Catheter-related Candidemia

Preceptorship Program
Sesion 3

Emilio Bouza
Hospital General Universitario
"Gregorio Marañón"

Madrid.

Hospital General Universitario Gregorio Marañón

Madrid

Case 1

Liver Transplant patient with fever 6 weeks after trasplantation

Presentation

62 year old lady with Liver Tx 6 weeks ago.

Intestinal leak. Reinterventions on days + 10 and + 20.

Receiving Meropenem

Total Parenteral Nutrition and a Hickman catheter since 3 weeks ago

Presentation

Shaking chills and fever (39°C)

Hemodinamically stable

No particular physical findings

Chest examination: normal

Chest X-Ray: normal

Wounds in good healing

Abodiminal echography: No new findings

Topics selected for initial discussion

Incidence and dimension of the problem

The empirical use of antifungals

The assessment of the catheter involvement

The biofilm penetration by antifungals

Candida species and the relative risk

Topics selected for initial discussion

To keep or to retrieve the line

Guidewire for the replacement?

Is lock-therapy an alternative?

What is the antifungal treatment of choice.

How long to treat?

In your opinion what sentence defines best the incidence of Catheter-Related Candidemia?

Catheter related candidemia causes:

1.- 20 to 30% of all episodes of CRI.

2.- 10-19% of all episodes of CRI

3.- 5-10% of all episodes of CRI

4.- < 5% of all episodes of CRI

5.- I don't know a figure

Catheter related candidemia causes:

1.- 20 to 30% of all episodes of CRI.

2.- 10-19% of all episodes of CRI

3.- 5-10% of all episodes of CRI

4.- < 5% of all episodes of CRI

5.- I don't know a figure

Candidemia species in the whole institution

1985-2010

	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Candida no alb.	2	3	3	10	3	17	5	8	13	18	14	30	25	23	25	18	24	33	24	27	23	54	68	54	50	35
C. albicans	8	14	11	6	10	18	14	7	19	11	17	12	9	20	21	13	16	24	21	20	24	33	62	38	38	48

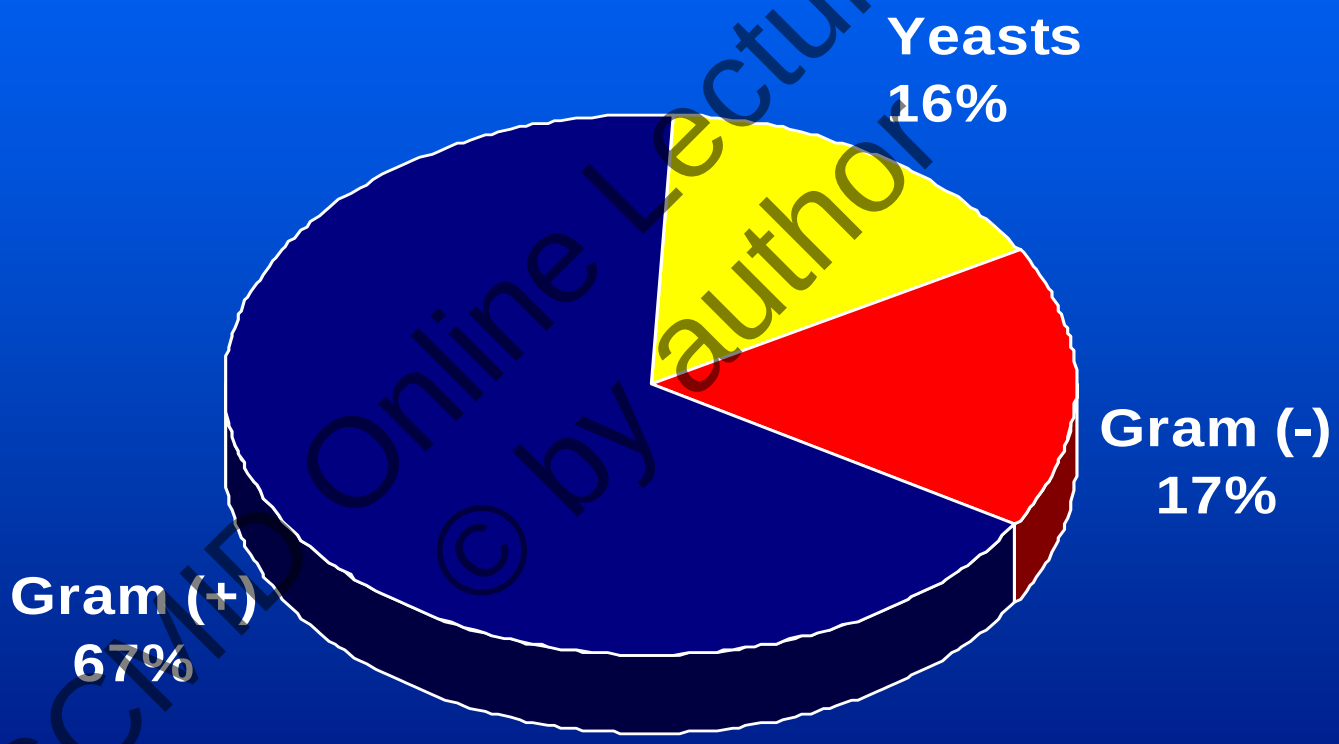
Candidemia in ICU's

1985-2010

	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
ICU's	3	5	5	5	6	8	6	4	12	4	8	18	15	10	23	14	19	38	30	23	22	56	47	37	20	38
All other	8	10	6	8	5	33	17	12	23	17	23	24	20	33	23	14	23	19	18	24	25	31	83	55	61	45

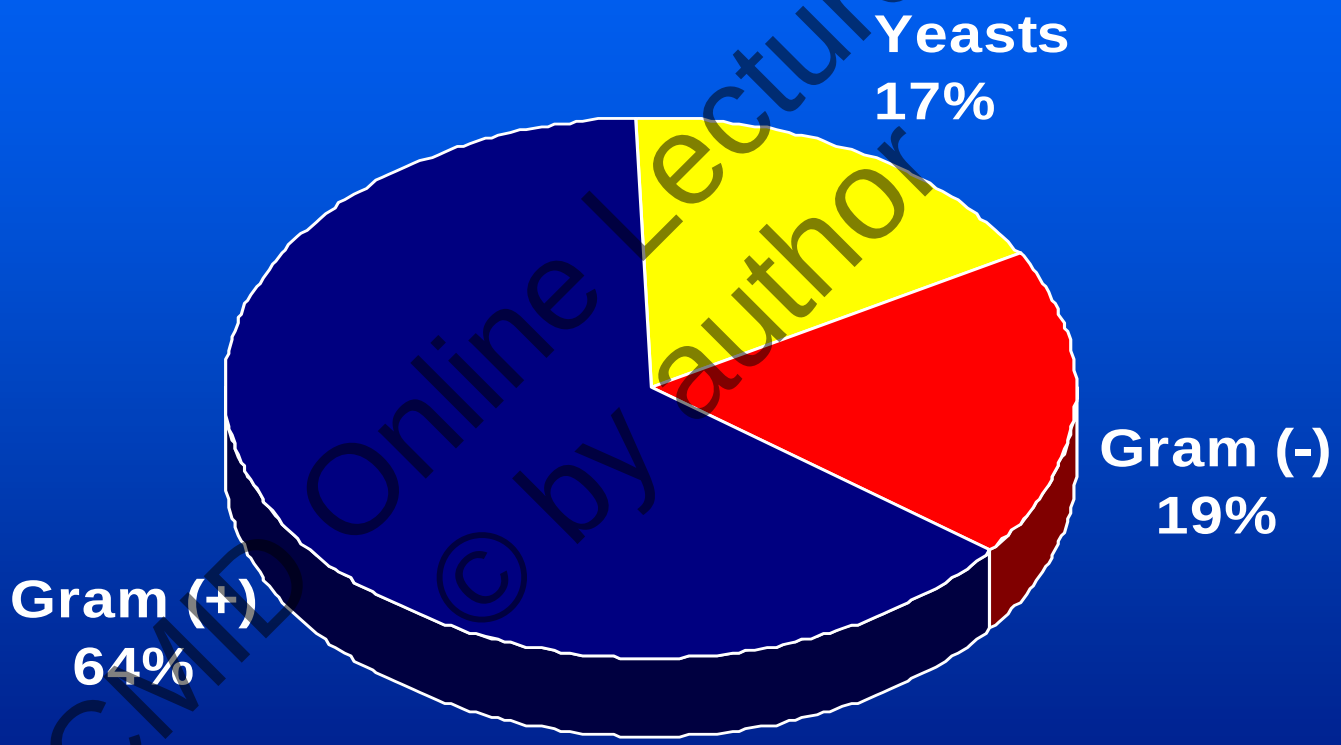
All Catheter related BSI (2003-2010). HGUGM

