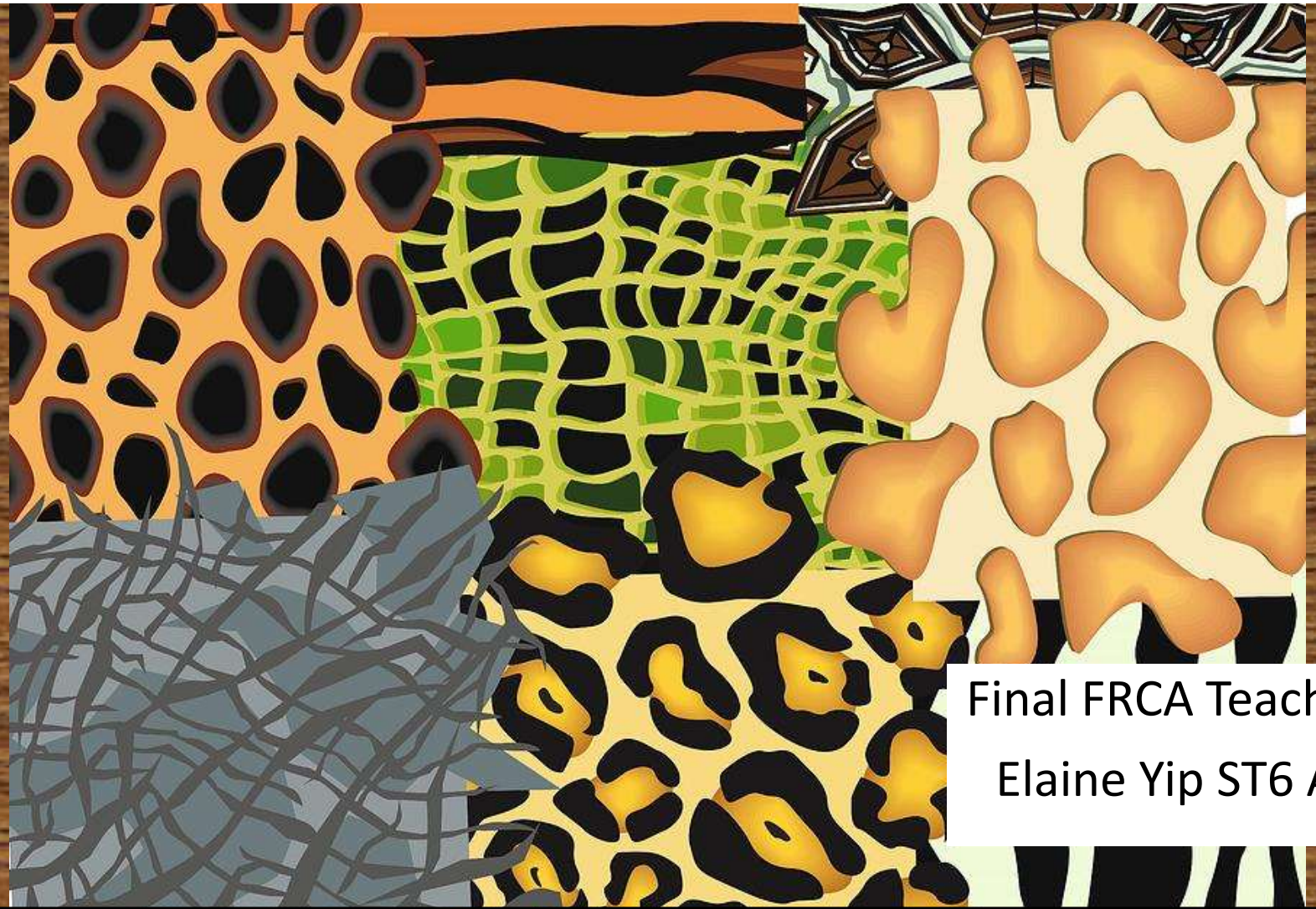
Skin Conditions in Critical Care



Final FRCA Teaching February 2022

Elaine Yip ST6 Anaesthetics/ICM

Overview

- Why this topic important?
- Some MCQs
- Primary skin conditions
- Secondary skin conditions

Why important?

- Skin is largest organ
- Failure can lead to multi-organ involvement → death
- (Extra) Psychological support often required
- Long stay

Anaesthetic Implications

- Challenging case – severe septic shock, comorbidities, extensive prolonged surgery, little time to pre-optimise
- Intra-op – blood loss, coagulopathy, electrolyte disturbances, massive fluid shifts, haemodynamic instability
- Multiple trips to theatre

Intensive Care: General Principles

- MDT approach: surgeons/opthalm/derma/dietician/physio/psych
- Skin failure = Another organ failure = similar to major burn
- Meticulous ICU care:
  - Fluid balance
  - Nutrition
  - DVT/Stress ulcer prophylaxis
  - Strict infection prevention

  Pain Control
  Temp management
  Wound/eye care

- Early referral to tertiary centre

Possible questions

- MCQs – about necrotising fasciitis/toxic shock/SJS/TEN
- CRQs – unlikely full question but: ??
- SOEs – all fair game

1. The most appropriate statements regarding necrotising soft tissue infection include:

(a) Type 1 infection accounts for 70–80% of cases and is likely to occur in the perineal and trunk areas.

