Fungal infections in transplant recipients

Dr Subramanian S

MD DNB MNAMS

American Board Medicine

American Board Infectious Diseases

Gleneagles Global Hospitals, Chennai/ Bengaluru

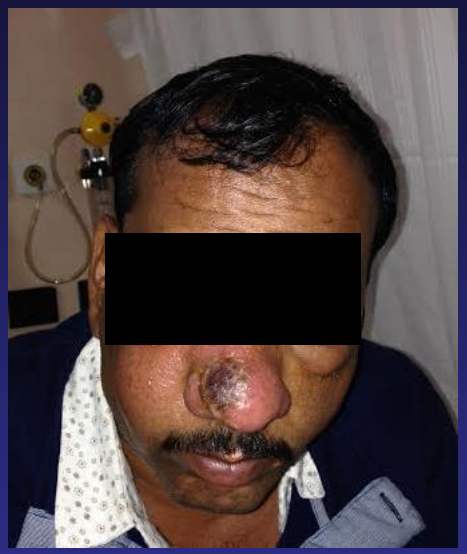
Secretary, CIDS

Disclosures

- Speaker's bureau: Pfizer,Mylan, MSD, BioMerieux, Sanofi
- Advisory board: MSD, Pfizer, Sanofi, Mylan, Cipla, GSK, Glenmark, Thermofisher

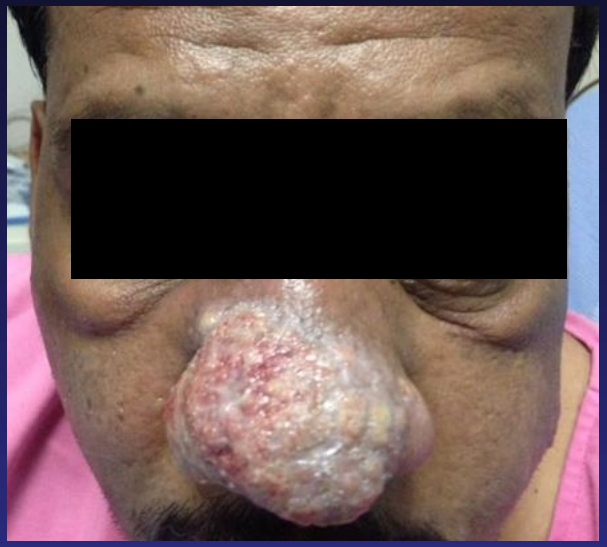
What's that?

- 43 year old male post liver transplant in 2011 presents with a small blister over the left nostril 3 years later. No fever or any systemic symptoms. He is on tacrolimus only, and has never had rejection. He is sent home on oral antibiotics



But….

- He returns in a few days with the lesion worsening and a red eye. A biopsy is done urgently….



Mucormycosis

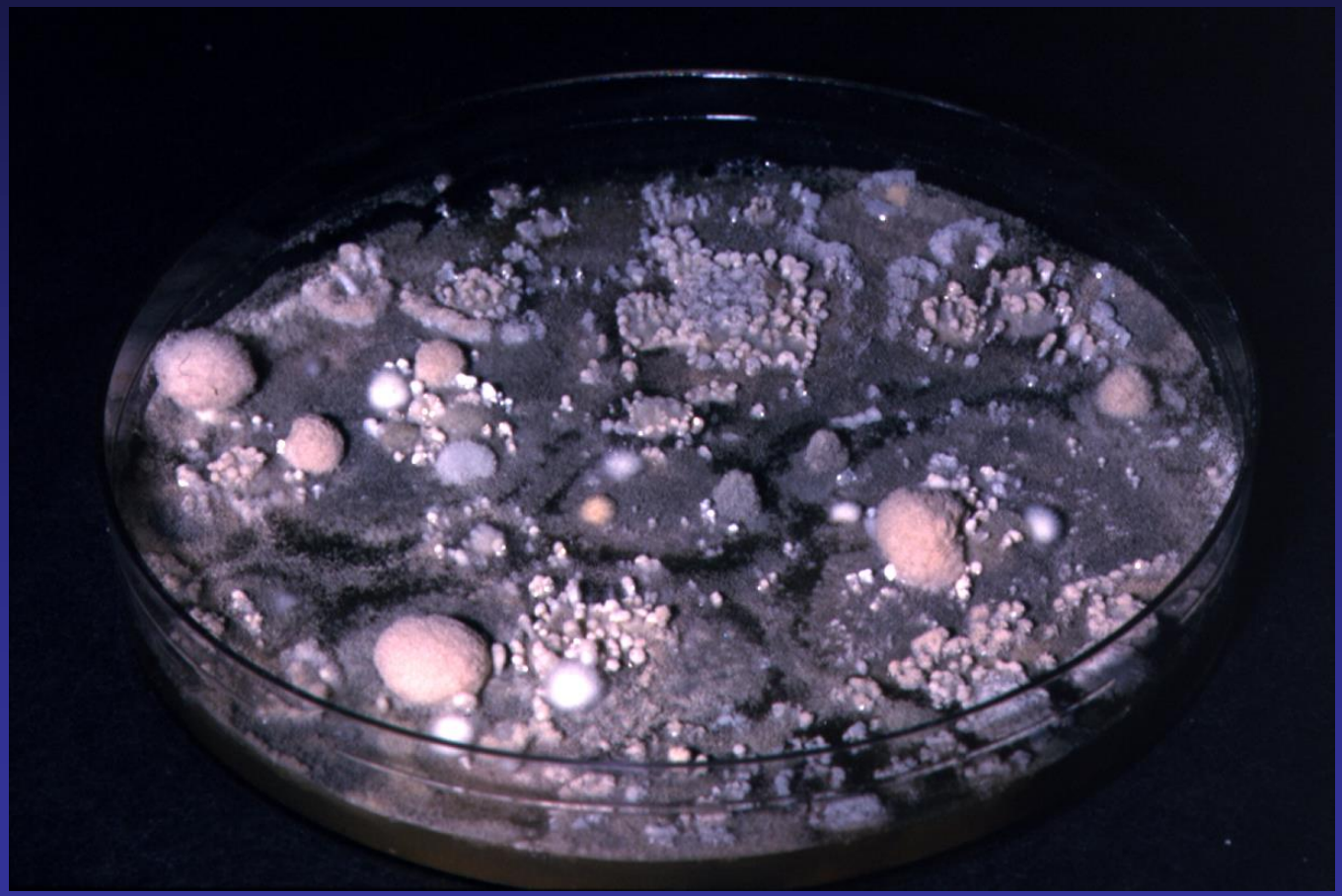
- Shurpanaka procedure
- MRI shows minimal eye involvement
- CT head and chest clear
- Full recovery with Ambisome
- Reconstruction of nose after 6 months

Why?

- 3 years after transplant?
- Minimal immune suppression
- No recent rejection!

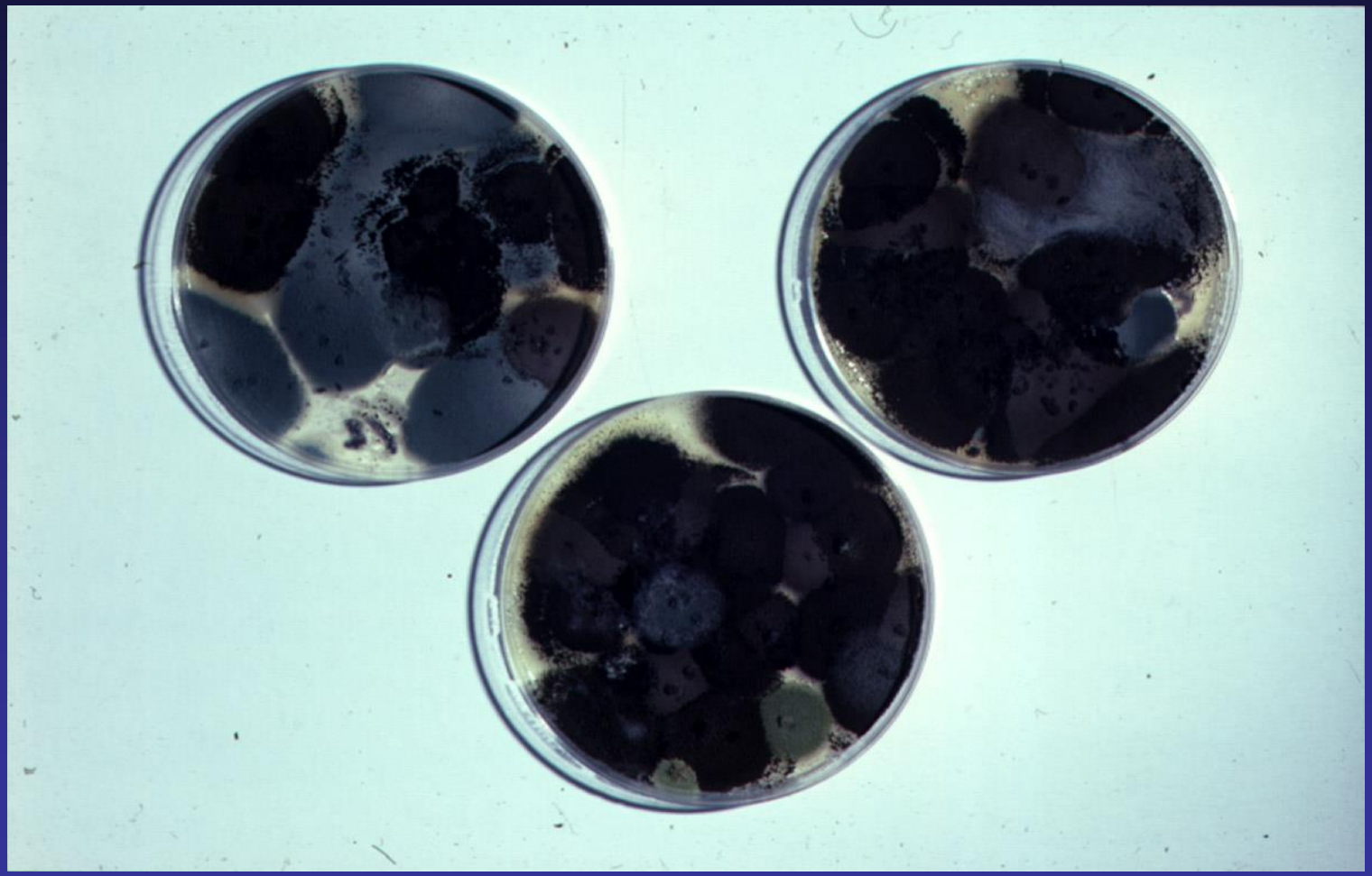
- Was in a bullock cart race in his village to celebrate 3 years of post transplant life

Aspergillus is in the air!

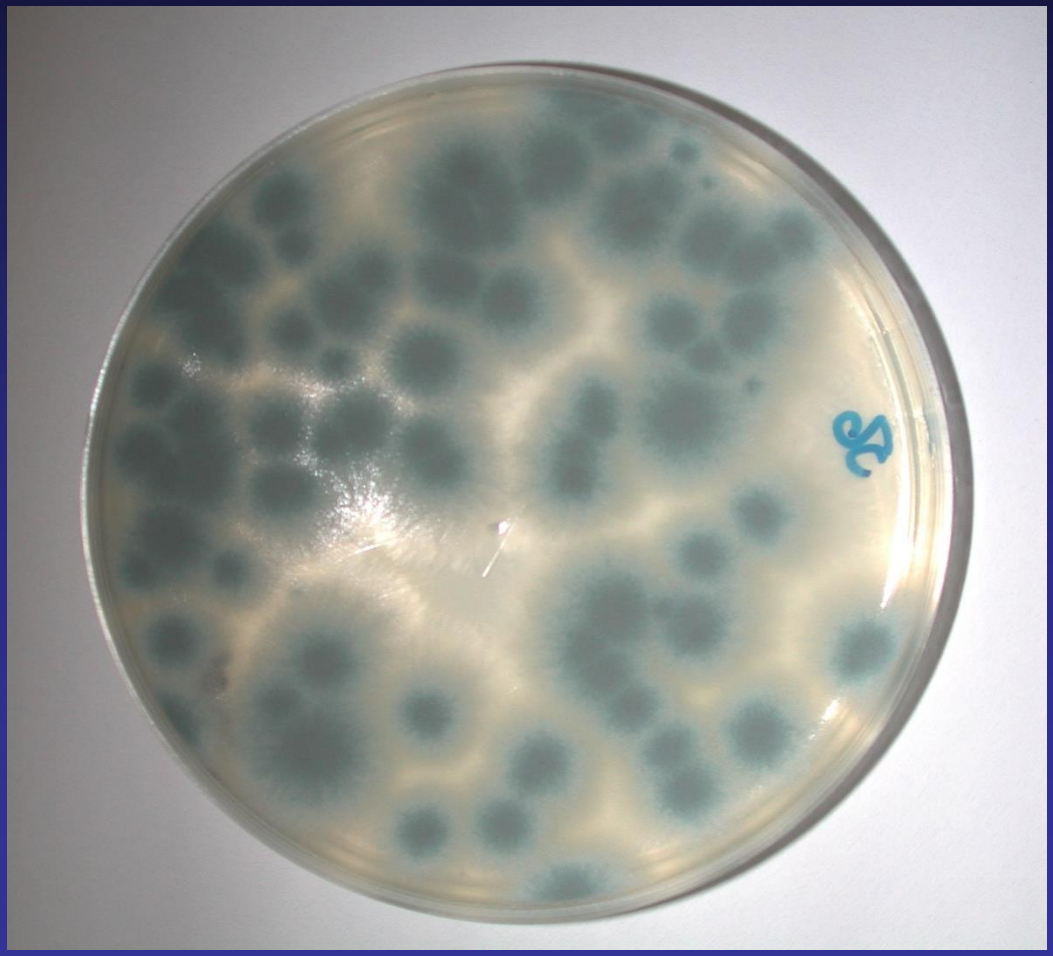


Nosocomial aspergillosis

Aspergillus is in tea!



