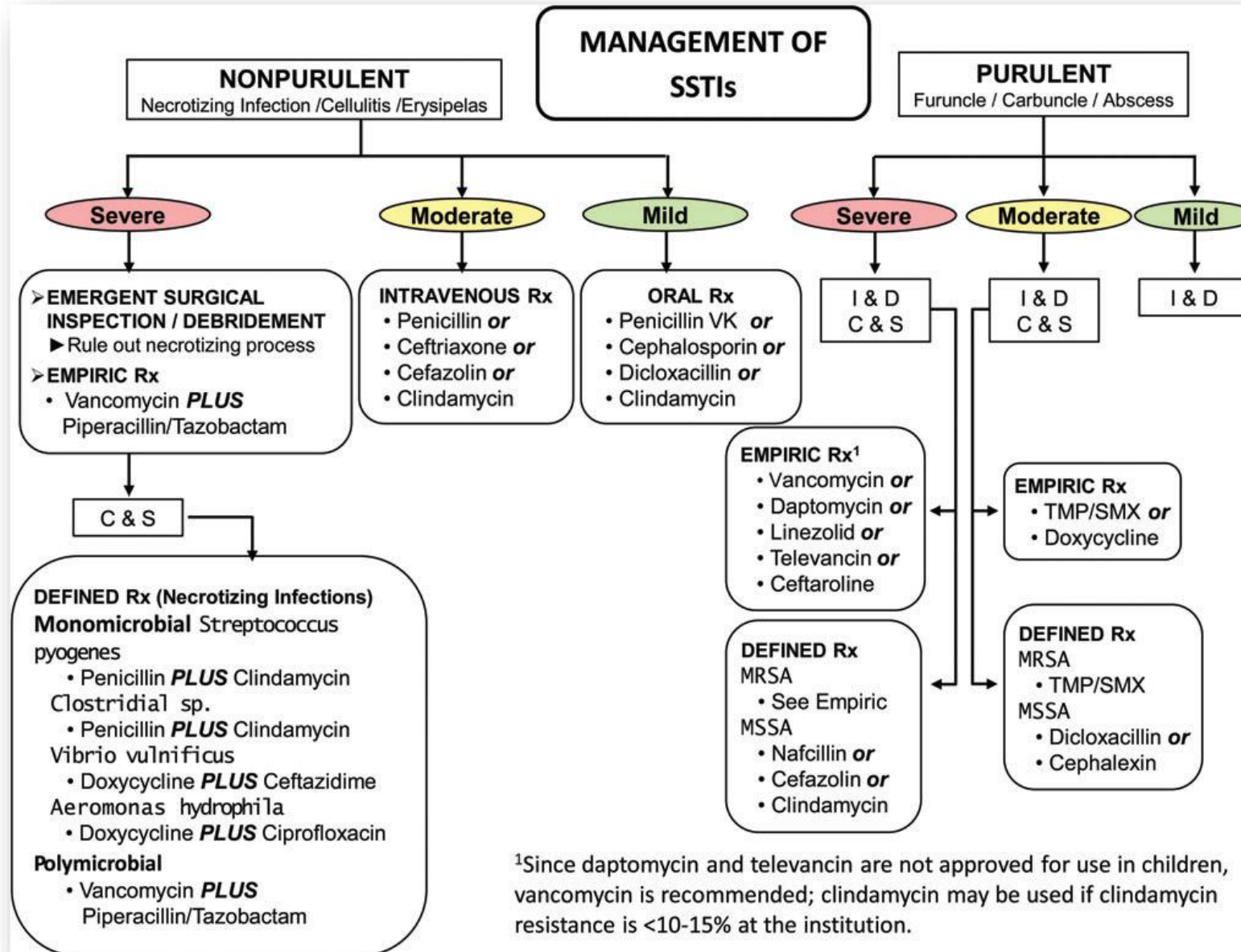


Infections nécrosantes des parties molles

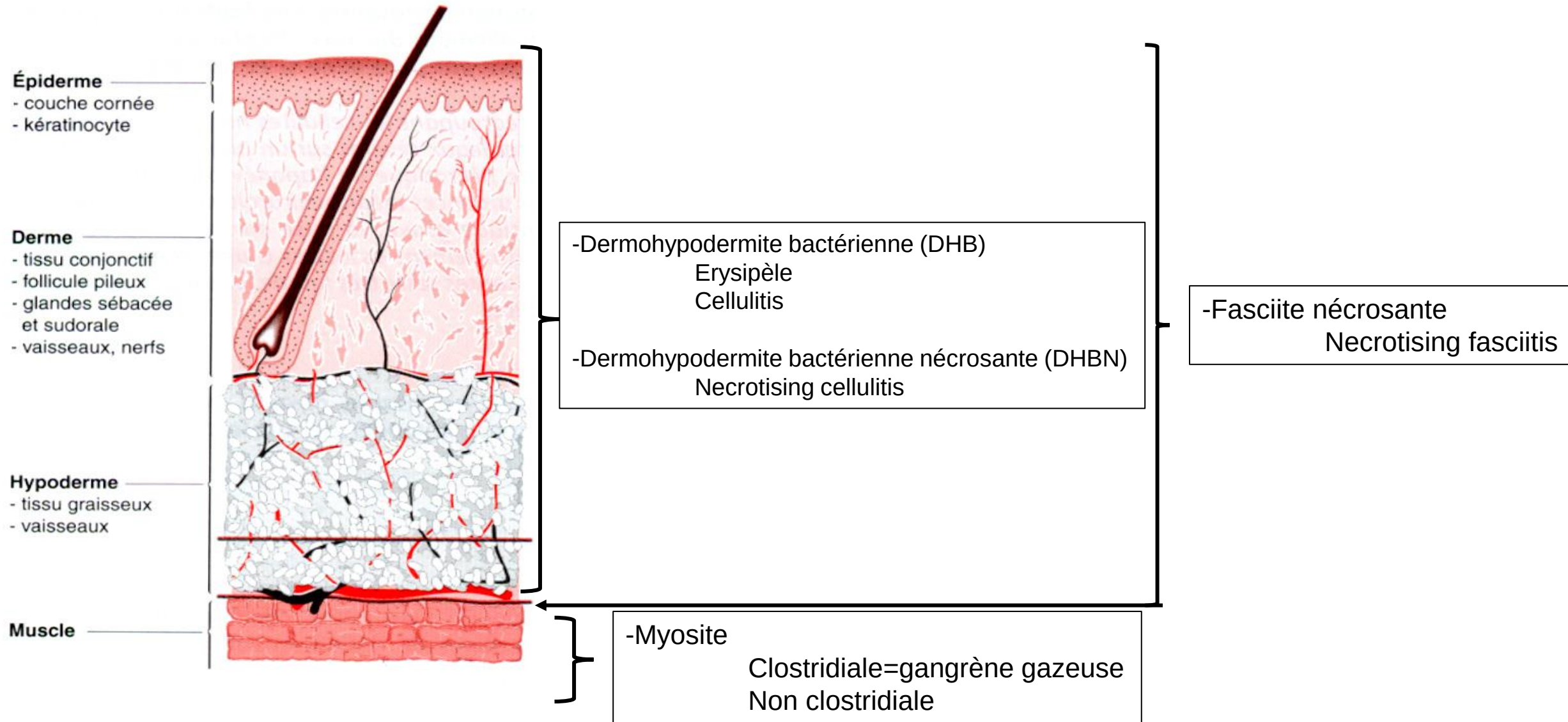
Pr Julien Poissy
Médecine intensive/Réanimation CHU Lille

DUCAI
26/01/2023

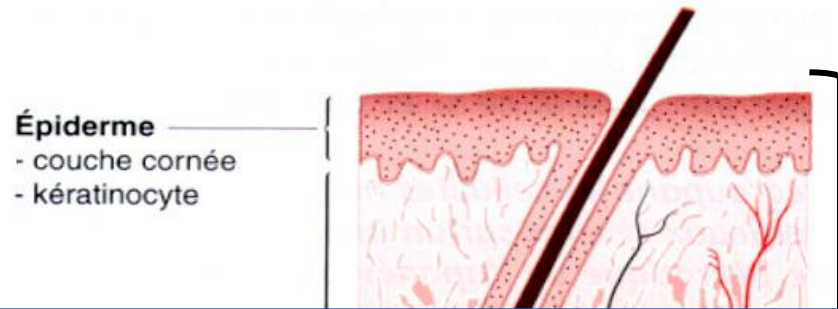
Terminologie - classification



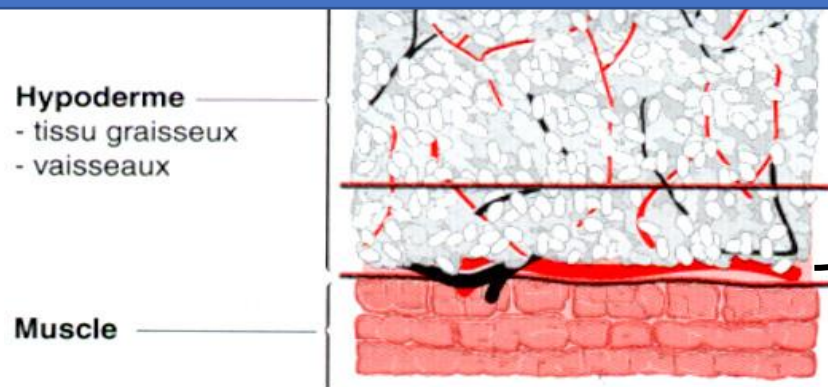
Les infections « non purulentes »: classification selon la **profondeur de l'atteinte** et le **caractère nécrotique**



Les infections « non purulentes »: classification selon la **profondeur de l'atteinte** et le **caractère nécrotique**



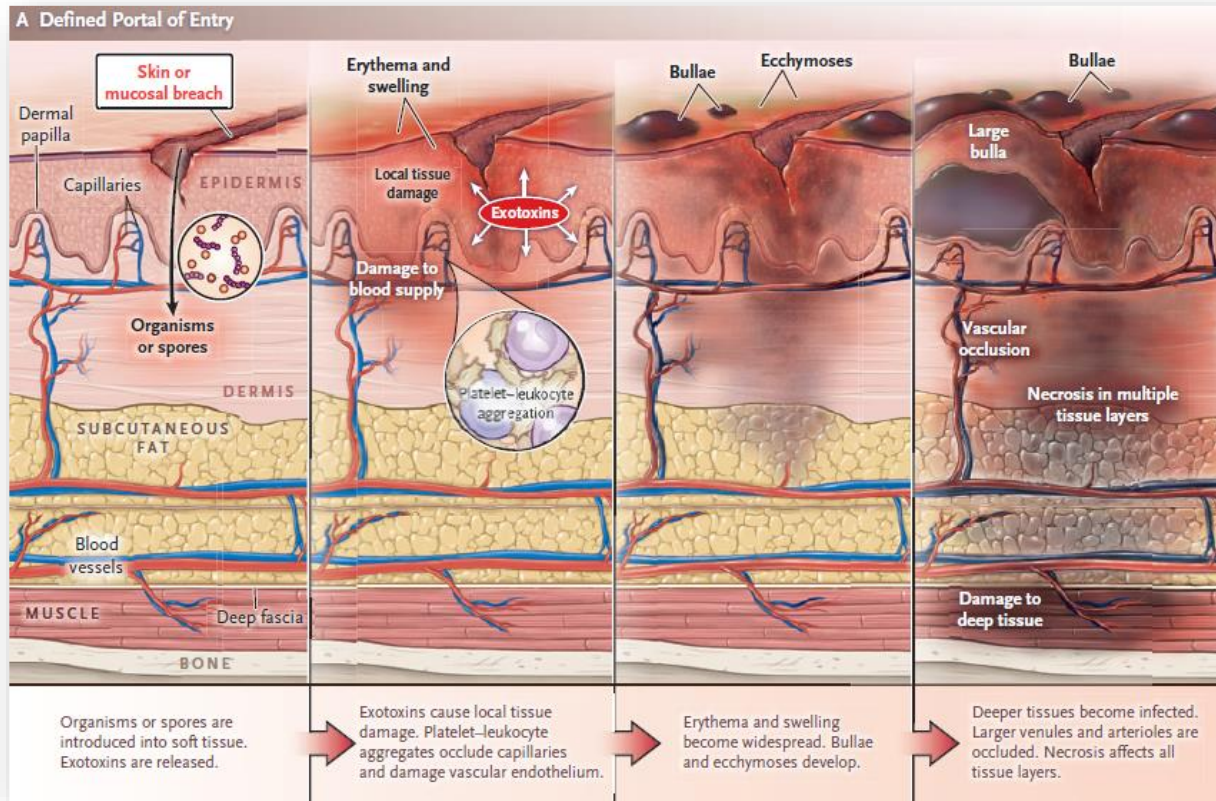
Necrotizing soft tissue infections : NSTIs Infections nécrosantes peau et parties molles



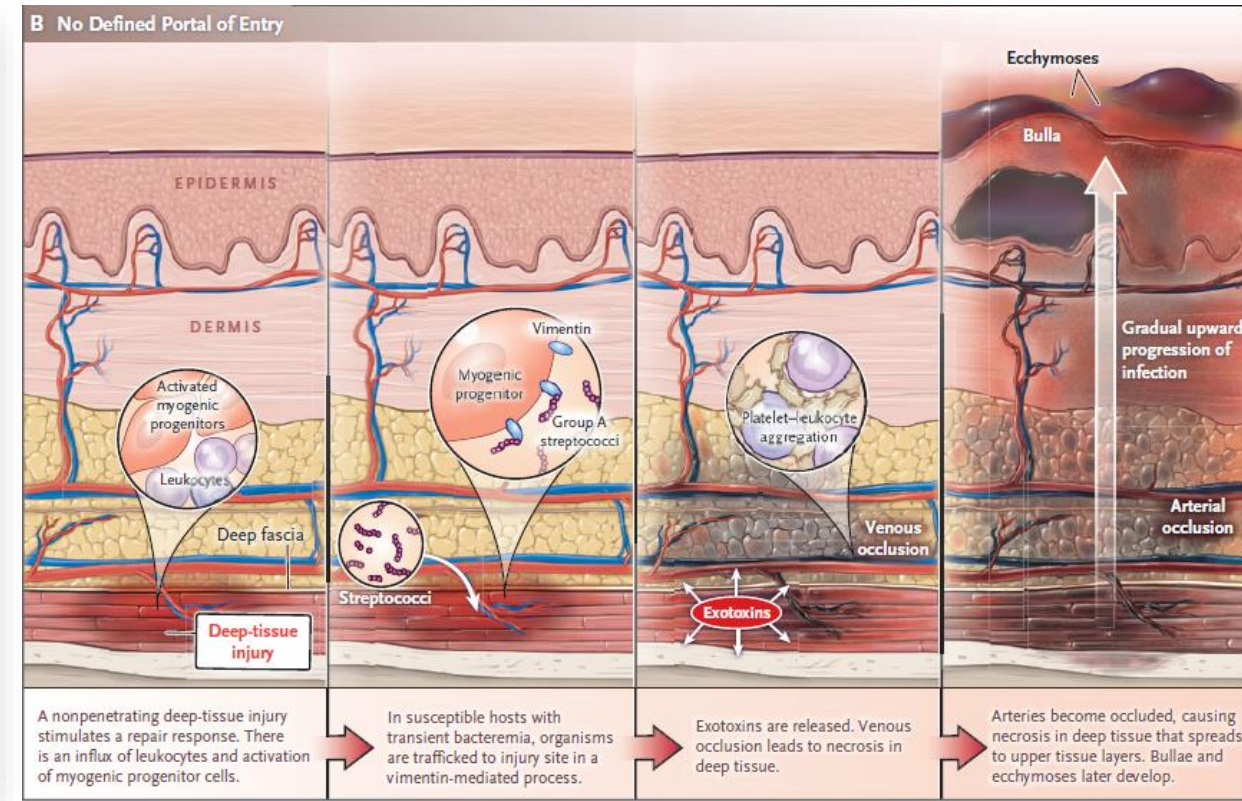
-Myosite

Clostridiale=gangrène gazeuse
Non clostridiale

Différentes présentations cliniques des NSTIs selon la porte d'entrée



Porte d'entrée « connue » de type effraction
Progression de la surface vers la profondeur



Porte d'entrée « inconnue »
Progression de la profondeur vers la surface

Nécrosant versus non-nécrosant : plus rare

DH non nécrosante

- Adulte de plus de 50 ans
- 10-100 nouveaux cas par an/100 000 habitants
- Facteurs de risque
 - Obésité
 - Lymphoedème/insuffisance veineuse
 - Porte d'entrée : intertrigo, ulcères etc...
 - Diabète non équilibré
 - immunodépression

DH nécrosante

- 4-8 nouveaux cas par an/100 000 habitants
- Myosite clostridiale devenue très rare
- Facteurs de risque
 - Les mêmes + :
 - Contusion
 - Effraction/plaie pénétrante
 - Cancer
 - Rôle discuté des AINS

Nécrosant versus non-nécrosant : plus grave, multimicrobien

DH non nécrosante

- Monomicrobien
 - Majoritairement Streptocoque B-hémolytique du groupe A (*Streptococcus pyogenes*)
 - Plus rarement Staphylocoque doré (*Staphylococcus aureus*)
- Spécificités bactériologiques en fonction du terrain
- Gravité/retentissement général rares
 - Choc septique

DH nécrosante

- 70-80% plurimicrobien
 - Synergie flore aérobie/anaérobie.
 - Genre et espèces en fonction des localisations (membres, périnées, face) et des circonstances de survenue
- 20-30 % monomicrobien
 - *S. pyogenes* et *S. aureus*
- Spécificités bactériologiques en fonction du terrain
- Grave :
 - Réanimation dans 50% des cas

