Toxic shock syndrome:
Case report and literature review

Speaker: Clerk2 劉詩俊

Supervisor: VS 洪偉誠醫師

2025 . 11 . 26

Patient Profile

- Chart number:
- Name: 張〇誠
- Age: 37
- Gender: M
- Admission date: 2025/10/20

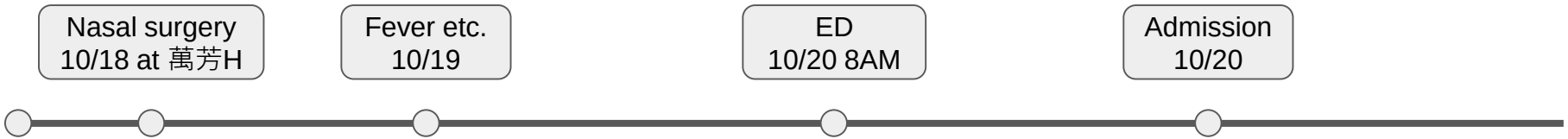
- Underlying disease
  - Denied any underlying diseases
- Denied A/B/C history and T.O.C.C. history

Patient Profile

- Chief complaint
  - Fever for two days

Present illness

- Underwent bilateral nasal laser surgery at 萬芳醫院 on 2025/10/18
- Intermittent **fever**, **muscle soreness**, **sore throat**, **odynophagia** and **neck pain** since 10/19 at night
- **Vomiting** and **diarrhea** once for each, with **general weakness**



Present illness

- Denied
  dyspnea, stridor, cough, sputum, rhinorrhea, drooling, dysphagia, chest pain, palpitation, syncope, headache or urinary symptoms

Nasal surgery
10/18 at 萬芳H

Fever etc.
10/19

ED
10/20 8AM

Admission
10/20

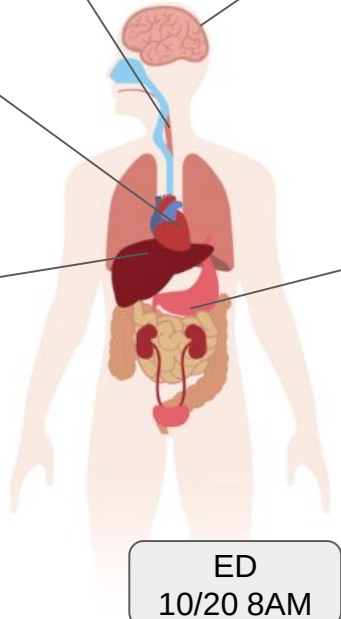
Physical examination

SpO2: 99% BT: **38.4**℃
HR: **135**次/分 RR: **28次/分**
SBP: **93 mmHg**
DBP: **47 mmHg**

Throat: **tenderness over bil grade I tonsils, mild injected oropharynx**
Neck: supple, normal

Consciousness: alert, E4V5M6
Conjunctiva: not pale
Sclera/Conjunctiva: anicteric

Chest:
symmetric movement with respiration
Breath sound:
Right side: clear
Left side: clear
Heart sound:
Rhythm: regular
S1 and S2:normal
S3:absent
S4:absent
Murmur:absent
Other extra sound:absent



Abdomen:
Inspection: normal
Bowel sound: normoactive
Palpation:
general: soft, flat
tenderness: absent
rebound pain: absent
Percussion: normal
Flank knocking pain: Right
General appearance:
grossly normal
Edema: absent

Nasal surgery
10/18 at 萬芳H

Fever etc.
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10/20

Lab Data 10/20

10201923 0933	生化				
Na	Blood	129	mmol/L	136	146
K	Blood	5.2	mmol/L	3.5	5.1
Creatinine	Blood	4.11	mg/dL	0.70	1.30
Creatinine & eGFR	Blood				
Bilirubin-T.	Blood	1.4	mg/dL	0.2	1.2
ALT	Blood	46	U/L		41
Glucose AC	Blood	137	mg/dL	70	100
eGFR(CKD-EPI)	Blood	18.2		60.0	
eGFR(MDRD)	Blood	16.5		60.0	
Sample Hemolysis	Blood	2+			