(b) Type 2 infection is likely to be polymicrobial.

(c) Type 4 infection is likely to occur in immunocompetent patients.

(d) In type 3 infection, the commonest Gram-negative organism is *Vibrio* spp.

(e) Type 2 necrotizing soft tissue infection is associated with toxic shock syndrome.

2. The most appropriate statements concerning the pathophysiology and clinical presentation of necrotising fasciitis include:

(a) Despite extensive infection of underlying fascia in the early pathological stages, the skin is likely to appear normal.

(b) Pain usually precedes skin changes by 12 h.

(c) Meleney's gangrene is commonly used to refer to abdominal wall fasciitis.

(d) The most critical early distinctive symptom of necrotizing fasciitis is a disproportionate level of pain compared with physical findings.

(e) The presence of skin bullae, blisters and skin fluctuation suggests early disease.

Other skin conditions: Question 1

A 27-yr-old woman presents with a 1 day history of widespread macular rash, diarrhoea and oropharyngeal ulceration. The vital signs are: blood pressure of 87/54 mm Hg and core temperature of 39.0°C. Her alanine aminotransferase (ALT) is found to be twice the upper limit of normal.
Appropriate statements regarding this scenario include:

a) Serology for measles should be investigated.

b) Clindamycin should be added to her antibiotic regime.

c) Intravenous immunoglobulins should be administered at the earliest opportunity.

d) Absence of desquamation or shedding of the rash is likely to enable exclusion of toxic shock syndrome (TSS).

e) The possibility of a retained tampon should be excluded.

Question 2

A 40-yr-old man presents with a widespread, painful rash. It started a few weeks ago with painful ulcers in his mouth and has now appeared over most of his torso. He has epidermal loss over these areas and is struggling to take fluids orally. He is tachycardic, and his serum sodium is 154 mmol/L. You are likely to:

a) Administer intravenous fluids.

b) Refer the patient to the regional burns centre.

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Question 3

A 32-yr-old woman presents with widespread skin pustules that have formed over a few hours. She has confirmed recently that she is pregnant and has stopped taking ibuprofen, which was used to control pain associated with her rheumatoid arthritis. She is pyrexial and tachycardic, and has an increased white cell count. Appropriate statements regarding this scenario include:

a) Serology for cytomegalovirus (CMV) and Epstein–Barr virus (EBV) should be checked.

b) There should be a low threshold for antibiotic treatment.

c) Systemic corticosteroid therapy should be started immediately.

d) Liver function tests including albumin level do not need checking at this time.

e) If she develops a fever, then this is a clear sign that she has a secondary infection.

Question 4

A man with toxic epidermal necrolysis affecting 70% of his body surface is in multi-organ failure in the ICU. His trachea is now intubated and his lungs are ventilated. You are likely to:

a) Administer enteral feeding as soon as possible.

b) Place a central line through diseased skin if other sites are not available.

c) Plan his care via a multidisciplinary team (MDT) meeting.

d) Avoid administering additional sedation and analgesia during change of dressings and wound care as these lesions are not painful.

e) Continue all of his medications that were noted on admission.

Initial Approach

- **History** → Examination → Investigations

- Timing of skin lesions/Rate of involvement
- Systemic symptoms
- Mucosal involvement

- New medications
- Trauma: new wounds/bites
- Foreign travel
- Post-partum/Menstruation?
- Immunocompromised?