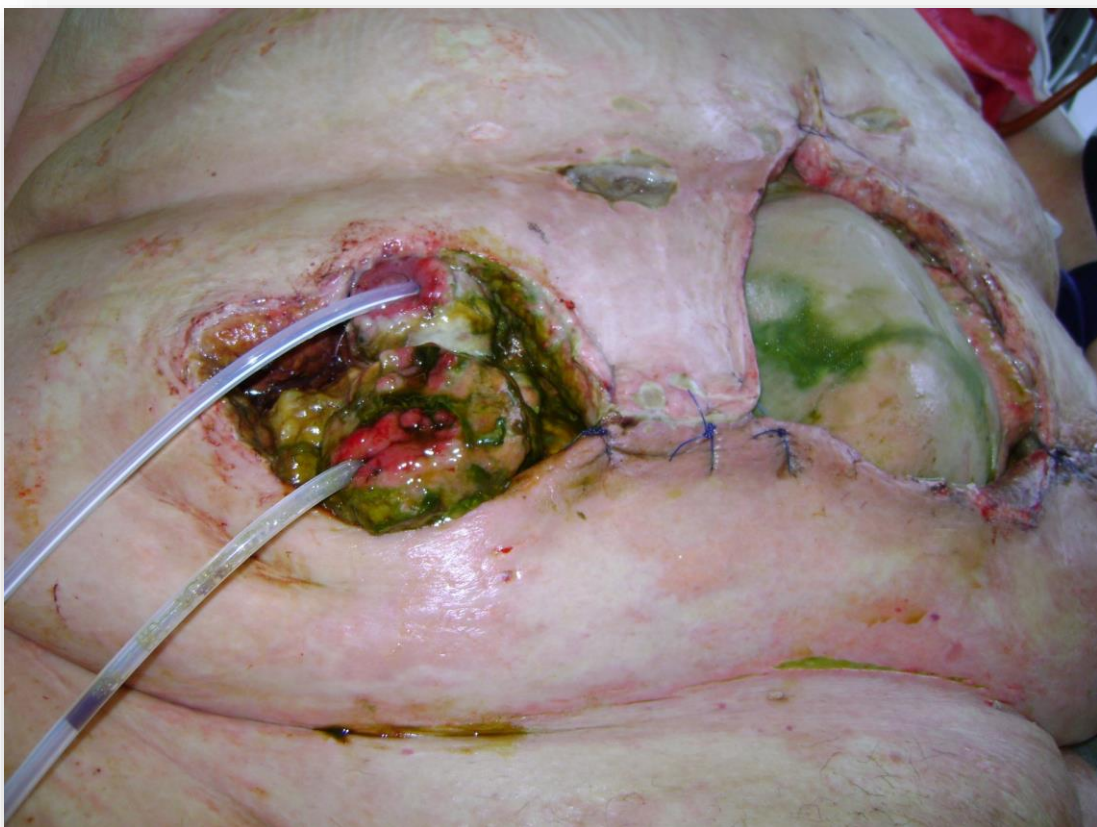


Crédit photo: www.smartfiches.fr











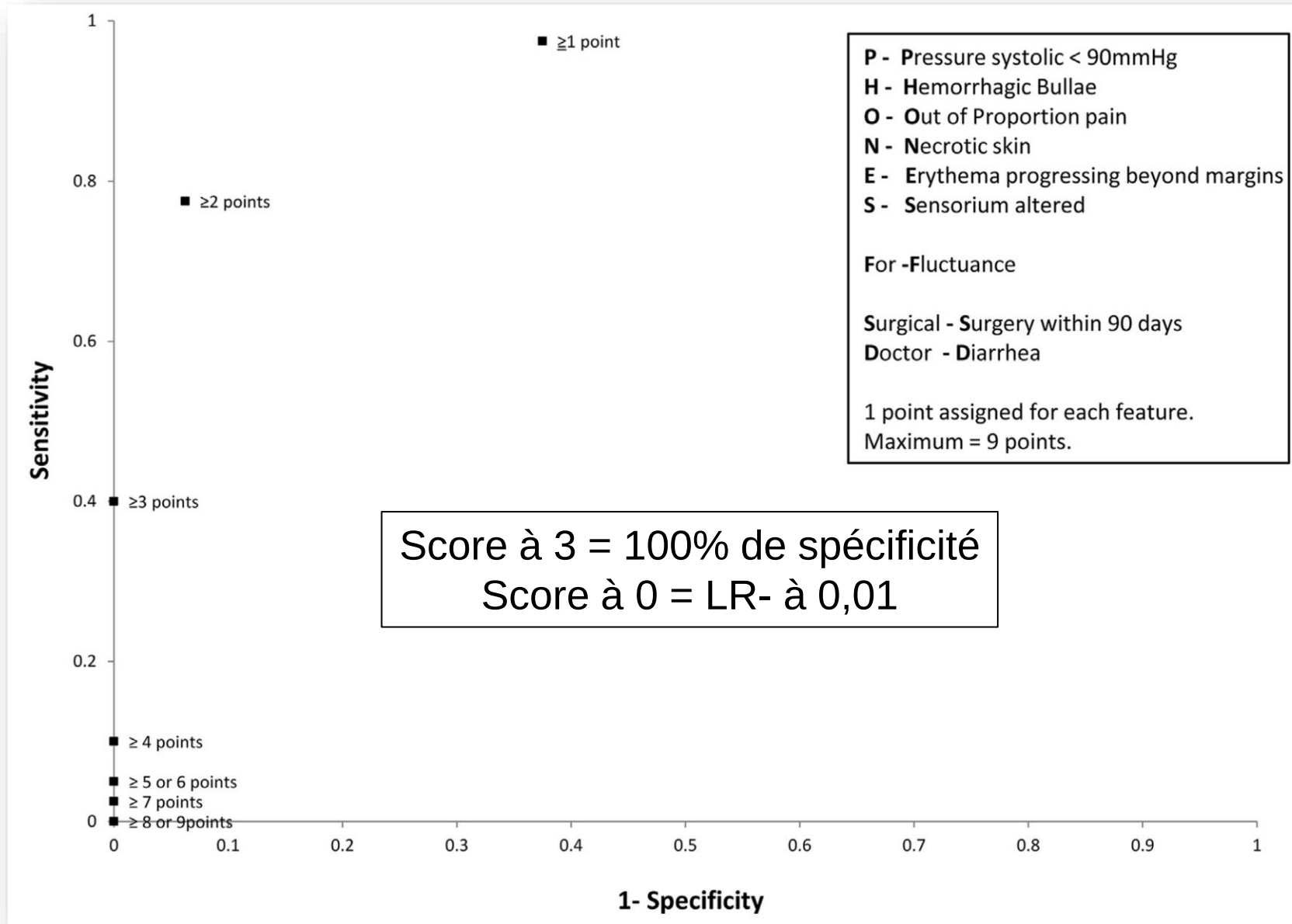
Enjeu 1 : faire le diagnostic de NSTI et poser l'indication chirurgicale

Diagnostic Accuracy of History and Physical Examination Findings in Distinguishing Necrotizing Fasciitis from Cellulitis

History	Sensitivity	Specificity	PPV	NPV	LR+	LR-
Subjective fever	0.45	0.68	0.41	0.71	1.38	0.81
Chills	0.33	0.66	0.33	0.66	0.96	1.01
Shortness of breath	0.3	0.85	0.5	0.708	2.0	0.82
Skin swelling	0.6	0.08	0.27	0.30	0.66	4.57
Pain	0.75	0.1	0.29	0.44	0.83	2.5
Pain out of proportion ←	0.4	0.91	0.7	0.75	4.57	0.66
Skin anesthesia	0.0	0.96	0.0	0.66	0.0	1.03
Surgery within 90 days ←	0.35	0.95	0.78	0.75	7.0	0.68
Nausea and vomiting	0.33	0.86	0.54	0.72	2.36	0.78
Diarrhea ←	0.075	0.98	0.75	0.68	6.0	0.93
Physical examination	Sensitivity	Specificity	PPV	NPV	LR+	LR-
Erythema	0.85	0.05	0.31	0.4	0.89	3
Erythema progressive beyond margins ←	0.43	0.86	0.61	0.75	3.09	0.67
Tenderness	0.73	0.16	0.3	0.54	0.87	1.69
Swelling	0.7	0.05	0.27	0.25	0.74	6.0
Local warmth	0.35	0.28	0.19	0.46	0.48	2.36
Fluid-filled vesicles (ulcers, blisters, bullae)	0.3	0.75	0.38	0.68	1.2	0.93
Skin fluctuance ←	0.13	0.98	0.71	0.69	5.0	0.9
Skin induration	0.1	0.91	0.36	0.67	1.14	0.99
Hemorrhagic bullae ←	0.1	0.99	0.8	0.69	8.0	0.91
Skin anesthesia	0.0	0.98	0.0	0.66	0.0	1.01
Crepitus	0.13	1.0	1.0	0.7	N/A	0.88
Necrosis ←	0.38	0.99	0.94	0.76	30.0	0.63
Ischemia	0.0	1.0	N/A	0.66	N/A	1.0
Cyanosis	0.15	1.0	1.0	0.7	N/A	0.85
Purulence	0.4	0.85	0.57	0.74	2.67	0.71
Altered LOC	0.25	0.93	0.63	0.71	3.33	0.81



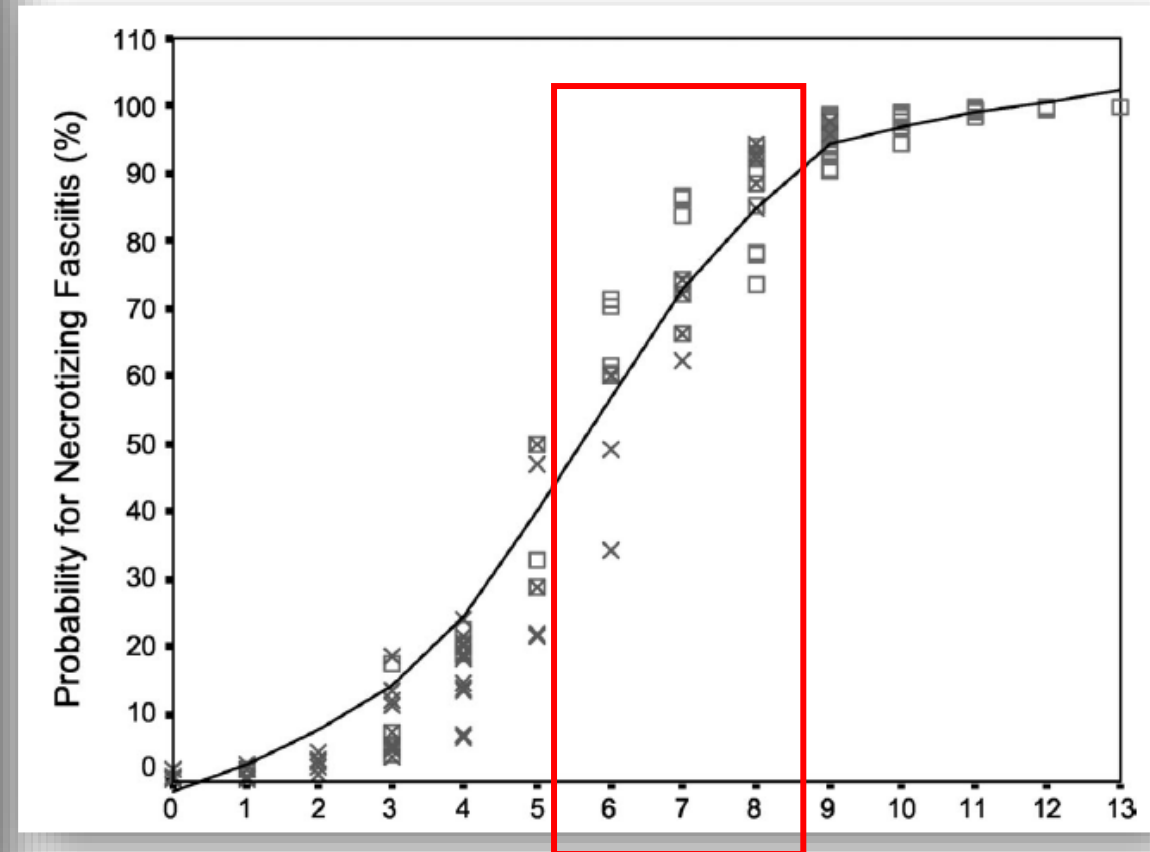
Le score clinique « Phones for surgical doctor »



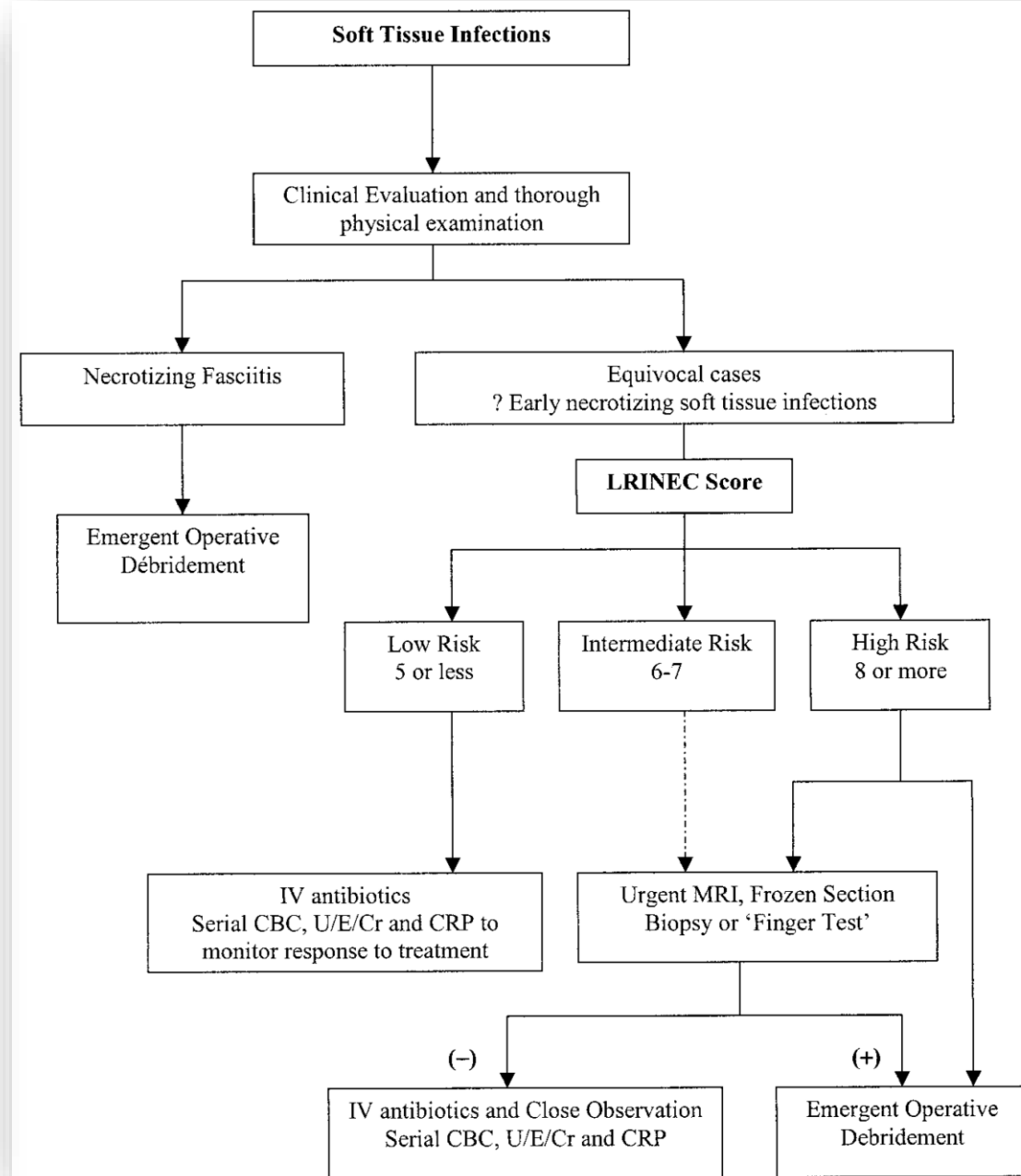
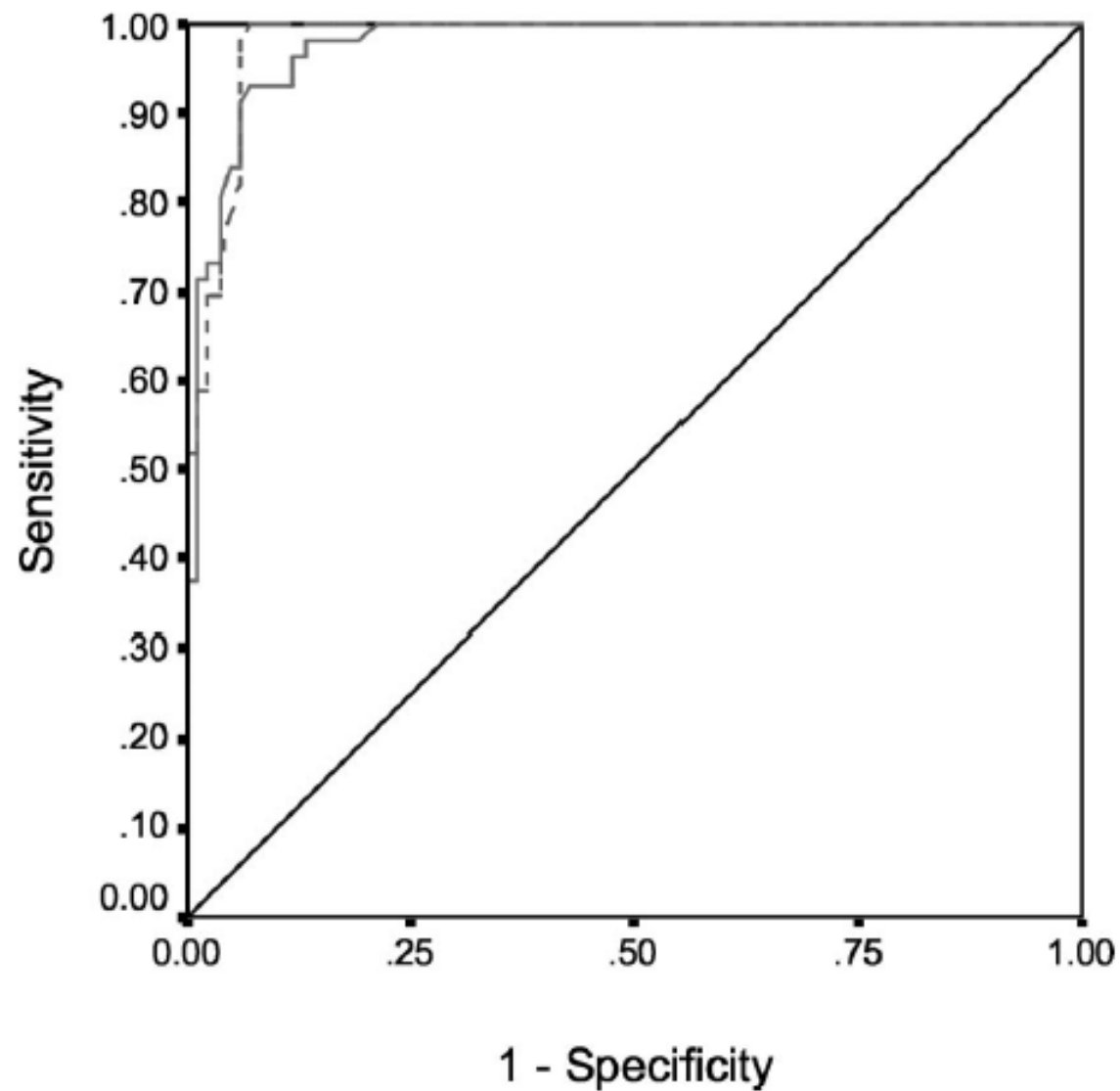
Le score biologique LRINEC

Table 2. Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score

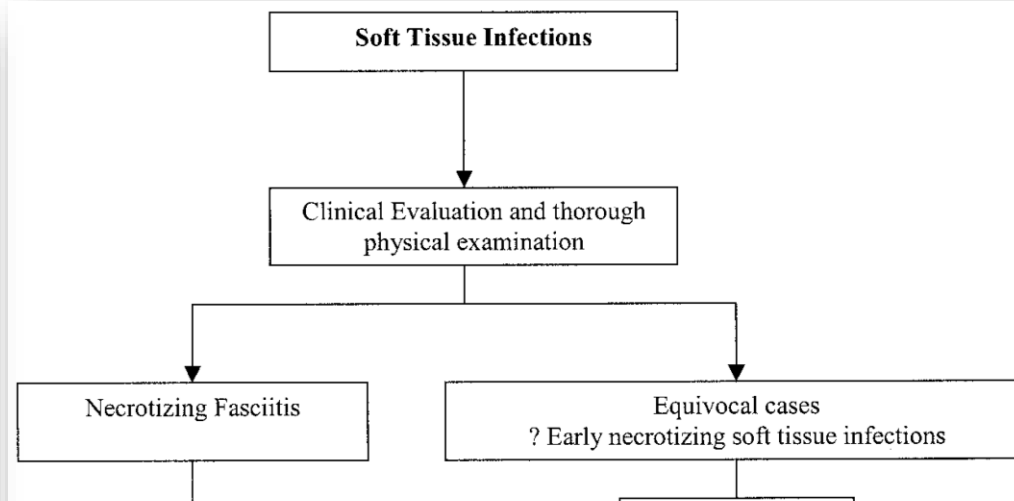
Variable, Units	β	Score
C-Reactive Protein, mg/L		
<150	0	0
≥ 150	3.5	4
Total white cell count, per mm ³		
<15	0	0
15–25	0.5	1
>25	2.1	2
Hemoglobin, g/dL		
>13.5	0	0
11–13.5	0.6	1
<11	1.8	2
Sodium, mmol/L		
≥ 135	0	0
<135	1.8	2
Creatinine, $\mu\text{mol/L}$		
≤ 141	0	0
>141	1.8	2
Glucose, mmol/L		
≤ 10	0	0
>10	1.2	1



