Diagnostic value of fungal surveillance cultures in critically ill patients - the cons

Malcolm Richardson PhD, FIBiol, FRCPath

Department of Bacteriology & Immunology,

University of Helsinki, and

HUS-LAB, Helsinki University Central Hospital

“Candida here, Candida there, Candida everywhere”

George Bernard Shaw
1903

Current view point

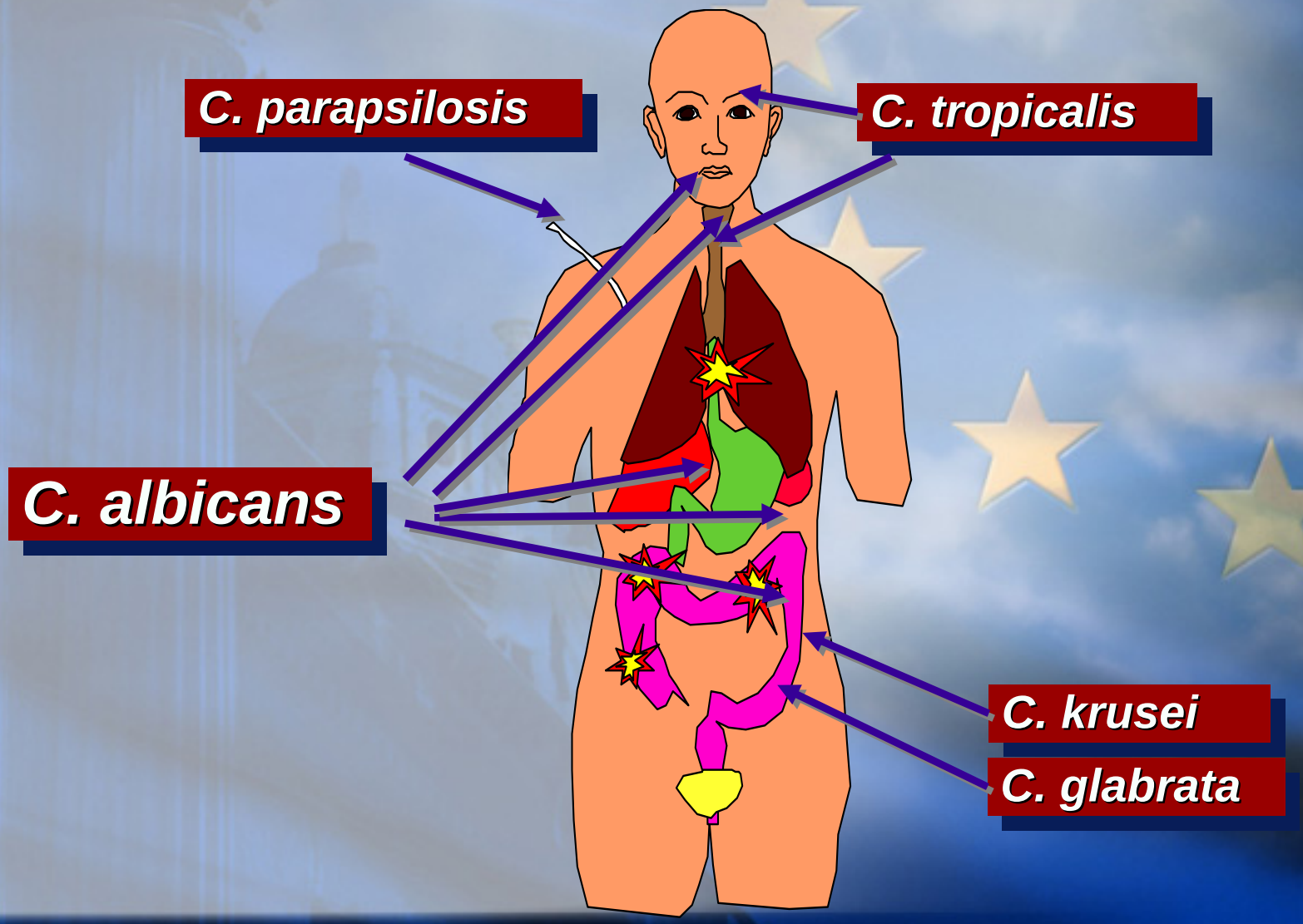
"Heavy fungal colonisation is a known risk factor for fungal infection, yet the value of fungal surveillance cultures is uncertain"