Initial Approach

- History **Examination** Investigations

- ABCDE: Vital signs
- Describe lesions
- Distribution
- BSA: Lund-Browder chart

Initial Approach

- History → Examination → **Investigations**

- Full blood panel: FBC, U+E, LFTS, Bone, Inflam markers, Clotting

Plus

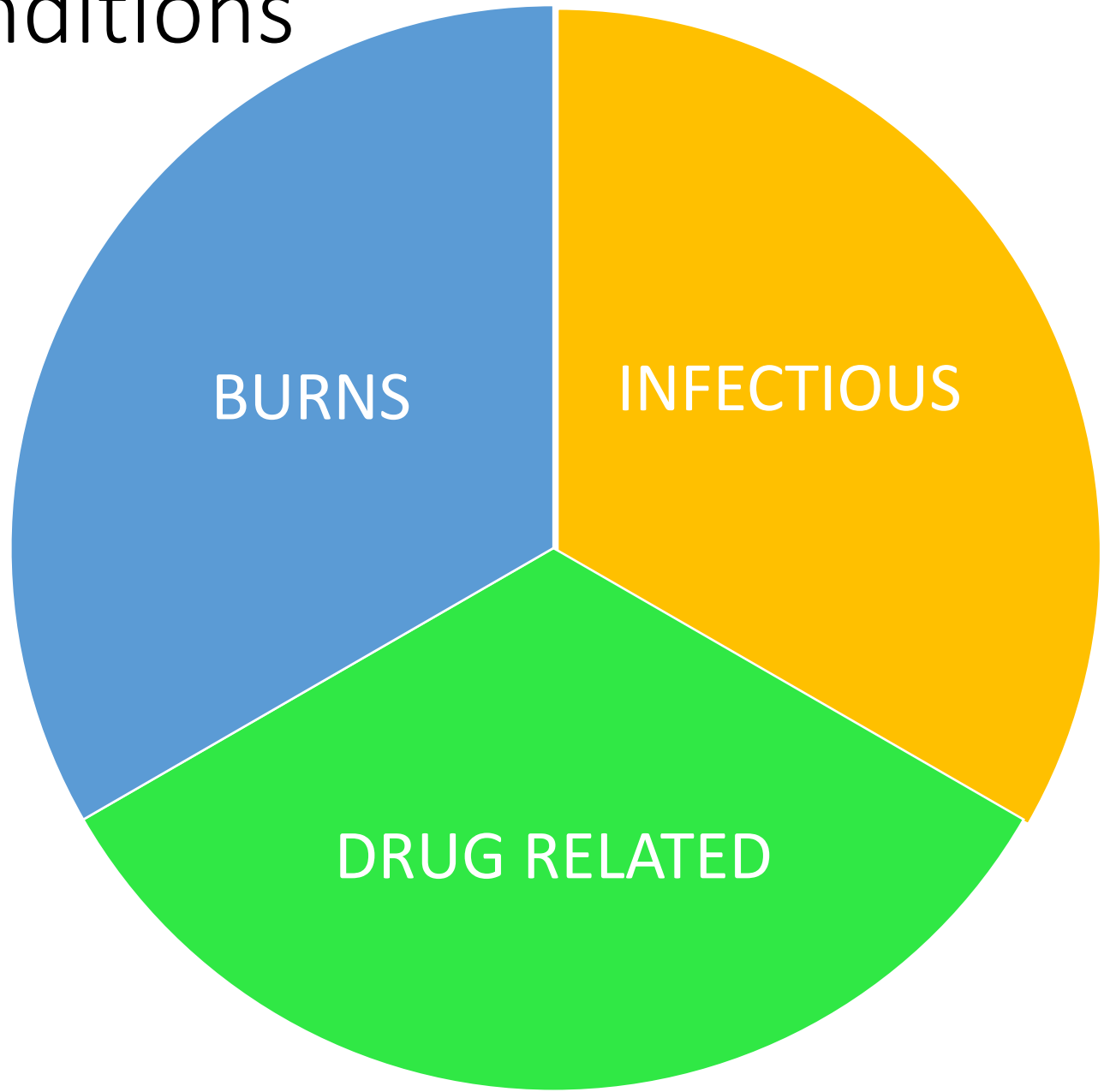
- Autoimmune screen
- Specific serology
- Septic screen: Blood, Swabs, Urine
- Skin biopsy?

General Principles of Care: if life-threatening