ROC Curve

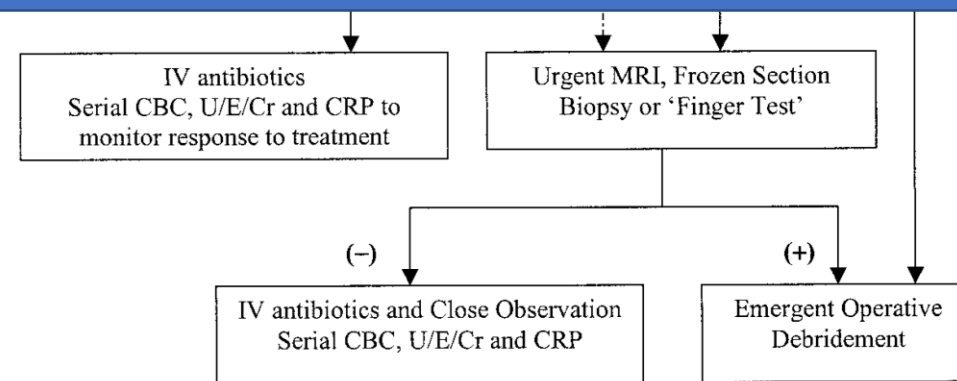
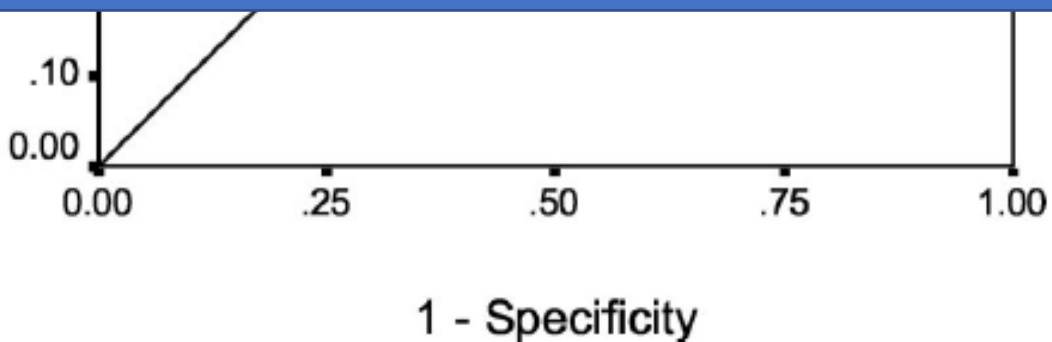


ROC Curve

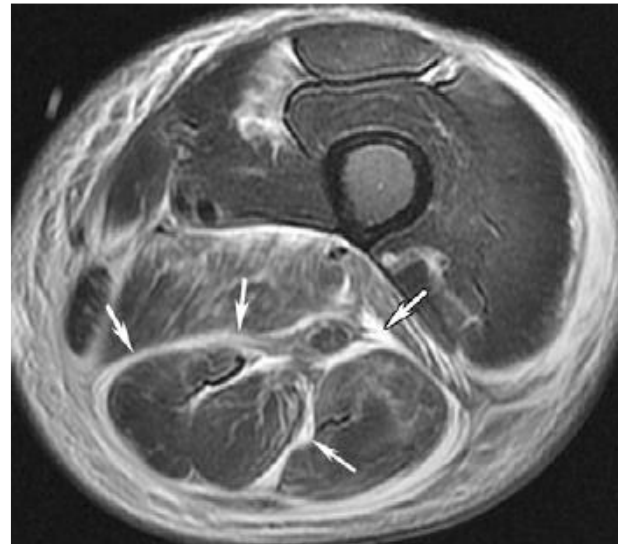
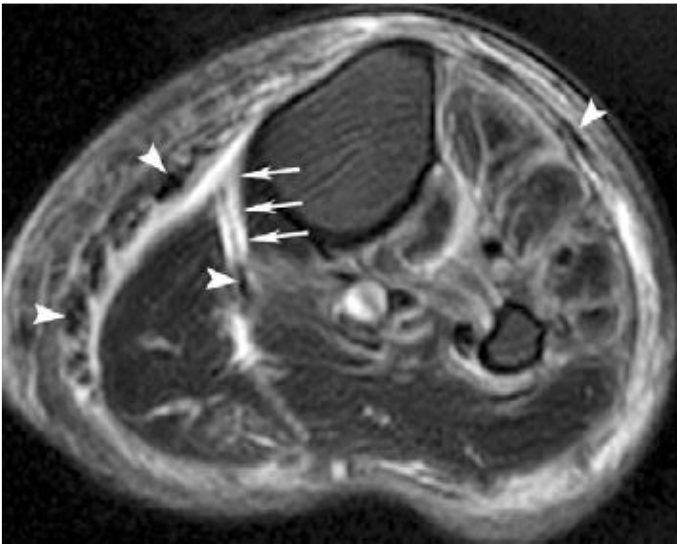


Quelques drapeaux rouges supplémentaires :

- Etat de choc : défaillances viscérale, lactates
- CPK
- Prise de pression dans les loges



Les données d'imagerie évocatrices de fasciite nécrosante



Kim KT et al. Radiology. 2011

TDM
Epaississement des fascias
Absence de réhaussement à l'injection
Carbonetti F et al. Radiol Med. 2016

Prevalences of MR Findings in NIF and Non-NIF Patient Groups

MR Sequence and Finding	NIF Group (n = 7)	Non-NIF Group (n = 23)	P Value
T2-weighted imaging*			
Signal intensity			.009†
Low	1 (14)	0 (0)	
High	4 (57)	23 (100)	
Mixed high and low	2 (29)	0 (0)	
Signal intensity thickness			.025†
Thin (<3 mm)	1 (14)	16 (70)	
Thick (≥3 mm)	6 (86)	7 (30)	
Pattern of abnormal signal intensity in muscle			.38
No abnormality	1 (14)	14 (61)	
Peripheral bandlike high signal intensity	5 (71)	5 (22)	
Patchy high signal intensity	1 (14)	4 (17)	
Degree of deep fascia involvement‡			.007†
Partial	0 (0)	14 (61)	
Extensive	7 (100)	9 (39)	
Degree of compartment involvement			.009†
Less than three compartments	1 (14)	17 (74)	
Three or more compartments	6 (86)	6 (26)	
Contrast-enhanced T1-weighted imaging§			
Contrast enhancement pattern of abnormal deep fascia			.013†
No enhancement	1 (14)	2 (9)	
Enhancement	1 (14)	17 (74)	
Enhancement with nonenhancing portion	5 (71)	4 (17)	
Contrast enhancement pattern in muscle			.397
No abnormality	4 (57)	16 (70)	
Peripheral bandlike enhancement	3 (43)	4 (17)	
Patchy enhancement	0 (0)	3 (13)	
Abscess in subcutaneous fat layer			.326
Present	2 (29)	11 (48)	
Absent	5 (71)	12 (52)	

Les données d'imagerie évocatrices de fasciite nécrosante

- Et les DHBN ?
 - Expérience du radiologue en pratique ?
 - /!\: ces infections NE SONT PAS COLLECTEES !!
 - La recherche de collection n'est pas la question posée
- L'absence de collection ne doit pas faire écarter le diagnostic de NSTIs
- L'absence de collection ne doit pas faire récuser la chirurgie
 - Rien ne doit retarder la chirurgie
- Le chirurgien est votre meilleur allié : soyez convaincant !!
 - La clinique prime !!++
 - Au moindre doute : avis chirurgical
- Au moindre doute pendant l'avis chirurgical : chirurgie !

Present	2 (29)	11 (48)
Absent	5 (71)	12 (52)



En pratique le délai de réalisation de la chirurgie a un impact majeur sur le pronostic

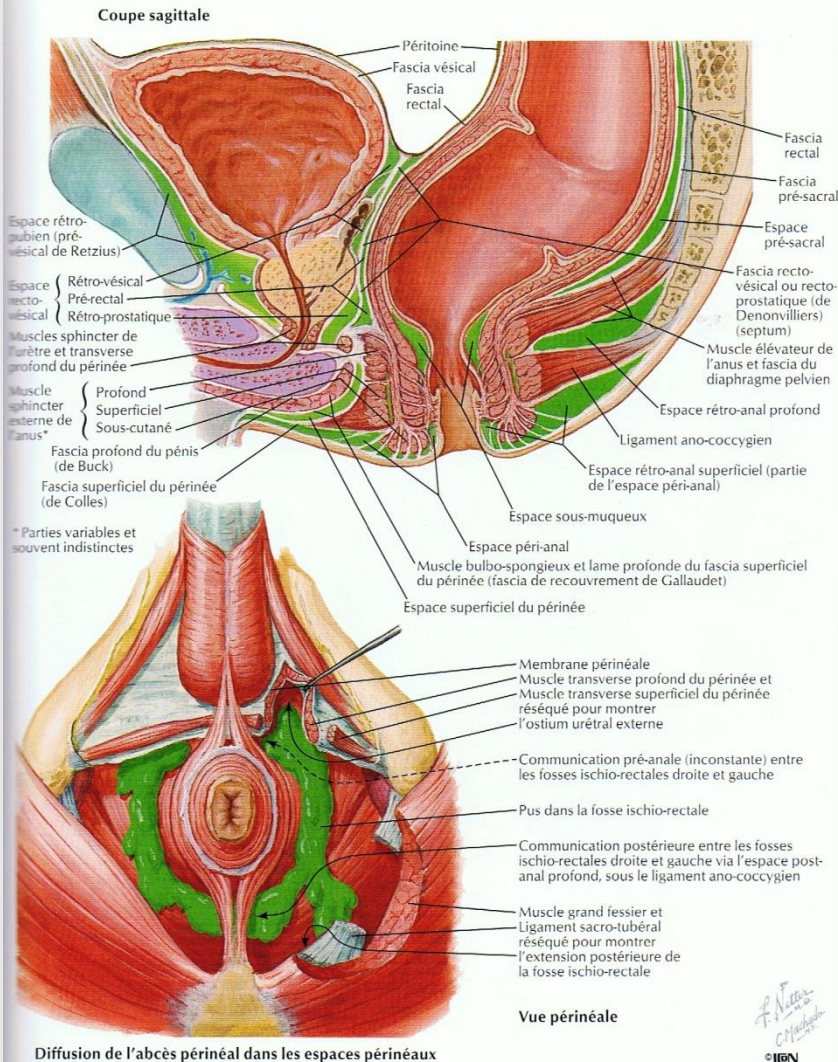
Variables	Adjusted OR	95% CI	<i>P</i> value
SAPS II	1.15	1.04–1.26	0.02
Cardiovascular disease			
No	1	–	
Yes	13.9	1.8–106	0.01
Localization			
Extremities	1	–	
Abdominoperineal	15.1	1.5–149	0.002
Time from first signs to diagnosis; <i>n</i> = 99 ^a			
>72 h	1	–	
≤72 h	0.09	0.01–0.68	0.02
Time from diagnosis to surgery in patients with septic shock; <i>n</i> = 33 ^b			
≤14 h	1	–	
>14 h	34.5	2.05–572	0.007

La conception classique : un geste radical « carcinologique »



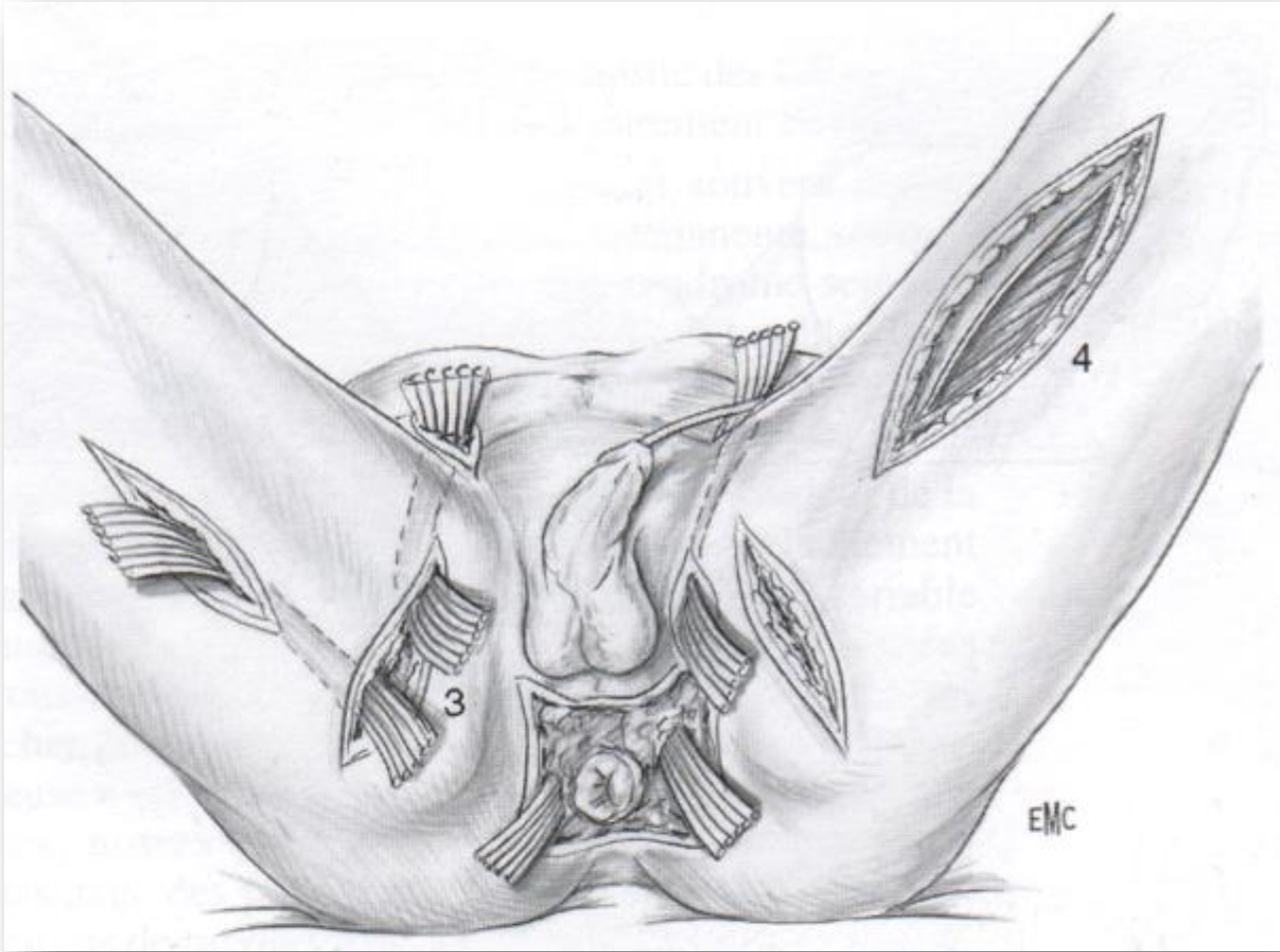
Quelques plans de clivage anatomiques à connaître : extension/porte d'entrée

Espaces périnéo-pelviens réels et potentiels

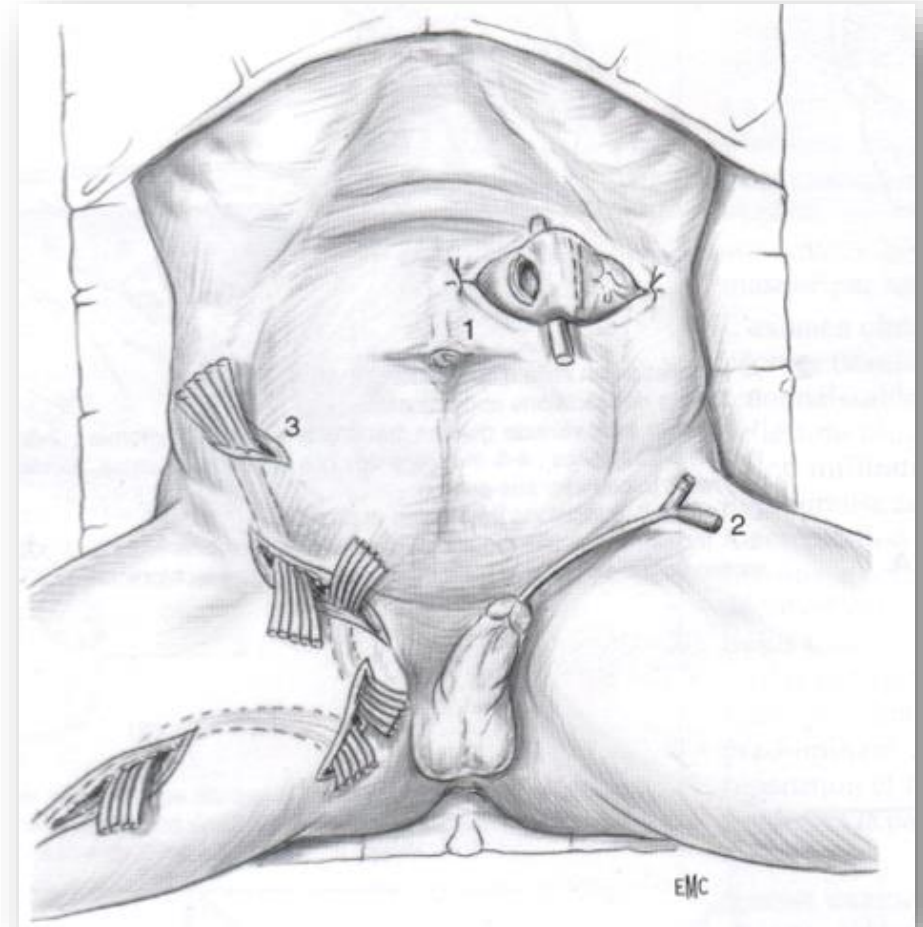




Chirurgie : localisation périnéale



Drainage par mise en place de lames de Delbet



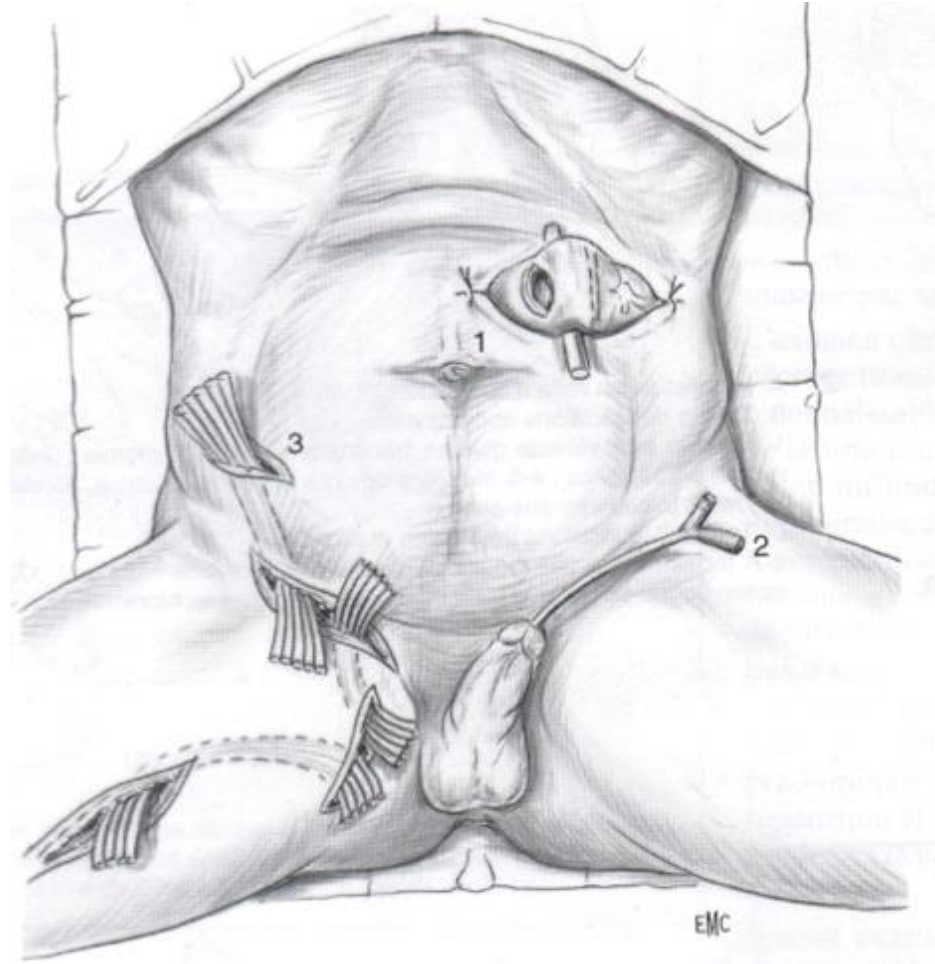
Dérivation urinaire et digestive

Dérivation urinaire :