Lab Data

10201118 0933 CBC-DC	10200950 BCulture NG
	10201857 BCulture NG

CBC-I	Blood				
HGB	Blood	16.8	g/dL	13.0	17.0
HCT	Blood	50.4	%	39.0	52.0
MCV	Blood	84.8	fL	82.0	101.0
RBC	Blood	5.94	10^6/µL	4.10	5.90
MCHC	Blood	33.3	g/dL	31.0	36.0
WBC	Blood	29.99	10^3/µL	3.80	10.40
WBC DC	Blood				
Additional parameter	Blood				
Platelet	Blood	198	10^3/µL	140	400
Neutrophil	Blood	72.2	%	40.0	75.0
Lymphocyte	Blood	0.0	%	20.0	50.0
Monocyte	Blood	1.9	%	3.0	10.0
Eosinophil	Blood	0.0	%	0.0	7.0
Basophil	Blood	0.0	%	0.0	2.0
Band	Blood	19.4	%	0.0	3.0
Myelo.	Blood	0.9	%		
MCH	Blood	28.3	pg	27.0	33.0
RDW-CV	Blood	13.1	%	11.5	14.5
PDW	Blood	15.2	fL	9.0	17.0
Meta-myelo	Blood	5.6	%		
MPV	Blood	11.20	fL	9.30	12.10
ANC	Blood	27.47	10^3/uL	2.50	7.00
Plateletcrit	Blood	0.22	%	0.17	0.32

Lab Data

10201004 VGAS	0933				
VBG	Blood				
PH	Blood	7.290		7.310	7.410
PCO2	Blood	42.6	mmHg	41.0	57.0
PO2	Blood	18.4	mmHg	30.0	40.0
HCO3-	Blood	20.0	mmol/L	23.0	30.0
BE	Blood	-6.3	mmol/L	-2.0	2.0
O2SAT	Blood	23.7	%	70.0	75.0

Lab Data

10201126 Urine sed	0933	

Urine Routine Sed.	Urine				
Specific Gravity	Urine	1.027		1.005	1.030
PH	Urine	5.0		5.0	9.0
Protein	Urine	1+			
Glucose	Urine	-			
Urobilinogen	Urine	0.2	EU./dL	0.1	1.0
Bilirubin	Urine	-			
Nitrite	Urine	-			
WBC	Urine	1+			
P/C Ratio	Urine	Normal			
Color	Urine	Yellow			
Appearance	Urine	Clear			
Ketones	Urine	-			
Occult Blood	Urine	+/-			
RBC	Urine	0.6	/HPF	0.0	3.0
WBC	Urine	12.5	/HPF	0.0	3.0
Squa.Epithelial cell	Urine	4.7	/HPF	0.0	3.0
Bacteria	Urine	1.37	10^5/mL	0.00	1.00

Lab Data

10201214 生化+		1154			
Ca	Blood	8.3	mg/dL	8.6	10.3
BUN	Blood	39	mg/dL	7	25
ALBUMIN	Blood	4.2	g/dL	3.5	5.7
CRP	Blood	26.810	mg/dL	0.000	1.000
10202043 +		2000			
Lactate	Blood	6.68	mmol/L	0.50	2.20
PCT	Blood	>100.00	ng/mL	0.00	0.50

Lab Data

10202000 stool			
Stool Routine	Stool		
Appearance	Stool	Semifluid	
Color	Stool	black	
WBC	Stool	0-1	
RBC	Stool	0-1	
Stool OB	Stool	4+	

Lab Data

10202000 生化					
ALBUMIN	Blood	3.4	g/dL	3.5	5.7
10202100 infection test					
Influenza A RNA	鼻咽拭子	Not Detected			
Influenza B RNA	鼻咽拭子	Not Detected			
SARS-CoV-2 RNA	鼻咽拭子	NEGATIVE by Liat Real-Time RT-PCR			

Image finding

- 10/20 Chest PA
  No specific finding
- 10/20 KUB
  No specific finding
- 10/20 CT Chest & Neck
  - **Mucosal thickening of left maxillary sinus**
  - **Visible lymph nodes of bil neck**
  - **Fat stranding of bil perirenal space**