- Immediate referral to a burns centre.
- Strict barrier nursing
- IV lines through non-lesional skin
- Use usual indicators for fluid therapy. Consider albumin
- Careful handling of skin: avoid BP cuffs, adhesive dressings, ECG leads and ID bands
- Avoid routine abx – only if infection
- Consider FMS if diarrhoea

Primary Skin Conditions

Primary Skin Conditions



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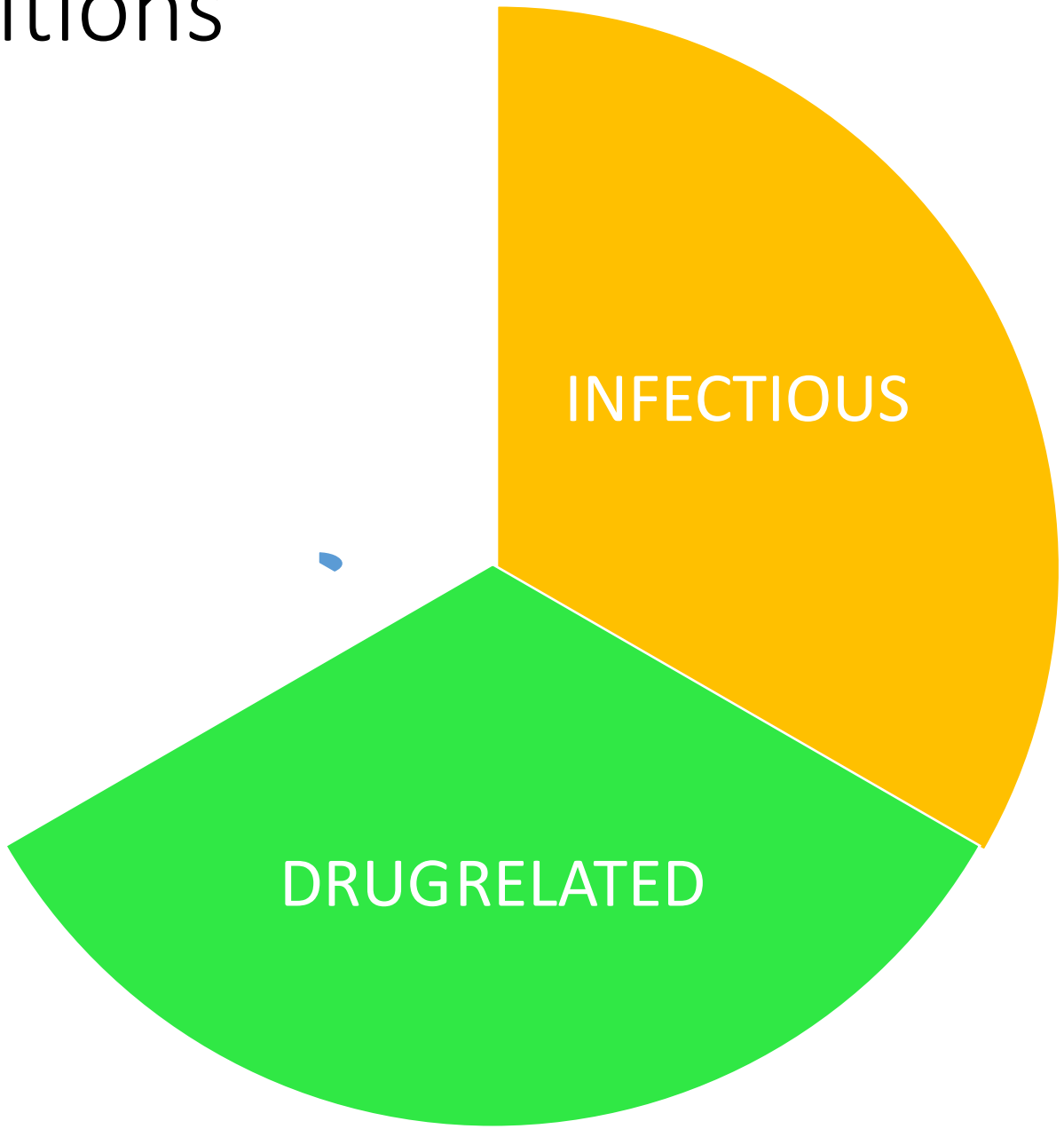