Dust



Invasive Aspergillosis with severe flu

- Retrospective study in 2015-16 season
- 6 of 8 ICU flu cases had Aspergillus isolated; 5 were classified as invasive; no other Aspergillosis cases reported
- 57 cases in search of literature
- 65% non classical; 86% lymphopenic; 46% died

Crum-Ciamflone. Open Forum Infect Dis.

Outbreak of Zygomycosis from laundry

- 6 immunosuppressed patients developed R.microsporus pulmonary/cutaneous infection
- Clothing from specific laundry contaminated (27.8%) compared to 0%
- Phylogenetically related; 61% environmental and 100% air samples contaminated at laundry
- Attention to washing, drying and storage!

Cheng VCC. Clinical Infectious Diseases® 2016;62(6):714–21

BLAME

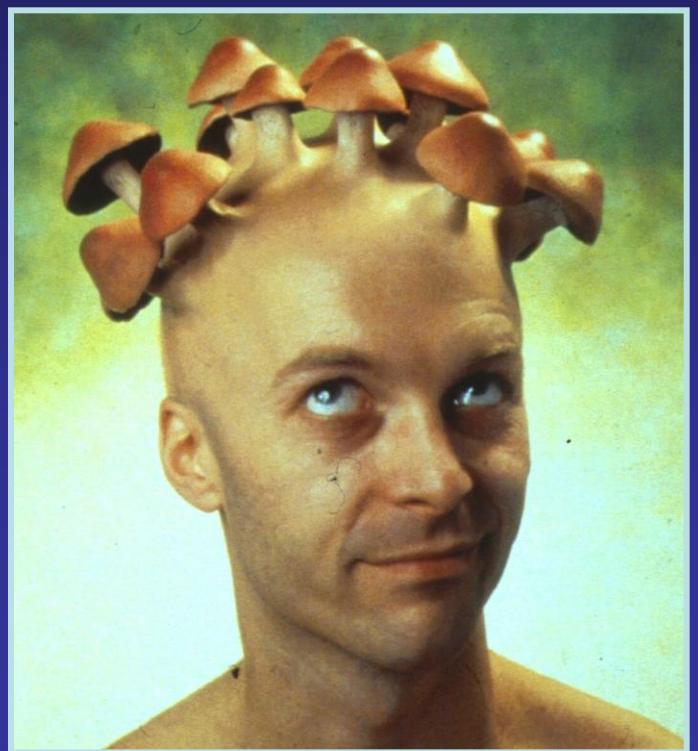
THE SECRET TO SUCCESS IS KNOWING WHO TO BLAME FOR YOUR FAILURES.

IFI among organ transplant recipients- results of TRANSNET

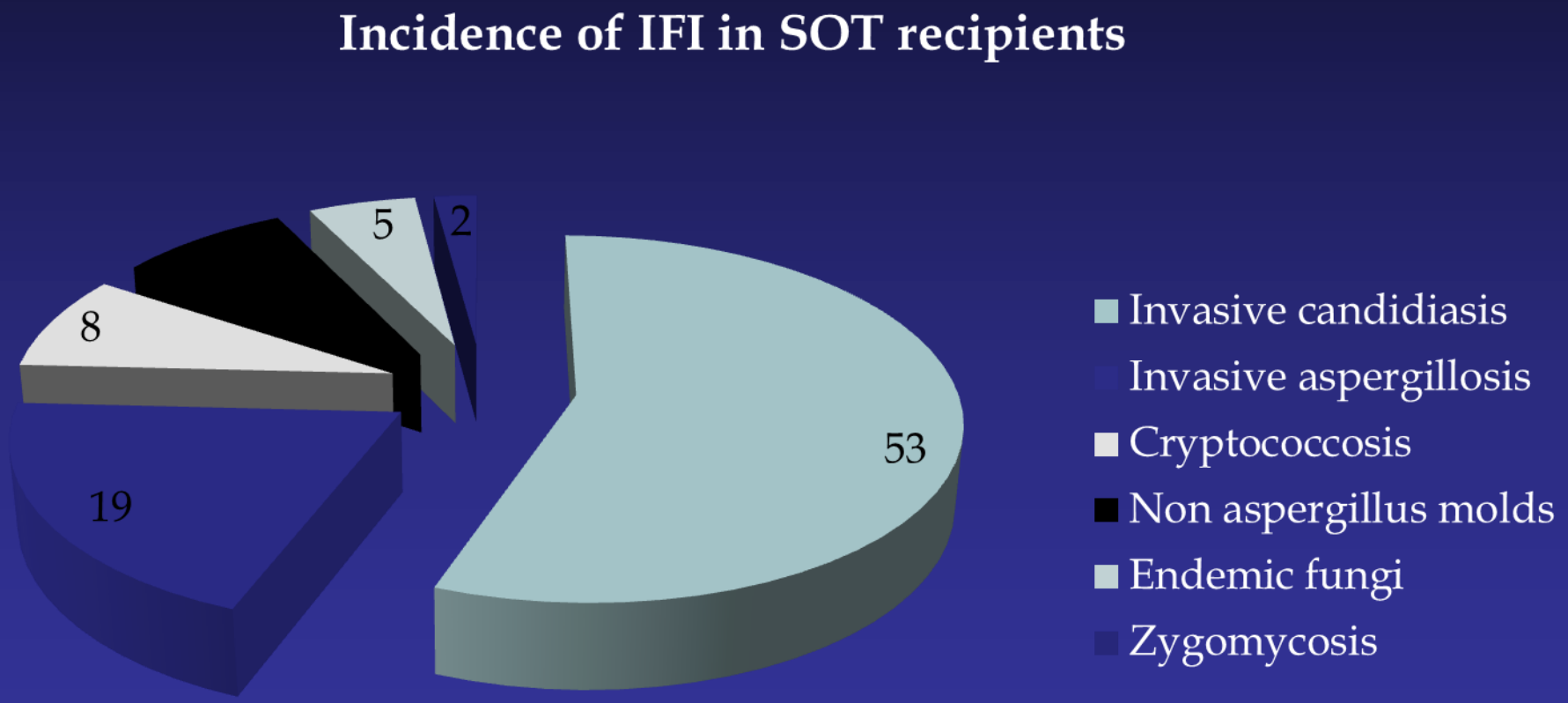
- TRANSNET: Transplant associated Infection Surveillance Network
- 1208 IFIs among 1063 organ transplant recipients

- One year cumulative infection among solid organ transplant recipients for first IFI were

- Small bowel – 11.6%
- Lung – 8.6%
- Liver – 4.7%
- Heart – 4.0%
- Pancreas – 3.4%
- Kidney – 1.3%



In the surveillance period 1208 IFIs were found among 1063 organ transplant recipients



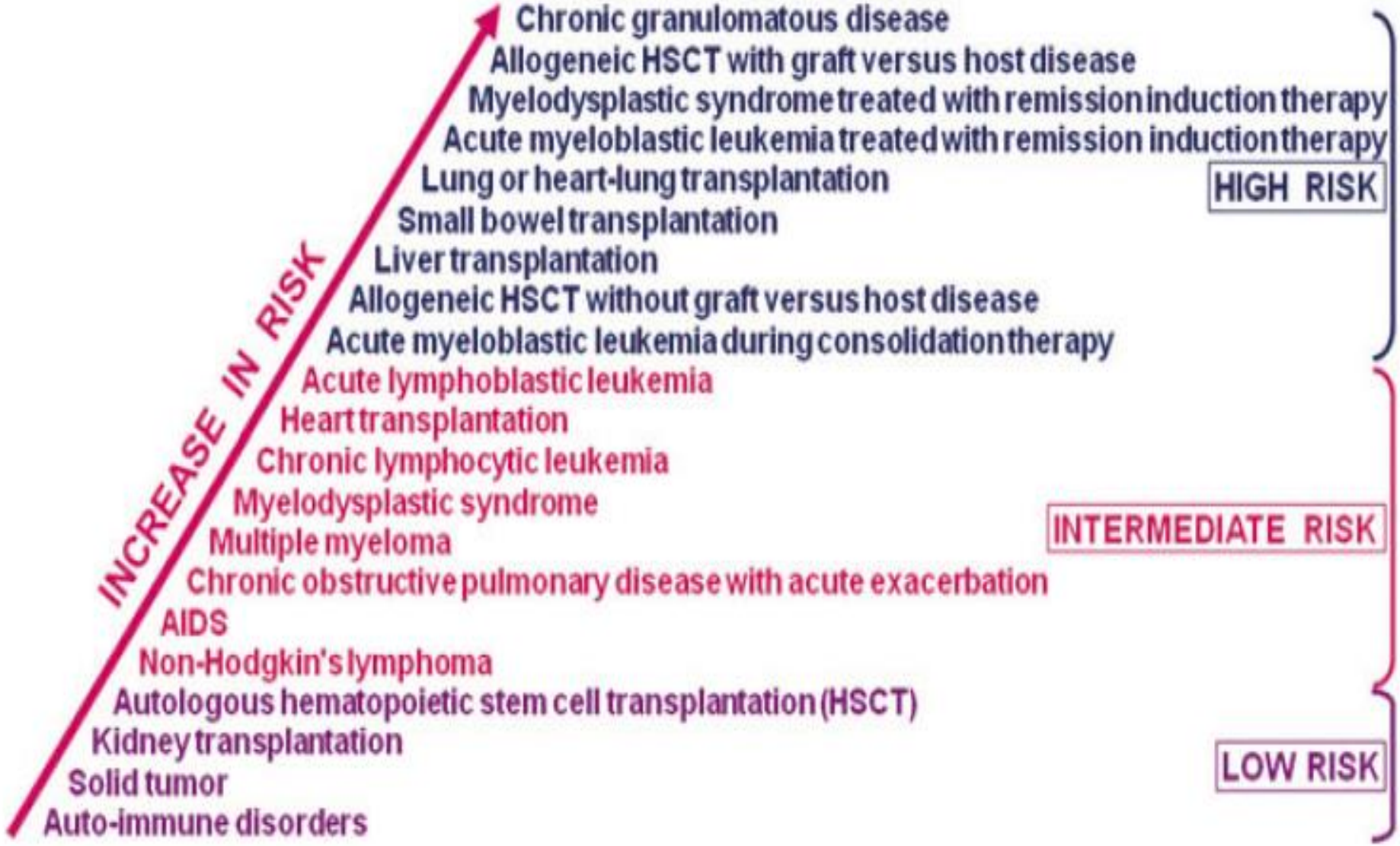
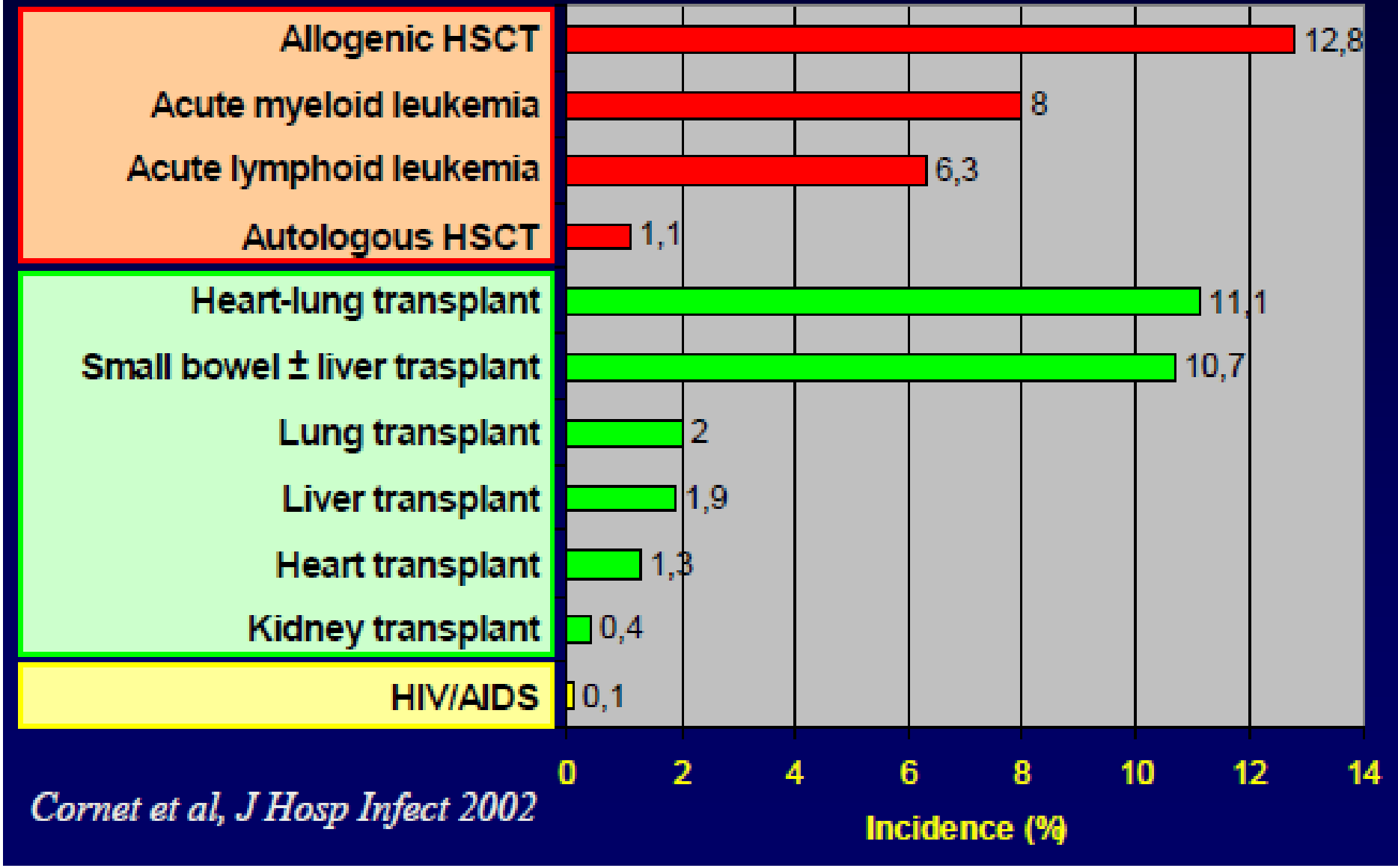