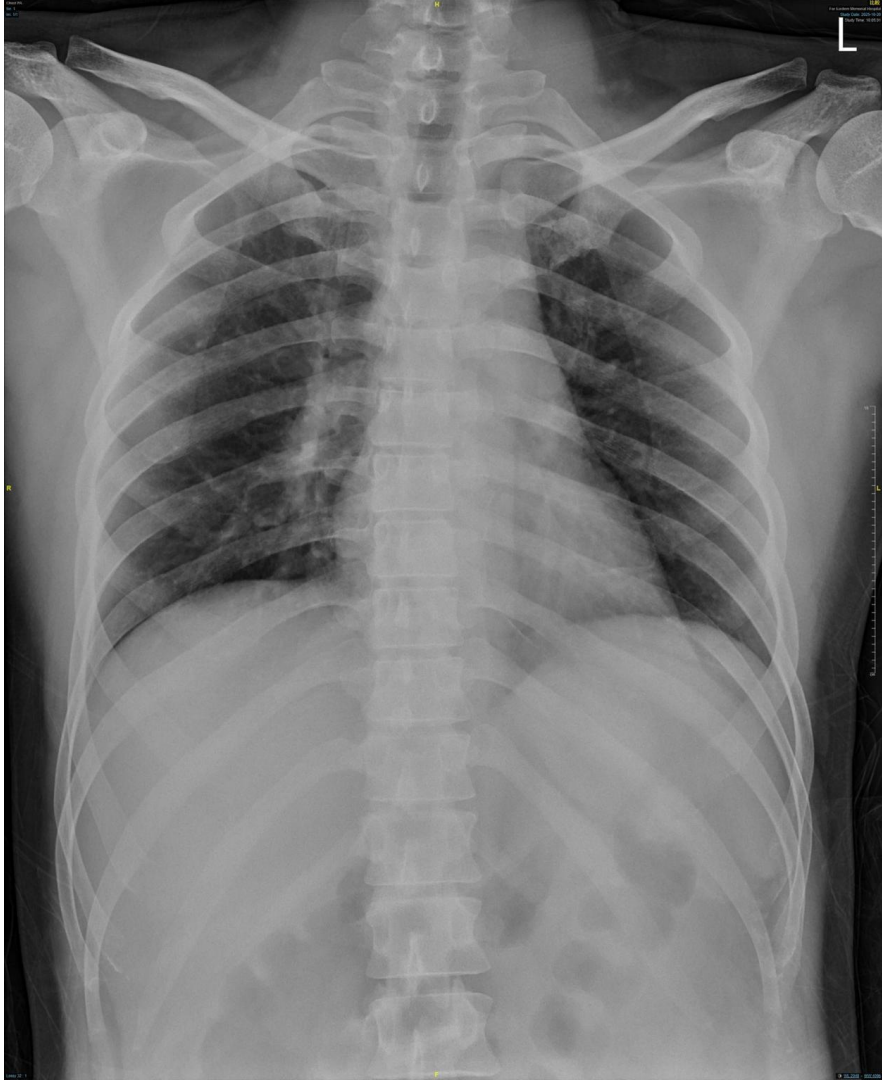

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Image finding

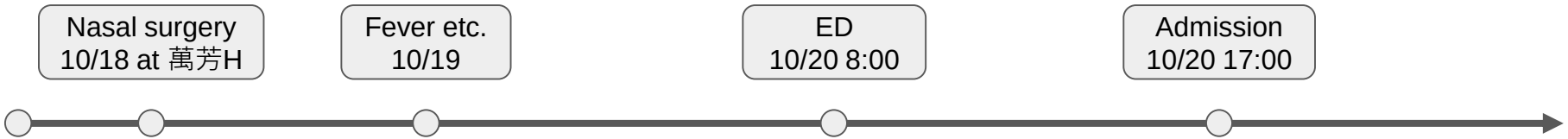
- 10/21 Water’s view
  There is no obvious increase density in bilateral maxillary sinuses.