- Sonde vésicale

Dérivation digestive :

- Colostomie de protection (transverse gauche)
- Collecteur fécal







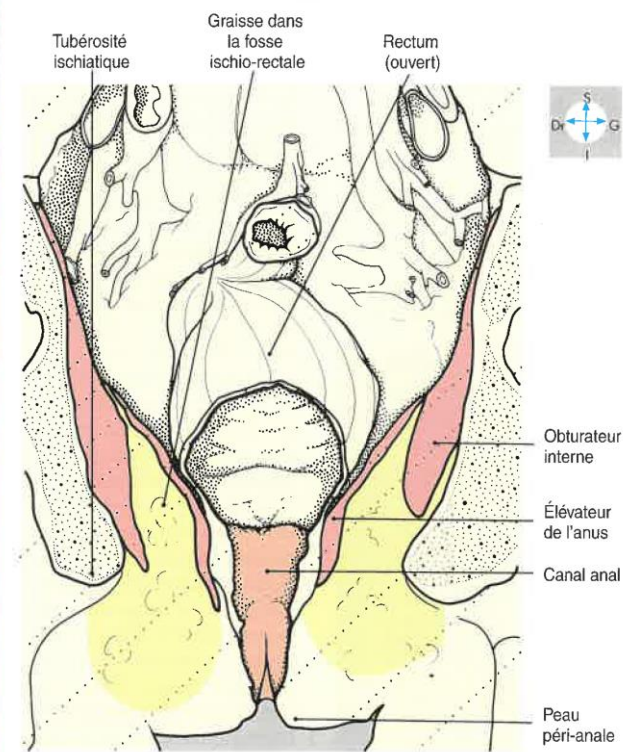
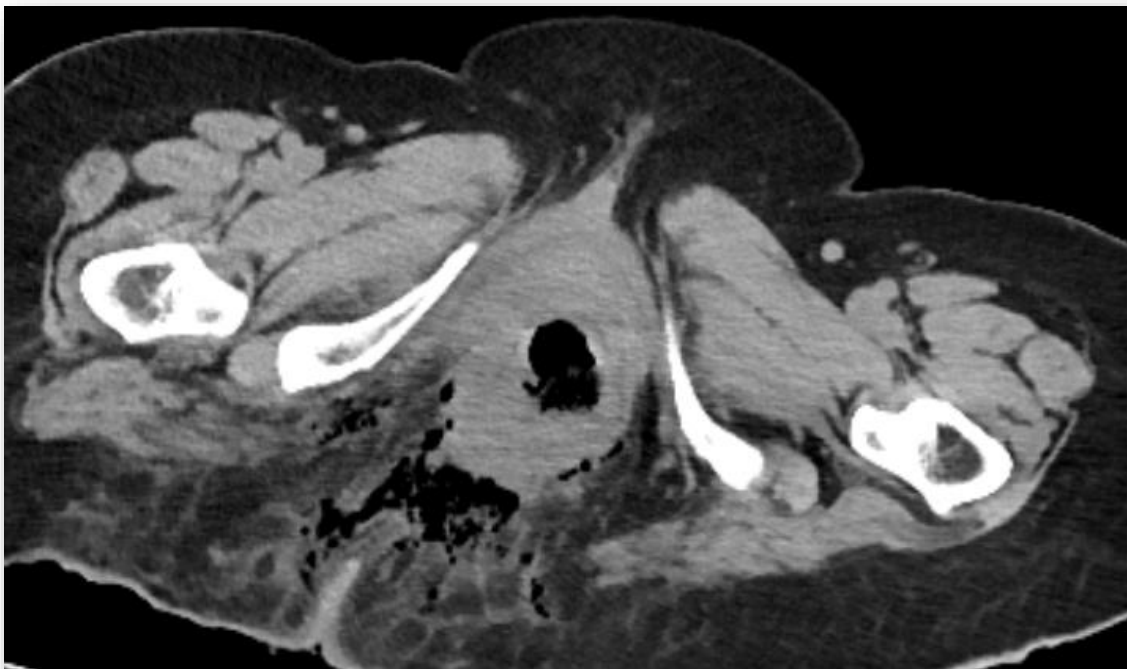
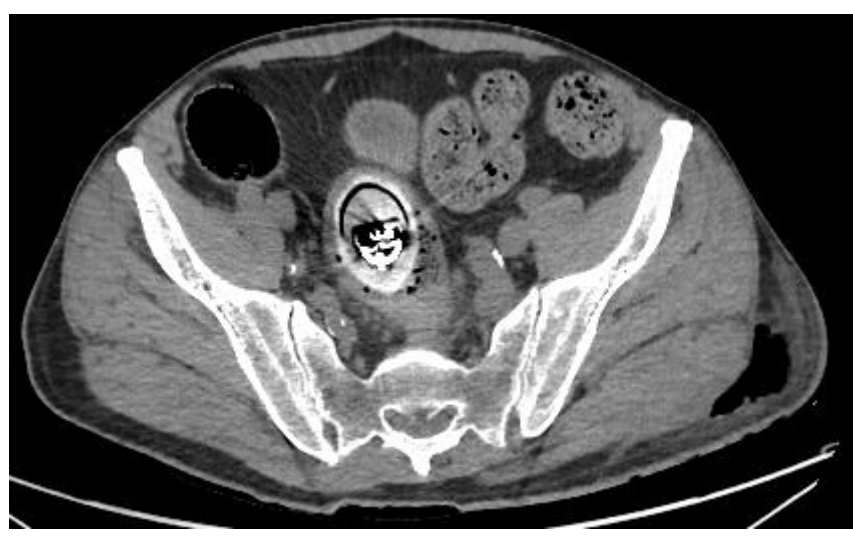
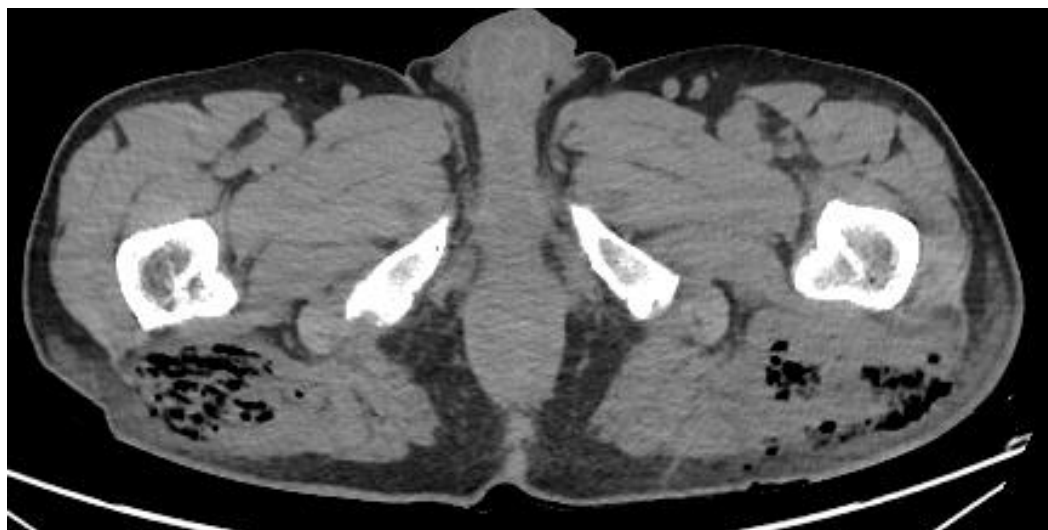


Fig. 5.34 Coupe frontale dans le canal anal et les fosses ischio-rectales.

In Anatomie humaine. Gosling et al. Éd De Boeck





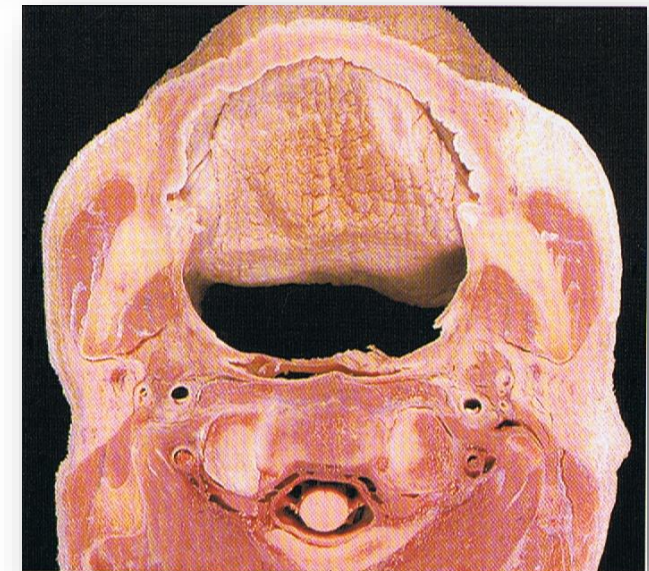
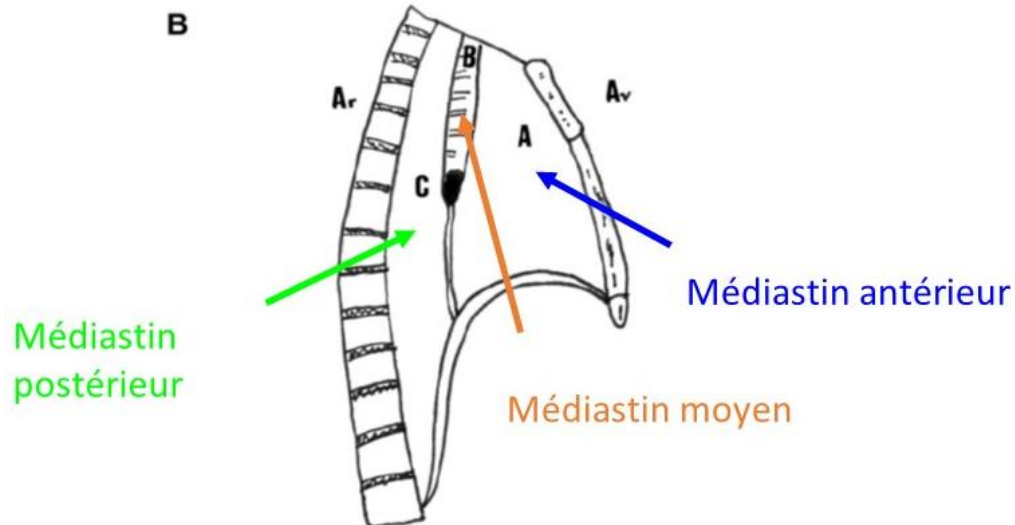
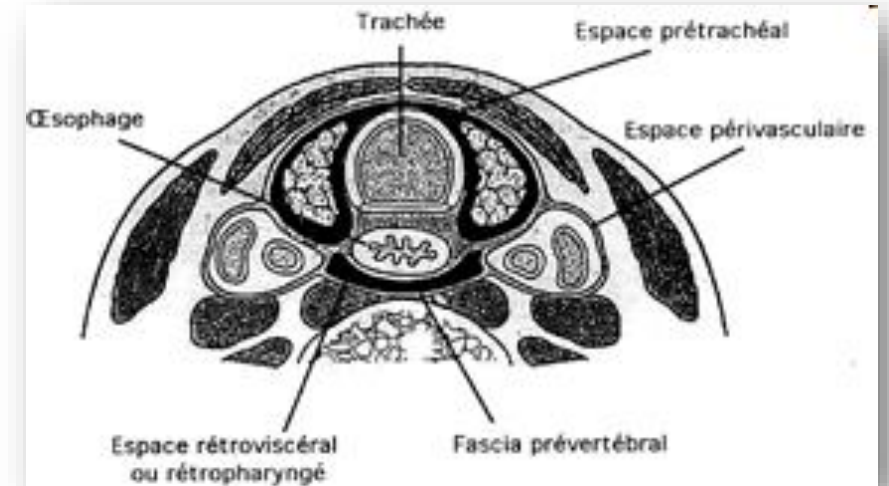
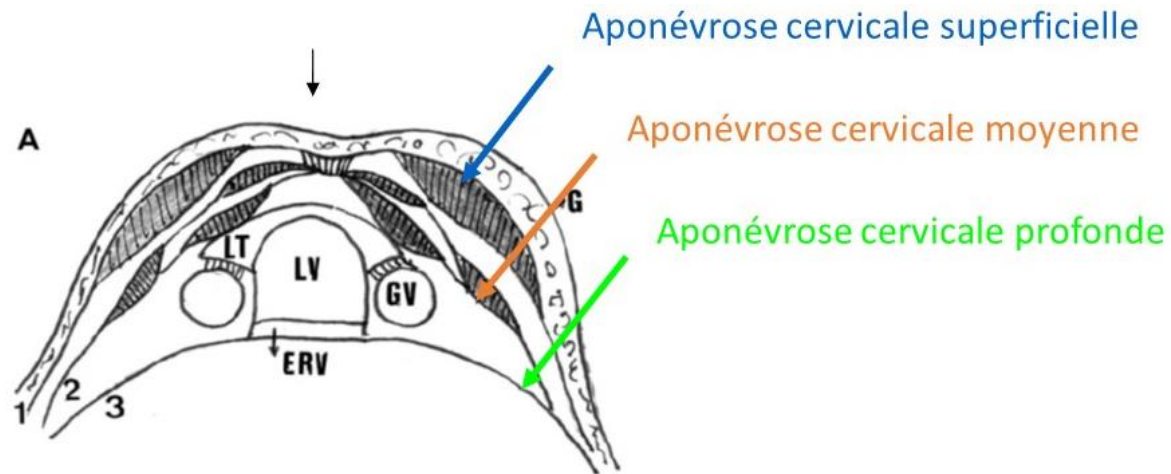


Diagnostic différentiel

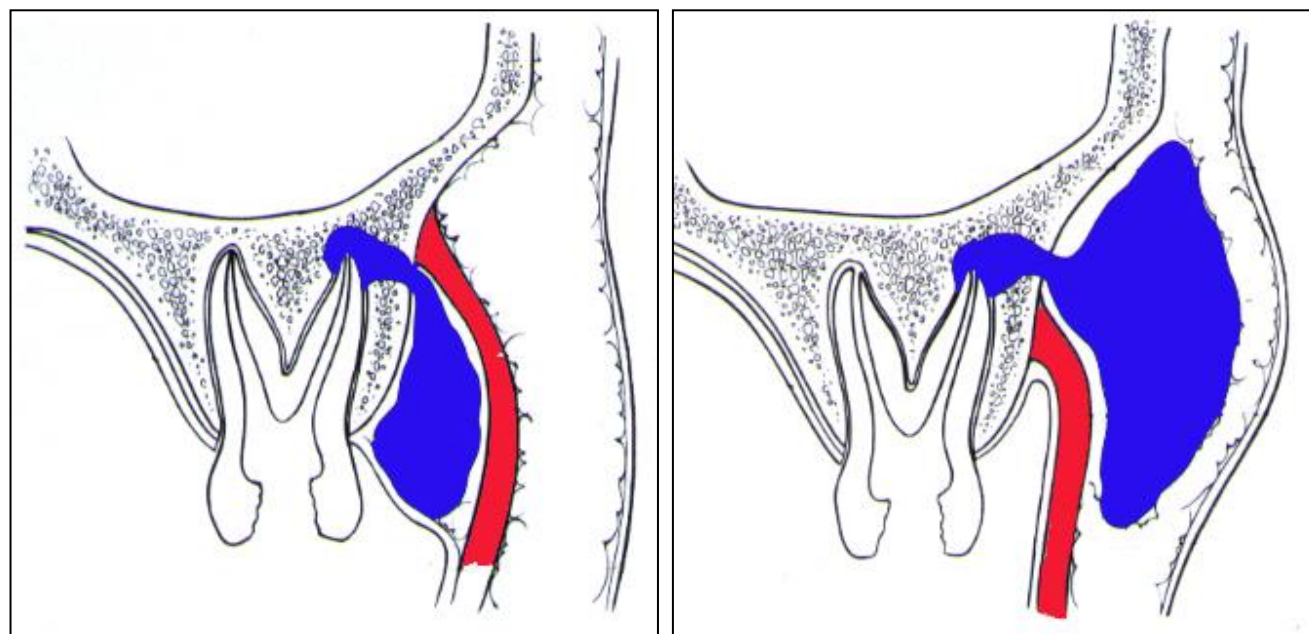




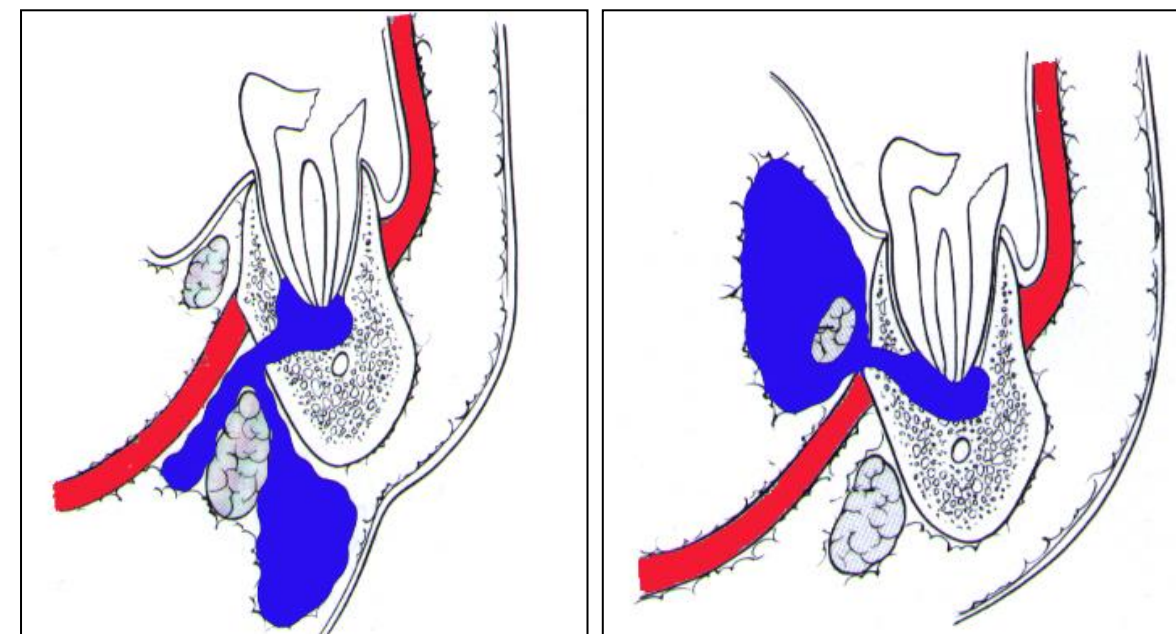
Les multiples extensions possibles en cervical