Figure 3. Risk of invasive aspergillosis based on the primary host factor.

Herbrecht R, et al. Ann. N.Y. Acad. Sci. 2012;1272:23-30

IA: Incidence



Cornet et al, J Hosp Infect 2002

Epidemiology in India SOT

- Fungal infections account for 6.1 % of infections among KT recipients
- They contribute to 63% mortality
- The most common fungi are Aspergillus, Candida, Cryptococcosis and Mucor
- Rarely Phaeohyphomycosis can occur
- No single Indian study documenting the epidemiology of IFI in SOT

Risk factors for IFIs in SOTs

- Technical/anatomical abnormalities
  - Skill in operative and perioperative management
  - Vascular access devices
  - Drainage catheters/ET tubes
- Intensity of environmental exposures
  - Community
  - Nosocomial
- Net state of immunosuppression
  - CMV and herpes viruses
  - Treatment of rejection with steroids and monoclonal Ab
  - Renal failure

Global Epidemiology

1980s[1]

***C albicans*—76%**

Non-*albicans*—24%

1997–2000[2]

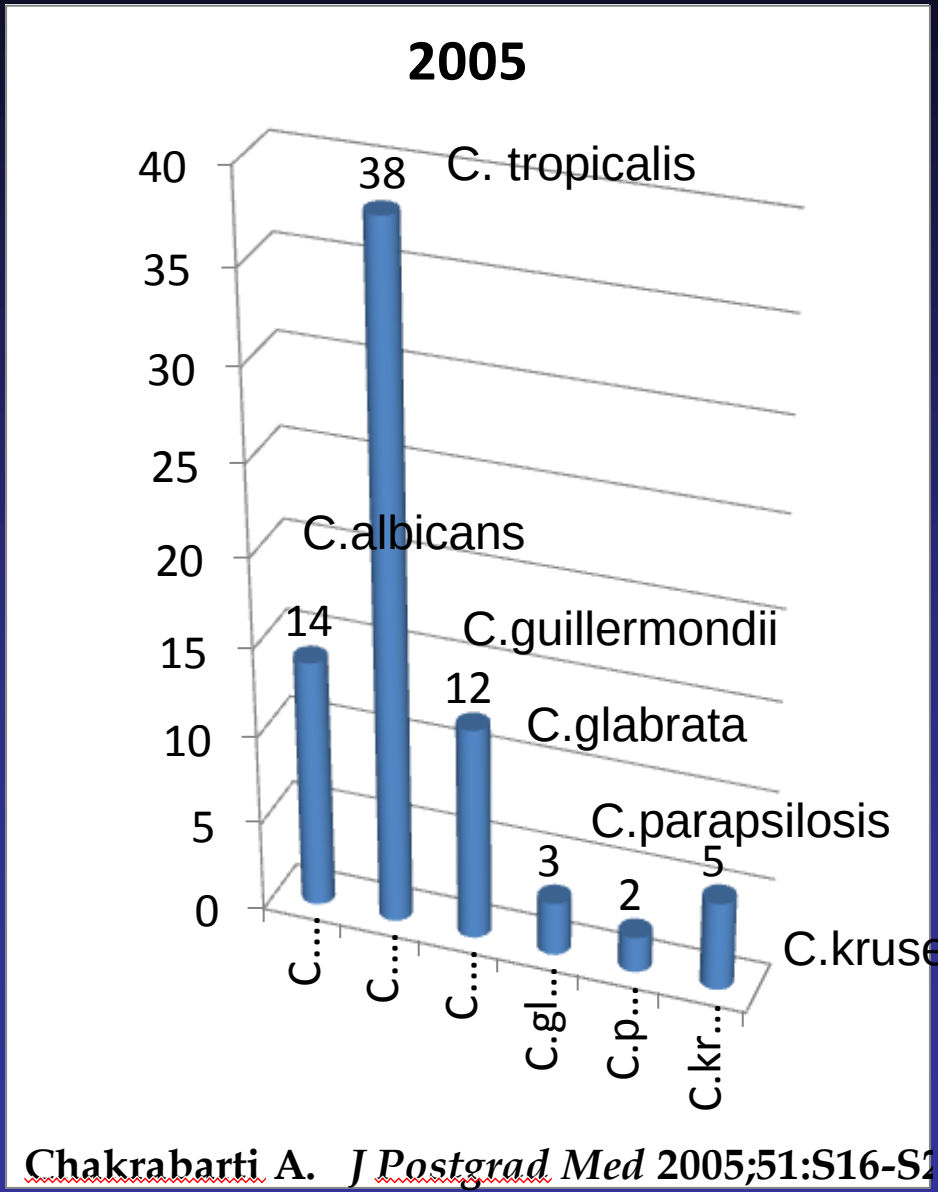
***C albicans*—54%**

Non-*albicans*—46%

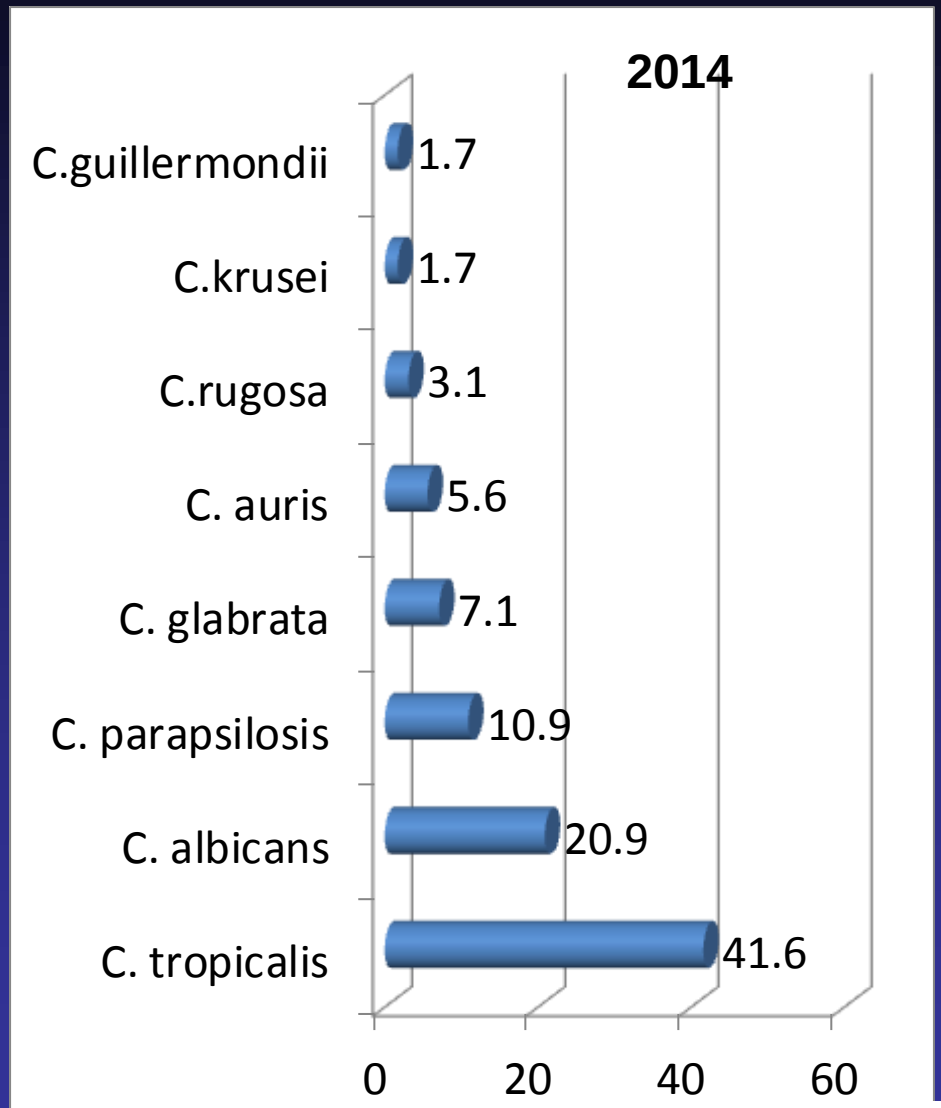
- *C glabrata*—16%
- *C parapsilosis*—15%
- *C tropicalis*—10%
- *C krusei*—2%
- Other—3%

1. Beck-Sagué CM et al. *J Infect Dis.* 1993;167:1247–1251.
2. Pfaller MA et al. *J Clin Microbiol.* 2002;40:852–856.

Indian Epidemiology of Candidemia



Chakrabarti A. *J Postgrad Med* 2005;51:S16-S2



Intensive Care Med
DOI 10.1007/s00134-014-3603-2

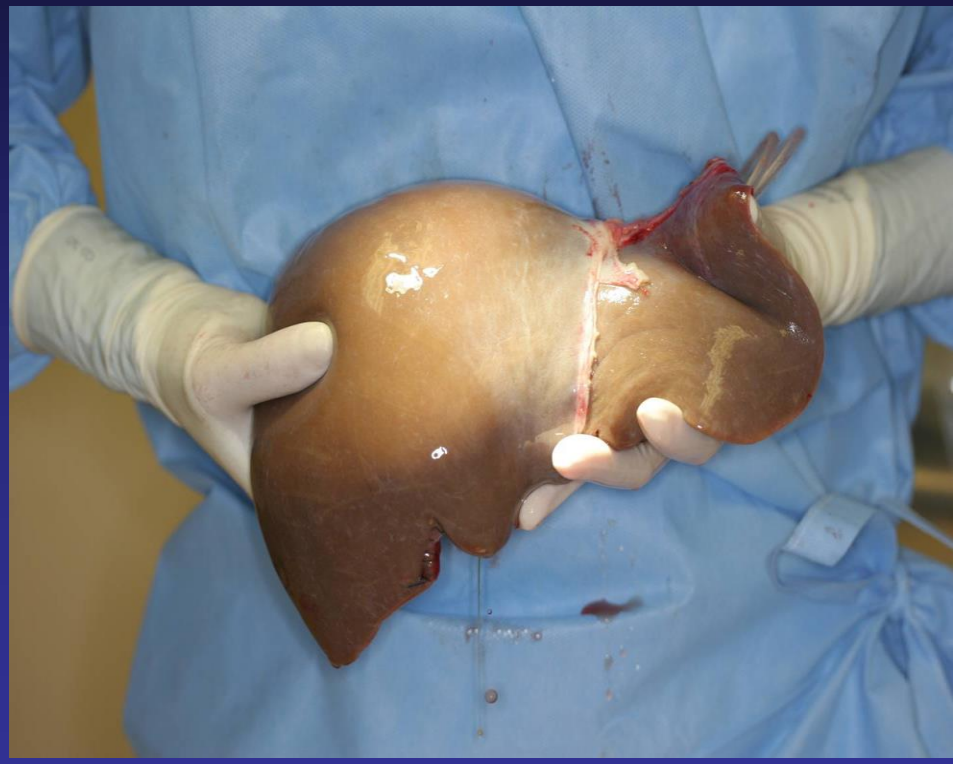
Antifungal Activity

(■ > 75% sensitive, ■ ≤ 50%, ■ < 5%; mixed colours: differing results; modified after O'Brien et al., ASH Edu 2003)

Pathogen	AmB	Fluco	Itra	Vori	Caspo	Flucyt.
C. albicans						
C.parapsilosis						
C. tropicalis						
C. glabrata						
C. krusei						
A. fumigatus						
A. flavus						
A. terreus						
Zygomycetes						
Fusarium spp.						