Primary diagnosis

- # Septic shock, postoperative, suspected upper airway infection
- # Acute kidney injury

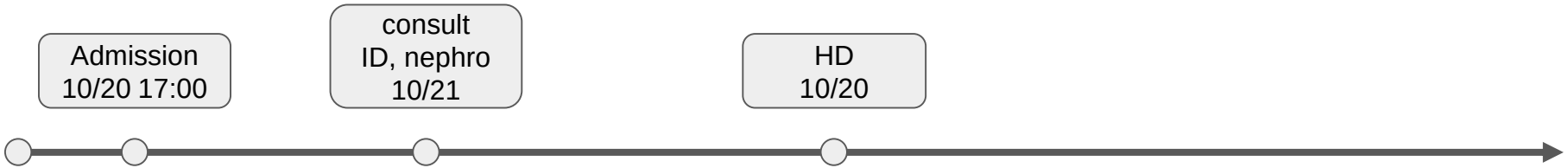
Clinical course

- 2025.10.20 ER **BP: 88/53 mmHg**
  Flomoxef sodium 1 gm/vial IV + **Doxycyclin** HCL 100 mg/cap PO
  Fluid resuscitation with sodium chloride 2.0L -> 1.0L -> 0.5L
- 2025.10.20 Admission **BP: 103/51 mmHg, BT: 39.1℃**
  Levophed through CVC on R't femoral vein



Clinical course

- 2025.10.21, HR: **126** bpm, BP: **119/69** mmHg, RR: **39**/min
  consult ID(感染內科)
  Flumarin -> Tazocin + Minocycline
  keep **levophed**
  nasal cannula 3L/min, SpO2 97%
  Magnesium Sulfate 10% 20ml/amp, Vitacal 20ml/amp,
  Albumin human serum 25% 50ml/vial



Clinical course

- 2025.10.22, HR: **107** bpm, BP: **112/82** mmHg, BT: 37.1℃

  Sod.bicarbonate 250ml/bot

VBG	Blood				
PH	Blood	7.390		7.310	7.410
PCO2	Blood	30.9	mmHg	41.0	57.0
PO2	Blood	121.3	mmHg	30.0	40.0
HCO3-	Blood	18.3	mmol/L	23.0	30.0
BE	Blood	-5.4	mmol/L	-2.0	2.0
O2SAT	Blood	98.4	%	70.0	75.0

Admission
10/20 17:00

consult
ID, nephro
10/21

HD
10/23

類別＼日期		10/20	10/21	10/22	10/23	10/24	10/25	10/26
輸入	pump	31	6					
	開水/口服藥物		340	20	90			200
	注射	160	1900	2520	1880	1060	1040	1120
	飲食量		130	150	253	1136	1329	870
輸入合計			2376.5	2690	2223	2196	2369	2190
輸出	便			0				
	Foley尿道							
	尿+便	50	0	50				
	胸水				370			
	H/D				4000		2500	
	Foley				150	80	260	230
	尿		270	110	70	50		
輸出合計			270	160	4590	130	2760	230
輸入輸出量差		-	+2106.5	+2530	-2367	+2066	-391	+1960
排泄	大便次數	1		2	1	1	1	4
測量	血氧濃度	99	98	94	97	97	98	99

Clinical course

- 2025.10.23, HR: **107** bpm, BP: **139/86** mmHg, BT: 36.5℃
  11:08 on Foley catheter, 16 Fr
  11:12 Dyspnea noted, RR 40/min
  -> simple mask 10L/min, RR 14-24cpm, SpO2 100%
  Chest X-ray:
  Butterfly infiltrative change at bilateral peri-hilar areas

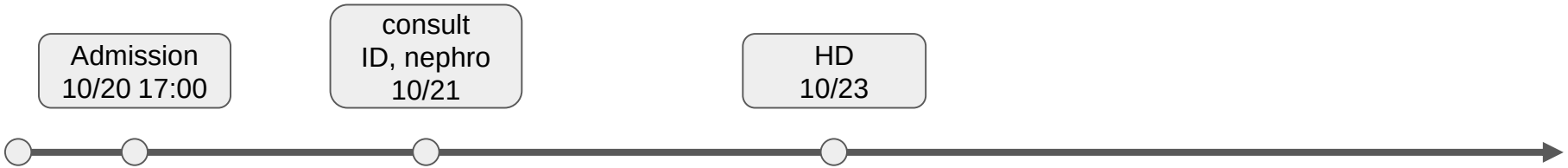
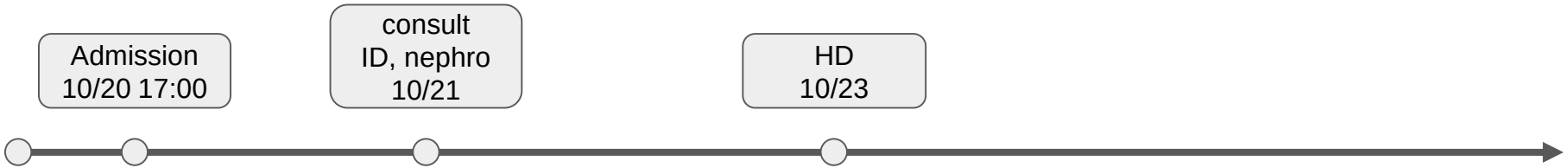