Infectious

- Necrotising fasciitis
- Cellulitis
- Toxic Shock Syndrome

Necrotising fasciitis

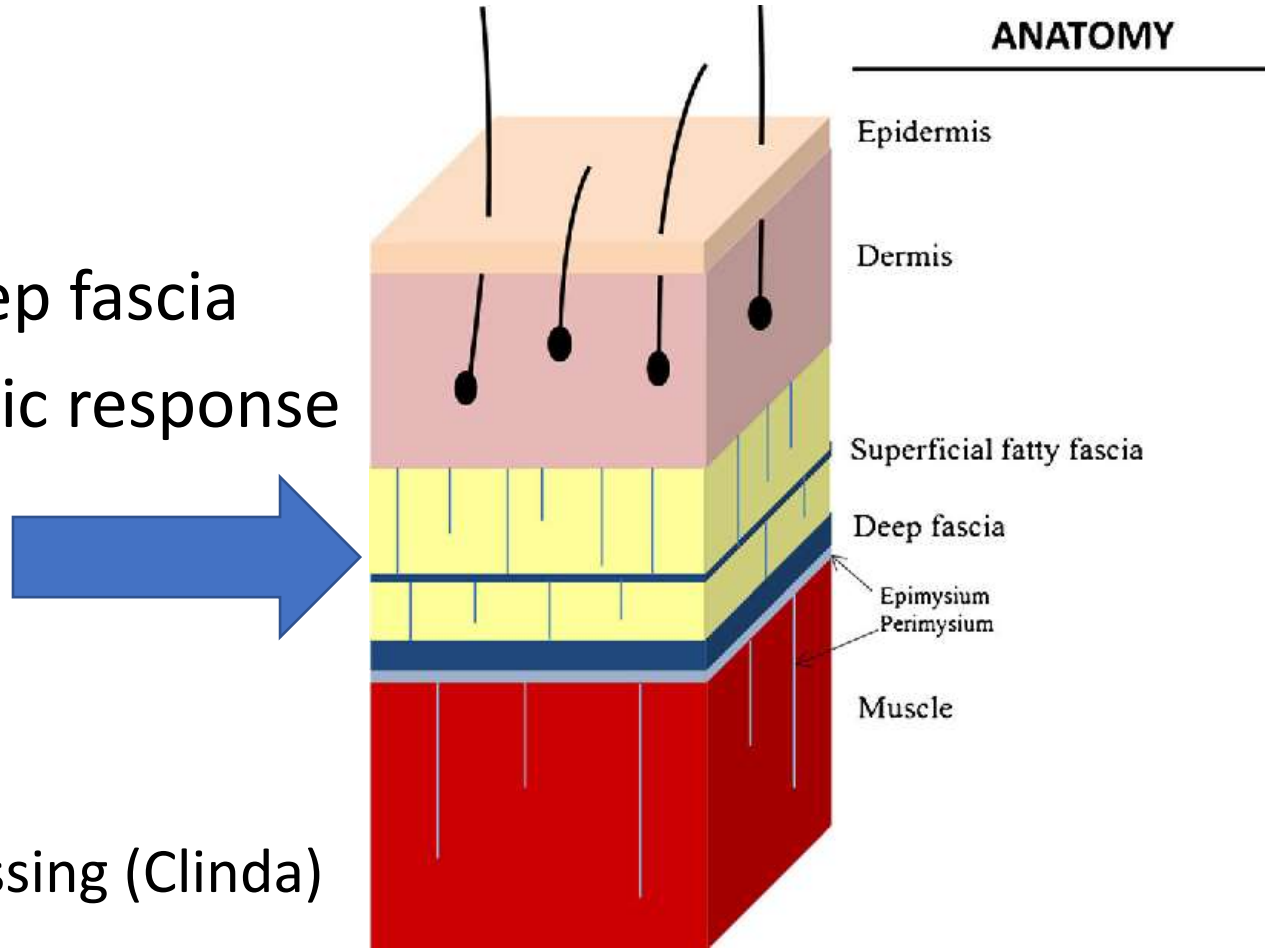
- KEY POINTS

Necrotising fasciitis

- KEY POINTS

- Infection below superficial +/- deep fascia
- Disproportionate pain and systemic response

- Management:
  - Early recognition!
  - Early surgical involvement
  - Broad spectrum abx + toxin-suppressing (Clinda)

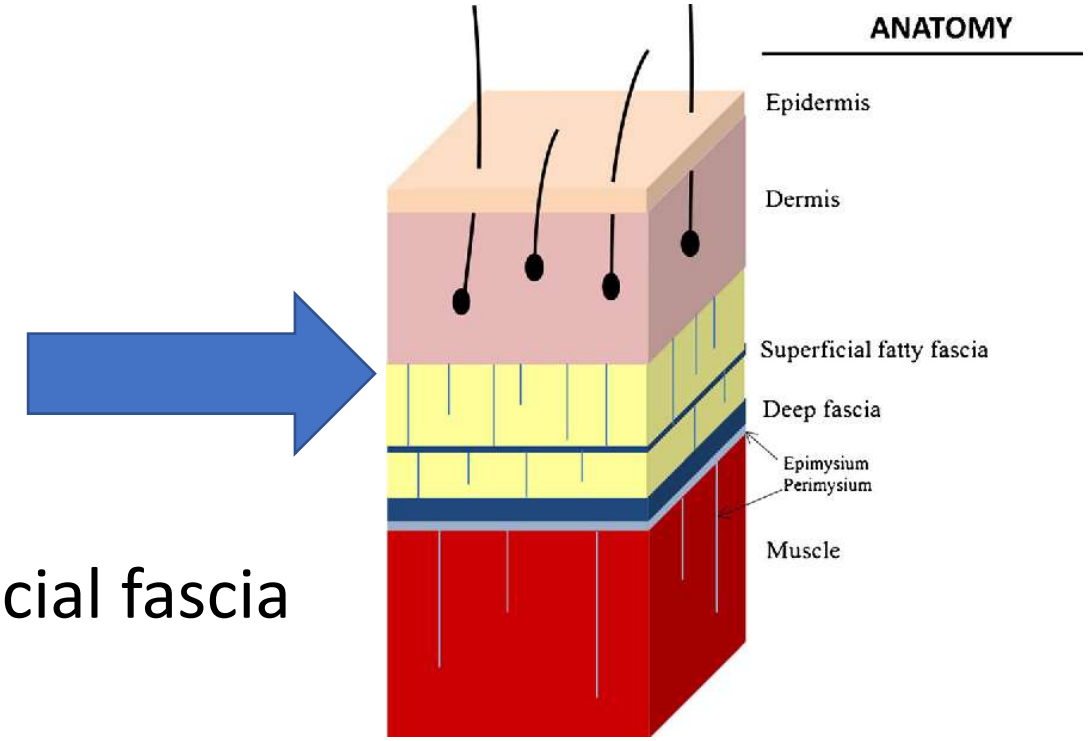


Necrotising fasciitis: Types

Types of NF	Aetiology	Organism(s)	Clinical progress	Mortality
Type I (70–80% cases)	Polymicrobial, synergistic, often bowel flora-derived	**Mixed** anaerobes and aerobes	More indolent, better prognosis, easier to recognize clinically	Variable; depends on underlying co-morbidities
Type II (20–30% cases)	Often monomicrobial, skin- or throat-derived	**Usually group A β-haemolytic streptococcus (GAS)**, occasionally *S. aureus*	Aggressive, protean presentations, easily missed	>32%, depends if associated with myositis or toxic shock
Type III	Gram-negative, often marine-related organisms	***Vibrio*** spp. mainly	Seafood ingestion or water contamination wounds	30–40%
Type IV (fungal)	Usually trauma associated, immunocompetent patients	***Candida*** spp. immunocompromised patients. Zygomycetes immunocompetent patients	Aggressive with rapid extension especially if immunocompromised	>47% (higher if immunocompromised)

Cellulitis

- KEY POINTS



- Infection between dermis and superficial fascia
- Common in ICU
- Can develop into septic shock
- Mostly *Staph Aureus* (MSSA/MRSA) or Group A Strep
- Beware of Panton–Valentine leucocidin *Staph. Aureus*
- Appropriate abx: check colonisation/discuss Micro!