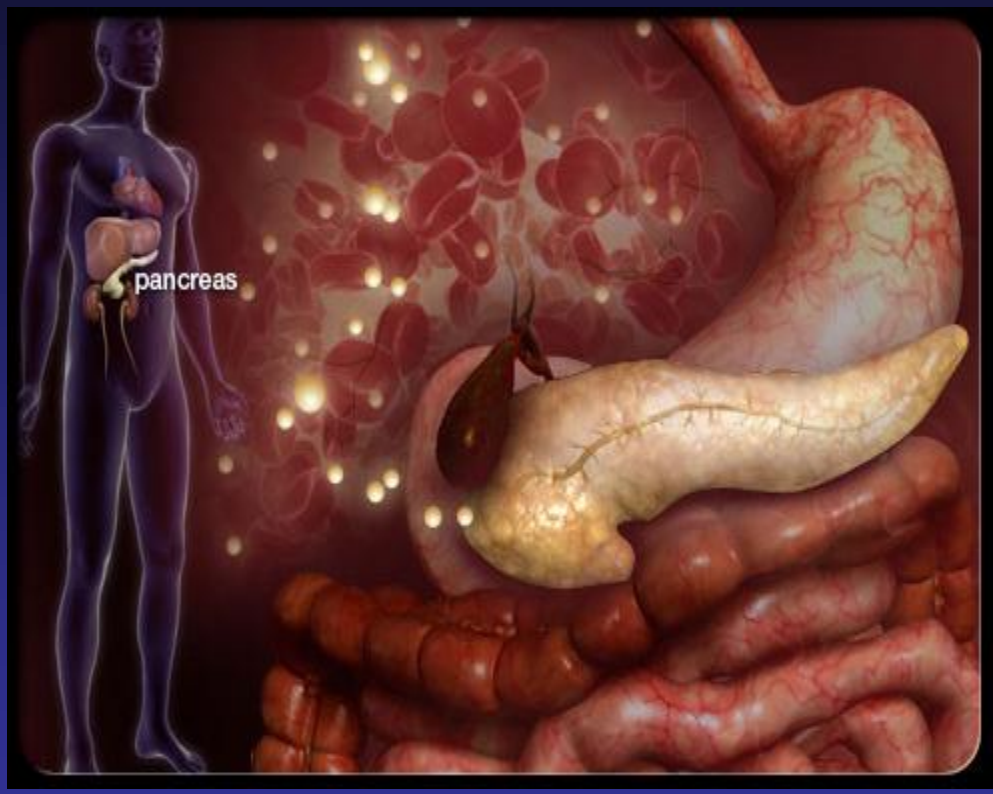
Risk factors for IFIs in specific organs

- Liver (aspergillus):
- Hepatic or renal dysfunction
- Hemodialysis
- OKT3 monoclonal antibodies
- Liver (candida):
- Longer surgery time
- Blood loss
- Repeated surgeries
- Broad spectrum antibiotics
- Renal failure



Risk factors for IFI in SOT

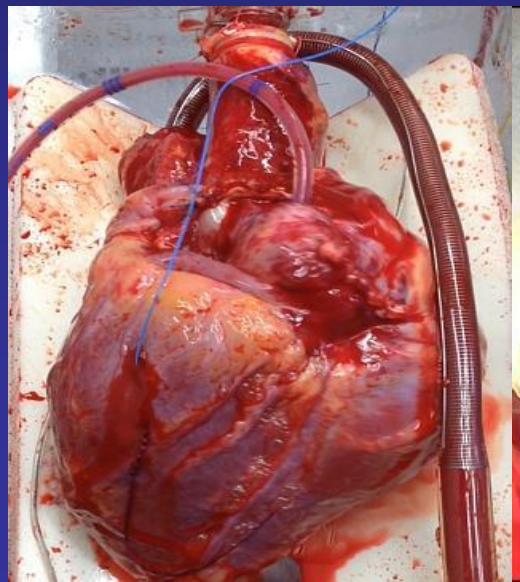
- Pancreas: Candida is a major problem
- Intra-abdominal abscesses and deep wound & surgical site infections occur in 7-14% of transplants
- 1 year survival is 70% if infected and 92% if no infection
- Risk factors are ↑ donor age, enteric drainage, pancreas and kidney transplant, peritoneal dialysis, retransplantation

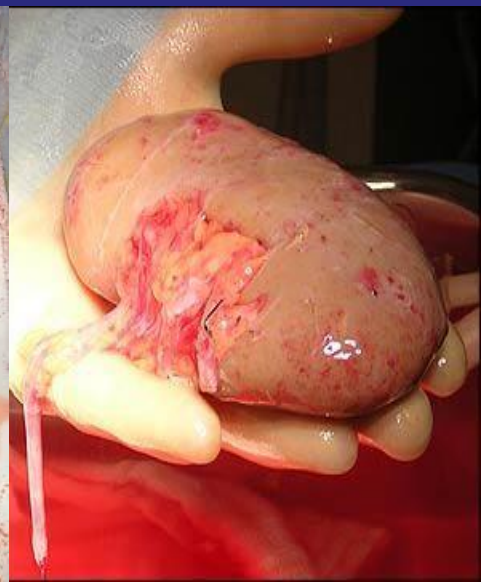


Risk factors for IFI in SOT

- Heart: Incidence of IA varies from 1-15% ~ 5.2%
- Candida, aspergillus and pneumocystis are the common pathogens
- Risk factors are OKT3 monoclonal ab, Pre-transplant invasive procedures (ECMO, previous surgery, VAD, mech ventilation) and at transplantation

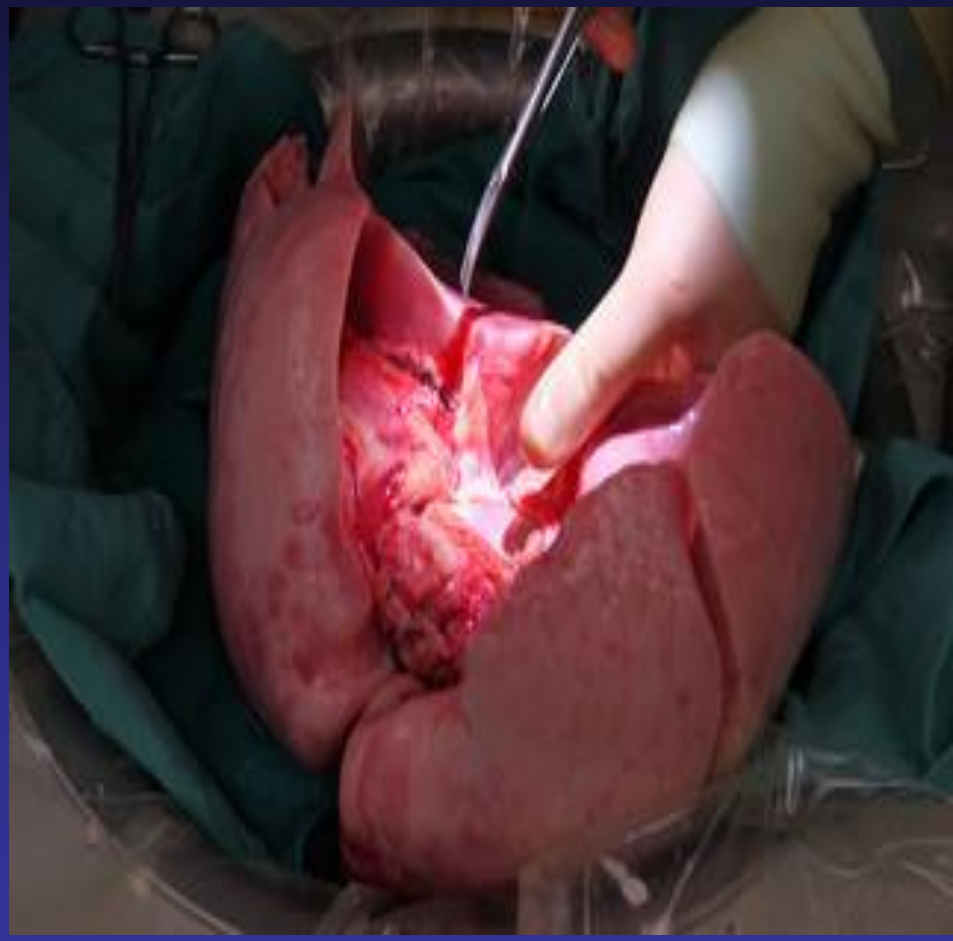
- Kidney: Incidence of IC and IA is low
- Risk factors are ESRD due to diabetes, pre-transplant dialysis, maintenance tacrolimus and allograft rejection



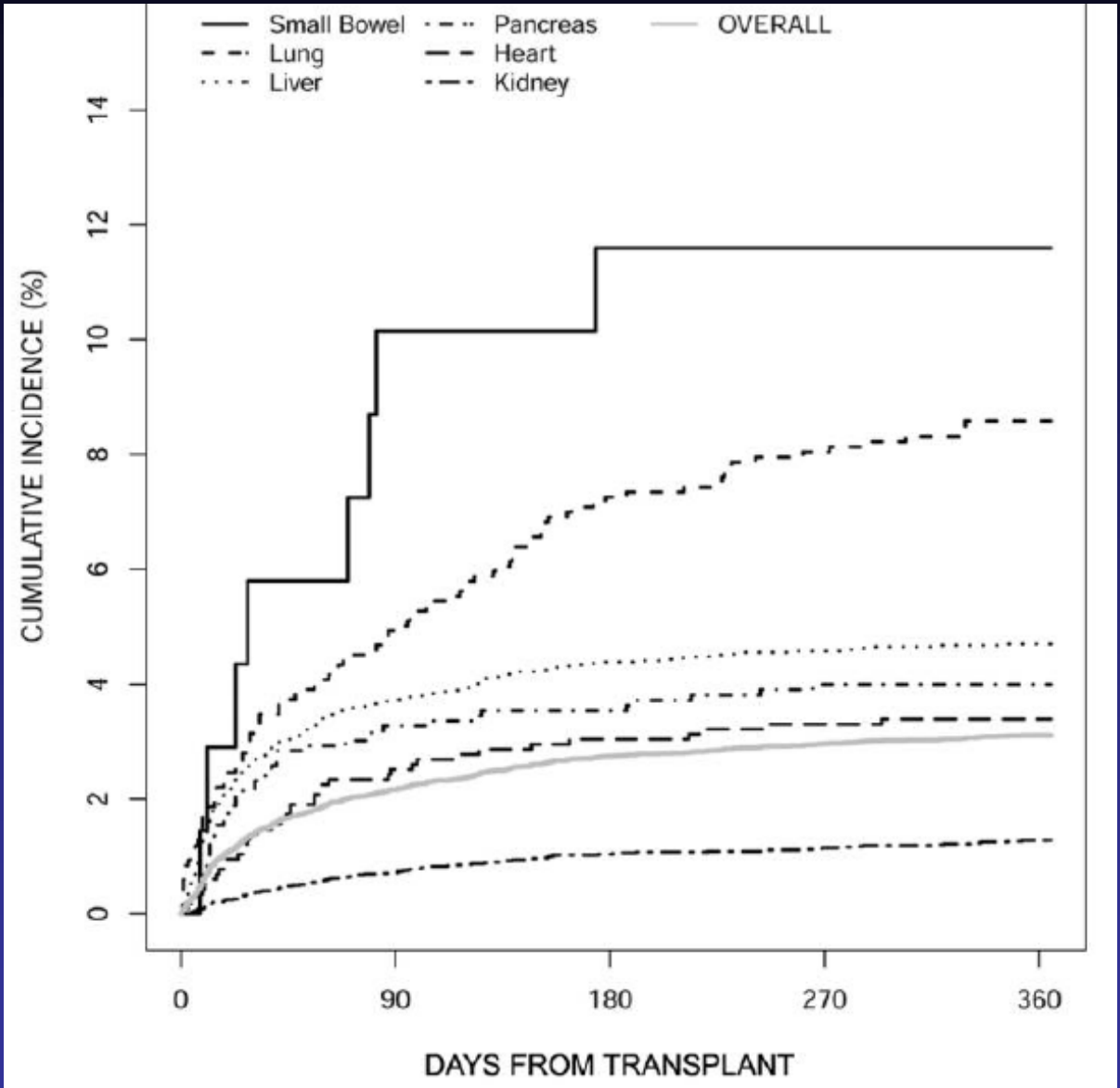


Risk factors for IFIs in specific organs

- Lung (aspergillus):
- Airway colonization common
- 11-22 fold higher risk of invasion
- Risk factors are CMV infection, BO, rejection, ↑ immunosuppression
- Median time is 120 days
- 49% occur within 3/12; 68% within 6/12; 79% within 9/12
- Mortality with IA in lung transplant is 68%