Image finding

- 10/23 Chest X-ray AP
  Butterfly infiltrative change at bilateral peri-hilar areas
- suspected pulmonary edema

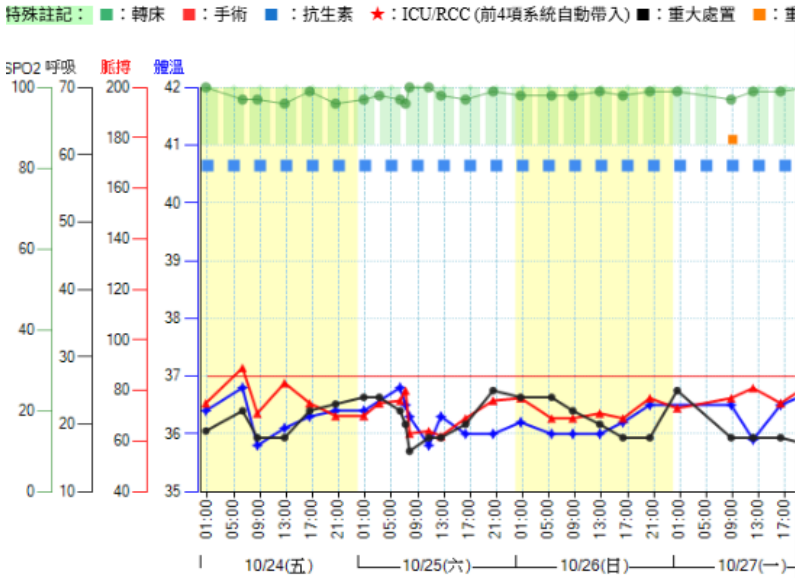
Clinical course

- 2025.10.23, HR: **107** bpm, BP: **139/86** mmHg, BT: 36.5℃
  Furosemide (Furosemide) 20mg/2ml/amp
  Thoracentesis to relieve pleural effusion
  simple mask 10L/min -> BIPAP 15L/min SpO2 100%



Clinical course

- 2025.10.24 simple mask 6L/min
- 2025.10.25 nasal cannula 3L/min, HD
- 2025.10.26 room air SpO2 99%
- 2025.10.28-11.8 HD



Admission
10/20 17:00

consult
ID, nephro
10/21

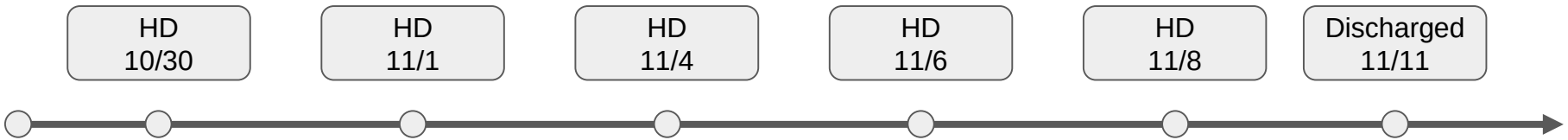
HD
10/23

HD
10/25

HD
10/28

Clinical course

- 2025.11.4
  Under stable condition
  completed 14D IV **Tazocin** + **Minocycline -> Doxycycline PO**
- 2025.11.10
  dyspnea with cough, suspect pneumonia
  Doxycycline -> levofloxacin
- 2025.11.11 AAD 轉院 to TPEVGH



Diagnosis

- # Septic shock, postoperative, suspected upper airway infection
  - Aspiration pneumonia
  - Deep neck infection
  - Postoperative infection
  - GI infection
- # Acute kidney injury

Lab Data

10231300					
HIV Ag/Ab combo	Blood	0.38 Non-reactive	COI		1.00
Anti-HBs	Blood	<2.0 Non-reactive	mIU/mL		10.0
RPR	Blood	Non-reactive			