Toxic Shock Syndrome

- KEY POINTS

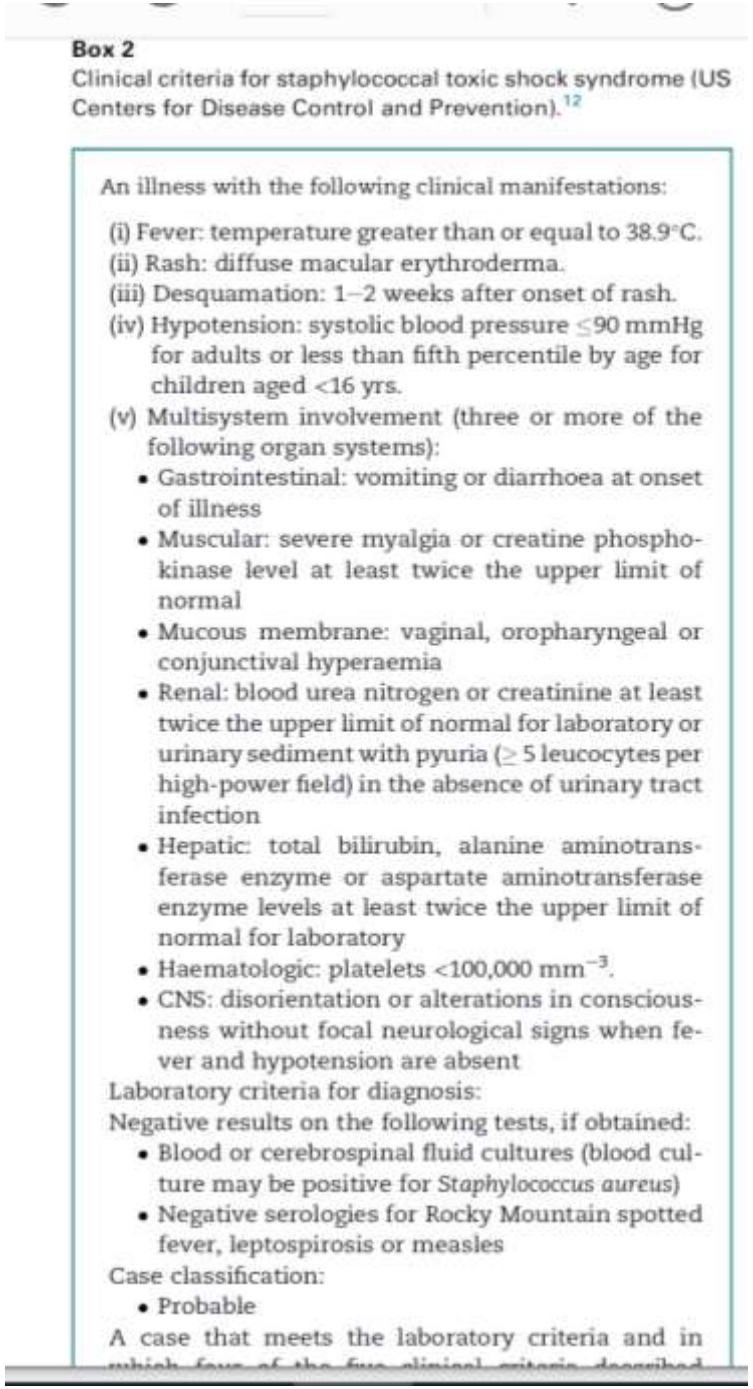
Toxic Shock Syndrome

- KEY POINTS
- Staphyloccal vs Streptoccoccal (MSSA/MRSA/Group A Strep)
- Severe disease resulting from exotoxin release
- Staph disease in young people (antibodies to TSST-1 by age 40)
- No longer predominantly due to sanitary product retention

Toxic Shock Syndrome

- CDC criteria / Working Group Strep criteria
- Multi-system involvement
- Can start with flu-like symptoms
- Rapidly evolving fever, rash, shock, multi-organ failure

Skin Desquamation – later sign



Box 2
Clinical criteria for staphylococcal toxic shock syndrome (US Centers for Disease Control and Prevention).[12]

An illness with the following clinical manifestations:

(i) Fever: temperature greater than or equal to 38.9°C.
(ii) Rash: diffuse macular erythroderma.
(iii) Desquamation: 1–2 weeks after onset of rash.
(iv) Hypotension: systolic blood pressure ≤90 mmHg for adults or less than fifth percentile by age for children aged <16 yrs.
(v) Multisystem involvement (three or more of the following organ systems):
- Gastrointestinal: vomiting or diarrhoea at onset of illness
- Muscular: severe myalgia or creatine phosphokinase level at least twice the upper limit of normal
- Mucous membrane: vaginal, oropharyngeal or conjunctival hyperaemia
- Renal: blood urea nitrogen or creatinine at least twice the upper limit of normal for laboratory or urinary sediment with pyuria (≥ 5 leucocytes per high-power field) in the absence of urinary tract infection
- Hepatic: total bilirubin, alanine aminotransferase enzyme or aspartate aminotransferase enzyme levels at least twice the upper limit of normal for laboratory
- Haematologic: platelets <100,000 mm^{-3}.
- CNS: disorientation or alterations in consciousness without focal neurological signs when fever and hypotension are absent