1234 episodes microbiologically proven



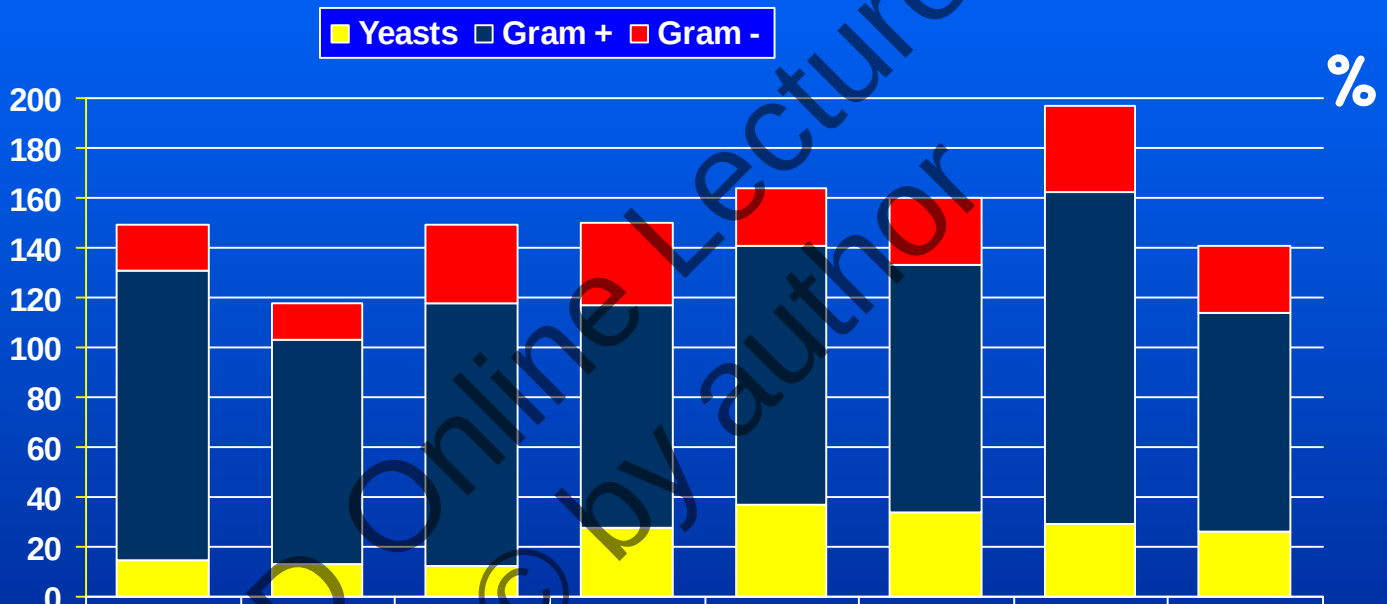
Catheter related BSI in ICUs (2003-2010). HGUGM

429 episodes microbiologically proven



Catheter related BSI (2003-2010). HGUGM

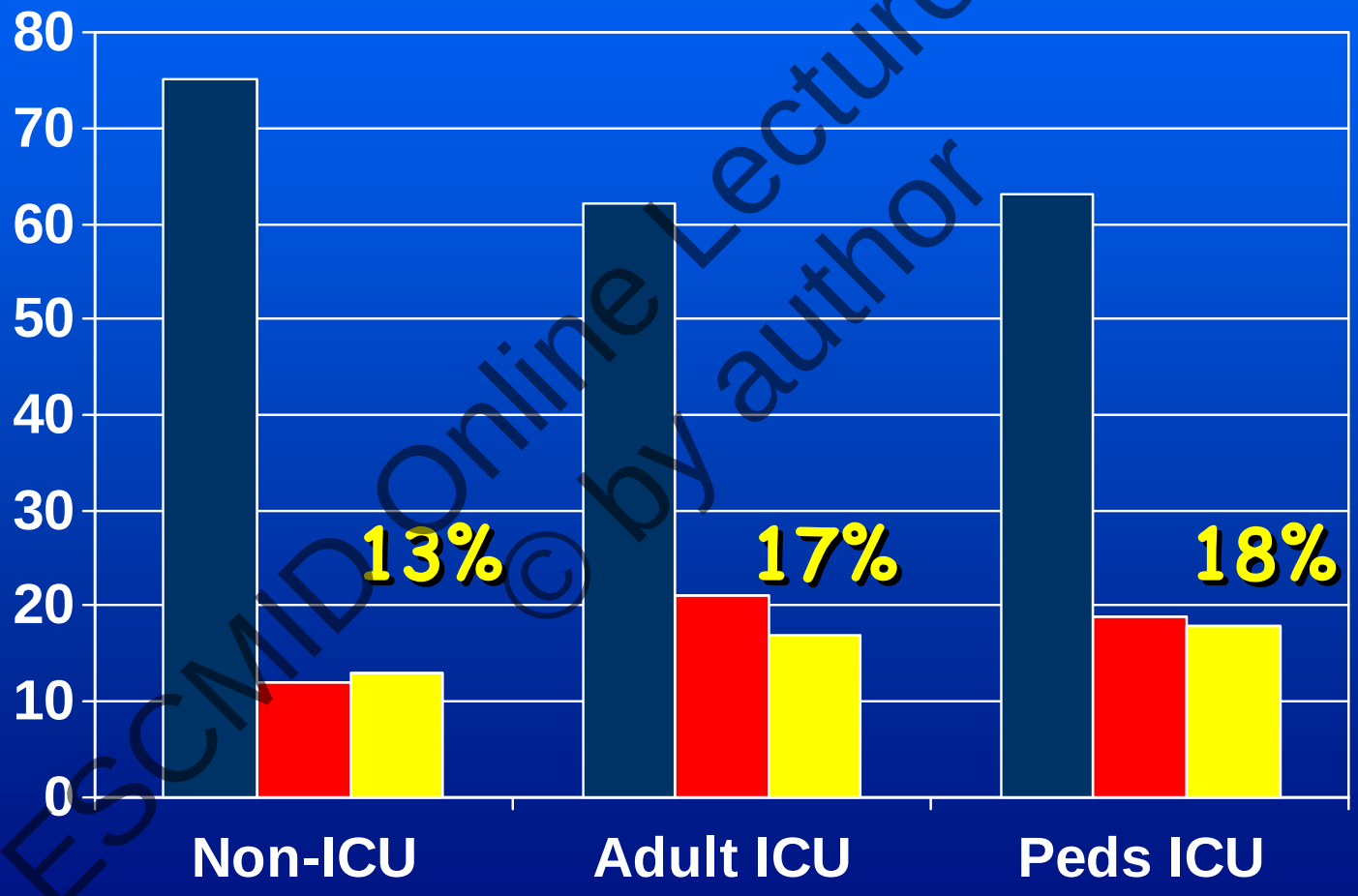
1234 episodes. Evolution of Candida proportion



	03	04	05	06	07	08	09	10
Gram -	18	15	31	33	23	27	35	27
Gram +	116	90	106	89	104	99	133	88
Yeasts	15	13	12	28	37	34	29	26
	10%	11%	8%	18%	23%	23%	15%	18%

Catheter related BSI in HGUGM (2003-2010)

1234 episodes microbiologically proven



Incidence of Candidemia:

4th Leading BSI microorganism (USA)

Causing 5-10% of all BSI in ICU's

6th-10th BSI microorganism (E.U.)

Richards MJ. I.Cont.Hosp.Epi. 2000

Rangel-Frausto MS. C.I.D. 1999

Wisplinghoff H. C.I.D. 2003.

Nolla-Salas J. Int.Care.Med. 1997

Bouza E. Clin.Microb.Infect. 1999

Incidence of Candida-CR-BSI

Prowle et al. Critical Care 2011, 15:R100
http://ccforum.com/content/15/2/R100

RESEARCH Open Access

Acquired bloodstream infection in the intensive care unit: incidence and attributable mortality

Candida, *Staphylococcus* and Gram negatives associated with increase in death

Prowle JR. Crit.Care. 2011

Incidence of Candida-CR-BSI

6339 ICU admissions

330-BSI (5.2%)

34-Proven CR-BSI (10%)

Candida: 15.5% of all ICU acquired BSI

Prowle JR. Crit.Care. 2011

Population-based study in Barcelona

345 episodes of Candidemia

4.3 cases/100,000 inhabitants
0.5 cases/1,000 hospital discharges
0.7 cases/10,000 patient-days

57.4% likely related to the catheter

Almirante B. J.Clin.Microb.2005

When confronted with a septic patient with suspicion of catheter origin. When do you include antifungal empiric treatment?

Empirical treatment

1.- All patients on broad spectrum antibiotics

2.- All patients already colonized by Candida

3.- Patients with a femoral line

4.- All solid and Bone Marrow transplants

5.- All of the above

Empirical treatment

1.- All patients on broad spectrum antibiotics

2.- All patients already colonized by Candida

3.- Patients with a femoral line

4.- All solid and Bone Marrow transplants

5.- All of the above

Empirical treatment of Candida if:

Total parenteral nutrition
Broad-spectrum abx.
Hematologic malignancy
Bone marrow transplantation
Solid-organ transplant
Femoral catheterization,
Colonization due to Candida species at multiple sites

B-II

Mermel L- C.I.D. 2009

Empirical treatment of Candida:

Clinical Practice Guidelines for the Management of Candidiasis: 2009 Update by the Infectious Diseases Society of America

Empirical antifungal therapy should be considered for critically ill patients with risk factors for invasive candidiasis and no other known cause of fever, and it should be based on clinical assessment of risk factors, serologic markers for invasive candidiasis, and/or culture data from nonsterile sites (B-III).

Pappas PG. C.I.D. 2009

Empirical treatment of Candida if:

27. In addition to coverage for gram-positive pathogens, empirical therapy for suspected CRBSI involving femoral catheters in critically ill patients should include coverage for gram-negative bacilli and *Candida* species (A-II).

Lorente L. C.I.D. 2009

Empirical treatment of Candida:

Zilberberg *et al. BMC Infectious Diseases* 2010, **10**:150
http://www.biomedcentral.com/1471-2334/10/150

RESEARCH ARTICLE Open Access

Inappropriate empiric antifungal therapy for candidemia in the ICU and hospital resource utilization: a retrospective cohort study

90% inadequate treatment in first 24 h
Delays 95%, Inadequate dosage 26%

Zilberberg MD. BMC Infect. 2010

What approach do you trust more to assess if the catheter is the origin?