Lab Data

pH Pleural	Pleural fluid	7.4	
Appearance	Pleural fluid	Cloudy	
Amount	Pleural fluid	4.0	mL
RBC	Pleural fluid	1000	/µL
WBC	Pleural fluid	4495	/µL
Diff(L:N:M+H)	Pleural fluid	13:80:7	
Rivalta test	Pleural fluid	Positive	
Color	Pleural fluid	Yellow	
Total cell count	Pleural fluid	5495	/µL

10231700	
Culture No growth	

Total protein(PL)	Pleural fluid	1.4	g/dL
LDH (PL)	Pleural fluid	110	IU/L
GLUCOSE(PL)	Pleural fluid	131	mg/dL

Lab Data

10301000					
C3	Blood	73.8	mg/dL	87.0	200.0
C4	Blood	15.2	mg/dL	19.0	52.0
C-ANCA (Anti-PR3)	Blood	<0.20 Negative	IU/mL		2.00
P-ANCA (Anti-MPO)	Blood	0.30 Negative	IU/mL		3.50
Antinuclear Ab (ANA)	Blood				
ANA	Blood	Negative (<1:80)			

Lab Data

10301100					
Anti-GBM Ab	Blood	<1.5	EliA U/mL		7.0
Anti-dsDNA	Blood	4.20 Negative	IU/mL		10.00
RF	Blood	<10.0	IU/mL	0.0	14.0
ASLO	Blood	<100.0	IU/mL	0.0	250.0

Lab Data

1143111649139	鉤端螺旋體病	徐御凡	2025-10-30 15:44:33	●血清/顯微凝集試驗(MAT)/陰性 //尿液,全血/核酸檢測(NAT) /陰性
1143111649142	漢他病毒症候群	徐御凡	2025-10-30 15:46:13	●血清 /抗體檢測（ELISA-IgG）/陰性 // 抗體檢測（ELISA-IgM）/陰性

Lab Data

10311100 stool		culture No growth	
Stool Routine	Stool		
Appearance	Stool	Semifluid	
Color	Stool	brown	
WBC	Stool	0-1	
RBC	Stool	0-1	
Stool OB	Stool	2+	
Toxigenic C.difficil	Stool	NEGATIVE	

Lab Data

11101000		
Blood culture	Aerobic No growth	
sputum culture	Normal florae	

Diagnosis

- # Septic shock, postoperative, suspected upper airway infection
  - Aspiration pneumonia
  - Deep neck infection
  - Postoperative infection, cannot be ruled out
  - GI infection
- # Acute kidney injury

- Discussion -

Toxic Shock Syndrome : A Literature Review (2024)

Atchade E, De Tymowski C, Grall N, Tanaka S, Montravers P. Toxic Shock Syndrome: A Literature Review. Antibiotics (Basel). 2024 Jan 18;13(1):96. doi: 10.3390/antibiotics13010096. PMID: 38247655; PMCID: PMC10812596.

Table of Contents

Introduction

- Rare, life-threatening toxin-mediated infectious process
- Rapid progression

  → **severe shock**, **multi-organ failure**, **death**
- Mainly caused by
  - ***Staphylococcus aureus***
  - ***Streptococcus pyogenes*** (GAS)
- Other bacteria occasionally reported

Methods

- Literature review using **PubMed** **database**
- Keywords:
  “toxic shock syndrome”, “TSST-1”, “superantigen”,
  “severe streptococcal infection”, “necrotizing soft tissue infection”
- Sources: **original articles**, **reviews**, **case reports**
- Exclusion: **non-English** publications

Pathophysiology

- TSS linked to secretion of **superantigenic exotoxins**
- Exotoxins
  - genetically encoded **bacterial virulence factors**
- Induce **unconventional** **T-cell** activation via **antigen-presenting cells** (**APCs**)

Pathophysiology

- **Conventional** activation:
  - Ag processed → MHC II groove → binds TCR → monoclonal T-cell response
- **Superantigen** activation:
  - binds TCR + MHC II outside Ag site
- Results in **nonspecific**, **polyclonal** **activation** (5–30% of T cells)

Pathophysiology

- Polyclonal activation → strong **NF-κB** activation
- Massive release of **proinflammatory cytokines**
- Clinical signs:
  - **capillary leakage**, **hypotension**, **organ failure**, **coagulation activation**
- Specificities differ in staphylococcal vs. streptococcal TSS