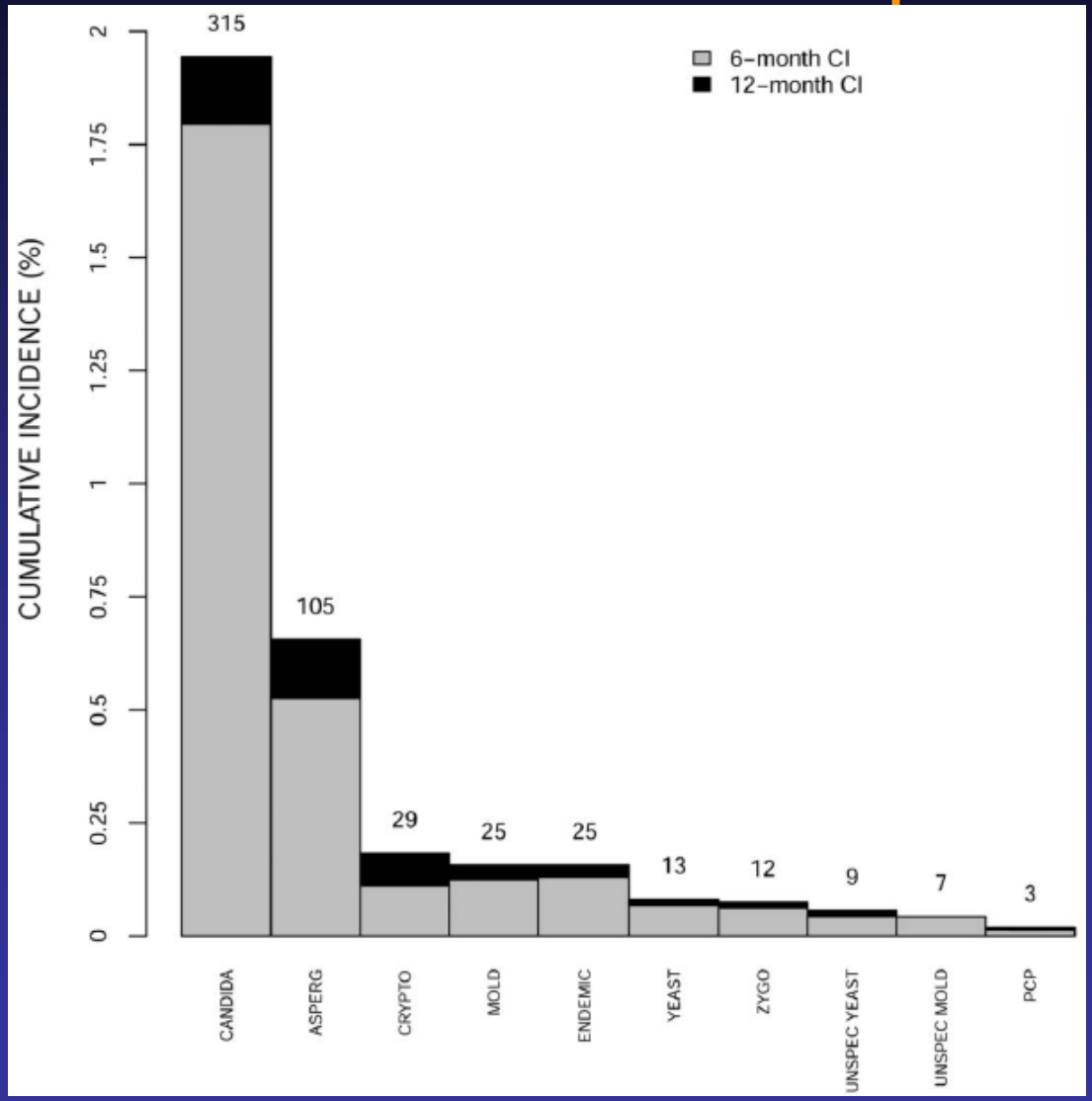


Time to IFI (n=1208) after SOT (n=16,808)



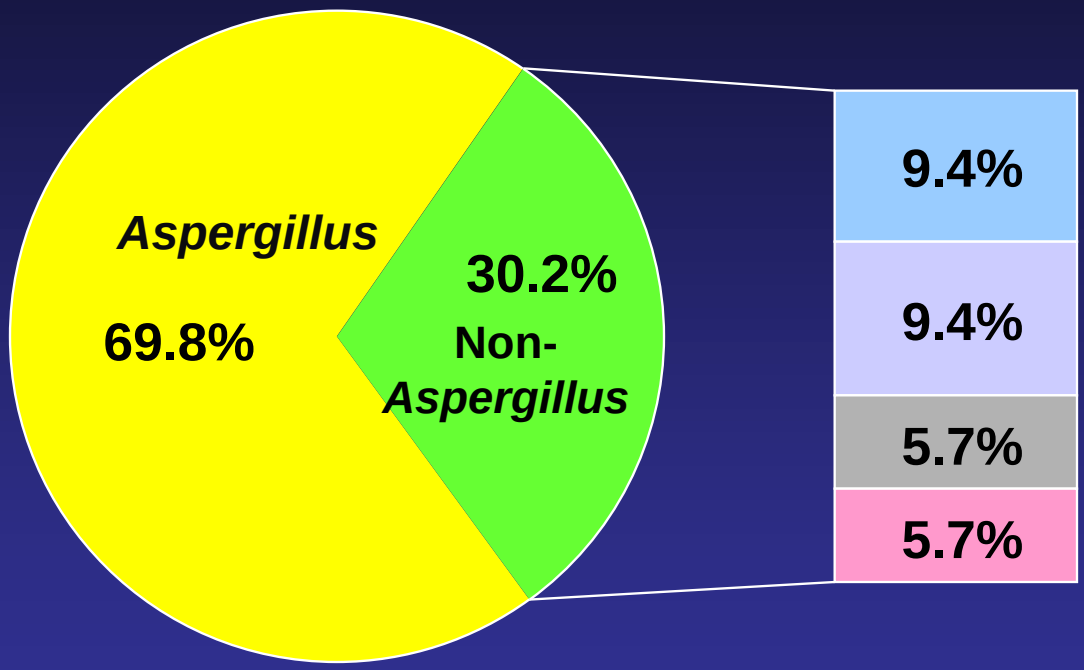
TRANSNET Invest Clin Infect Dis. 2010 Apr 15;50(8):1101-11.

Cumulative incidence (CI) of specific invasive fungal infection (IFI) at 6 months and 12 months after transplantation



TRANSNET Invest Clin Infect Dis. 2010 Apr 15;50(8):1101-11.

MOLD INFECTIONS in ORGAN TRANSPLANT RECIPIENTS



Husain *et al*. *Clin Infect Dis* 2003

No. (%) of Invasive Fungal Infection (IFI) Cases by Transplant Type (TRANSNET)

IFI type	Kidney (*n* = 332)	Liver (*n* = 378)	Pancreas (*n* = 128)	Lung (*n* = 248)	Heart (*n* = 99)	Small bowel (*n* = 22)
Candidiasis	164 (49)	255 (68)	97 (76)	56 (23)	48 (49)	19 (85)
Aspergillosis	47 (14)	42 (11)	6 (5)	109 (44)	23 (23)	0 (0)
Zygomycosis	8 (2)	9 (2)	0 (0)	8 (3)	3 (3)	0 (0)
Other mold	10 (3.0)	9 (2.4)	4 (3.1)	49 (19.8)	7 (7.1)	0 (0.0)
Unspecified mold	7 (2.1)	8 (2.1)	0 (0.0)	7 (2.8)	2 (2.0)	0 (0.0)
Cryptococcosis	49 (15)	24 (6)	6 (5)	6 (2)	10 (10)	1 (5)
Endemic mycoses	33 (10)	17 (5)	8 (6)	3 (1)	3 (3)	0 (0)
Pneumocystosis	5 (1)	0 (0)	1 (1)	4 (2)	3 (3)	0 (0)
Other yeast	6 (1.8)	9 (2.4)	5 (3.9)	0 (0.0)	0 (0.0)	1 (5)
Unspecified yeast	3 (0.9)	5 (1.3)	1 (0.8)	6 (2.4)	0 (0.0)	1 (5)

TRANSNET Invest Clin Infect Dis. 2010 Apr 15;50(8):1101-11.

Location and risk factors for candidemia in Solid Organ Transplant recipients and non-SOT patients

	SOT no. (%)	Non-SOT no. (%)	*P*-val
Setting for candidemia[1]			
Inpatient healthcare-associated	22 (92)	728 (81)	NS
Outpatient-acquired			
Healthcare-associated	2 (8)	104 (12)	NS
Outpatient	0	63 (7)	NS
Total	24	895	NS
Ward of diagnosis			
ICU	11 (46)	313 (32)	NS
Other	13 (54)	655 (67)	NS
Total	24	968	

- liver (n=455)
- kidney (n=1605)
- single lung (n=57)
- bilat lung (n=183)
- heart &lung (n=18)
- heart (n=157)
- pancreas (n=62)

vanHaal et al. Transpl Infect Dis. 2009 Apr;11(2):122-7. Epub 2009 Apr 7.

Location and risk factors for candidemia in SOT recipients and non-SOT patients

Vascular access device	10 (42)	424 (47)	NS
Urinary tract	1 (4)	57 (6)	NS
Gastrointestinal tract	1 (4)	53 (6)	NS
Other	1 (4)	53 (6)	NS
Unknown	11 (46)	308 (34)	NS
Total	24	895	
Risk factors present within the preceding 30 days of diagnosis[2]			
Antimicrobial use	20 (83)	754 (86)	NS
Sepsis present	16 (67)	689 (79)	NS
Neutropenia	3 (13)	161 (19)	NS
Steroid use	17 (71)	249 (29)	$P < 0.01$
TPN	6 (25)	326 (38)	NS
Recent surgery	9 (38)	360 (42)	NS
Diabetes	7 (29)	130 (15)	NS

vanHaal et al. Transpl Infect Dis. 2009 Apr;11(2):122-7. Epub 2009 Apr 7.

Species, sensitivity of Candida isolated, and mortality in SOT by the use of antifungal prophylaxis at time of diagnosis

	Antifungal prophylaxis number (%)	No prophylaxis number (%)	*P*-value
SOT patients with candidemia	12 (50)	12 (50)	NS
Candida species			
C. albicans	6 (50)	5 (42)	NS
C. glabrata	3 (25)	2 (17)	NS
C. parapsilosis	1 (8)	2 (17)	NS
C. krusei	1 (8)	0	NS
C. dubliniensis	0	1 (8)	NS
C. tropicalis	1 (8)	1 (8)	NS
Other	0	1 (8)	NS
Fluconazole sensitivity of *Candida* species			
Sensitive[1]	8 (67)	10 (83)	NS
SDD or resistant[2]	4 (33)	2 (17)	NS
30 day all-cause mortality	3 (25)[3]	2 (17)[4]	NS

vanHaal et al. Transpl Infect Dis. 2009 Apr;11(2):122-7. Epub 2009 Apr 7.