The assessment of catheter causality

1.- Differential quantitative blood cultures

2.- Differential time to positivity

3.- Superficial cultures permit to rule out the cather origin if negative

4.- None of the above

5.- All of the above

The assessment of catheter causality

1.- Differential quantitative blood cultures

2.- Differential time to positivity

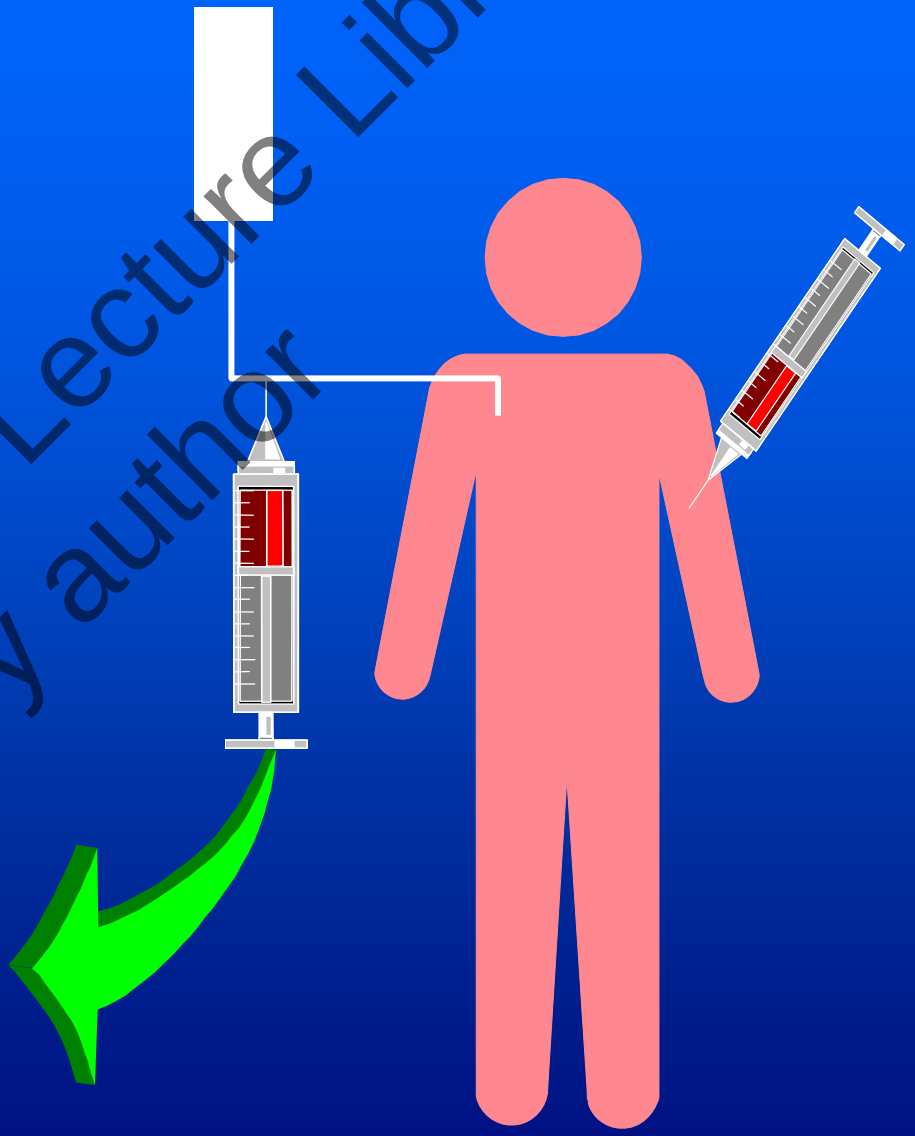
3.- Superficial cultures permit to rule out the cather origin if negative

4.- None of the above

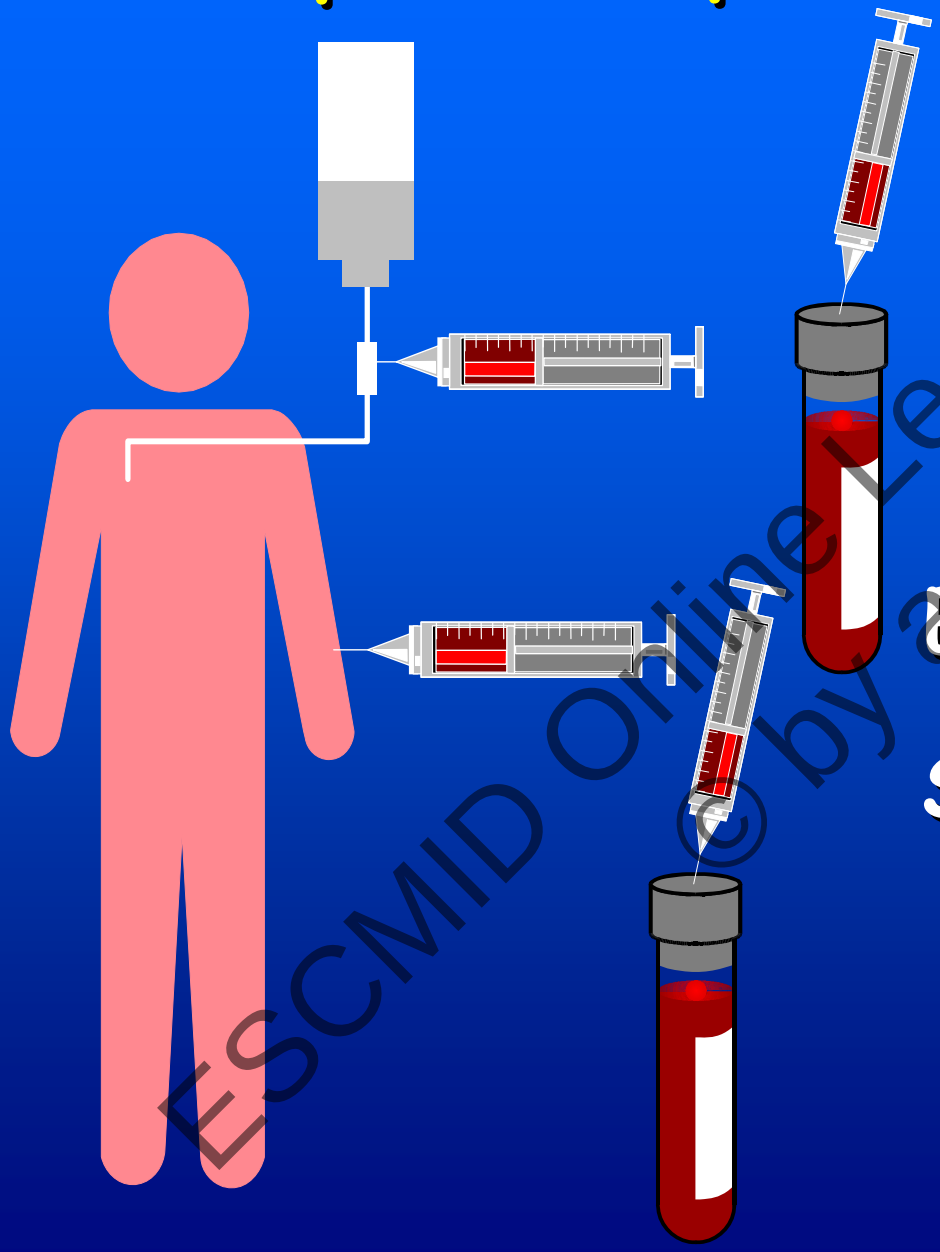
5.- All of the above

DX: Differential time to positivity

Blot. J.Clin.Microbiol. 1998



DX: Comparative quantitative bacteremia



> 5 times

Especificity 100%

Sensitivity >80%

Mosca . Surgery 1987

Differential Time to Positivity: A Useful Method for Diagnosing Catheter-Related Bloodstream Infections

Issam Raad, MD; Hend A. Hanna, MD, MPH; Badie Alakech, MD; Ioannis Chatzinikolaou, MD; Marcella M. Johnson, MS; and Jeffrey Tarrand, MD

Background: Catheter-related bloodstream infections are associated with recognized morbidity and mortality, especially in critically ill patients. Accurate diagnosis of such infections results in proper management of patients and in reducing unnecessary removal of catheters.

Objective: To evaluate differential time to positivity as a method for diagnosing catheter-related bacteremias caused by both short-term and long-term use of central venous catheters.

Design: Prospective study design.

Setting: M.D. Anderson Cancer Center, Houston, Texas, a tertiary care cancer center.

Patients: All patients, between September 1999 and November 2000, who had the same organism isolated from blood cultures drawn simultaneously through the central venous catheter and the peripheral vein.

Measurements: Time necessary for the blood cultures from the central venous catheter and the peripheral vein to become positive, as well as other relevant patient information.

Results: 191 bloodstream infections with positive simultaneous central venous catheter and peripheral vein blood cultures were included. One hundred eight patients had catheter-related bacteremias, and 83 had non–catheter-related bacteremias. Catheter-related bacteremias were more frequently caused by staphylococci and less likely to be associated with underlying hematologic malignant conditions, neutropenia, and longer duration of hospitalization. As a diagnostic tool for catheter-related bacteremia (using a composite definition reference standard according to the Infectious Diseases Society of America guidelines), differential time to positivity of 120 minutes or more was associated with 81% sensitivity and 92% specificity for short-term catheters and 93% sensitivity and 75% specificity for long-term catheters.

Conclusion: Differential time to positivity of 120 minutes or more is highly sensitive and specific for catheter-related bacteremia in patients who have short- and long-term catheters.

