (cells/mm^3)	
<15	0
15–25	1
>25	2
Hemoglobin (g/dL)	
>13.5	0
11–13.5	1
<11	2
Sodium (mmol/L)	
≥135	0
<135	2
Creatinine (mcg/L)	
≤141	0
>141	2
Glucose (mmol/L)	
≤10	0
>10	1

A sum ≥6 has a high correlation with necrotizing soft-tissue infection.

LAB data to predic NF

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Classification of necrotizing fasciiatis

Table 1. Classification of Necrotizing Soft Tissue Infection

Classification factor	Comment
Anatomic location	Fournier's gangrene of perineum/scrotum
Depth of infection	Necrotizing adipositis (most common), fasciitis, myositis
Microbial cause	Type I: Polymicrobial (most common) Type II: Monomicrobial (*Staphylococcus, Streptococcus, Clostridia* sp) Type III: *Vibrio vulnificus**

*Classification of *Vibrio vulnificus* necrotizing infection as type III is not universally agreed on.

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Commom bacteria in necrotizing fasciiting

Table 1. Causative Bacteria of Type 1 and Type 2 Necrotizing Fasciitis

type 1
- polymicrobial infections including anaerobes.

type 2
- *Streptococcus pyogenes* (Group A Streptococcus)
- *Staphylococcus aureus*, including methicillin-sensitive and resistant

Other microbiological etiologies
- *Vibrio vulnificus*
- *Aeromonas hydrophila*
- Enterobacteriaceae (*Escherichia coli*, *Pseudomonas* spp., and *Klebsiella* spp)

Common microbial in type I necrotizing soft tissue infection

Table 2. Common Microbial Causes of Type I Necrotizing Soft-Tissue Infection

Organism	Gram stain	Percent of isolates[9] (n = 162)	Percent of isolates[2] (n = 272)
Staphylococcus aureus	Gram-positive cocci	16	22
Streptococcus species	Gram-positive cocci	19	17
Klebsiella species	Gram-negative rod	10	
Escherichia coli	Gram-negative rod	7	
Gram-negative bacteria			18
Anaerobic bacteria		7	18

**Clostridia* species (gram-positive rods) are a rare cause of necrotizing soft-tissue infection.

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Staging of necrotizing fascii

Table 1. Clinical features of necrotizing fasciitis as the disease progress through clinical stages

Stage 1 (Early)	Stage 2 (Intermediate)	Stage 3 (Late)
Tenderness to palpation (extending beyond the apparent area of skin involvement)	Blister or bullae formation (serous fluid)	Hemorrhagic bullae
Erythema	Skin fluctuance	Skin anesthesia
Swelling	Skin induration	Crepitus
Warm to palpation		Skin necrosis with dusky discoloration progressing to frank gangrene

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Management of NF

- Treatment of necrotizing fasciitis consists of early and aggressive surgical exploration and debridement of necrotic tissue, antibiotic therapy, and hemodynamic support as needed.
- The best indication for surgical intervention is severe pain, toxicity, fever and elevated CPK with or without radiographic findings.

Surgical intervention for deep soft tissue infection

- Aggressive surgical intervention is not only diagnostically but also therapeutically important.
- Decision to surgical explore:
  - Cutaneous evidence of an infectious process, severe localized pain and toxicity
  - Not responding to medical management or clinically deteriorating.

Annu. Rev. Med. 2000. 51: 271

Treatment of Necrotizing Fasciitis, First-line Antimicrobial Agent, by Infection Type

Mixed infection	*Streptococcus* infection
Ampicillin-sulbactam	Penicillin
or	**plus**
pipellacillin-tazobactam	clindamycin
plus	*S. aureus* infection
clindamycin	Cefazolin
plus	Vancomycin(for resistant strains)
ciprofloxacin	Clindamycin
Imipenem/cilastatin	*Clostridium* infection
Meropenem	Clindamycin
Cefotaxime	Penicillin
plus	*Vibro vulnificus*
metronidazole	3rd -generation cephalosporin
or	**Plus**
Clindamycin	tetracycline

Inter Med 49: 1051-1057, 2010

Risf factor of increase mortality in necrotizing soft tissue infection

Table 6. Variables Associated with Mortality in Necrotizing Soft Tissue Infection[2,4,13,31,41]

Timing to operative intervention*
Age older than 60 years
Number of comorbidities
Diabetes mellitus
Shock on admission
Acute renal failure
Coagulopathy or acidosis on admission
Clostridial or group A streptococcal infection
Vibrio vulnificus infection
Admission white blood cell count > 30 cells/mm^3
Admission serum creatinine > 2 mg/dL.

*Only variable that has been shown to be predictive of survival in all studies.

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Table 3. Risk factors for mortality of Vibrio necrotizing fasciitis identified by multivariate analysis

Variable	Odds ratio (95% confidence interval)	p Value
Continuous variables		
Leukocyte count	1 (1–1)	0.086
Band forms	0.866 (0.788–0.951)	0.003*
Segmented forms	0.953 (0.909–1)	0.049*
Platelet count	0.237 (1–1)	0.237
Albumin	6.213 (1.134–34.03)	0.035*
Categorical variables		
Systolic blood pressure ≤ 90 mm Hg	40.39	0.011*
Leukocyte count ≤ 7000	2.571	0.308
Band forms > 7%	1.253	0.815
Segmented forms ≤ 70%	1.373	0.748
Platelet count ≤ 80,000	43.849	0.009*
Albumin ≤ 2	16.564	0.021*

Clin Orthop Relat Res (2010) 468:2230–2237

V. Vulnificus lab risk

Vibro vulnificus

- Gram-negative, motile, curved, rod-shaped bacteria
- Present in marine environments such as estuaries, brackish ponds, or coastal areas
- Infections due to V. vulnificus are most common in chronic underlying illness, liver disease or hemochromatosis

Prevalence of Vibro vulnificus in Taiwan

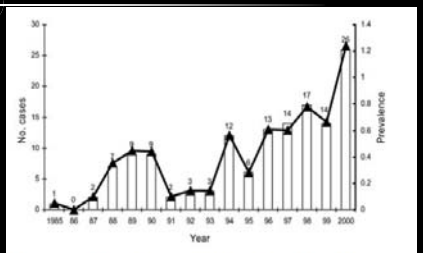

Figure 1. Estimated prevalence (per 10^6 population) and annual number of cases of *Vibrio vulnificus* infection reported from 1985 to 2000 in Taiwan. The line and triangles represent the prevalence and the bars the number of cases.

Emerging Infectious Diseases • Vol. 10, No. 8, August 2004 1363-1368

Mortality rate

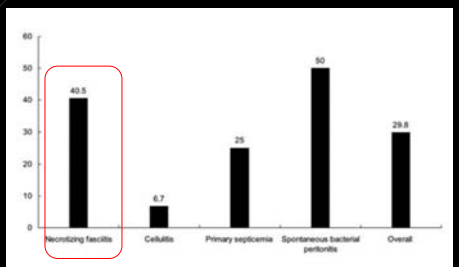

Figure 3. Rates of deaths according to different types of infection of 84 patients with *Vibrio vulnificus* infection.

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Take home message

- There are four general principles that guide the management of a necrotizing soft-tissue infection: ***(1) early identification (2) source control (3) antibiotics (4) supportive care***.

THANKS FOR YOUR ATTENTION