Laboratory criteria for diagnosis:
Negative results on the following tests, if obtained:
- Blood or cerebrospinal fluid cultures (blood culture may be positive for *Staphylococcus aureus*)
- Negative serologies for Rocky Mountain spotted fever, leptospirosis or measles

Case classification:
- Probable

A case that meets the laboratory criteria and in

Toxic Shock Syndrome: Treatment

- Resuscitation
- Early surgical involvement: source control
- Appropriate antibiotic empirical therapy:
  - **Clindamycin:** inhibits exotoxin synthesis *via* its action on the 50S subunit of the bacterial ribosome
  - Consider Vancomycin if Staph
  - IV IG reserved for severe cases (poor evidence)

Drug Related – Toxic Epidermolysis

Drug Related – Toxic Epidermolysis

- severe muco-cutaneous reactions characterized by erythema, extensive epidermal necrosis, and widespread bullous epidermal detachment
- most commonly triggered by drugs (but can be spontaneous)
- affect all age groups

- Stephen-Johnson's Syndrome (SJS) and Toxic Epidermal Necrolysis (TEN) are variants of the same disease spectrum
- SJS is the less severe form, affecting <10% TBSA
- TEN is more severe and affects >30% TBSA

Features

- 4 days to 4 weeks following exposure

- Aetiology:
  - Drugs - i) Allopurinol, (ii) Anticonvulsants (Carbamazepine, Lamotrigine, Phenobarbital, Phenytoin, (iii) Antibiotics (Cotrimoxazole, Aminopenicillins, Quinolones, Cephalosporins), (iv) NSAIDs, (v) Nevirapine
  - Infectious – Viral (**HIV**, CMV), Bacterial (Mycoplasma)
  - Malignancy – (Lung > Lymphoma> Bladder)

Features

- Flu-like symptoms
- Nikolsky’s sign
- Mucosal involvement (eyes, oropharynx, GI, GU tract)

Management

- Supportive treatment
  - As per burn
  - MDT
  - Infection/nutrition/DVT
  - Protect/treat mucosal areas
- Stop offending agent
  - Report MHRA
- Poor evidence:
  - IV IG
  - Steroids
  - Ciclosporin

- Age ≥ 40 yr
- Malignancy
- Initial area of epidermal detachment ≥10% TBSA
- Heart Rate ≥120 bpm
- Serum Urea >10 mmol l^{-1}
- Serum Glucose >14 mmol l^{-1}
- Serum Bicarbonate <20 mmol l^{-1}

Score	Predicted Mortality (%)
0-1	3.2
2	12.1
3	35.3
4	58.3
5 or more	90

Secondary Skin Conditions

- Drug Reactions
  - **DRESS: Drug reactions with eosinophilia and systemic symptoms**
  - **AGEP: Acute generalised exanthematous pustulosis**

DRESS: Drug reactions with eosinophilia and systemic symptoms

- Rare: used to be known only in relation to Phenytoin
- Mortality 10%
- Drug culprit in 80%

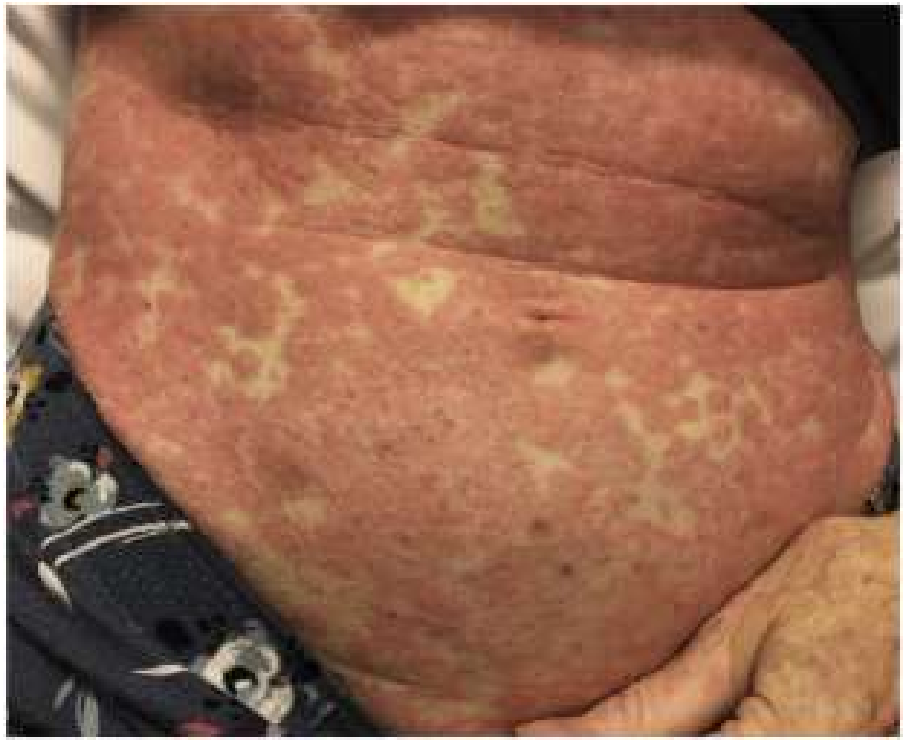
- Genetic and immunosuppressive susceptibility
  - HLA subtypes according to ethnicity
  - Reactivation of HHV