Diffusion vestibulaire ou génienne
La limite du muscle buccinateur



Diffusion sus ou sous mylohydiene
Cellulites péri-mandibulaires



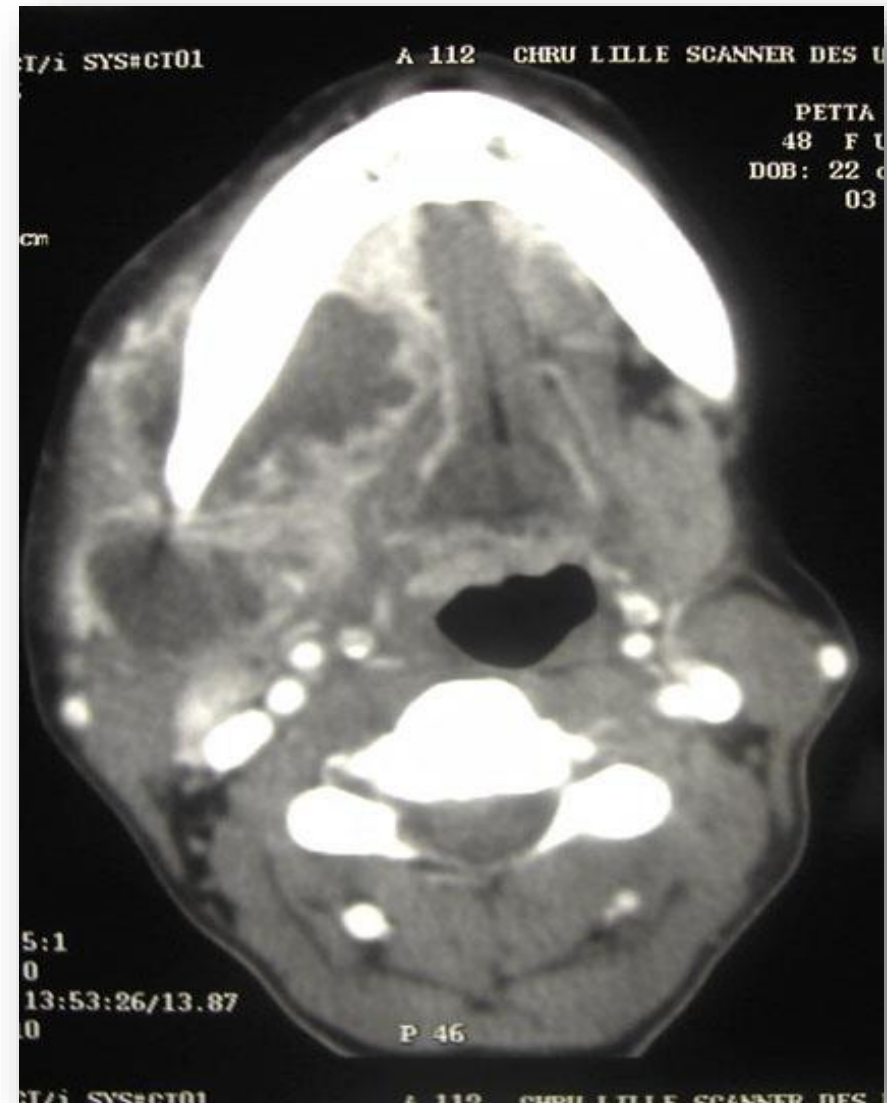
Infections collectées vs infections « séreuses » : pas toujours évident cliniquement

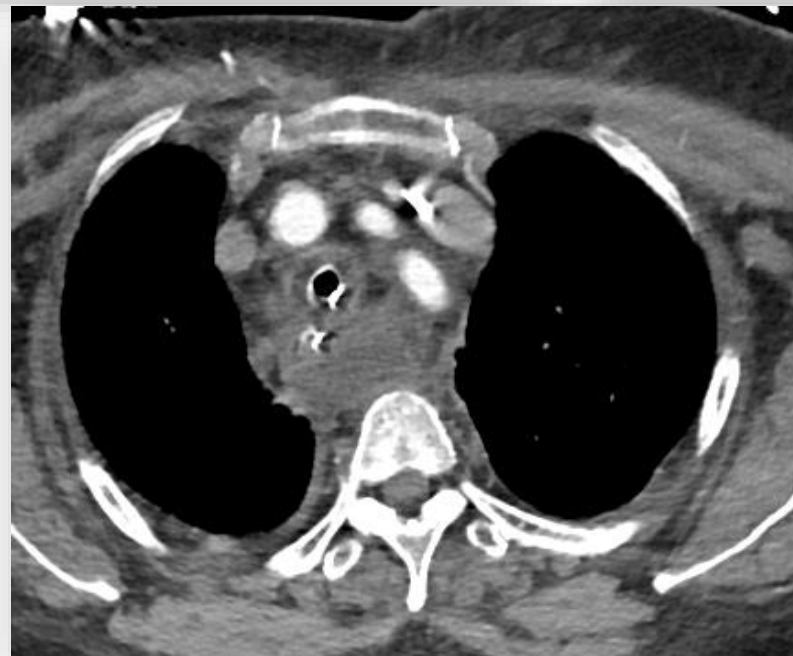
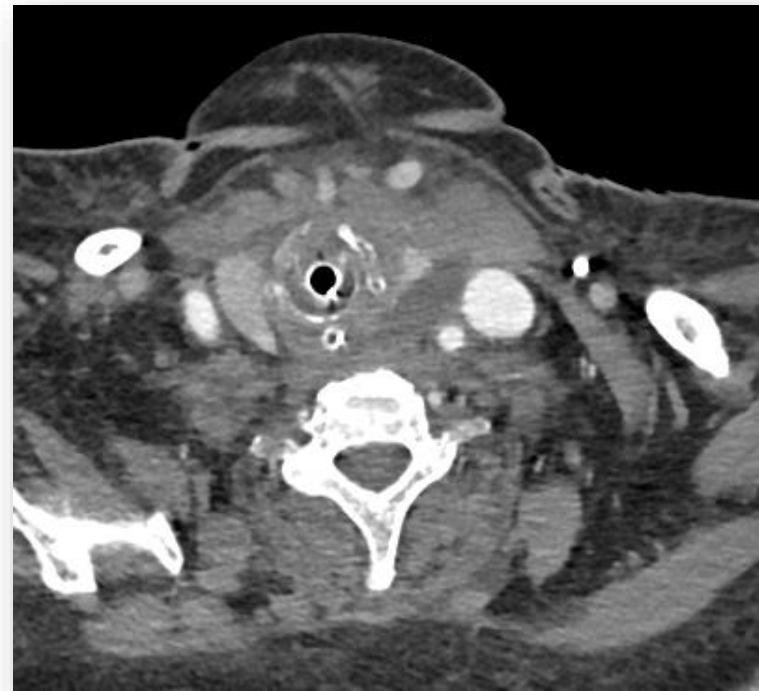


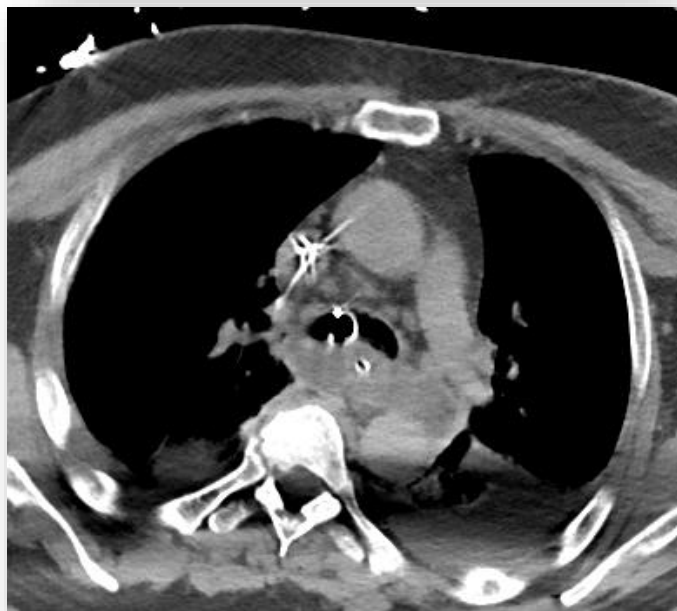
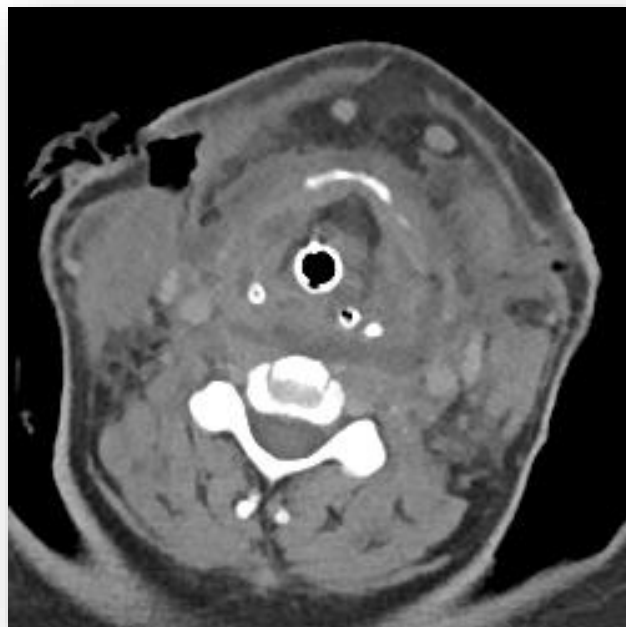
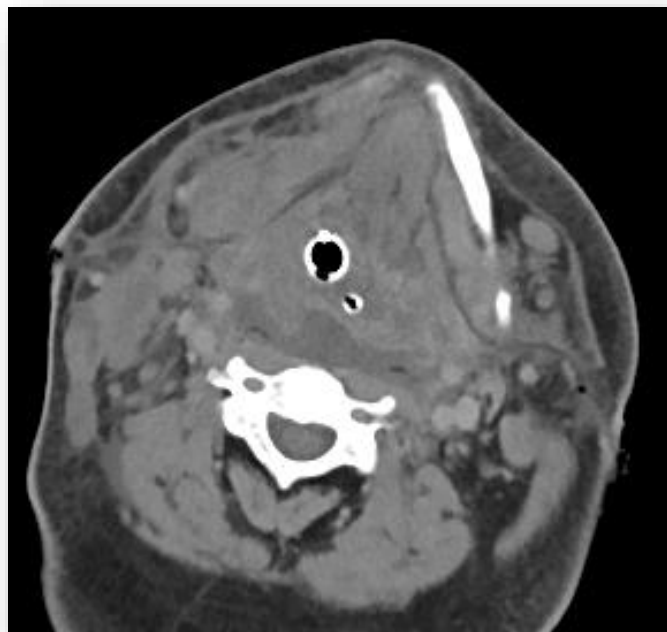
Les signes cliniques à rechercher/évaluation de la gravité

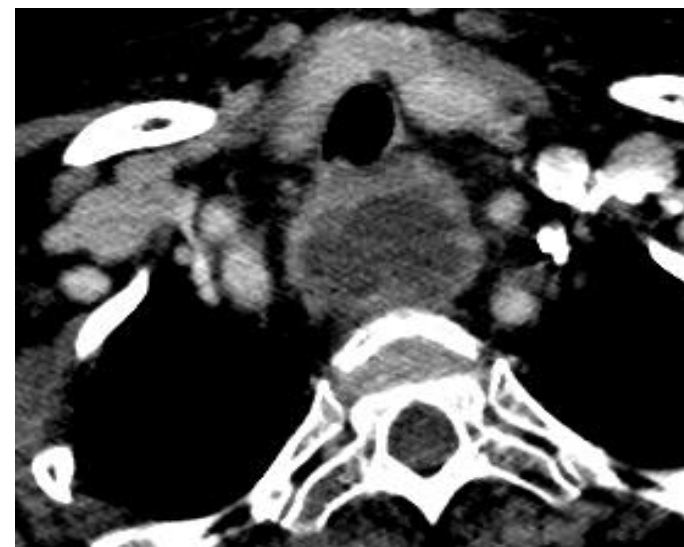
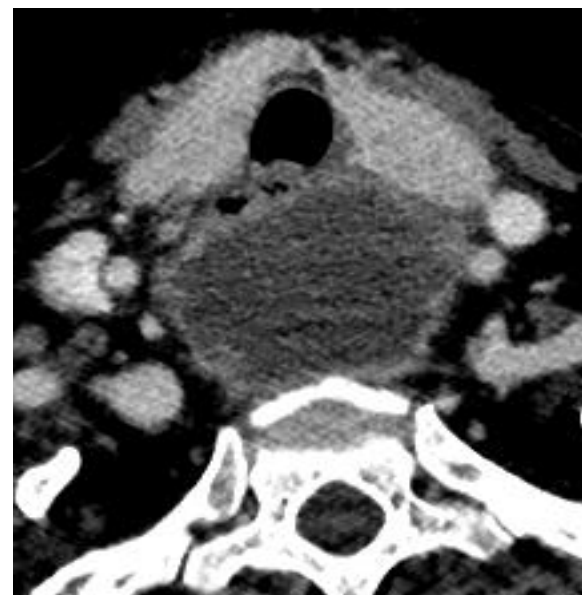
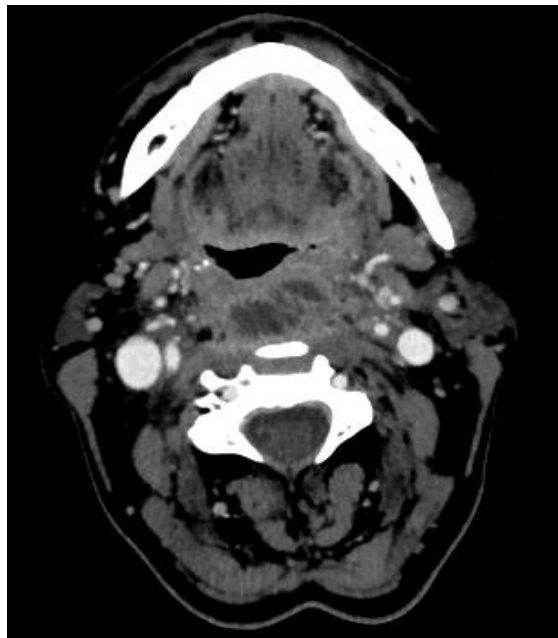
- Recherche de la porte d'entrée
 - Examen buco dentaire
 - Examen ORL amygdales/pharynx
 - Guidé par les plaintes fonctionnels et la topographie de la diffusion
- Complications « locales », en fonction de la localisation
 - Trismus : attention intubation /\
 - Dyspnée-Dysphagie : attention espace rétro pharyngé (cf cours physiopath/diffusion)
 - Thromboses vasculaires
 - Staphylococcie maligne et thrombose de sinus caverneux
 - Angine de Lemierre et thrombose jugulaire
- Retentissement général du sepsis
 - Plutôt rare par rapport aux complications locales (cf cours spécifique)

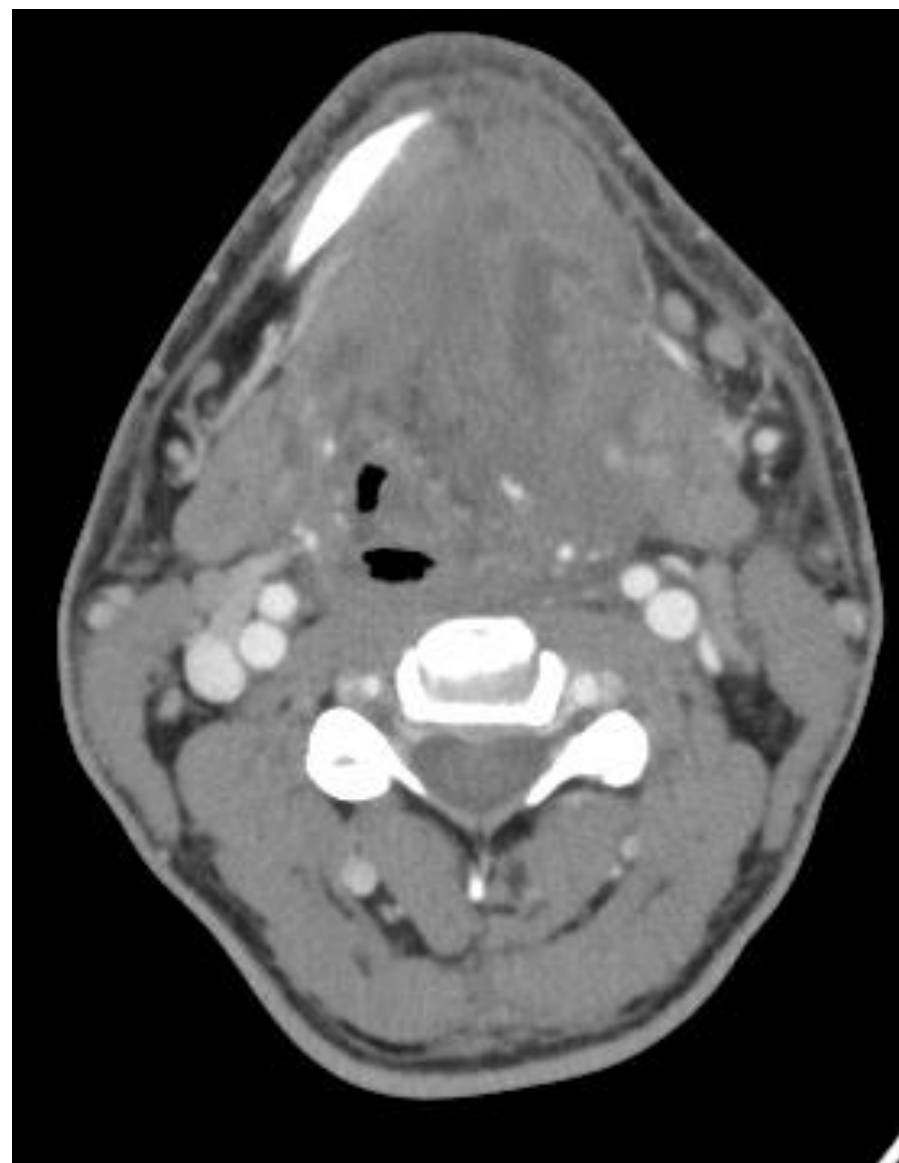
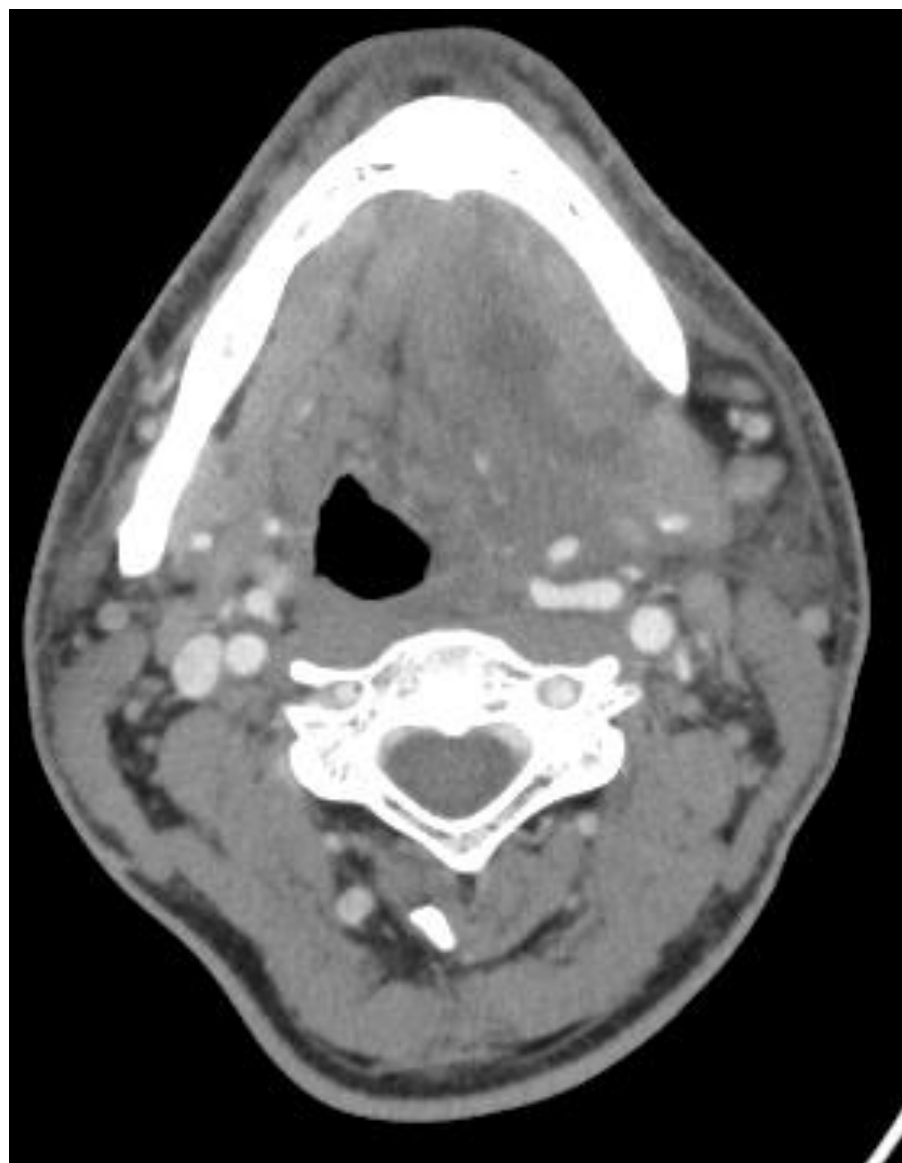
Importance du scanner cervico thoracique : porte d'entrée, collection, extension, thromboses