Ann Intern Med. 2004;140:18-25. www.annals.org

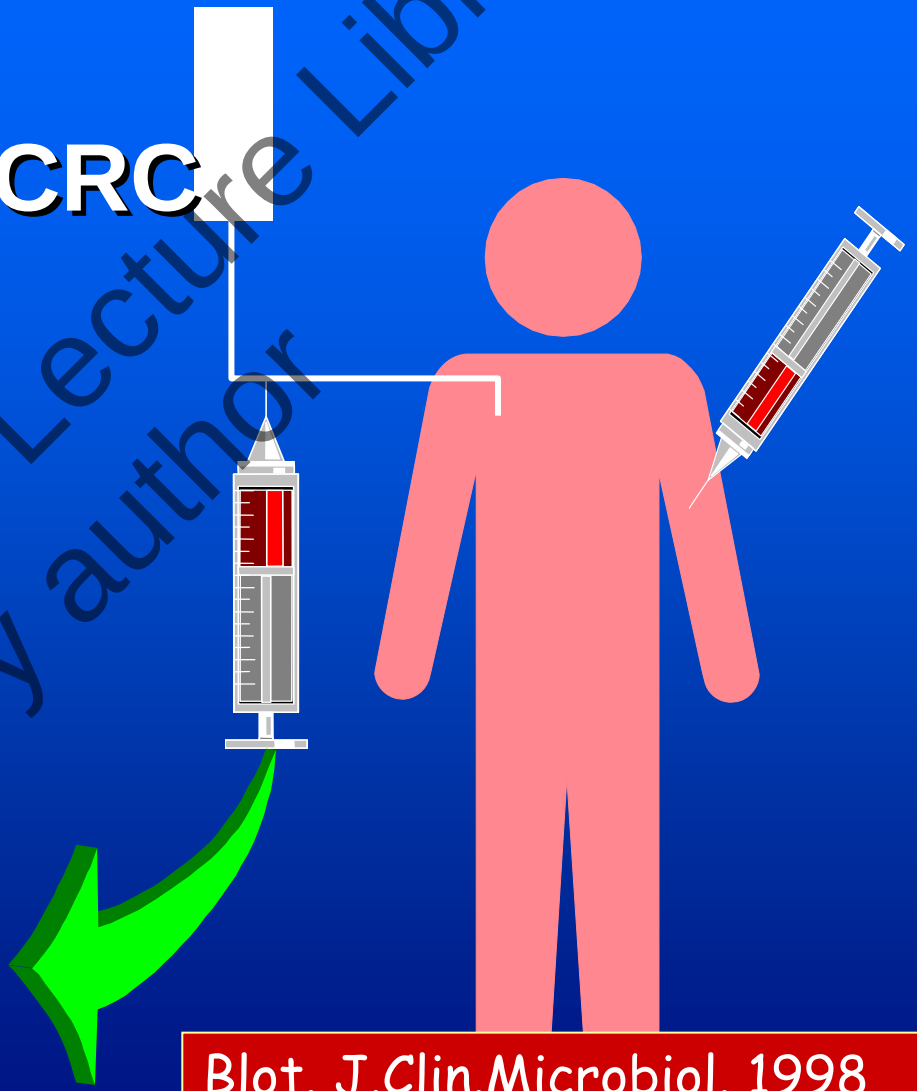
For author affiliations, see end of text.

See editorial comment on pp 62-64.

Raad I. Ann.Intern.Med. 2004

DX: Differential time to positivity

> 2 h suggestive of CRC



Blot. J.Clin.Microbiol. 1998

Raad I. Ann.Intern.Med. 2004

Differential time to positivity

Differential time to positivity

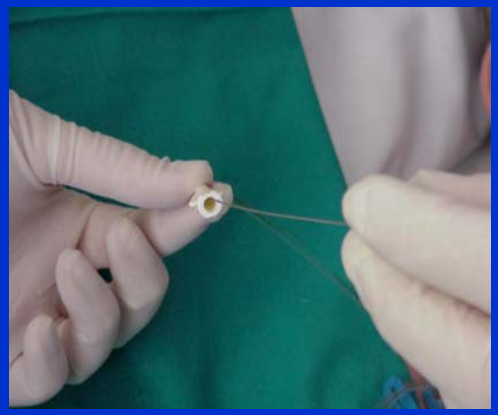
- 204 ICU patients included
  - 26 CRB
  - 29 BSI from other origins
  - 36 Cath colonization

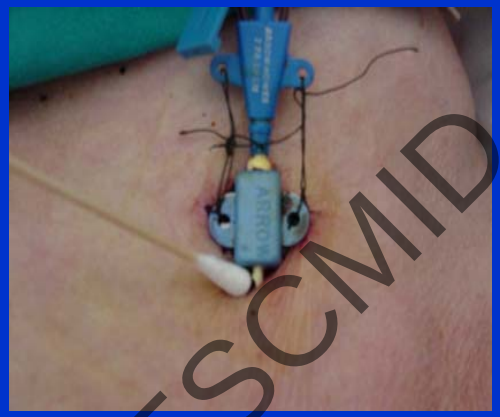
6 candidemias

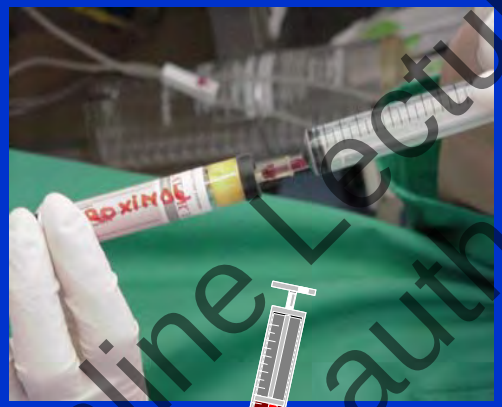
	Superficial	DQC	DTTP
Sensitivity	78.6	71.4	96.4
Specificity	92.0	97.7	90.3
PPV	61.1	83.3	**61.4**
NPV	**96.4**	95.6	99.4
Accuracy	90.2	94.1	91.2

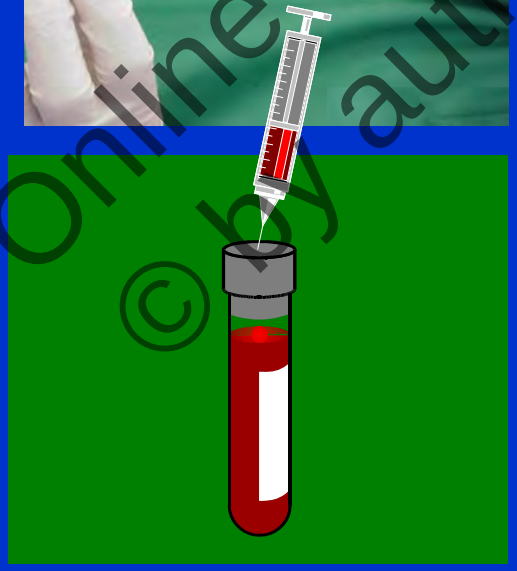
DTP: In Intensive Care Units

Superficial	DQC:Lysis	DTP









Bouza E. C.I.D. 2007

DTP: In Intensive Care Units

	Superficial	DQC	DTTP
Sensitivity	78.6	71.4	96.4
Specificity	92.0	97.7	90.3
PPV	61.1	83.3	61.4
NPV	96.4	95.6	99.4
Accuracy	90.2	94.1	91.2

Bouza E. C.I.D. 2007

The challenge of anticipating catheter tip colonization in major heart surgery patients in the intensive care unit: Are surface cultures useful?

Emilio Bouza, MD, PhD; Patricia Muñoz, MD, PhD; Almudena Burillo, MD, PhD; Javier López-Rodríguez, MD; Cristina Fernández-Pérez, MD, PhD; María Jesús Pérez, RN; Cristina Rincón, RN; and the Cardiovascular Infection Study Group

Preliminary results in candidemia: PPV 100%, NPV 75%

- Sensitivity 83.5% (73.6-90.4)
- Specificity 67.1% (60.6-72.9)
- PPV 47.6% (39.5-55.9)
- **NPV 91.9% (86.5-95.3)**

Time to positivity and candidemia

JOURNAL OF CLINICAL MICROBIOLOGY, July 2008, p. 2222–2226
0095-1137/08/$08.00+0 doi:10.1128/JCM.00214-08

Time to Blood Culture Positivity as a Marker for Catheter-Related Candidemia▽

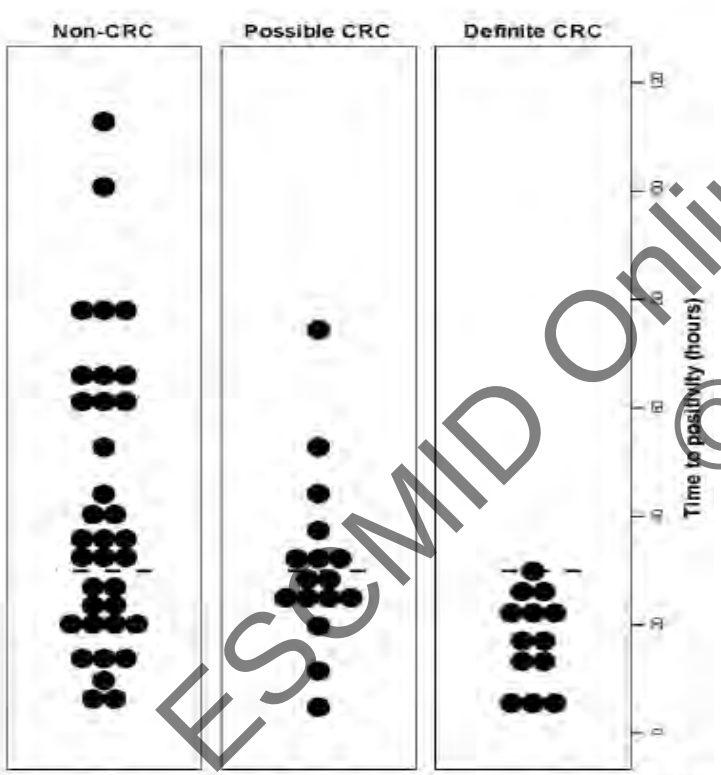


FIG. 1. Time to positivity among patient populations with different likelihoods of catheter-related candidemia. The short horizontal dashed lines mark the 30-h cutoff.

Time to positivity
< 30 h
Sensitive but non-specific
> 30 h Rule out
Catheter origin

Ben-Ami R. J.Clin.Microb. 2008

Withdrawing the catheter

Management of Central Venous Catheters in Patients with Cancer and Candidemia

Early catheter removal (< 72 h) improves response to antifungal agents in cases with a catheter-related fungemia

Factors of secondary origin: Neutropenia, disseminated disease, poor response to antifungal treatment, prior chemotherapy, corticosteroid treatment

Raad I. C.I.D. 2004

Could you assess the catheter as a potential origin without initial catheter withdrawal?