Epidemiology of yeast colonization in the ICU

- single unit: 194 pts: sampled: mean 9 ± 11 d
- rectal and buccal mucosa, every 3 days
- colonised on admission: 65%
- colonised after admission: 17%
- Persistent colonisation: 51/92 patients (55%) who had more than 3 cultures performed.

Hedderwick et al. Eur J Clin Microbiol Infect Dis 2000; 19: 663-670.

Candida: colonisation



Infection control in the ICU
Epidemiological surveillance: definition

"The continuous collection, tabulation, analysis, and dissemination of all information on the occurrence of nosocomial infections in a specific ward/hospital"

"Total surveillance with the meticulous collection of clinical and microbiological data for each patient is labour-intensive, time-consuming, and not always practical on a practical basis"

Eggimann and Pittet 2001 Chest 120: 2059-2093.

Limitations of “colonization studies”

- haematological/solid organ malignancies
- mixed patient populations
- single institution data
- data collected over long period of time
- very few studies prospective
- the few prospective studies not SICU

The diagnostic value of fungal surveillance cultures in critically ill patients

- single institution
- 172 patients: oncology center/medical and surgical ICUs; 159 eligible
- surveillance cultures: 5 sites: 2 x week
- 14 pts: IFI
- ≥2 surveillance sites positive/single day:
  - odds ratio: 8.2(1.1-358.0)(p=0.03)
  - NPV: 0.98
  - Sensitivity: 0.92
  - Likelihood ration: 1.6

Pelz et al. 2000 Surgical Infections; 1: 273-281.

The diagnostic value of fungal surveillance cultures in critically ill patients

Conclusions

"Surveillance cultures are helpful in determining fungal colonisation but do not have a high positive predictive value for SFI in a broad population of ICU patients. However, SFI is more likely in heavily colonised patients, and surveillance cultures show that fungal infection is extremely unlikely in patients without fungal colonisation"

Pelt et al. 2000 Surgical Infections; 1: 273-281.

Risk factors for candidal bloodstream infection in SICU patients: The NEMIS prospective multicentre study

- 6 sites
- >48 hours in unit
- 2-year period
- 4276 patients: 42 Candida BSIs (41 in surgery patients)
- Independent risk factors:
  - prior surgery
  - acute renal failure
  - TPN
  - surgical patients: presence of triple lumen catheter
- Decreased risk: receipt of antifungals

Blumberg et al. 2001 CID 33: 177-186.

NEMIS study

- 6 SICUs: prospective data gathering
- 4276 pts: 2 year study period: 42 BSIs
- Dominant risk factors:
  - prior surgery
  - acute renal failure
  - TPN
  - shock
  - disseminated intravascular coagulation
  - adult respiratory syndrome
  - triple-lumen catheter

NEMIS Study

- weekly rectal and urinary surveillance cultures: at admission, and weekly
  - identification, susceptibility testing, typing
- positive rectal swabs: 30% (n=1280): PPV=2%
- positive urine: 15%: PPV=2.7%
- positive urine+positive stool: NOT associated with increased risk of developing CBSI

Only ~1% patients developed a CBSI

"The finding of urinary or rectal fungal colonisation alone, does not appear to be clinically useful for deciding when to start presumptive antifungal therapy"

Blumberg et al. 2001 33: 177-186 (NEMIS Study Group)

NEMIS vs. other “colonisation studies”