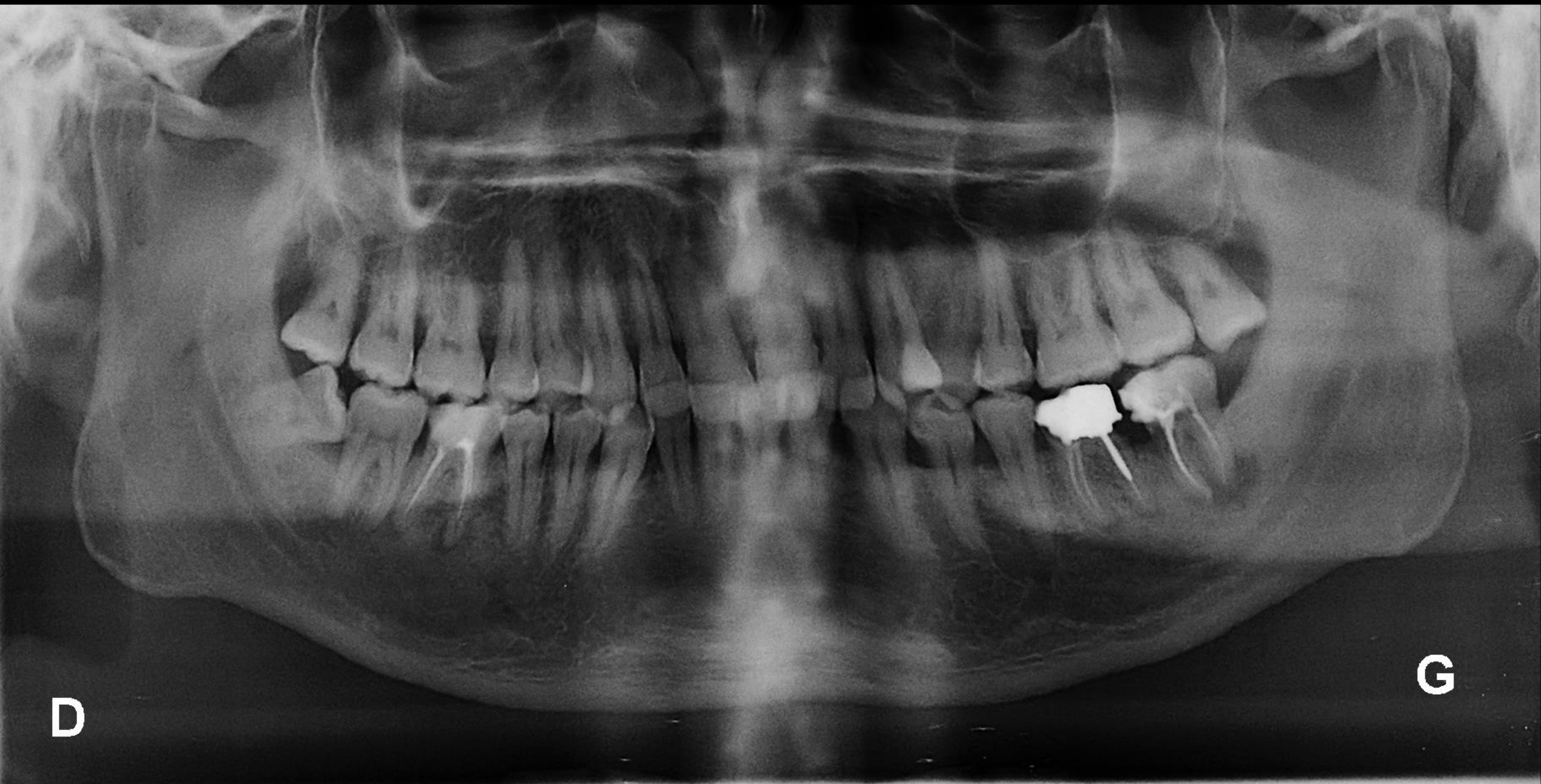










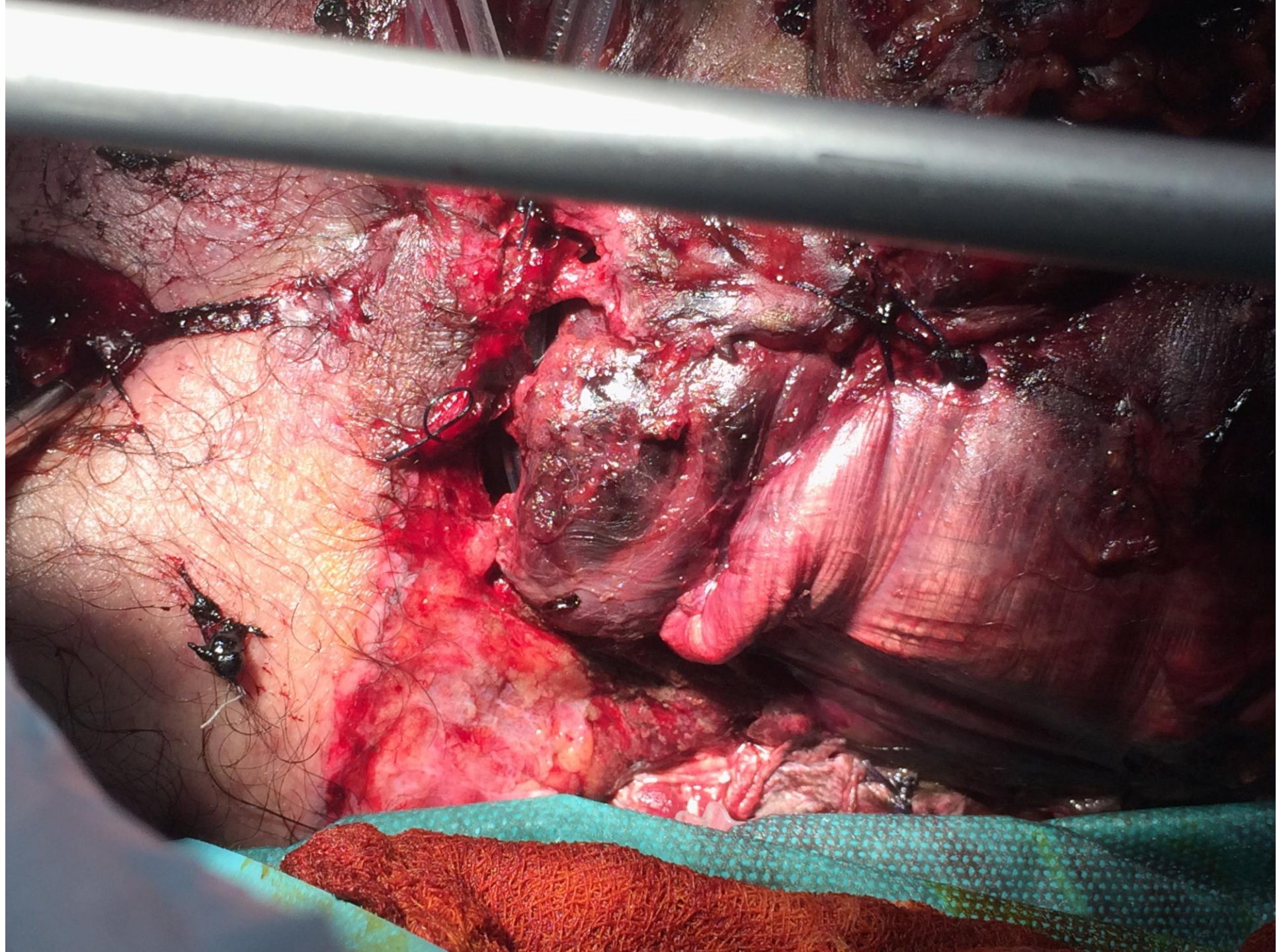


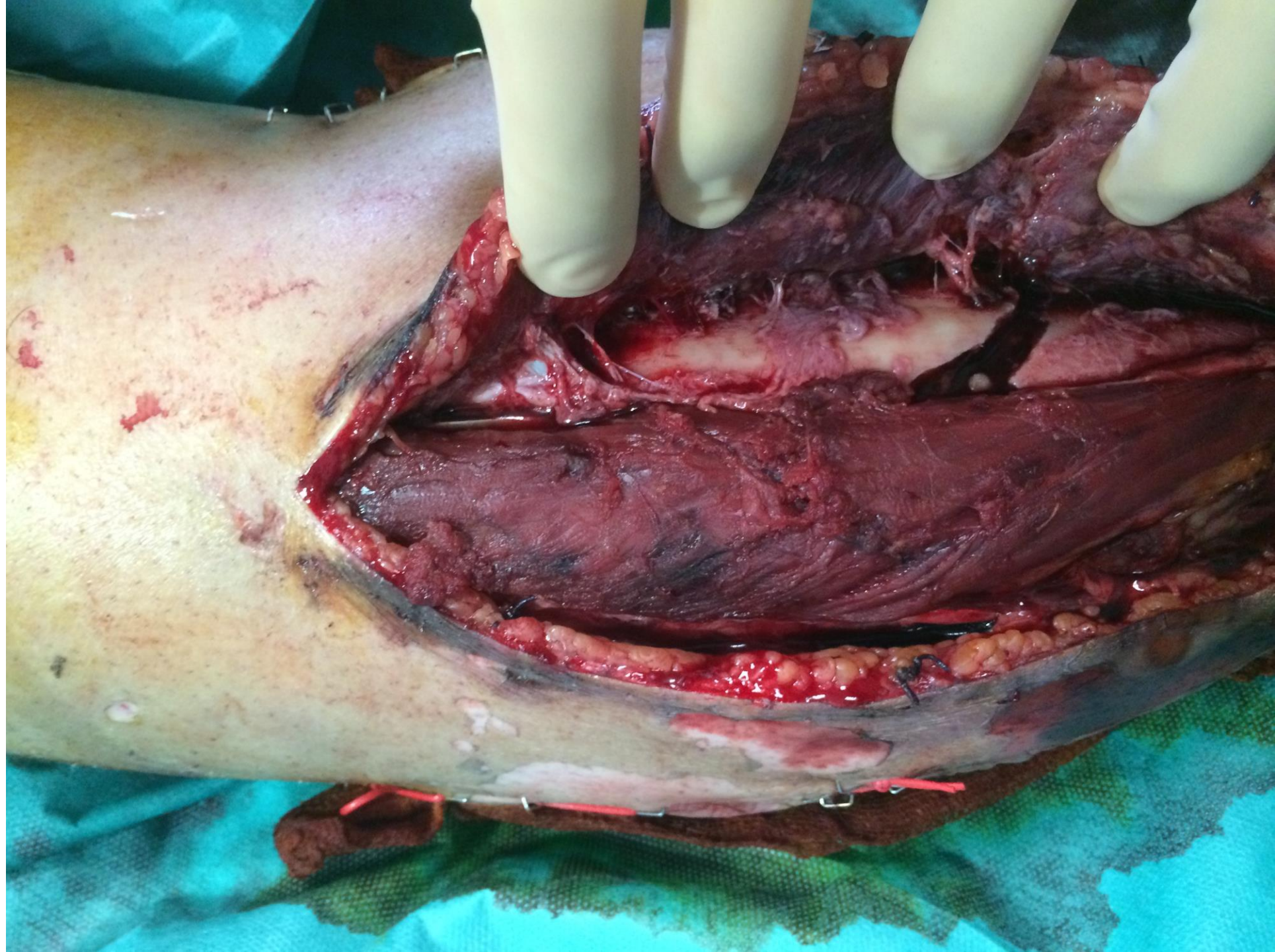
Erysipèle vs staphylococcie maligne de la face





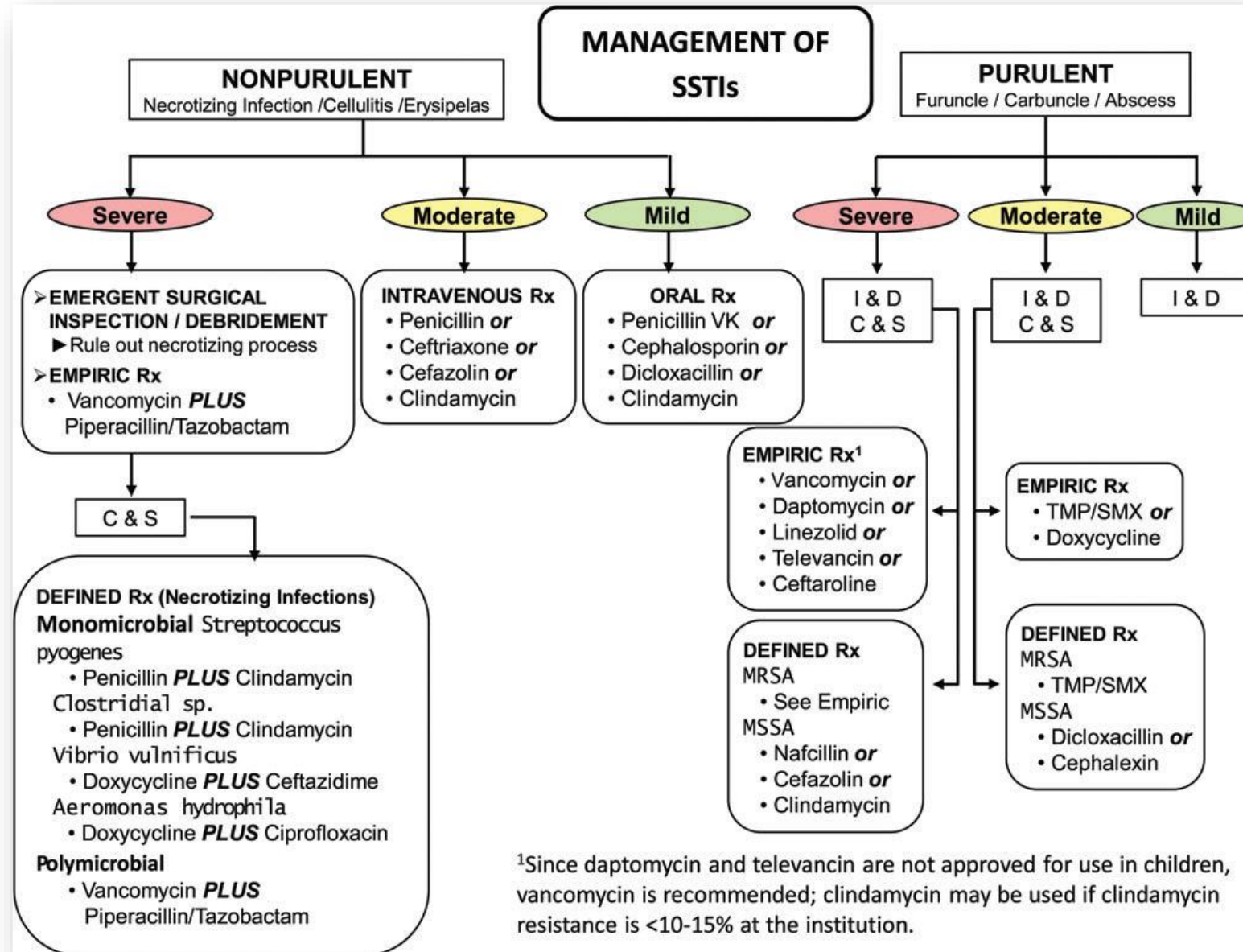








Antibiothérapie : les recommandations de l'IDSA « polluées » par le staphylocoque



Rank order of bacterial pathogens producing SSTI by region for the years 1998 to 2004, as determined by the SENTRY Program

Region/rank	7 years total (%)	Occurrence (%) by year					
		1998	1999	2000	2002	2003	2004
<i>North America</i>							
1. <i>S. aureus</i>	2602 (44.6)	535 (42.5)	178 (40.4)	644 (45.9)	606 (40.5)	— ^a	639 (51.6)
2. <i>P. aeruginosa</i>	648 (11.1)	160 (12.7)	48 (10.9)	152 (10.8)	186 (12.4)	—	102 (8.2)
3. <i>Enterococcus</i> spp.	542 (9.3)	105 (8.3)	47 (10.7)	115 (8.2)	153 (10.2)	—	122 (9.8)
4. <i>E. coli</i>	422 (7.2)	85 (6.8)	42 (9.5)	98 (7.0)	111 (7.4)	—	86 (6.9)
5. <i>Enterobacter</i> spp.	282 (4.8)	49 (3.9)	22 (5.0)	81 (5.8)	79 (5.3)	—	51 (4.1)
6. <i>Klebsiella</i> spp.	248 (4.2)	41 (3.3)	18 (4.1)	71 (5.1)	69 (4.6)	—	49 (4.0)
7. β-Streptococcus	237 (4.1)	57 (4.5)	15 (3.4)	32 (2.3)	67 (4.5)	—	66 (5.3)
8. <i>P. mirabilis</i>	166 (2.8)	45 (3.6)	5 (1.1)	42 (3.0)	42 (2.8)	—	32 (2.6)
9. CoNS ^b	161 (2.8)	30 (2.4)	16 (3.6)	48 (3.4)	44 (2.9)	—	23 (1.9)
10. <i>Serratia</i> spp.	125 (2.1)	30 (2.4)	9 (2.0)	28 (2.0)	41 (2.7)	—	17 (1.4)
Total isolates tested (% of top 10)	5837 (93.1)	1258 (90.4)	441 (90.7)	1403 (93.4)	1496 (93.4)	0	1239 (95.8)
<i>Latin America</i>							
1. <i>S. aureus</i>	824 (33.5)	142 (33.3)	157 (34.3)	153 (35.0)	197 (33.6)	— ^a	175 (31.6)
2. <i>E. coli</i>	344 (14.0)	61 (14.3)	60 (13.1)	54 (12.4)	79 (13.5)	—	90 (16.3)
3. <i>P. aeruginosa</i>	308 (12.5)	40 (9.4)	57 (12.4)	58 (13.3)	98 (16.7)	—	55 (9.9)
4. <i>Klebsiella</i> spp.	173 (7.0)	31 (7.3)	21 (4.6)	36 (8.2)	40 (6.8)	—	45 (8.1)
5. <i>Enterococcus</i> spp.	168 (6.8)	41 (9.6)	31 (6.8)	29 (6.6)	32 (5.5)	—	35 (6.3)
6. <i>Enterobacter</i> spp.	127 (5.2)	21 (4.9)	23 (5.0)	20 (4.6)	32 (5.5)	—	31 (5.6)
7. CoNS ^b	125 (5.1)	25 (5.9)	27 (5.9)	25 (5.7)	19 (3.2)	—	29 (5.2)
8. <i>P. mirabilis</i>	83 (3.4)	13 (3.1)	16 (3.5)	14 (3.2)	15 (2.6)	—	25 (4.5)
9. <i>Acinetobacter</i> spp.	81 (3.3)	21 (4.9)	16 (3.5)	11 (2.5)	16 (2.7)	—	17 (3.1)
10. β-Streptococcus	53 (2.2)	3 (0.7)	19 (4.1)	4 (0.9)	20 (3.4)	—	7 (1.3)
Total isolates tested (% of top 10)	2461 (92.9)	426 (93.4)	458 (93.2)	437 (92.4)	587 (93.4)	0	553 (92.0)
<i>Europe</i>							
1. <i>S. aureus</i>	1732 (37.5)	437 (35.7)	16 (15.8)	216 (31.0)	40 (34.8)	550 (41.8)	473 (40.5)
2. <i>P. aeruginosa</i>	555 (12.0)	179 (14.6)	24 (23.8)	97 (13.9)	14 (12.2)	131 (9.9)	110 (9.4)
3. <i>E. coli</i>	501 (10.8)	123 (10.0)	23 (22.8)	94 (13.5)	11 (9.6)	119 (9.0)	133 (11.4)
4. <i>Enterococcus</i> spp.	281 (6.1)	84 (6.9)	3 (3.0)	51 (7.3)	8 (7.0)	70 (5.3)	65 (5.6)
5. <i>Enterobacter</i> spp.	243 (5.3)	53 (4.3)	12 (11.9)	40 (5.7)	6 (5.2)	70 (5.3)	62 (5.3)
6. CoNS	235 (5.1)	69 (5.6)	4 (4.0)	34 (4.9)	2 (1.7)	69 (5.2)	57 (4.9)
7. β-Streptococcus	215 (4.7)	31 (2.5)	1 (1.0)	12 (1.7)	12 (10.4)	65 (4.9)	62 (5.3)
8. <i>Klebsiella</i> spp.	205 (4.4)	59 (4.8)	7 (6.9)	40 (5.7)	5 (4.3)	44 (3.3)	50 (4.3)
9. <i>P. mirabilis</i>	145 (3.1)	39 (3.2)	1 (1.0)	23 (3.3)	3 (2.6)	35 (2.7)	44 (3.8)
10. <i>Acinetobacter</i> spp.	87 (1.5)	30 (2.4)	5 (5.0)	21 (3.0)	2 (1.7)	31 (2.4)	18 (1.5)
Total isolates tested (% of top 10)	4622 (90.8)	1225 (90.1)	101 (95.0)	697 (90.1)	115 (89.6)	1317 (89.9)	1167 (92.0)