IFI in liver recipients

Risk Factor	Organism	N	Odds Ratio (95% CI)
Preoperative Risk Factors			
SBP prophylaxis with FQ	*Candida*	35	11.0 (3.0–33.8)
Operative Risk Factors			
Retransplantation	*Candida*	35	11.0 (3.3–36.4)
	Candida	50	Not provided
>18 units cryoprecipitate transfused in OR	*Candida*	405	3.6 (1.8–7.3)
Long transplantation time	*Candida*	50	Not provided
Class II HLA partial or complete match	*Candida*	405	2.5 (1.2–5.3)
Donor from male	*Candida*	50	Not provided
Retransplantation	*Aspergillus*	260	29.9 (2.1–425.1)
Postoperative Risk Factors			
Posttransplant HD	*Candida*	35	8.0 (3.1–20.0)
High number of erythrocyte units transfused posttransplant	*Candida*	50	Not provided
Posttransplant bacterial infection	*Candida*	405	4.6 (2.3–9.2)
CMV viremia	*Candida*	35	3.0 (1.2–7.3)
CMV disease	*Aspergillus*, early onset	88	2.3 (1.1–4.9)
	Aspergillus, late onset	260	6.7 (1.0–42.5)
Use of muromonab-CD3	*Aspergillus*	2180	6.29 (0.93–42.65)
Aspergillus antigenemia post-LT	*Aspergillus*	260	50.0 (3.56–650)
Dialysis	*Aspergillus*	131	5.5 (1.5–19.6)
Need for dialysis post-LT	*Aspergillus*	260	24.5 (1.25–354)

Eschenauer GA et al. LIVER TRANSPLANTATION 15:842-858, 2009

Who needs prophylaxis?

- **Retransplantation, dialysis, prophylaxis for SBP, CMV viremia, and return to surgery**

- **Risk with <1 factor present 10.3% (0.R. , 1.0)**

  Risk with 1 factors present 25% (O.R., 2.9)

  Risk with 2 factors present 61.1% (O.R., 136)

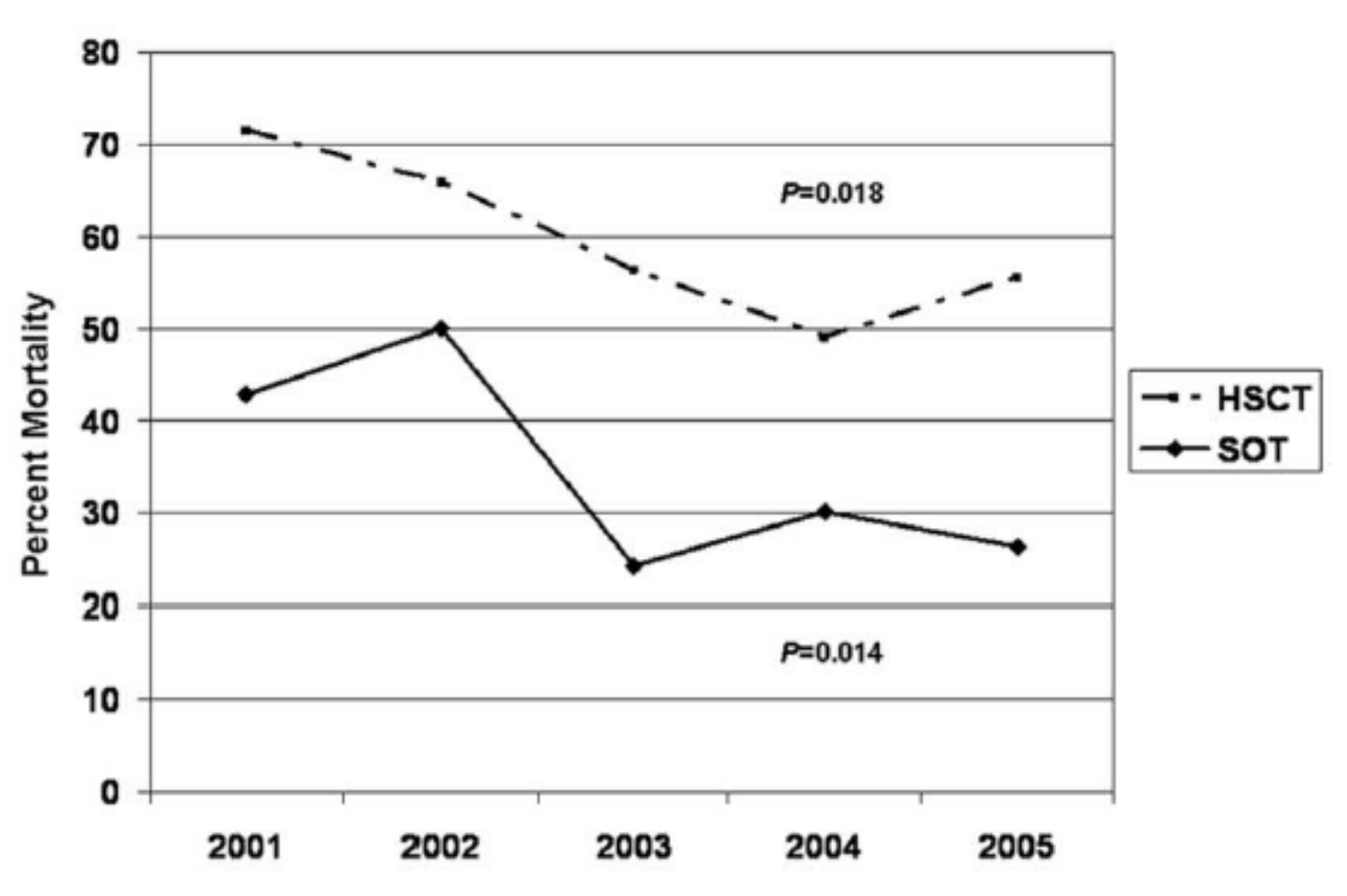
  Risk with 3 factors present 87.5%(O.R., 60.7)

  Risk with 4 factors present 100%

  Chi-square for trend p = .001

  Hussain et al, ICAAC 01

Mortality rates among 415 HSCT and 227 SOT with invasive aspergillosis



Baddley JW et TRASNET Investig. Clin Infect Dis. 2010 Jun 15;50(12):1559-67.

Risk factors of mortality (n=78) among 227 SOT with invasive aspergillosis

Model, variable	OR (95% CI)	P^a
Age	1.0 (0.99–1.05)	.20
Male sex	2.0 (0.9–4.4)	.076
White race	0.6 (0.2–1.8)	.34
Renal insufficiency	2.0 (1.0–4.1)	.047
Prednisone use	0.3 (0.1–0.7)	.005
CNS disease	5.4 (1.2–24.1)	.028
Amphotericin B formulation	4.4 (2.1–9.1)	<.001
Caspofungin	2.7 (1.1–6.3)	.023

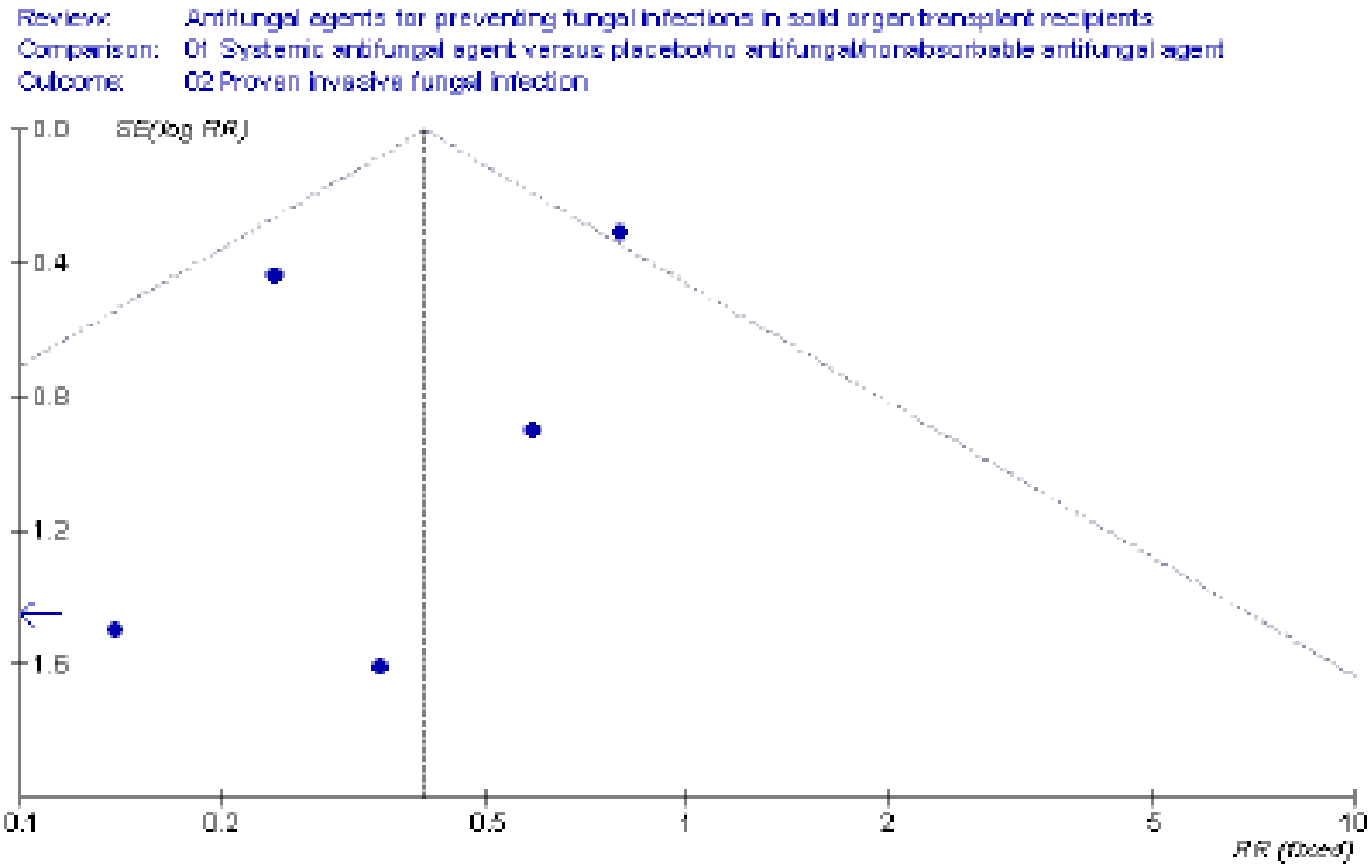
Baddley JW et al. Clin Infect Dis. 2010 Jun 15;50(12):1559-67.

OBSTACLES

SOME THINGS CAN NOT BE OVERCOME WITH DETERMINATION AND A POSITIVE ATTITUDE.

Antifungal agents for preventing fungal infections in solid organ transplant recipients (Review)

Figure 2. Funnel plot for systemic antifungal agents versus placebo/no antifungal/nonabsorbable antifungal agent; outcome=proven invasive fungal infections



Citation: Playford EG, Webster AC, Craig JC, Sorrell TC. Antifungal agents for preventing fungal infections in solid organ transplant recipients. *Cochrane Database of Systematic Reviews* 2004, Issue 3. Art. No.: CD004291. DOI: 10.1002/14651858.CD004291.pub2.