- Clinical diagnosis inaccurate (<25%)
- Help from the lab
  - Is the catheter colonized?
    - Superficial cultures
  - Has the patient CRBSI?
    - Differential time to positivity > 2 hours
    - Time to positivity > 30 hours
    - >25 cfu/ml in peripheral blood (Telenti A)

Time to positivity in CR candidemia

- TTP in peripheral blood is a sensitive but nonspecific marker for catheter-related candidemia
- TTP of more than 30 h can help exclude an intravascular catheter as the possible source of candidemia

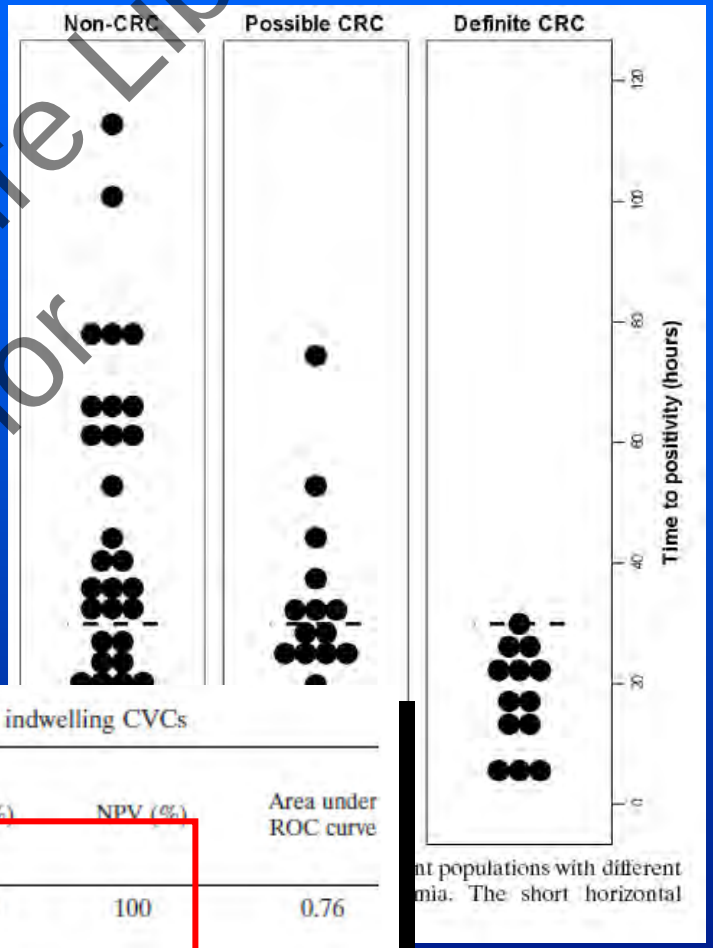


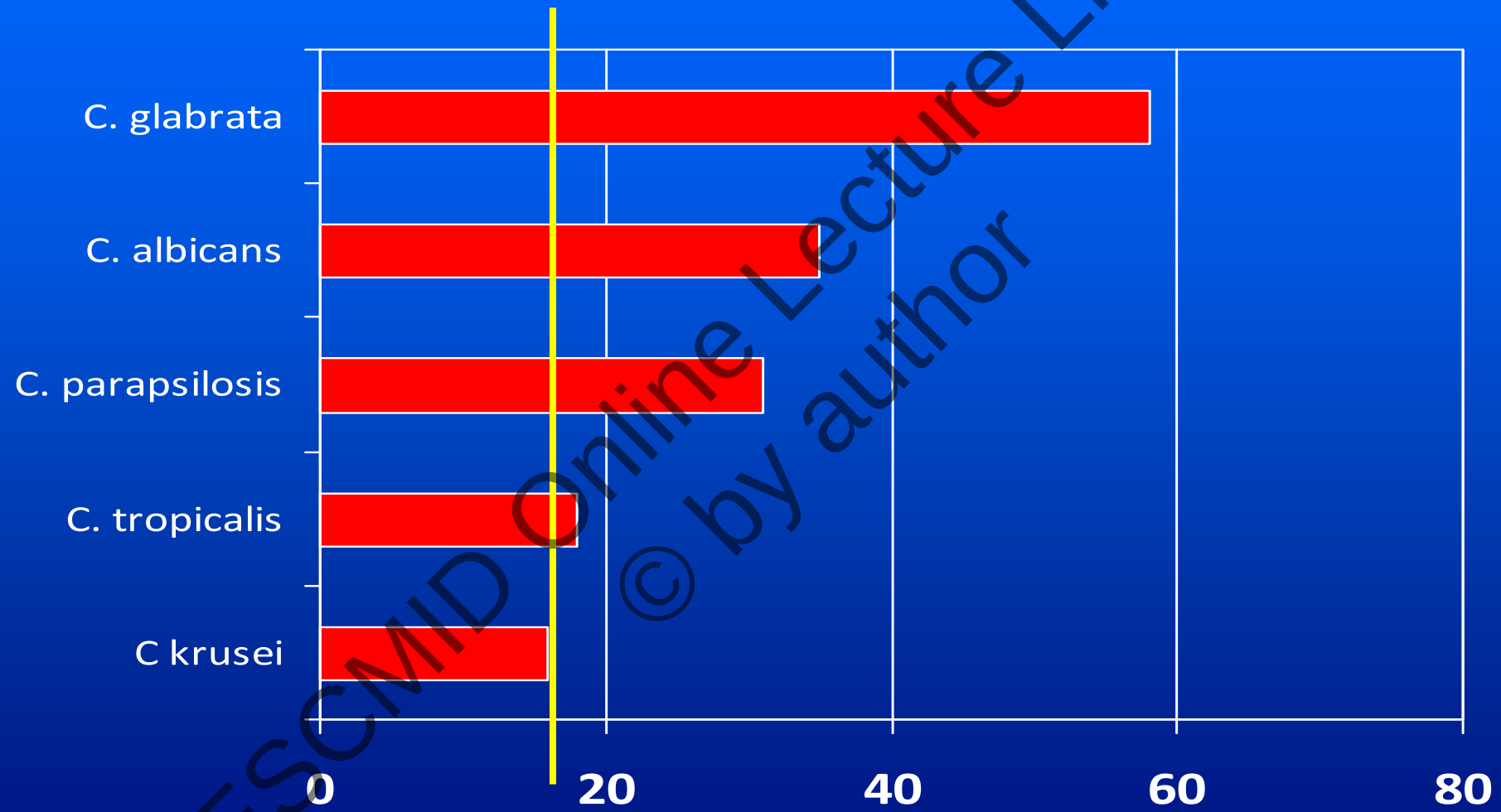
TABLE 3. Accuracy of a TTP cutoff of 30 h for the diagnosis of CRC in 50 patients with indwelling CVCs

Patient group	No. of patients with CRC diagnosis with the following TTP cutoff:		Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Area under ROC curve
	TTP ≤ 30 h	TTP > 30 h					
Definite CRC	13	0	100	51.4	41.9	100	0.76
Possible + non-CRC	18	19					
Definite + possible CRC	22	7	75.9	57.1	71.0	63.2	0.66
Non-CRC	9	12					

nt populations with different
mia. The short horizontal

Ben-Ami. J Clin Microbiol 2008

Median time to positivity in Candidemia blood cultures (hours)



CRITICAL WINDOW: 12-24 H

How difficult to penetrate is Candida biofilm?

The penetration of Candida biofilm

1.- Azoles penetrate very well

2.- Amphotericin B penetrates well

3.- Candins penetrate well in Candida biofilm

4.- Candins penetrate well but not equally

5.- I don't think penetration in biofilm matters for the treatment of CR-Fungemia

Candida biofilms

ELSEVIER DOYMA

Revista Iberoamericana de Micología

www.elsevier.es/reviberoammicol

Actividad de la micafungina contra las biopelículas de *Candida*

Amphotericin B and azole drugs: poor penetration

Quindós G. Rev.IberoAm. Micol 2009

Candida biofilms

ELSEVIER DOYMA

Revista Iberoamericana de Micología

www.elsevier.es/reviberoammicol

Actividad de la micafungina contra las biopelículas de *Candida*

Candins

Good penetration in *Candida: albicans, dubliniensis, glabrata and krusei*

Variable in *Candida: parapsilosis and tropicalis*

Quindós G. Rev.IberoAm. Micol 2009

Candida biofilms: Activity of candins

Require 10-100 times concentrations than in planctonic cells

Inter-species variability

Depends on the substrate use in the study

Micafungin has a shorter period for action
Caspofungin and other candins are inactive in *Trichosporon ashaii* and *Cryptococcus neoformans* biofilms

Quindós G. Rev.IberoAm. Micol 2009

Candida biofilms

International Journal of Antimicrobial Agents 37 (2011) 380–384

Contents lists available at ScienceDirect

International Journal of Antimicrobial Agents

journal homepage: http://www.elsevier.com/locate/ijantimicag

Short communication

Possible role of azole and echinocandin lock solutions in the control of *Candida* biofilms associated with silicone

8 *C. albicans* and 6 *C. glabrata*
Caspo, Mica and Posaconazole activity

Cateau E. Int.J.Antimicrob.Agents. 2011

Candida biofilms

Table 2
Reductions in the metabolic activity of young *Candida* biofilm yeasts induced by antifungal lock solutions.

Candida spp.	Post-lock interval (h)	Decrease in metabolic activity (%)[a]				
		Caspofungin		Micafungin		Posaconazole
		5 (mg/L)	25 (mg/L)	5 (mg/L)	15 (mg/L)	10 (mg/L)
C. albicans	24	81.3 ± 8.8	76.9 ± 12	75.1 ± 14.1	70.7 ± 11.3	54.2 ± 6
	48	76.8 ± 12.4	78.6 ± 11.1	77.7 ± 14.4	65.4 ± 18.3	49.7 ± 12
	72	78.6 ± 17.4	79.5 ± 8.3	81.2 ± 9.3	74.8 ± 13.3	41.3 ± 7.9
C. glabrata	24	76.7 ± 10.1	N/S	92.7 ± 0.4	N/S	None[b]
	48	55.8 ± 16.7	N/S	91.6 ± 20.7	N/S	None
	72	42.8 ± 19.1	N/S	92.4 ± 0.8	N/S	None

N/S, not studied.