- Staphylococcal TSS -

SA TSS

- First described in 1978 (Todd et al., pediatric cases)
- Clinical features:
  - **fever**, **rash**, **confusion**, **shock**, **multi-organ failure**
- CDC diagnostic criteria (1980s, revised 2011)

CDC Diagnostic Criteria

- **Fever** ≥ **38.9 °C**.
- **Rash** - **diffuse macular erythroderma**.
- Desquamation -

  1-2 weeks after onset of the illness, particularly on palms and soles.
- **Hypotension** -

  SBP ≤ **90 mmHg** for adults or <5th percentile for children <16 years.
- Multisystem involvement - at least 3 of the following:
  - Gastrointestinal - vomiting or diarrhea;
  - Muscular - severe myalgia or elevated creatine phosphokinase twice the upper limit of normal;
  - Mucous membranes - hyperhaemia of any mucosal surface;
  - Renal - blood urea nitrogen or creatinine twice-upper limit of normal;
  - Hepatic - total bilirubin twice-upper limit of normal;
  - Hematological - platelets ≤ 100,000/mm3;
  - Central nervous system - disorientation, combativeness, or alterations in consciousness without focal neurological signs.

Classification of SA-TSS

- SA-TSS divided into:
  - **Menstrual TSS (m-TSS)**
  - **Non-menstrual TSS (nm-TSS)**
- Classification based on clinical context and pathogenesis

Menstrual TSS (m-TSS)

- Occurs in healthy young menstruating women
- Linked to vaginal colonization with TSST-1 producing *S. aureus*
- Risk factors: **tampon use**, absence of **protective antibodies**
- Blood cultures **negative** → exclusively toxin-mediated shock

Non-menstrual TSS (nm-TSS)

- Associated with **staphylococcal** infections (postoperative, postpartum, cutaneous)
- Mixed **septic** + **toxin-mediated** **shock**
- Clinical features similar to m-TSS but in **older** patients
- Blood cultures often **positive** for ***S. aureus***

Risk Factors after Nasal Surgery

- Nasal packing (**51.5%** of cases)
  - **42.4**% nonabsorbable, **15.2**% absorbable
- Stent placement (**9.1**% of cases)
  - **15.2**% had both **packing** and **stents**
- No packing or stent
  - **21.2**% of cases occurred **without foreign material**

O'Shaughnessy J, Chiu J, Shim T, Liao Y, Yang J, Chung S, Koos J, Marcus S. Incidence and Risk Factors for Toxic Shock Syndrome After Endoscopic Sinus Surgery: A Systematic Review. Otolaryngol Head Neck Surg. 2025 Feb;172(2):399-405. doi: 10.1002/ohn.1010. Epub 2024 Oct 16. PMID: 39413334.

Risk Factors after Nasal Surgery

- Perioperative antibiotics (**48.0**% of cases)
  - **No reduction** in TSS risk
- **Duration** of packing
  - **No clear association**
- Other contributing factors
  - **Retained** foreign materials
  - Breaks in sterile technique
  - Pre-existing ***Staphylococcus aureus*** colonization

O'Shaughnessy J, Chiu J, Shim T, Liao Y, Yang J, Chung S, Koos J, Marcus S. Incidence and Risk Factors for Toxic Shock Syndrome After Endoscopic Sinus Surgery: A Systematic Review. Otolaryngol Head Neck Surg. 2025 Feb;172(2):399-405. doi: 10.1002/ohn.1010. Epub 2024 Oct 16. PMID: 39413334.

Microbiology & Resistance

- Superantigenic exotoxins: **TSST-1, enterotoxins A,B,C**
- **TSST-1**: majority of m-TSS, ~**50%** of nm-TSS
- Most strains **methicillin-susceptible**; **MRSA rare** but reported
- Nasal colonization with TSST-1 producing *S. aureus* may be a risk factor

- Streptococcal TSS -

STSS

- First described in 1987 (Cone et al.) → “streptococcal toxic shock-like syndrome”
- 1989: Stevens et al. → 20 cases with shock, multi-organ failure, tissue destruction
- Now recognized as streptococcal toxic shock syndrome (STSS)