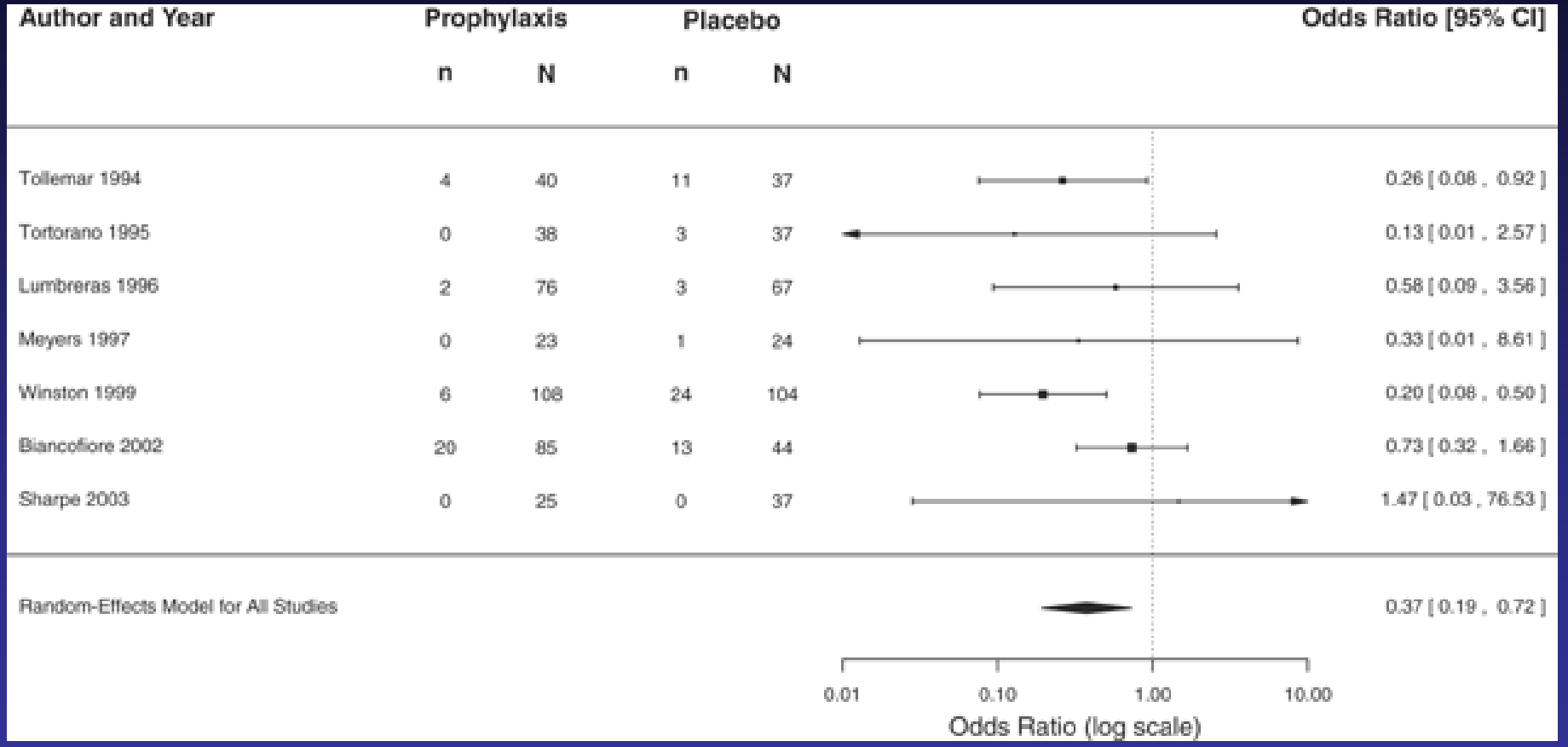
Conclusions of cochrane review

- Meta-analyses of 14 randomized trials with 1497 patients undergoing SOTs
- Antifungal prophylaxis did not reduce mortality [RR= 0.9, 95% CI 0.57-1.44]
- In liver transplants fluconazole significantly reduced IFI [RR=0.28, 95% CI 0.13-0.57]. NNT to prevent one infection was 14

Prophylaxis

- Selective digestive decontamination
- Azoles- fluconazole and itraconazole
- Amphotericin B
- Echinocandins

Antifungal Prophylaxis in Liver Transplantation: A Systematic Review and Network Meta-Analysis



Evans JDW et al. American Journal of Transplantation
Volume 14, Issue 12, pages 2765-2776, 13 NOV 2014 DOI: 10.1111/ajt.12925
http://onlinelibrary.wiley.com/doi/10.1111/ajt.12925/full#ajt12925-fig-0002

Selective digestive decontamination

- Aspergillus inhalational, so immaterial
- Nystatin, clotrimazole and Ampho B can clear Candida from bowel, but returns quickly
- Studies done poorly
- Zwaveling et al evaluated ampho B, and noted that in 30 days after transplantation, significantly fewer infections due to *Candida* (15/29 versus 4/26, P 0.05). *T*otal number of postoperative infections and infection-related morbidity was unaffected, and infections caused by gram-positive pathogens increased

Fluconazole prophylaxis

- Early studies on 100 mg/day, then 400
- Low dose seemed to suggest reduction in Candida, and a tendency to mold infection
- Winston et al looked at 400 mg/day for 10 weeks. Showed less proven (9% vs 43%) and invasive (6% vs 23%) fungal infections. Less related mortality
- Benefit for baseline fungal colonization, repeated transplantation, and United Network Organ Sharing (UNOS) Status 1

Fluconazole

Outcome	Patients	Studies	OR (CI)	p-Value	Cochran Q p-value	I^2 (%)
1.All results are odds ratios (OR) with 95% confidence intervals (CI). IFI—invasive fungal infection; Cochran Q p-value and I^2 statistic—measures of heterogeneity (see Methods). OR less than 1 favor systemic prophylaxis.						
Proven IFI	477	4	0.24 (0.11–0.52)	0.0003	0.73	0
Proven or suspected IFI	477	4	0.42 (0.23–0.76)	0.005	0.55	5.6
Superficial fungal infection	402	3	0.19 (0.07–0.47)	0.0003	0.21	42.0
Fungal colonization	360	3	0.29 (0.13–0.68)	0.0025	0.06	65.3
Adverse events	482	4	1.06 (0.43–2.64)	0.90	0.68	0
Mortality attributed to fungal infection	402	3	0.22 (0.06–0.75)	0.016	0.49	0
Overall mortality	477	4	0.94 (0.53–1.66)	0.82	0.26	0
Aspergillus IFI	487	4	0.59 (0.15–2.31)	0.45	0.59	0

Itraconazole

- Three studies, not conclusive
- Although studies showed lower Candidial isolation, these were from urine, stool, mouth, vagina, respiratory secretions.
- No documented invasive infection in any of the trials

Liposomal Ampho B

- 1 study vs placebo, reduction in IFIs
- 3 studies fluconazole and L-AmB, no difference in proven IFI (OR 1.02, p = 0.97). Higher risk of bacterial infection and longer ICU stay in the fluconazole group
- 1 study liposomal and standard preparations of amphotericin B in patients also receiving fluconazole prophylaxis, no difference in fungal infection or renal function between the two preparations

Anidulafungin

- Anidulafungin vs fluconazole
- Randomized double blinded
- MELD ≥ 30 and use of antifungal pre Tx
- IFI risk similar (5.1% vs 8% fluconazole)
- Less Aspergillus colonization or infection
- Less break through IFI
- Fewer antifungal resistance

Winston DJ et al. Clin Infect Dis 2014

Micafungin

- Micafungin (18) vs ABLC (24)
- IFI in 11.1% (2 of 18) of micafungin, 8.3% (2 of 24) of ABLC, and 3% (7 of 234) of patients without high risks (P=0.12)
- ABLC versus micafungin had significantly higher creatinine on day 14 (P=0.04)
- However, renal and hepatic function, rejection, graft loss, and mortality did not differ for the two groups on day 90

Sun H-Y et al. Transplantation: September 2013 - Volume 96 - Issue 6 - p 573–578

Micafungin

- Open label non randomized
- 48% had MELD ≥ 20
- Control- fluconazole, caspo or L AmpB
- Adverse events for micafungin and standard care were 11.6% and 16.3%, discontinuation in 6.4% and 11.6% of cases

Saliba F et al. *Clinical Infectious Diseases*, Volume 60, Issue 7, 1 April 2015, Pages 997–1006

Caspofungin

- Prospective, non comparator, open label
- 71 patients- 2 infections- C.albicans and Mucor in wound
- 27.7% had Grade IV LFT anomaly

Fortun J et al. Transplantation: February 15th, 2009 - Volume 87 - Issue 3 - p 424-435

Caspofungin

- Caspofungin (97) vs fluconazole (98)
- Multicenter, retrospective, cohort
- 17 (8.7%) IFIs; breakthrough IFIs 11 (5.6%); IA 6 (3.1%)
- Less breakthrough IFIs (2.1% versus 9.2%, P = 0.04); in dialysis, less breakthrough IFIs (P = 0.03). Less IA in caspofungin (absolute risk reduction, 0.06; P = 0.044)

Fortun J et al. Liver Transpl. 2016 Apr;22(4):427-35.

History

- 55 year old diabetic on insulin for 15 years now
- Alcohol related liver disease diagnosed in 2009 after haematemesis for which variceal ligation was done
- History of alcohol abuse for 35 years, abstinent for 6 months. Past smoker
- No prior surgeries, no medication allergies

History

- He developed jaundice, abdominal distension and pedal edema in 2010. Managed in another center with liver supportive therapy.
- He had been treated for hepatic coma in August 2012.
- There was a documented episode of spontaneous bacterial peritonitis and hepatorenal syndrome.
- He was treated in our centre for grade II hepatic encephalopathy with MELD score of 19 in october 2012. In view of poor liver synthetic function, he had been offered liver transplantation.

Surgical findings

- Eight litres of serous ascites
- Cirrhotic liver. Liver was shrunken, hard , nodular and firm liver no focal lesion on the surface
- Severe portal hypertension
- Rest of viscera were normal
- Iatrogenic splenic tear- Emergency spleenectomy had to be performed to control major bleeding during the operation. This was associated with major blood transfusion and novo seven

Intra op product use

- Gelofusine 13 L
- Packed cells 41 units (+cell saver 3.2L)
- FFP 25 units
- Pooled cryo 15 units
- SDP 7 units
- 5% albumin 750 ml
- Volulyte 1.5 L

Intra op

- Peak lactate 8.2 by end of surgery
- No urine output for 3-4 hours
- Developed DIC
- Was on adrenaline, norad and vasopressin
- Abdominal packing done and taken to ICU

In ICU

- Awake, obeying commands
- Temp 96.5 F
- Vent, pressor dose reducing. Vaso stopped
- Significant bloody drain from abdomen
- Started on teicoplanin, meropenem and echinocandin
- CVVH started

Next day

- REEXPLORATION, UNPACKING, HEMOSTASIS AND BILIARY (DUCT TO DUCT ANASTAMOSIS) on 6/11/2012.

Surgery

- Clot in the peritoneal cavity about 1000 grams
- Bile tinge was present in the clot in the supracolic region
- Healthy liver allograft
- Few sites of active bleeding after unpacking
- Active biliary excretion from left hepatic duct
- Thorough peritoneal lavage was given, duct to duct biliary anastamosis was performed and hemostasis was ensured

Post op

- Continues to CVVHD
- Serosanguinous drain persisted
- Coagulopathy corrected
- Lactate steadily reduced to 1.2
- Started on tacrolimus, MMF and methyl pred
- Elective tracheostomy done on Nov 9, 2012
- Urine output slowly increased

Post op

- Bilateral pleural effusion drained (1.5 L)
- NG feeds started D6
- Weaned off ventilator D7
- Renal function normalised D10
- Persistent thrombocytopenia, SDP given
- Valgan prophylaxis started