[a] Decreases are calculated as the mean reduction for each species (10 strains of *C. albicans* and 6 of *C. glabrata*; Table 1); mean reductions are presented for each antifungal concentration tested (5 mg/L and 25 mg/L caspofungin, 5 mg/L and 15 mg/L micafungin and 10 mg/L posaconazole) and for each post-lock interval studied (24, 48 or 72 h).

[b] None indicates that no inhibition was measured.

Mica, Caspo and Posa reduce metabolic activity. No 100% inhibition

Micafungin has a more prolonged effect

Cateau E. Int.J.Antimicrob.Agents. 2011

Is the species of Candida present in blood of any help in assessing the catheter involvement?

Candida species and the catheter role

1.- All candida species can cause CR-BSI and the species does not help to assess the involvement

2.- *Candida parapsilosis* is particulary prone to CR-BSI

3.- *Candida krusei* is distinctly uncommon in patients with CR-BSI

4.- Candida with the crf gene are particularly prone to infect the catheter

5.- You don't have an opinion in this point

Candida species and the catheter role

1.- All candida species can cause CR-BSI and the species does not help to assess the involvement

2.- *Candida parapsilosis* is particulary prone to CR-BSI

3.- *Candida krusei* is distinctly uncommon in patients with CR-BSI

4.- Candida with the crf gene are particularly prone to infect the catheter

5.- You don't have an opinion in this point

Candida parapsilosis

Predictors of Adverse Outcome in Cancer Patients with Candidemia

Elias J. Anaissie, John H. Rex, Ömrün Uzun, Shahe Vartivarian

C. parapsilosis is more frequently associated to catheter infection and has a better prognosis

Anaissie E. Am.J.Med. 1998

Risk of Candidemia

2,853 patients admitted into the ICU.

118 with candidemia
41.4 cases per 1,000 ICU admissions
2.09 per 1,000 hospital admissions

18.6% *C. albicans*
81.4% *C. non-albicans*
66% *C. parapsilosis*
12.7% *C. tropicalis*
2.5% *C. glabrata*

C. parapsilosis strongly related with catheters

Horasan ES. Mycopathologia. 2010

If you are taking care of a patient with Candidemia presumptively related to the catheter, what is your attitude regarding retrieving the line?

Pulling or maintaining the line?

1.- I pull the line in all circumstances

2.- I keep the line if is badly needed, but treat with systemic antifungals

3.- I may keep the line for a few days but add lock therapy and systemic antifungals

4.- I keep the line, add lock and systemic antifungals and wait for the results of follow-up cultures

5.- I don't have an opinion on this point

Pulling or maintaining the line?

1.- I pull the line in all circumstances

2.- I keep the line if is badly needed, but treat with systemic antifungals

3.- I may keep the line for a few days but add lock therapy and systemic antifungals

4.- I keep the line, add lock and systemic antifungals and wait for the results of follow-up cultures

5.- I don't have an opinion on this point

Retrieving or Keeping the line

Remove the catheter A-I

Candidemia + short term ci
No obvious source of
Remove the cat end the tip for culture A-II

Al Remove on guidewire and sen tip for culture B-II

If positive tip with same Candida species: remove the newly inserted catheter

Mermel L- C.I.I. 2009

Withdrawing the catheter

Year	Author	Journal	Catheter Removal
1995	Rex JH	Clin.Infect.Dis	Yes
1995	Nguyen MH	Arch.Int.Med	Yes
1996	Hung CC	J.Formos Med Ass	Yes
1998	Nucci M	I.C.H.E.	Yes
2000	Karkowicz MG	Pediatrics	Yes
2004	Raad I	Clin.Infect.Dis	Yes
2005	Almirante B	J.Clin.Microb	Yes
2009	Mermel L	C.I.D.	Yes
2009	Pappas P	C.I.D.	Yes

Withdrawing the catheter

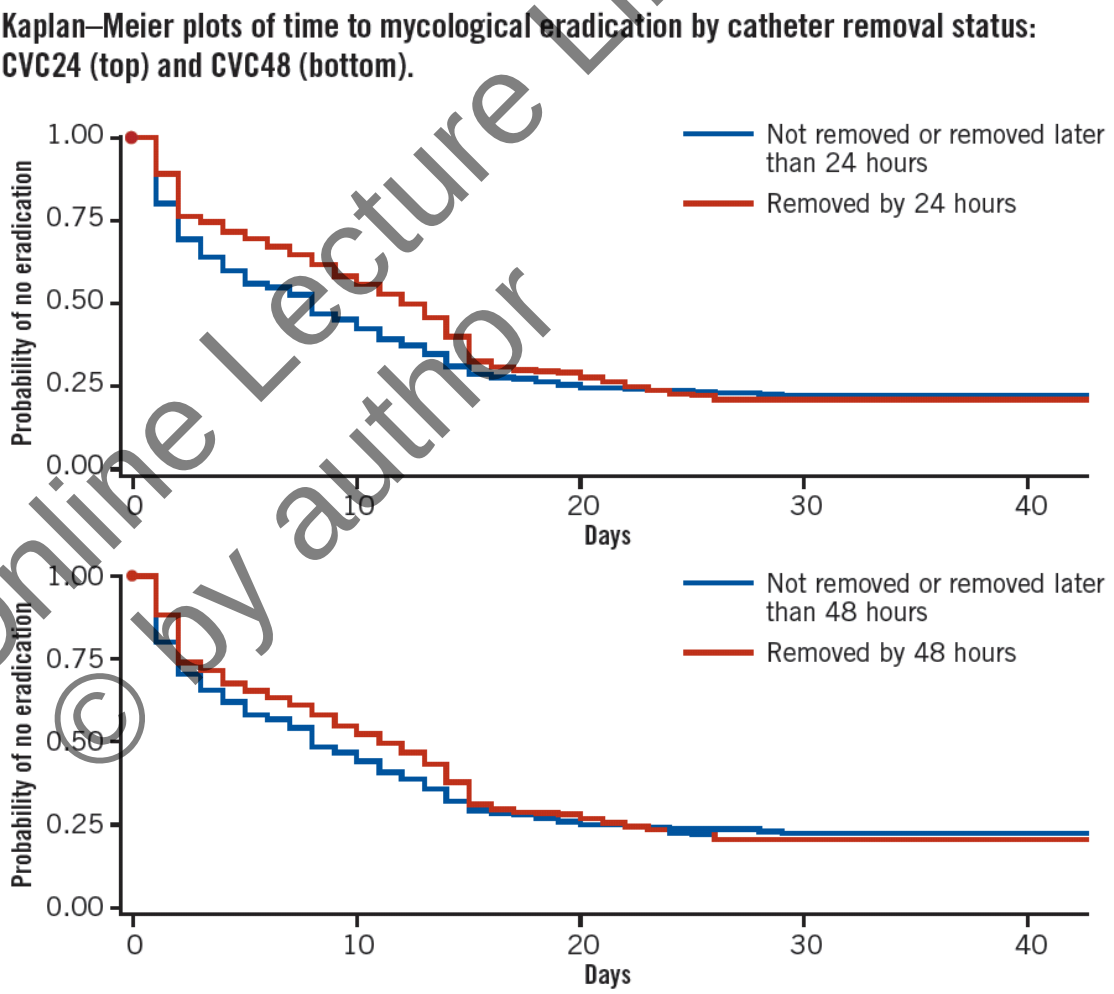
Early Removal of Central Venous Catheter in Patients with Candidemia Does Not Improve Outcome: Analysis of 842 Patients from 2 Randomized Clinical Trials

842 adults. Early removal of catheter (24-48h) was not associated with any clinical benefit.

Nucci M. CID 2010

Withdrawing the catheter

- Catheter removal by 24 or 48 hours after treatment initiation had no effect on:
  - Overall treatment success
  - Mortality
  - Mycological eradication
- Possible effect of removal after 48 hours was not assessed



Nucci M. CID 2010

In case you have to pull the line, what is your attittude regarding catheter replacement?

Catheter replacement

1.- I replace by guidewire and wait for catheter tip results

2.- I replace by guidewire but use for replacement a catheter inpregnated in antifungals

3.- I replace by guidewire and initiate antifungal lock for prevention

4.- I never replace by guidewire

5.- I don't have an opinion on this point

Catheter replacement

1.- I replace by guidewire and wait for catheter tip results

2.- I replace by guidewire but use for replacement a catheter inpregnated in antifungals

3.- I replace by guidewire and initiate antifungal lock for prevention

4.- I never replace by guidewire

5.- I don't have an opinion on this point

Guidewire exchange

For patients with unexplained fever, if blood culture results are positive, the CVC or arterial catheter was exchanged over a guidewire, and the catheter tip has significant growth, then the catheter should be removed and a new catheter placed in a new site

B-II

Mermel L. CID. 2009

Guidewire exchange

If other vascular sites are unavailable and/or the patient is at increased risk for bleeding diathesis in the setting of CRBSI not complicated by an exit site infection, then exchange the infected catheter over a guidewire

B-II

Mermel L. CID. 2009

Guidewire exchange for Candida

Alternatively, for patients with lim… venous access, exchange the cath… over a guidewire and perform cat… cultures

B-II

If the catheter is colonized with th… species of Candida as found in a percutaneous blood culture, the C… should be removed

A-II

Mermel L. CID. 2009

Pulling the line

Novel Approach Using Antimicrobial Catheters to Improve the Management of Central Line-Associated Bloodstream Infections in Cancer Patients

Exchanging infected catheters on guidewires is safe if the new catheter is coated with Minocycline and Rifampin
No cases caused by Candida

Chaftari AM. Cancer 2011

What is your opinion regarding the present and future of lock therapy in patients with Candidemia related to the catheter?