- design:
  - case-controlled (Wey et al. 1989; Bross et al. 1989)
  - relative degrees of colonisation: highly-selected at-risk patients (Pittet et al. 1994)
  - NEMIS: control group - other ICU patients not at risk from CBSI

Sobel and Rex 2001 CID; 33: 187-190

Comment on NEMIS study

- major factors predisposing to CBSI:
  - shock
  - dissseminated intravascular coagulation
  - adult respiratory distress syndrome
  - triple-lumen catheter
- colonisation: not an independent risk factor

The association between anatomic site of *Candida* colonization, invasive candidiasis, and mortality in critically ill surgical patients

- 182 SICU patients
- 2851 surveillance cultures: 5 anatomic sites (not quantitative/semiquantitative)

Frequency of IC

Urine+	Urine -	Resp+	Resp -	Rectum/ost+	R/ost-
13.2%	2.8%	8.0%	1.2%	8.4%	0%

Negative oropharyngeal/gastric colonisation: 0% IC
Negative urine and respiratory tract cultures: 0% IC

Oropharyngeal/gastric colonisation: did not impact upon developing IC

Candiduria: independently associated with SICU mortality

Maghill et al. Diag Micro Infect Dis 2006 (in press)

The association between anatomic site of *Candida* colonization, invasive candidiasis, and mortality in critically ill surgical patients

Conclusions

"Given the low PPV of *Candida* colonisation of the 5 body sites evaluated in this study, it is difficult to propose the routine use of surveillance fungal cultures of multiple body sites to detect colonisation and guide initiation of prophylactic and preemptive antifungal therapy"

"However, the very high NPV of lack of colonisation suggests that a relatively limited strategy of surveillance culturing could be used to help identify SICU patients who are unlikely to benefit from prophylactic antifungal therapy"

Magill et al. Diag Microbiol Infect Dis 2006 (in press).

A bedside scoring system ("Candida score") for early antifungal treatment in nonneutropenic critically ill patients with *Candida* colonization"

- 74 ICUs/70 teaching hospitals
- 1699 patients
- Surveillance cultures: weekly
  - urine; tracheal; gastrointestinal tract

Patient group	Mortality rate (%)
Neither colonized nor infected (719)	33.2
Candida spp. colonization (883)	
Unifocal (338)	26.5
Multifocal (495)	50.9
Candidal infection (97)	57.7

León et al. Crit Care Med 2006; 34: 730-737.

ICU-acquired infections: is post-discharge surveillance useful?

Surveillance of all patients discharged from the medical intensive care unit is not recommended, as it is resource demanding and allows the detection of few additional infections

Hugonnet et al., Crit Care Med 2002; 30: 2636-2638

Has surveillance been successful?

- increase in incidence
- mortality remains HIGH: 50-88%
- colonisation rate in ICU: 2.5-6%
- candidaemia: 0.16-0.5%

Surveillance for moulds

- No guidelines
- No standards
- Selection of sample:
  - air
  - dust
  - water
  - patient: nasal swabs/sinus lavage/antigens
- home environment: >70% IA in allo BMT: community acquired

Cost implications

"The thought of performing expensive, routine surveillance cultures to identify at-risk patients is terrifying"

- hospital staff costs
- lab staff costs
- material costs: increases as number of sites increases
  - quantitative cultures
  - species-level identification
  - sensitivity tests

Sobel and Rex 2001 CID; 33: 187-190.

Current situation

"Colonization is presumably a near-absolute requirement for infection"

"The strength of the data suggesting the relevance of extent and density of colonization is difficult to deny"

Sobel and Rex 2001 CID 33: 187-190

Invasive candidiasis: turning risk into a practical prevention policy?

Conclusion

"What is needed is specific guidance regarding the site(s) that should be cultured, and whether density of colonisation should be routinely determined".

Sobel and Rex 2001 CID; 33: 187-189.