DRESS

- RegisSCAR & J-SCAR criteria

Drug category	Drug name
Anticonvulsant	Carbamazepine Lamotrigine Phenobarbitone Phenytoin Sodium valproate
Antimicrobial	Ampicillin Cefotaxime Dapsone Ethambutol, isoniazid, pyrazinamide, rifampicin Linezolid Metronidazole, minocycline Quinine Sulphasalazine, streptomycin Trimethoprim–sulphamethoxazole Vancomycin
Antiviral	Abacavir Nevirapine Zalcitabine
Antidepressant	Fluoxetine
Antihypertensive	Amlodipine Captopril
Biologic	Efalizumab Imatinib
NSAID	Celecoxib

DRESS: features



- Lag phase quite long: 2-6 weeks
- Widespread measles-like rash
- Systemic symptoms: fever/malaise
- Haem: Eosinophilia ~ 30%; Haemophagocytic syndrome (MAS)
- Hepatic: ~80%
- AKI, ARDS, Myocarditis also seen

DRESS: treatment

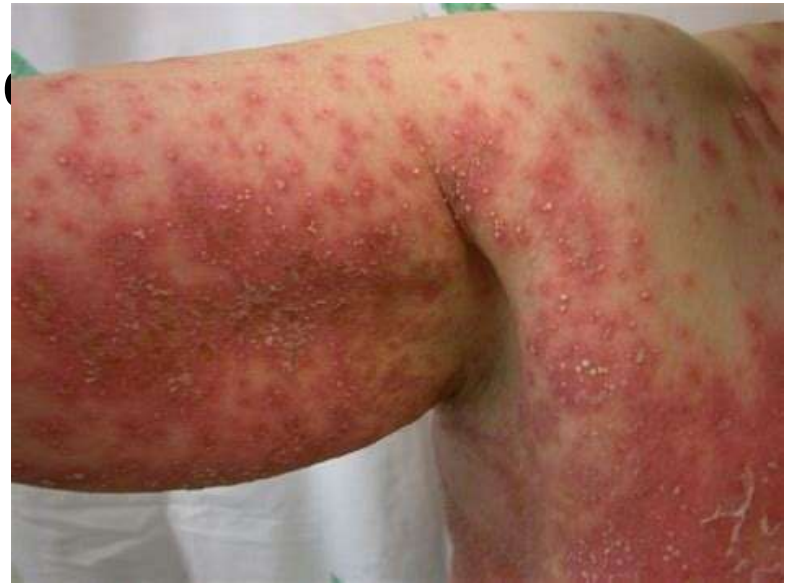
- Prompt recognition
- Stop offending drug
- IV steroids – high dose
- Consider IV IG, Plasmapharesis

- Skin failure bundle

- Continue supportive care

AGEP: Acute generalised exanthematous pustulosis

- 48-72 hours after exposure
- Intertriginous areas common
- Neutrophilia and sterile pustules overlying oe
- Organ involvement rare
- Self-limiting after cessation of drug



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Factors that should be considered when differentiating DRESS syndrome from Stevens–Johnson syndrome and toxic epidermal necrolysis (SJS/TEN) include:

a) DRESS syndrome typically presents within 4–28 days of drug exposure.
b) In patients with SJS/TEN, mucosal involvement is more prominent and tends to occur in more than one site.
c) Hepatic involvement is more common in SJS/TEN.
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Question 6

Appropriate statements regarding suspected causative agents and management of DRESS include:

a) The use of corticosteroids is supported by RCT evidence.

b) The pattern of renal involvement observed is that of tubulointerstitial nephritis.

c) Prompt recognition and withdrawal of potentially causative agents is a vital intervention.

d) Allopurinol is a recognised causative agent and is strongly associated with hepatic abnormalities.

e) Phenytoin is associated with a specific pattern of systemic involvement whereby cardiovascular impairment predominates.

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Question 7

Appropriate statements regarding presenting features and laboratory findings of drug reactions with eosinophilia and systemic symptoms (DRESS) include:

a) An erythematous, morbilliform rash is the most common presenting dermatological manifestation.

b) There is a weak association with the re-activation of human herpes group viruses (HHV).

c) Diffuse lymphadenopathy is the most commonly reported systemic feature and is present in up to 90% of patients.

d) Eosinophillia is present in up to 90% of cases.

e) Liver abnormalities with elevated serum alanine aminotransferase (ALT) are found in approximately 70% of patients with DRESS syndrome.

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Possible CRQs

- Types of nec fasc
- Organisms for nec fasc, TSS
- BSA calculations
- Scoring systems: LRINEC, SCORTEN, RegisCAR
- Antibiotic regime
- Anaesthetic/Surgical considerations
- ICM management

Take Home Messages

- Major skin failure is like a major burn
- Be sure to remember some key ICU points:

  infection control/pain/nutrition/tertiary referral
- Key anaesthetic principles:

  severe fluid loss/haem instability/coagulopathy/blood loss
- Skin disease can be a hallmark of/cause of rapidly progressing and potentially fatal multi-organ failure = take seriously!

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