Lock-therapy with antifungal agents

1.- I don't use Amphotericin B for locks

2.- I don't trust azoles for lock therapy

3.- I prefer candins for lock therapy

4.- Experimental models suggest that Micafungin is going to be the choice candin for lock therapy

5.- Lock therapy with anti-fungals is not established yet and should be considered in research phase

Lock-therapy with antifungal agents

1.- I don't use Amphotericin B for locks

2.- I don't trust azoles for lock therapy

3.- I prefer candins for lock therapy

4.- Experimental models suggest that Micafungin is going to be the choice candin for lock therapy

5.- Lock therapy with anti-fungals is not established yet and should be considered in research phase

Lock-therapy for Candida

Catheter removal is recommended for CRBSI due to S. aureus and Candida species, instead of treatment with antibiotic lock and catheter retention, unless there are unusual extenuating circumstances (e.g., no alternative catheter insertion site)

A-II

Mermel L. C.I.D. 2009

Lock-therapy for Candida

J Infect Chemother
DOI 10.1007/s10156-011-0224-3

ORIGINAL ARTICLE

In vitro effectiveness of antifungal lock solutions on catheters infected with *Candida* species

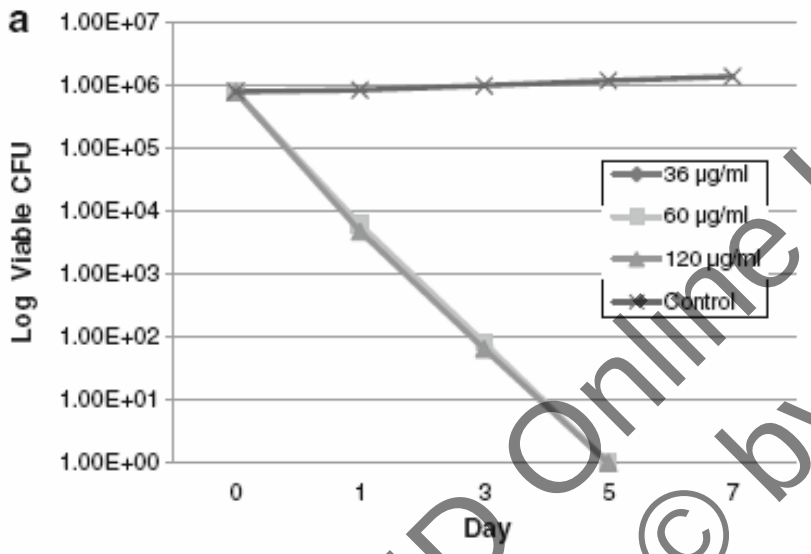
In vitro antibiotic Lock-Model
Infected catheters *C. albicans* and *C. parapsilosis*
AmphoB, Caspo, Fluco, Itra, Vori.
300, 500, 1000 fold MIC
1,3,5,7 days