Diagnostic Criteria

- CDC criteria: clinical **severity** + presence of **GAS**
- GAS detected in
  - **non-sterile** sites (throat, vagina, sputum)
  - or **sterile** sites (blood, CSF, peritoneal fluid, tissue biopsy)
- Diagnosis requires both clinical and microbiological evidence

Clinical Presentation & Risk Factors

- Typically affects older adults (50–69 years) with **comorbidities**
- Risk factors: **diabetes**, **malignancy**, **hepatic** disease, chronic **renal** impairment, **heart** disease
- **NSAIDs** and **alcoholism** suspected contributors
- Clinical features: **hypotension** (100%), **renal** failure (93%), **hepatic** failure (57%), **DIC** (64%), **multi-organ failure** (43%)
- Strong association with necrotizing infections (**NSTI**, **myonecrosis**)

Microbiological Features

- Entry via skin or mucosal barrier → **deep tissue spread**
- Superantigenic exotoxins: **SpE A**, **B**, **C**; streptococcal **superantigen A** (**SsA**)
- Common genotypes: *emm1* (41%), *emm3*, *emm28*, *emm89*
- **STSS** more frequent with ***Spe*A/*Spe*C** genes vs. ***SsA***
- ***Spe*B + M protein** → rapid dissemination, excessive immune activation

Other pathogens

- Reported in case studies:
  - Group B, C, G streptococci
  - *Yersinia pseudotuberculosis*
  - *Pseudomonas fluorescens*
  - *Mycoplasma arthritidis*
  - *Clostridium*
  - coagulase-negative staphylococci (CNS)
- Pathophysiology **not well established**
- Only **isolated human cases** → insufficient evidence

- Management of TSS -

Supportive management

- **Early recognition** and immediate **resuscitation** essential
- Organ support: **fluids**, **vasopressors**, **intubation**, **ventilation**, **renal** replacement if needed
- **No bedside test** for toxin detection

Source Control

- Remove foreign bodies in menstrual TSS (tampon, IUD, menstrual cup)
- Collect vaginal or cervical samples for *S. aureus*
- In **non-menstrual** or **streptococcal TSS**: urgent surgery → **debridement**, **drainage**, **deep tissue** sampling

Antibiotic Therapy

- Start **IV bactericidal antibiotics** within **1 hour** (Surviving Sepsis Guidelines)
- Empirical therapy: **Gram-positive cocci**; consider **MRSA** risk factors
- **NSTI**-associated **TSS**: **broad spectrum** (Gram+/-, anaerobes)
- De-escalate after susceptibility results
- **Duration**: not well defined; may stop **48–72h** post-final surgery if **stable**

Adjunctive Therapies

- Antitoxic antibiotics: **clindamycin**, **linezolid** → inhibit exotoxin production
- Evidence: observational studies, **recommended** in **GAS NSTI**
- **IVIG**: in vitro **neutralizes superantigens**; **mixed clinical evidence**
- Role of IVIG remains under evaluation

- Outcomes -

Staphylococcal TSS

- **Overall mortality ~5%**
- **Menstrual TSS** (**m-TSS**): mortality rare (**0**-**5.7**%), shorter hospital stay (~**5** days)
- **Non-menstrual TSS** (**nm-TSS**): higher mortality (**4**-**22**%), longer hospitalization (~**11** days)
- **Postoperative TSS**: mortality ~**9.4**%, **24**% permanent complications (amputation, reduced mobility, etc.)

Streptococcal TSS (STSS)

- **Mortality** significantly **higher**: **14-64**%
- **Lowest mortality** (<1%) in **postpartum STSS**
- Blood cultures **positive** in majority
- **STSS** during **invasive GAS** infection → **independent risk factor** for death (OR 12.7)
- Confirmed by European studies

Perspectives

- Probiotics (*Lactobacillus acidophilus, Lacticaseibacillus rhamnosus*) may **reduce *S. aureus* growth** and **TSST-1** production
- Recombinant TSST-1 variant vaccine: **safe**, well **tolerated**, **immunogenic** (**phase 1 trial**)
- Promising, but require **extended clinical trials**

Conclusions

- TSS: **rare** **but** **severe**, urgent management required
- Pathophysiology, clinical features, and management described, but **evidence remains low** (**retrospective, in vitro**)
- Further research needed: microbiota, environment, antitoxic antibiotics, IVIG, vaccination
- Prospective studies difficult due to low incidence