Longitudinal trends in key antimicrobial resistance occurring in different regions (SENTRY Program, 1998–2004)

Organism/continent	No. of isolates (% resistant) ^a by year						
	Total	1998	1999	2000	2002	2003	2004
<i>Oxacillin-resistant S. aureus</i>							
North America	2602 (35.9)	535 (26.2)	178 (36.0)	644 (29.5)	606 (39.1)	–	639 (47.4)
Latin America	824 (29.4)	142 (30.3)	157 (28.0)	153 (24.8)	197 (25.4)	–	175 (38.3)
Europe	1732 (22.8)	437 (24.3)	16 (43.8)	216 (22.2)	40 (30.0)	550 (21.1)	473 (22.4)
<i>VREs</i> ^b							
North America	542 (12.2)	105 (8.6)	47 (12.8)	115 (9.6)	153 (14.4)	–	122 (14.8)
Latin America	168 (4.2)	41 (0.0)	31 (3.2)	29 (3.4)	32 (12.5)	–	35 (2.9)
Europe	281 (3.6)	84 (3.6)	3 (0.0)	51 (2.0)	8 (0.0)	70 (1.4)	65 (7.7)
<i>Multidrug-resistant P. aeruginosa</i> ^c							
North America	648 (3.2)	160 (1.3)	48 (2.1)	152 (4.6)	186 (3.8)	–	102 (3.9)
Latin America	308 (24.7)	40 (20.0)	57 (19.3)	58 (24.1)	98 (32.7)	–	55 (20.0)
Europe	555 (10.8)	179 (10.1)	24 (20.8)	97 (11.3)	14 (35.7)	131 (9.2)	110 (8.2)
<i>ESBL-phenotype E. coli</i> ^d							
North America	422 (6.6)	85 (3.5)	42 (7.1)	98 (6.1)	111 (4.5)	–	86 (12.8)
Latin America	344 (15.1)	61 (11.5)	60 (9.5)	54 (5.6)	79 (20.3)	–	90 (24.4)
Europe	501 (12.4)	123 (8.1)	23 (13.0)	94 (9.6)	11 (0.0)	119 (11.8)	133 (19.5)
<i>ESBL-phenotype Klebsiella spp.</i> ^d							
North America	248 (11.3)	41 (4.9)	18 (0.0)	71 (11.3)	69 (7.2)	–	49 (16.3)
Latin America	173 (48.0)	31 (35.5)	21 (42.9)	36 (44.4)	40 (47.5)	–	45 (62.2)
Europe	205 (24.9)	59 (25.4)	7 (28.6)	40 (25.0)	5 (40.0)	44 (22.7)	50 (24.0)

Table 1. Factors Conferring a Predisposition to Specific Necrotizing Soft-Tissue Infections.*

Predisposing Factor	Clinical Syndrome	Etiologic Agent
Major penetrating trauma: crush or deeply penetrating wound	Gas gangrene	<i>Clostridium perfringens</i> , <i>C. histolyticum</i> , or <i>C. novyi</i>
Minor penetrating trauma	NF type II	
Freshwater laceration		<i>Aeromonas hydrophila</i>
Saltwater laceration		<i>Vibrio vulnificus</i>
Minor nonpenetrating trauma: muscle strain, sprain, or contusion	NF type II or streptococcal myonecrosis	<i>Streptococcus pyogenes</i>
Mucosal breach: mucosal tear (rectal, vaginal, urethral); gastrointestinal, genitourinary or gynecologic surgery	NF type I	Mixed aerobic and anaerobic organisms
Skin breach		
Varicella lesions	NF type II or streptococcal myonecrosis	<i>S. pyogenes</i>
Insect bites	NF type II or streptococcal myonecrosis	<i>S. pyogenes</i>
Injection drugs	Gas gangrene	<i>C. perfringens</i> , <i>C. histolyticum</i> , <i>C. novyi</i> , or <i>C. sordellii</i>
Immunocompromised state		
Diabetes with peripheral vascular disease	NF type I	Mixed aerobic and anaerobic organisms
Cirrhosis and ingestion of raw oysters	NF type II	<i>V. vulnificus</i>
Neutropenia	Gas gangrene	<i>C. septicum</i>
In women: pregnancy, childbirth, abortion (spontaneous or medically induced), gynecologic procedures or surgery	NF type II, streptococcal myonecrosis, or clostridial myonecrosis	<i>S. pyogenes</i> , <i>C. perfringens</i> , or <i>C. sordellii</i>
Occult factors: colonic lesions, including carcinoma	Spontaneous gas gangrene	<i>C. septicum</i>

Clinical Symptoms

Swelling, erythema, pain

Systemic Signs

Tachycardia, >120 beats/min; hypotension;
elevated CK level; CRP, >15 mg/dl;
LRINEC score, >6

No systemic signs

Radiographic Evidence

Gas in the tissue

No gas in the tissue

Immediate Surgery

Inspection and débridement
Specimen collection

Inspection and débridement
Specimen collection

Gram's Staining and Culture

Gram-positive
rods

Mixed aerobes
and anaerobes

Gram-positive
cocci

Gram-negative
rods

Differential Diagnosis

Clostridial myonecrosis (aggressive)
Spontaneous —
Clostridium septicum
Traumatic —
C. perfringens
Gynecologic —
C. sordellii
Clostridial anaerobic
cellulitis (indolent)

NF Type I
Nonclostridial crepitant
cellulitis
Synergistic necrotizing
cellulitis
Progressive bacterial
synergistic gangrene

NF Type II
Streptococcus pyogenes
Staphylococcus aureus
or group A strepto-
coccal myonecrosis

NF Type II
Aeromonas
Freshwater
Vibrio
Saltwater

Cellulitis
Erysipelas
Cutaneous abscess

Sites	Concentrations bactériennes par ml ou g	Rapport anaérobies/aérobies
<u>Voies aériennes supérieures</u>		
Narine	$10^3 - 10^4$	3 - 5 / 1
Salive	$10^8 - 10^9$	1 / 1
Plaque dentaire	$10^{10} - 10^{11}$	1 / 1
Gencive	$10^{11} - 10^{12}$	1000 / 1
<u>Tube digestif</u>		
Estomac	$10^2 - 10^5$	1/ 1
Duodénum	$10^2 - 10^4$	1/ 1
Iléon	$10^4 - 10^7$	1/ 1
Colon	$10^{11} - 10^{12}$	1000 / 1
<u>Tractus Génital Féminin</u>		
Vagin	$10^8 - 10^9$	3 - 5 / 1
Endocol	$10^8 - 10^9$	3 - 5 / 1

Pour faire simple

- Tête et cou : amoxicilline + acide clavulanique
- Membres : amoxicilline + acide clavulanique
- Périnée/OGE : pipéracilline/tazobactam
- Pied diabétique/contexte particulier : penser au *Pseudomonas/Staph*/ostéite/vascularisation
- SARM : en fonction terrain/circonstances



Et si un jour ça résiste

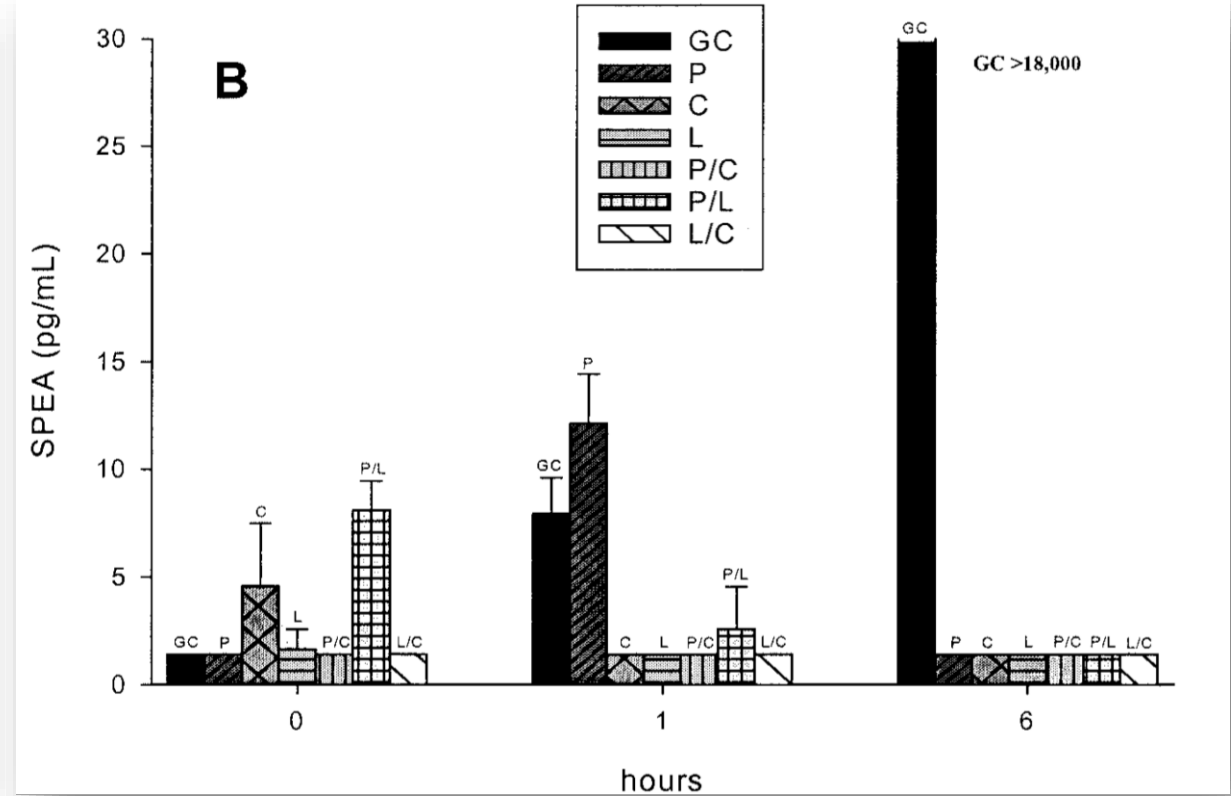
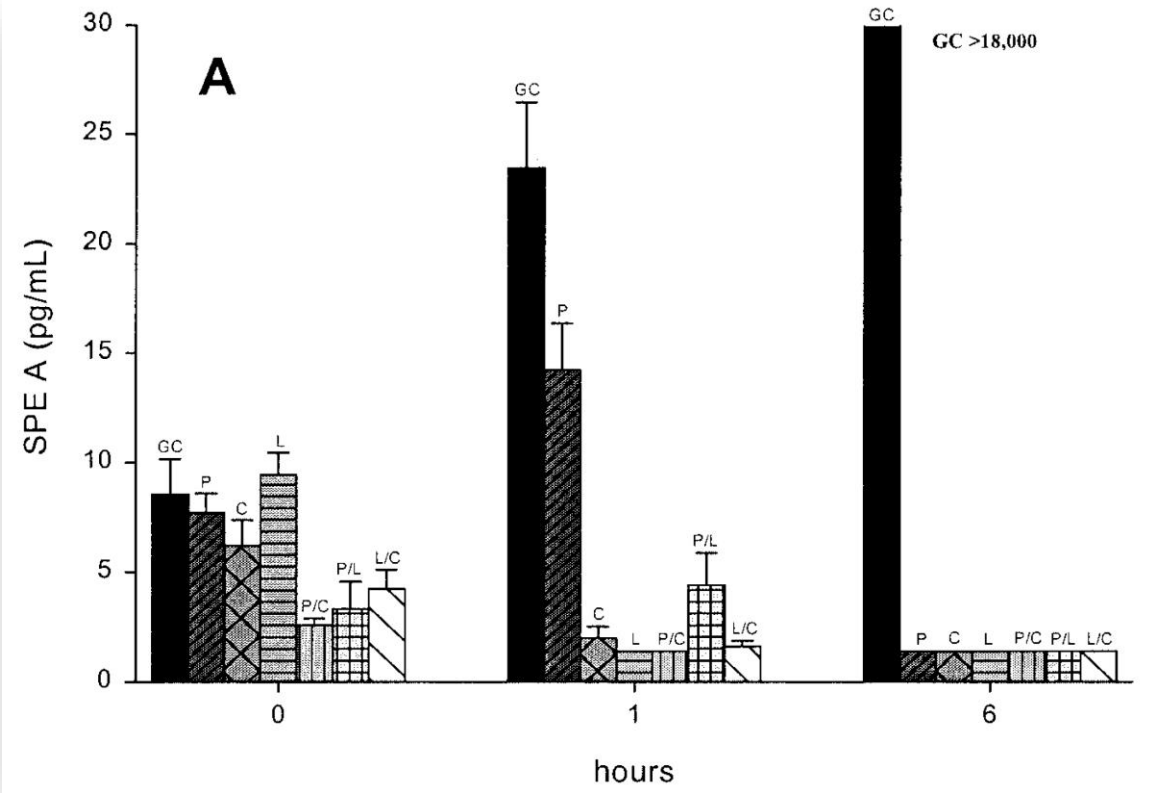
Antimicrobial activity of ceftazidime/avibactam, ceftolozane/tazobactam, meropenem/vaborbactam, imipenem/relebactam, and comparators against resistant subsets of *P. aeruginosa* isolates from patients with SSTI.

Resistant phenotype (no. of isolates)	% Susceptible per EUCAST			
	Ceftazidime/avibactam	Ceftolozane/tazobactam	Imipenem/relebactam	Meropenem/vaborbactam
Meropenem-nonsusceptible (MIC >2 mg/L; n=54)	92.6	90.6	88.9	61.1
Imipenem-resistant (MIC >4 mg/L; n=48)	93.8	91.5	87.5	56.3
Piperacillin/tazobactam-resistant (MIC >16 mg/L; n=57)	89.5	91.1	89.5	69.6
Ceftazidime-resistant (MIC >8 mg/L; n=48)	87.5	91.7	89.6	76.6
β -lactam-resistant ^a (n=17)	82.4	82.4	70.6	35.3

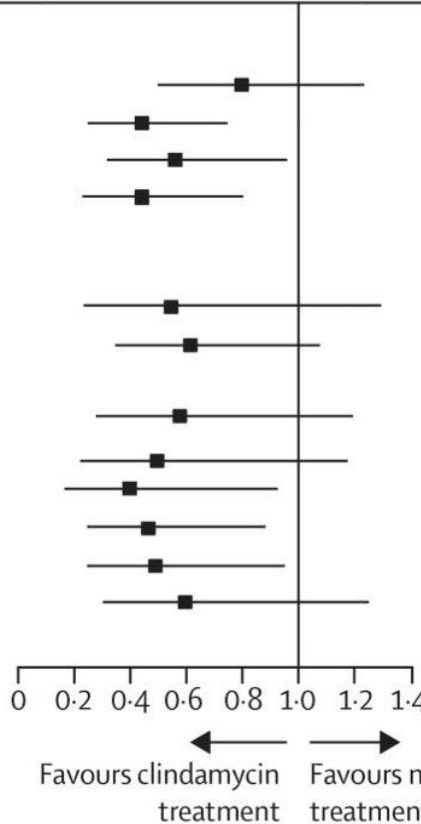
^a Isolates resistant to piperacillin/tazobactam (MIC >16 mg/L), imipenem (MIC >4 mg/L), and ceftazidime (MIC >8 mg/L) and nonsusceptible to meropenem (MIC >2 mg/L) per EUCAST criteria ([EUCAST, 2021](#)).