Oncu S. J.Infect.Chemother. 2011

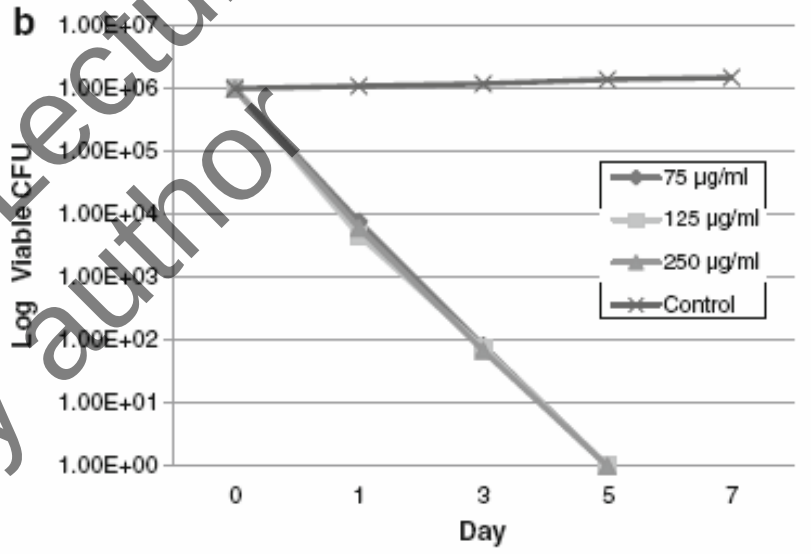
Lock for Candida

Oncu S. J.Infect.Chemother. 2011

C. albicans



C. parapsilosis

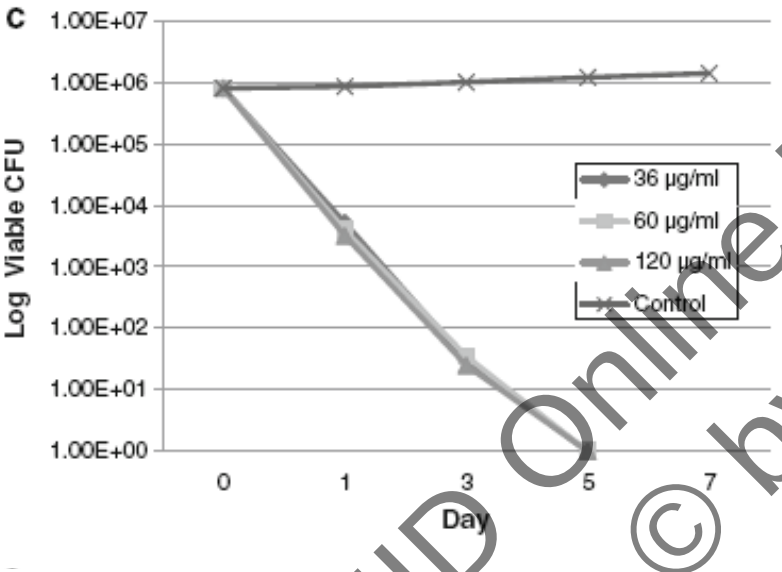


Ampho B

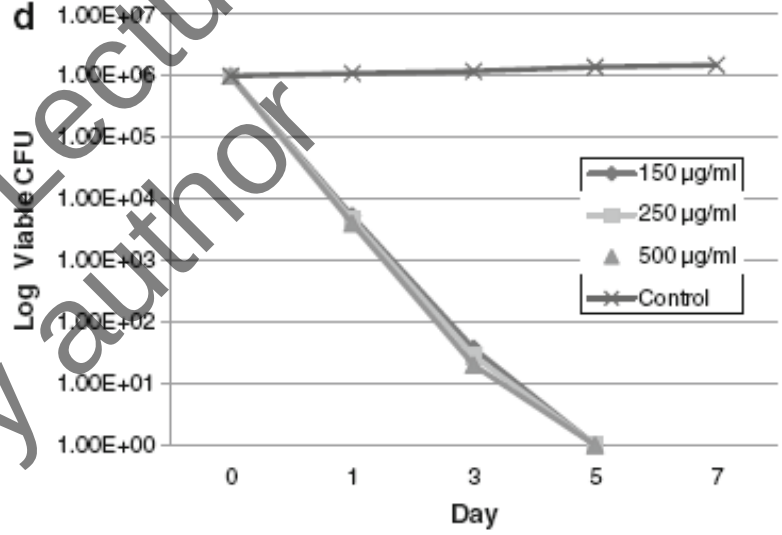
Lock for Candida

Oncu S. J.Infect.Chemother. 2011

C. albicans



C. parapsilosis

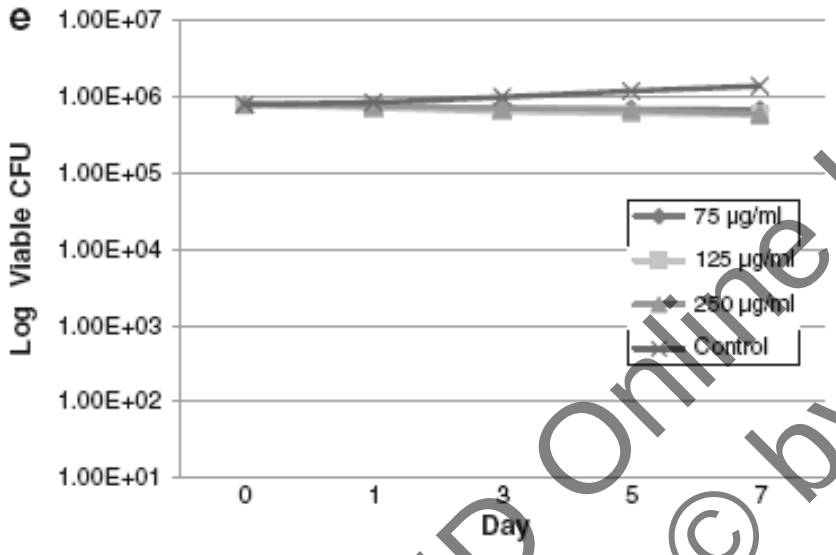


Caspofungin

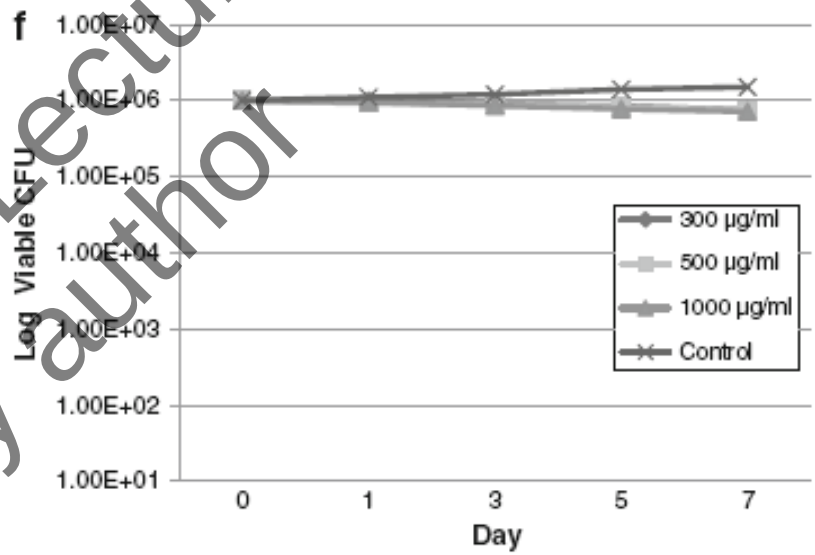
Lock for Candida

Oncu S. J.Infect.Chemother. 2011

C. albicans



C. parapsilosis

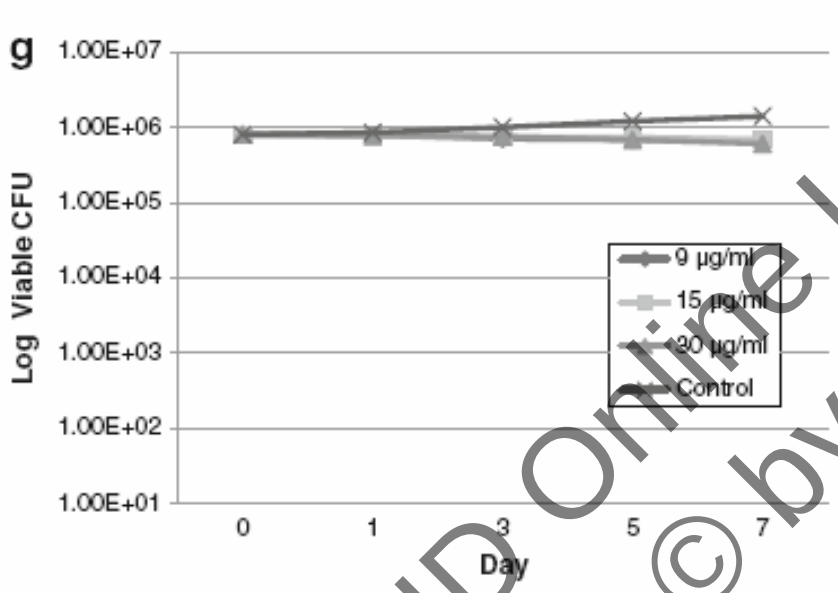


Fluconazole

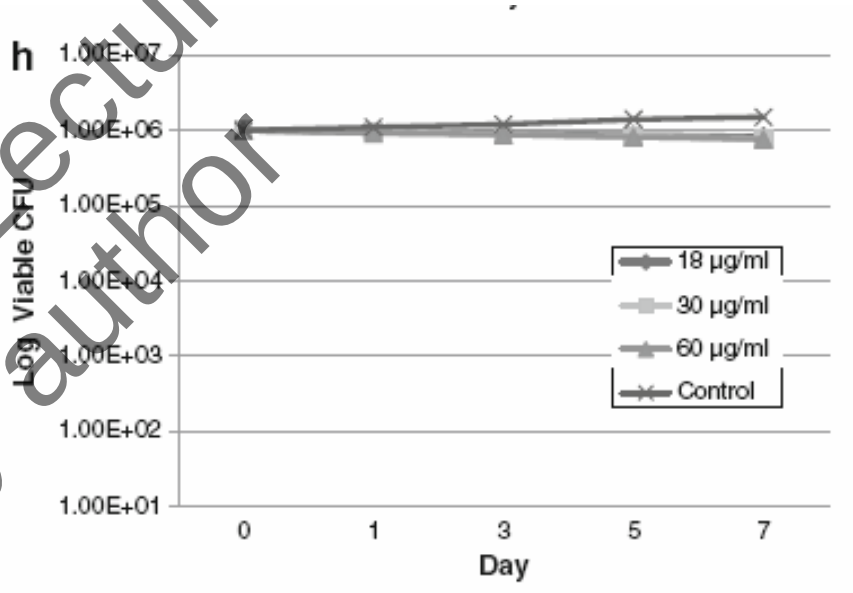
Lock for Candida

Oncu S. J.Infect.Chemother. 2011

C. albicans



C. parapsilosis

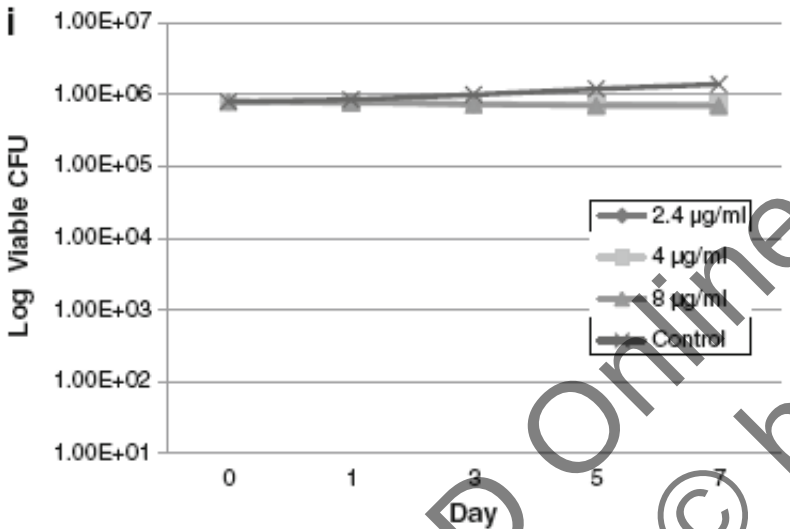


Itraconazole

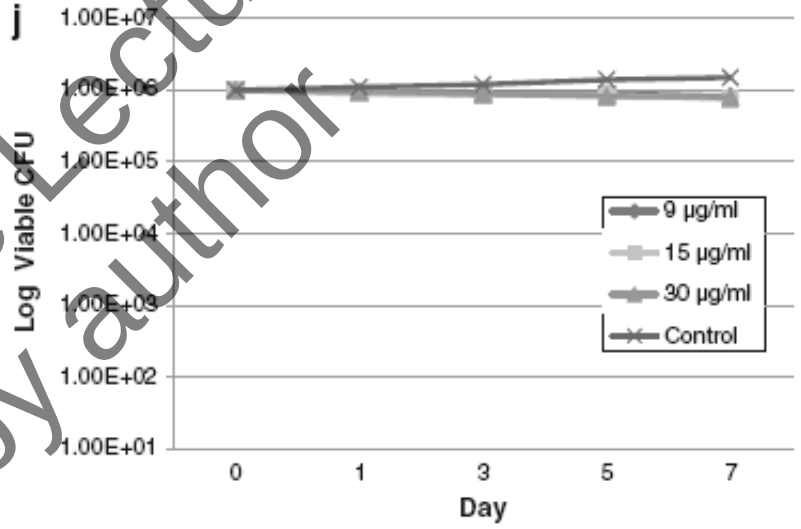
Lock for Candida

Oncu S. J.Infect.Chemother. 2011

C. albicans



C. parapsilosis



Voriconazole

How long would you treat patients with Catheter-Related candidemia?

How long would you treat?

1.- For 2 weeks after first positive blood cultures

2.- For 2 weeks after the first negative follow up blood cultures

3.- For 2 weeks after negative BC's but with a long-term follow up

4.- For 4-6 weeks if TEE is not available or if retinal lesions were present and with a long term follow up

5.- I don't have an opinion on this point

How long would you treat?

1.- For 2 weeks after first positive blood cultures

2.- For 2 weeks after the first negative follow up blood cultures

3.- For 2 weeks after negative BC's but with a long-term follow up

4.- For 4-6 weeks if TEE is not available or if retinal lesions were present and with a long term follow up

5.- I don't have an opinion on this point

What is your attitude in patients with catheter tips colonized with Candida, without concomitant fungemia?

Candida Colonized Catheters (CCC)

1.- I do not prescribe antifungals on the basis of Candida colonization of the catheter tips and do not perform follow-up BC's

2.- I do not prescribe antifungals on the basis of Candida colonization of the catheter tips but carefully follow-up BC's.

3.- I treat the patient as if BC's were positive.

4.- I treat the patients with antifungals until follow-up cultures return negative.

5.- I never saw a patient in that situation

Candida Colonized Catheters (CCC)

1.- I do not prescribe antifungals on the basis of Candida colonization of the catheter tips and do not perform follow-up BC's

2.- I do not prescribe antifungals on the basis of Candida colonization of the catheter tips but carefully follow-up BC's.

3.- I treat the patient as if BC's were positive.

4.- I treat the patients with antifungals until follow-up cultures return negative.

5.- I never saw a patient in that situation

Candida colonization without candidemia

Is *Candida* colonization of central vascular catheters in non-candidemic, non-neutropenic patients an indication for antifungals?

No differences in long term outcome between patients treated or not treated with antifungal therapy for Candida colonization of the catheter tips

Pérez-Parra A, Bouza E. Intensive Care Med. 2009

Candida colonization of the CVC tip

Hospital	1.750 beds
Adult ICU's	60 beds
February 2003	February 2007

Patients with Candida in the CVC tip
Blood cultures without candidemia

Clinical improvement

Poor outcome

Bouza E. et al. Preliminary data. 2008

Candida colonization without candidemia

Is *Candida* colonization of central vascular catheters in non-candidemic, non-neutropenic patients an indication for antifungals?

We were unable to demonstrate that antifungal therapy was an independent variable influencing outcome (OR 0.82; 95% CI, 0.27–2.47; $P = 0.73$). *Conclusions:* Our data suggest that, in non-neutropenic critically ill patients with no concomitant candidemia and with CVC tips colonized by *Candida*, antifungal therapy does not seem to have a significant influence on clinical outcome.

Pérez-Parra A, Bouza E. Intensive Care Med. 2009