Antibiotique	BLSE classe A, classe C et classe D non carbapénémases	Carbapénémases		Metallobétalactamase classe B	Pyo	Acinéto
		KPC	Oxa			
ceftolozane/tazobactam	+	-	-	-	+	-
ceftazidime/avibactam	+ (/!\ AmpC)	+	+/-	-	+	-
Imipénème-cilastatine/relebactam	+	+	-	-	+	-
Méropénème/vaborbactam	+	+	-	-	+/-	-
Aztréonam	-	-	-	+	+	-
céfidérocol	+	+	+	+	+	+

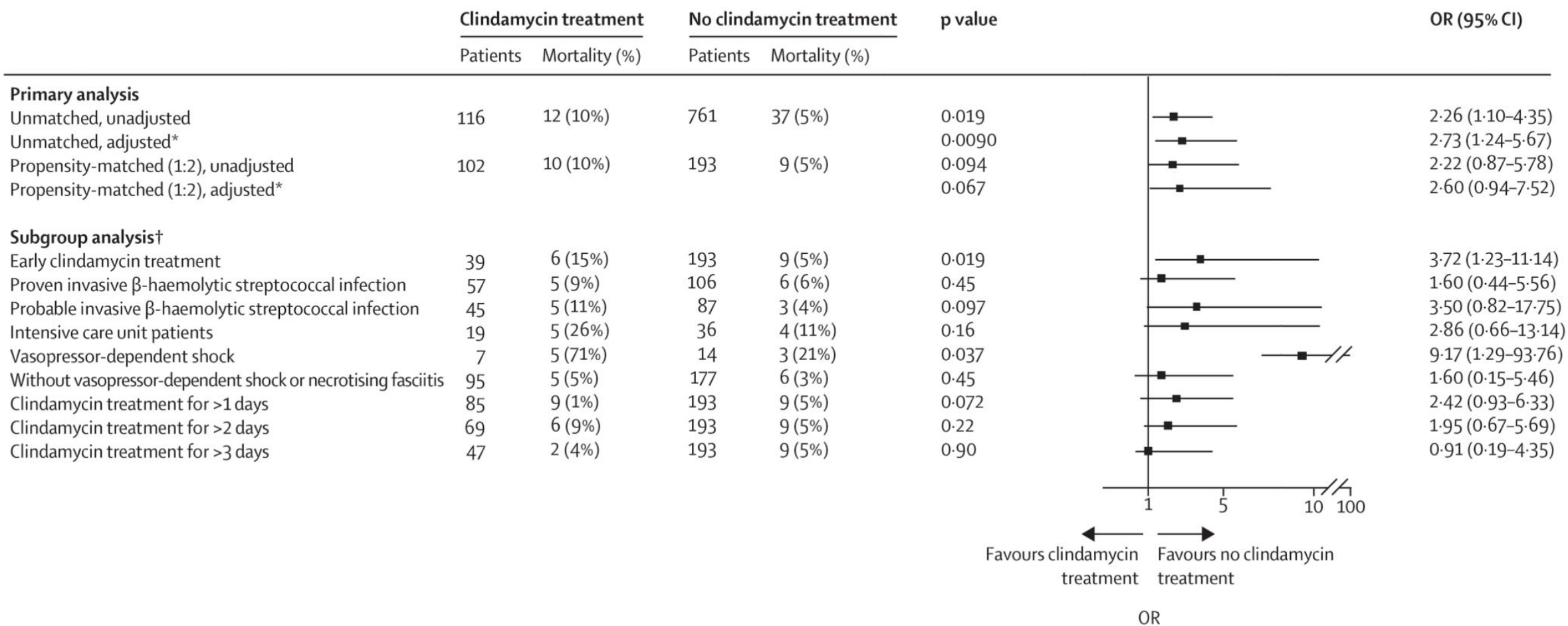
Approche antitoxinique



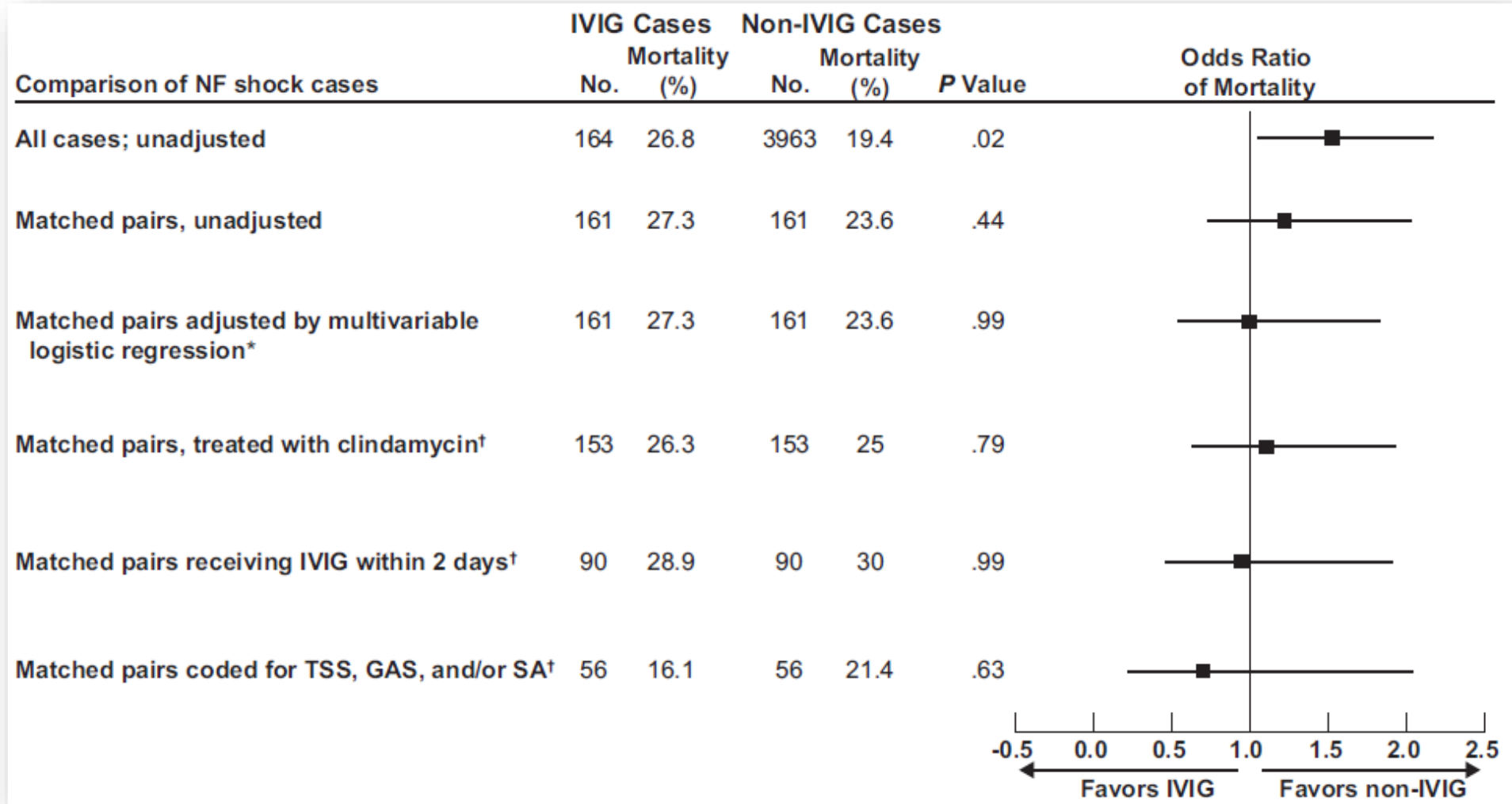
Effet positif de la clinda dans les infections à SBA, y compris sans choc et sans nécrose

	Clindamycin treatment		No clindamycin treatment		p value		OR (95% CI)
	Patients	Mortality (%)	Patients	Mortality (%)			
Primary analysis							
Unmatched, unadjusted	343	28 (8.2%)	736	74 (10.1%)	0.32		0.80 (0.50–1.24)
Unmatched, adjusted*					0.0031		0.44 (0.25–0.75)
Propensity-matched (1:2), unadjusted	277	18 (6.5%)	500	55 (11.0%)	0.042		0.56 (0.32–0.96)
Propensity-matched (1:2), adjusted*					0.011		0.44 (0.23–0.81)
Subgroup analysis†							
Early clindamycin treatment	97	6 (6.2%)	500	55 (11.0%)	0.16		0.53 (0.22–1.28)
Proven invasive β-haemolytic streptococcal infection	153	18 (11.8%)	282	51 (18.1%)	0.087		0.60 (0.33–1.06)
Probable invasive β-haemolytic streptococcal infection	124	0	218	4 (1.8%)	1.00		NA‡
Intensive care unit patients	55	13 (23.6%)	90	32 (35.6%)	0.13		0.56 (0.26–1.18)
Without vasopressor-dependent shock or necrotising fasciitis	37	12 (32.4%)	57	28 (49.1%)	0.11		0.48 (0.21–1.16)
Without vasopressor-dependent shock	239	6 (2.6%)	442	27 (6.1%)	0.043		0.40 (0.15–0.91)
Clindamycin treatment for >1 days	226	12 (5.3%)	500	55 (11.0%)	0.016		0.45 (0.23–0.87)
Clindamycin treatment for >2 days	183	10 (5.5%)	500	55 (11.0%)	0.032		0.47 (0.23–0.94)
Clindamycin treatment for >3 days	122	9 (6.9%)	500	55 (11.0%)	0.17		0.58 (0.29–1.24)

Résultats inverses dans les infections non à groupe A



Les immunoglobulines polyvalentes n'ont pas d'impact sur la mortalité des fasciites nécrosantes sous vasopresseurs



Les immunoglobulines polyvalentes n'améliorent pas le score fonctionnel à 6 mois dans les fasciites non sélectionnées

Primary outcome	IVIG group	Placebo group	Mean difference (95% CI) ^a	P value
PCS score adjusted for site of infection ^b	36 (0 to 43) [29]	31 (0 to 47) [28]	1 (-7 to 10)	0.81 ^c
Secondary outcomes	IVIG group	Placebo group	Relative risk (95% CI)	P value
Mortality				
Mortality, day 28	6/50 (12%)	6/50 (12%)	1.00 (0.35 to 2.89)	>0.99
Mortality, day 90	9/50 (18%)	11/50 (22%)	0.82 (0.37 to 1.80)	0.80
Mortality, day 180 ^d	11/49 (22%)	14/50 (28%)	0.80 (0.40 to 1.59)	0.65
Serious adverse reactions in the ICU				
All serious adverse reactions ^e	8/50 (16%)	11/50 (22%)	0.72 (0.32 to 1.65)	0.61
Acute kidney injury	6/45 (13%)	8/49 (16%)	0.82 (0.31 to 2.17)	0.78
Thrombi	2/50 (4%)	3/50 (6%)	0.67 (0.12 to 3.82)	>0.99
Use of life-support in the ICU				
Mechanical ventilation	49/50 (98%)	50/50 (100%)	0.98 (0.94 to 1.02)	>0.99
Vasopressor/inotrope	46/50 (92%)	47/50 (94%)	0.98 (0.88 to 1.09)	>0.99
Renal replacement therapy	11/50 (22%)	6/50 (12%)	1.83 (0.73 to 4.57)	0.29
Bleeding and amputation				
Any bleeding in the ICU	5/50 (10%)	5/50 (10%)	1.00 (0.31 to 3.24)	>0.99
Severe bleeding in the ICU	4/50 (8%)	2/50 (4%)	2.00 (0.38 to 10.43)	0.68
Amputation in the 180 days after randomisation	4/50 (8%)	6/50 (12%)	0.67 (0.20 to 2.22)	0.74
Secondary outcomes continued	IVIG group	Placebo group	Mean difference (95% CI)	P value
SOFA score day 1 to 7 ^f	NA	NA	0.15 (-1.70 to 2.00)	0.90 ^g
Blood products given in the ICU, ml	1529 (498 to 2559)	1712 (681 to 2742)	-183 (-1641 to 1275)	0.80
Time to resolution of shock in the 28 days after randomisation, days ^h	8.4 (6.1 to 10.8)	8.7 (6.4 to 11.1)	NA	0.69
Alive and off life-support in the 90 days after randomisation, days	70 (61 to 79)	67 (59 to 76)	NA	0.41
Alive and out of hospital in the 180 days after randomisation, days ⁱ	107 (90 to 124)	99 (82 to 117)	NA	0.50

Microbiological findings		
Polymicrobial infection ⁱ	31/47 (66%)	31/44 (70%)
Group A streptococcus	4/31 (13%)	1/31 (3%)
<i>S. aureus</i>	5/31 (16%)	3/31 (10%)
Other aerobic bacteria ^j	29/31 (94%)	31/31 (100%)
Anaerobic bacteria ^k	18/31 (58%)	20/31 (65%)
Fungi	4/31 (13%)	3/31 (10%)
Monomicrobial infection ⁱ	16/47 (34%)	13/44 (30%)
Group A streptococcus	9/16 (56%)	4/13 (31%)

Madsen MB et al. ICM. 2017

Un intérêt dans les infections à Strepto A ?

Table 3. Primary and secondary end points of a study assessing the efficacy of administration of high-dose intravenous polyspecific IgG.

End point	All included patients		Patients with GAS only	
	IVIg group (n = 10)	Placebo group (n = 11)	IVIg group (n = 8)	Placebo group (n = 10)
Primary: mortality day 28, no. (%) of patients	1 (10)	4 (36)	1 (12.5)	3 (30)
Secondary				
Time to resolution of shock, ^a h				
Mean	88	122	100	122
Median (range)	96 (2–159)	108 (47–294)	108 (2–159)	108 (47–294)
Time to no further progression of NF/cellulitis, h				
Mean	68 ^b	36 ^c	69 ^c	36 ^c
Median (range)	20 (2–168) ^b	24 (19–72) ^c	20 (2–168) ^c	24 (19–72) ^c
Mortality day 180, no. (%) of patients	2 (20)	4 (36)	1 (12.5)	3 (30)



Peu d'évidence pour l'OHB. Mais des séries de cas et des registres plutôt en faveur, malgré le surcoût

	HBOT (n = 405)	Control (n = 45,508)	p value
Mean age, years (95 % CI)	54.6 (53.2–56.1)	53.7 (53.6–53.9)	0.23
Gender			0.03*
Male	243 (60.0)	29,612 (65.1)	
Female	162 (40.0)	15,885 (34.9)	
Hospital bed size			0.02*
Small	33 (8.2)	5,359 (11.8)	
Medium	124 (30.6)	11,818 (26.0)	
Large	248 (61.2)	28,219 (62.2)	
Location/teaching status of hospital			<0.001*
Rural	16 (4.0)	4,865 (10.7)	
Urban non-teaching	222 (54.8)	18,621 (41.0)	
Urban teaching	167 (41.2)	21,910 (48.3)	
Deyo category [12]			0.05*
0	144 (35.6)	18,925 (41.6)	
1	129 (31.9)	12,808 (28.1)	
>1	132 (32.6)	13,775 (30.3)	
Admission type			<0.001*
Emergency	162 (43.4)	23,705 (59.9)	
Urgent	111 (29.8)	9,316 (23.5)	
Elective	92 (24.7)	6,344 (16.0)	
Newborn	0	81 (0.2)	
Others	≤10 ^b	122 (0.3)	
Admission source			<0.001*
Emergency room	147 (39.4)	21,976 (57.6)	
Another hospital	47 (12.6)	3,411 (8.9)	
Another facility including long-term care	19 (5.1)	969 (2.5)	
Court/law enforcement	0	36 (0.1)	
Routine/birth/other ^a	160 (42.9)	11,750 (30.8)	
Site of NSTI			
Truncal	19 (4.7)	1,491 (3.3)	0.10
Extremity	57 (14.1)	6,681 (14.7)	0.73
Mechanism of NSTI			0.75
Traumatic	≤10 ^b	1,018 (2.2)	
Non-traumatic	395 (97.5)	44,490 (97.8)	
Pathogen for NSTI			0.005*
Clostridial myonecrosis	66 (16.3)	10,032 (22.0)	
Non-clostridial myonecrosis	339 (83.7)	35,476 (78.0)	

	OHB	Pas d'OHB
Mortalité	4,5%	9,4%
Durée de séjour	14,3 jours	10,7 jours
Coût	52 205 \$	45 464 \$

La mortalité est-elle le bon critère de jugement ?



10/01



31/01



21/08/03

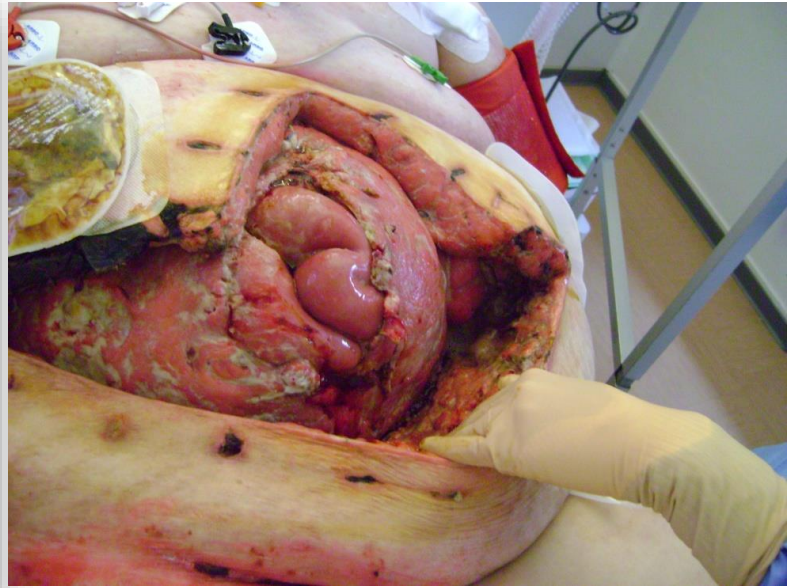


12/09/03

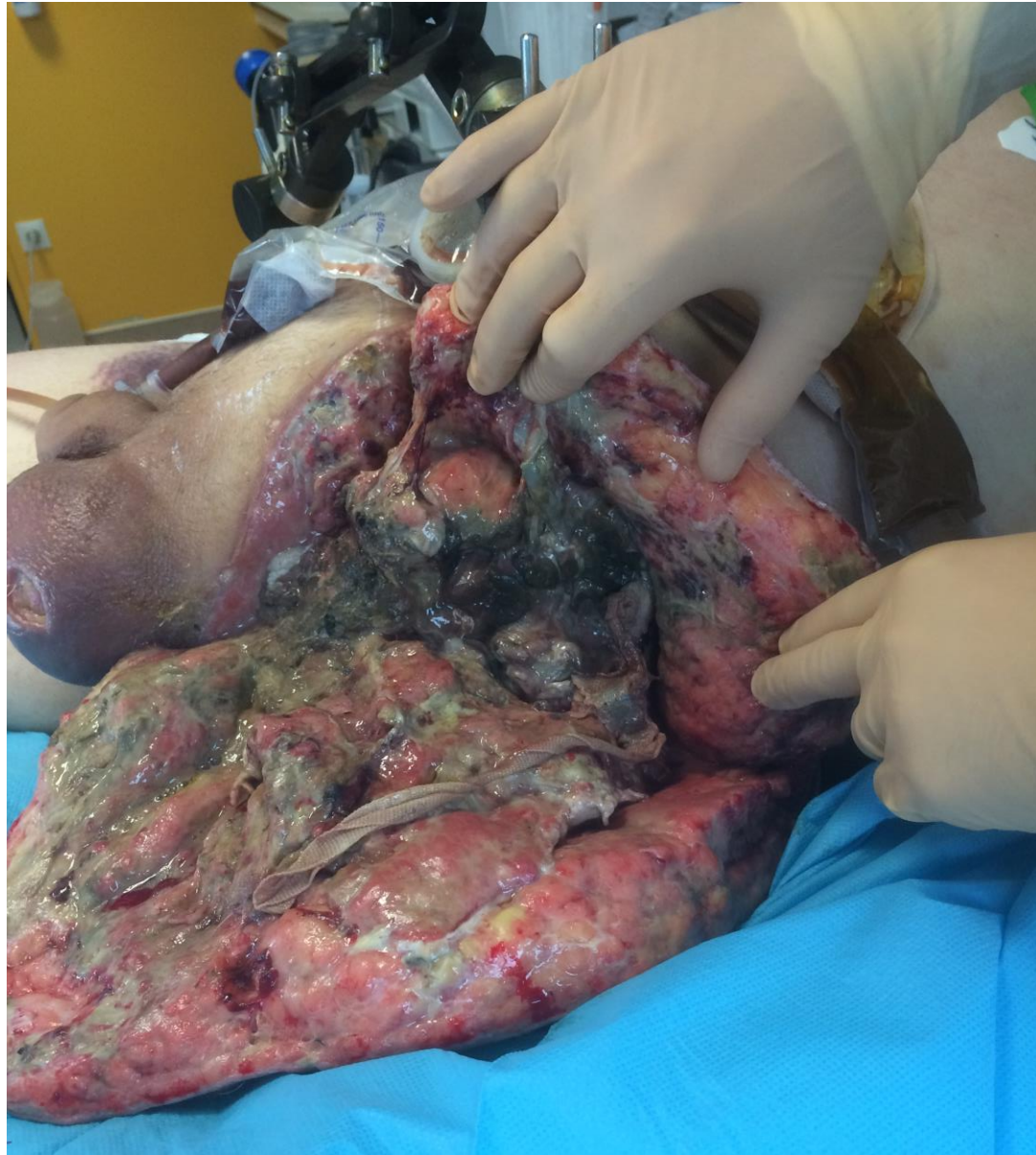


14/04/04









Ne pas oublier



- Plaies à haut risque donc SAT-VAT si non à jour
- Interrogatoire/quick-test
- Rappel tous les 20 ans à partir de 20 ans

- Réanimation du sepsis
- Petite spécificité : remplissage massif

Conclusion

- Poser l'indication chirurgicale à temps +++++++
 - Critères cliniques
 - Chirurgie conservatrice initialement
 - Répéter les nécrosectomies
- Antibiothérapie selon le site et le terrain
 - Considérer la vision staphylococcique méti-R américaine avec recul
- Traitements adjuvants
 - Ig et Strepto
 - OHB ? :
 - Changer les paradigmes d'évaluation ?
 - Echelles composites de qualité de vie ? Chirurgie « conservatrice » ?

Conclusion

- Poser l'indication chirurgicale à temps ++++++
- Critères cliniques
- Chirurgie conservatrice initialement
- Pénétrer les nécrosectomies

Appelez nous !!!

- Traitements adjuvants
 - Ig et Strepto
 - OHB ? :
 - Changer les paradigmes d'évaluation ?
 - Echelles composites de qualité de vie ? Chirurgie « conservatrice » ?