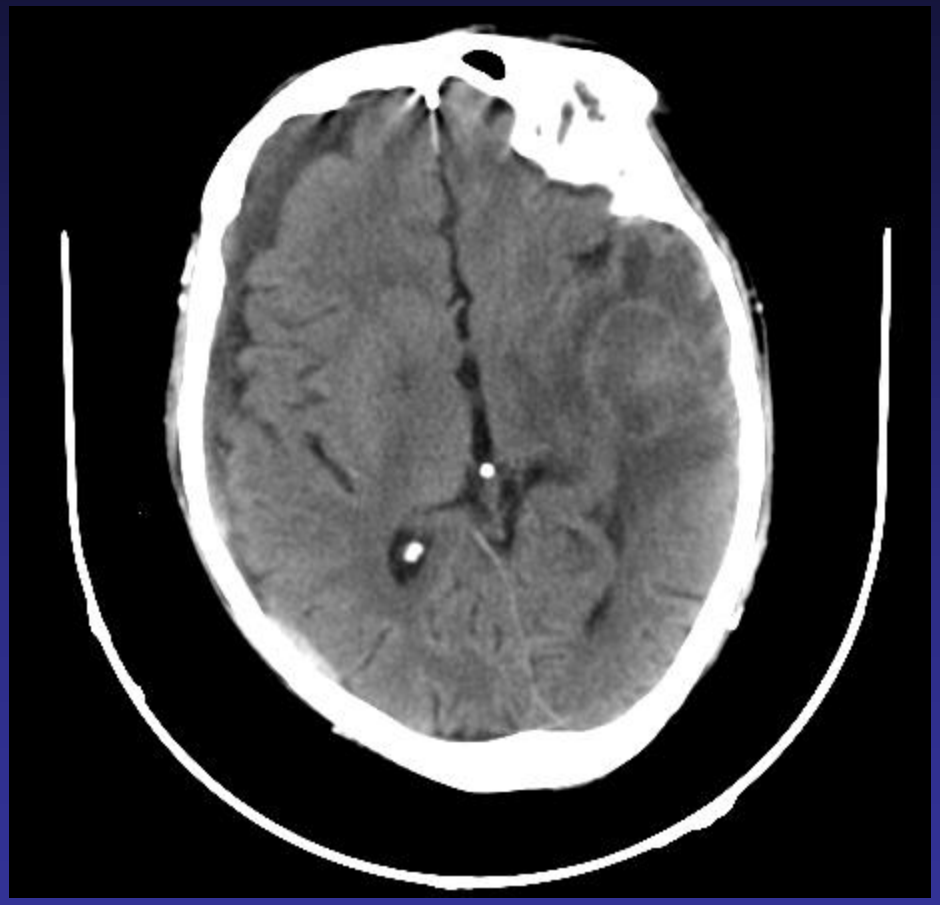
Day 10

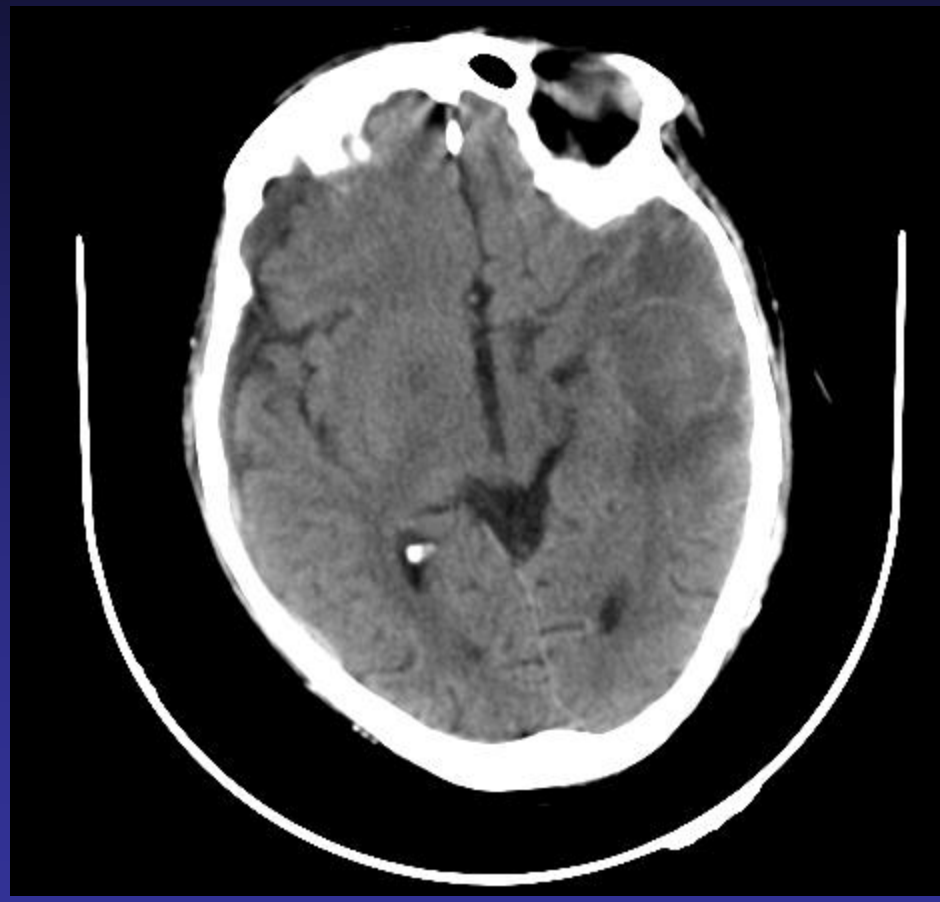
- Developed left hemiparesis
- Drowsy, irritable
- No seizures
- Options?
- Tacrolimus stopped and cyclosporine started

CT head

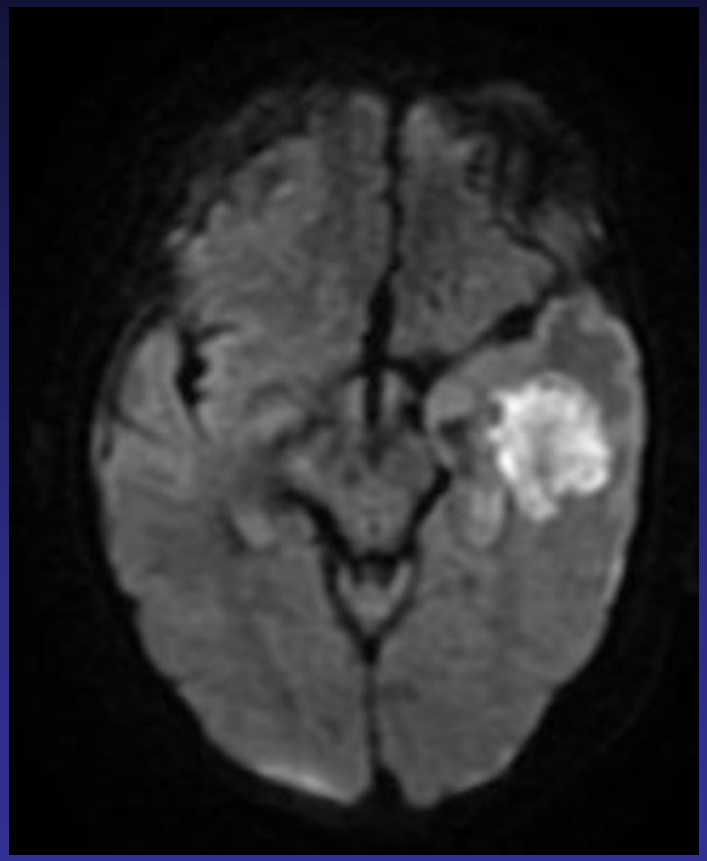
- Right frontotemporo parietal acute on chronic subdural haematoma
- Left temporal SOL
- Perilesional oedema
- Effacement of left lateral ventricle

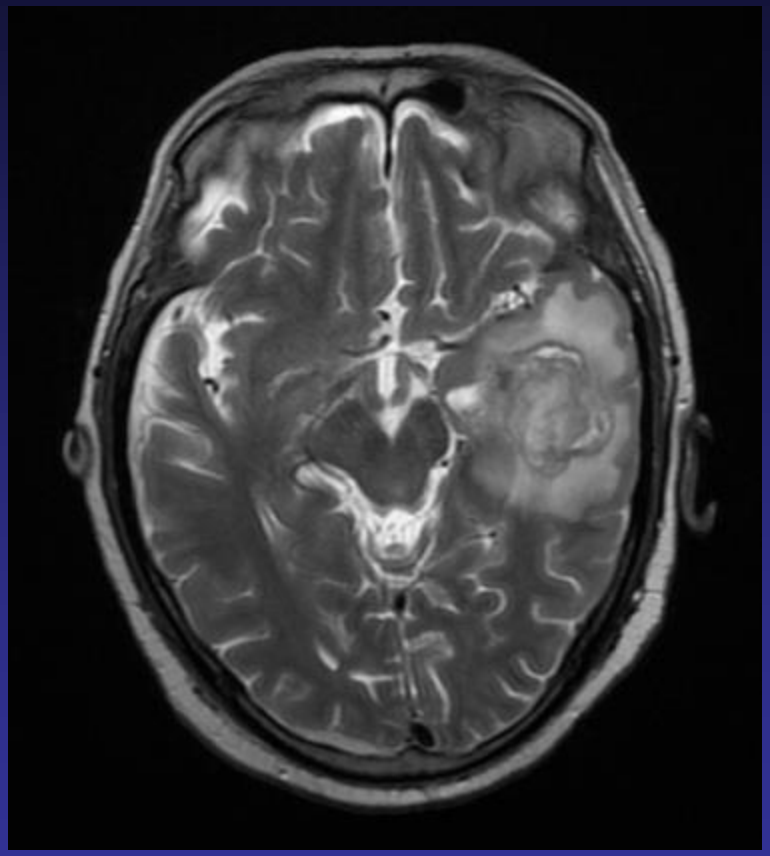
CT scan



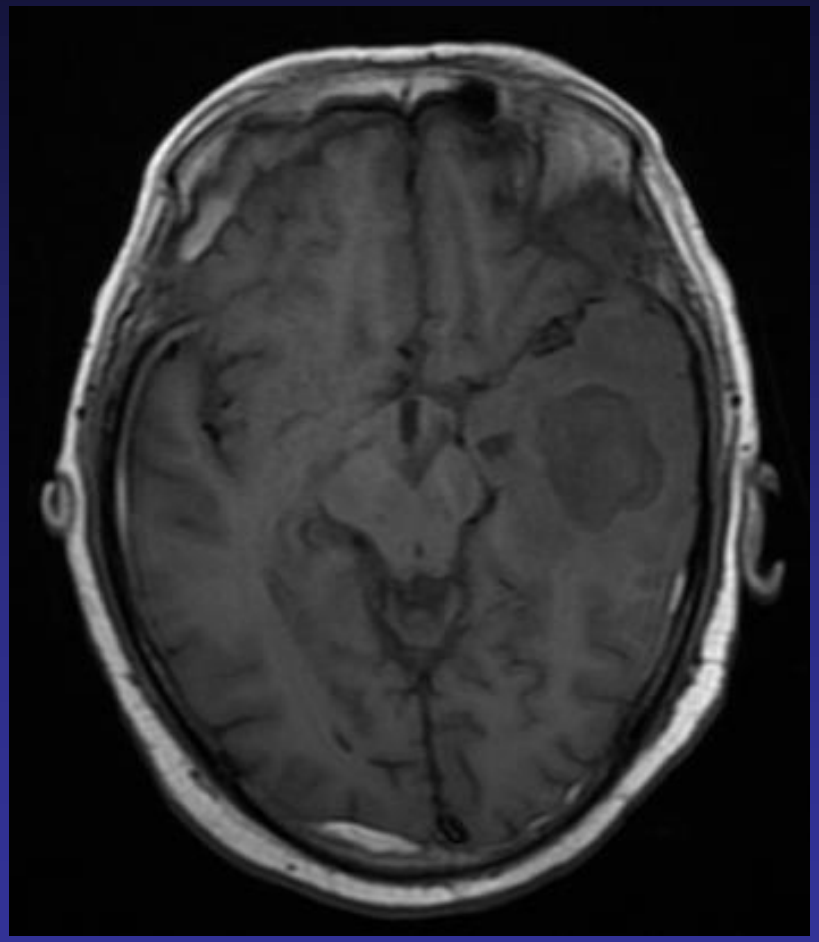


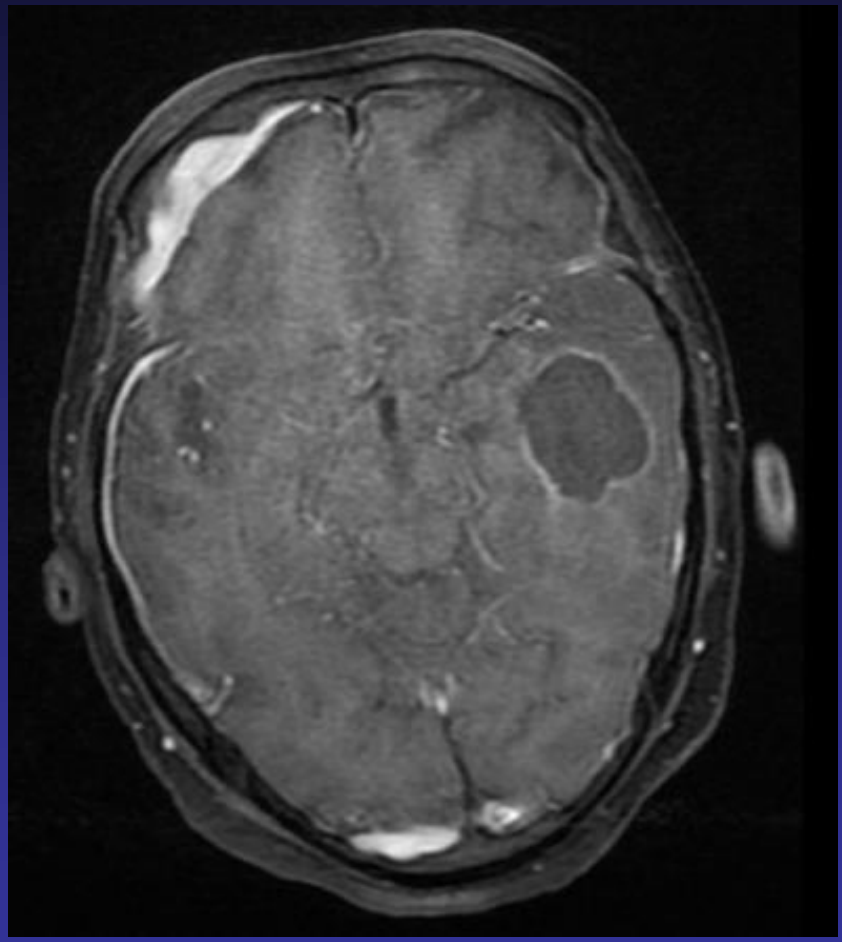
MRI head FLAIR and T2





MRI head T1 pre and post contrast

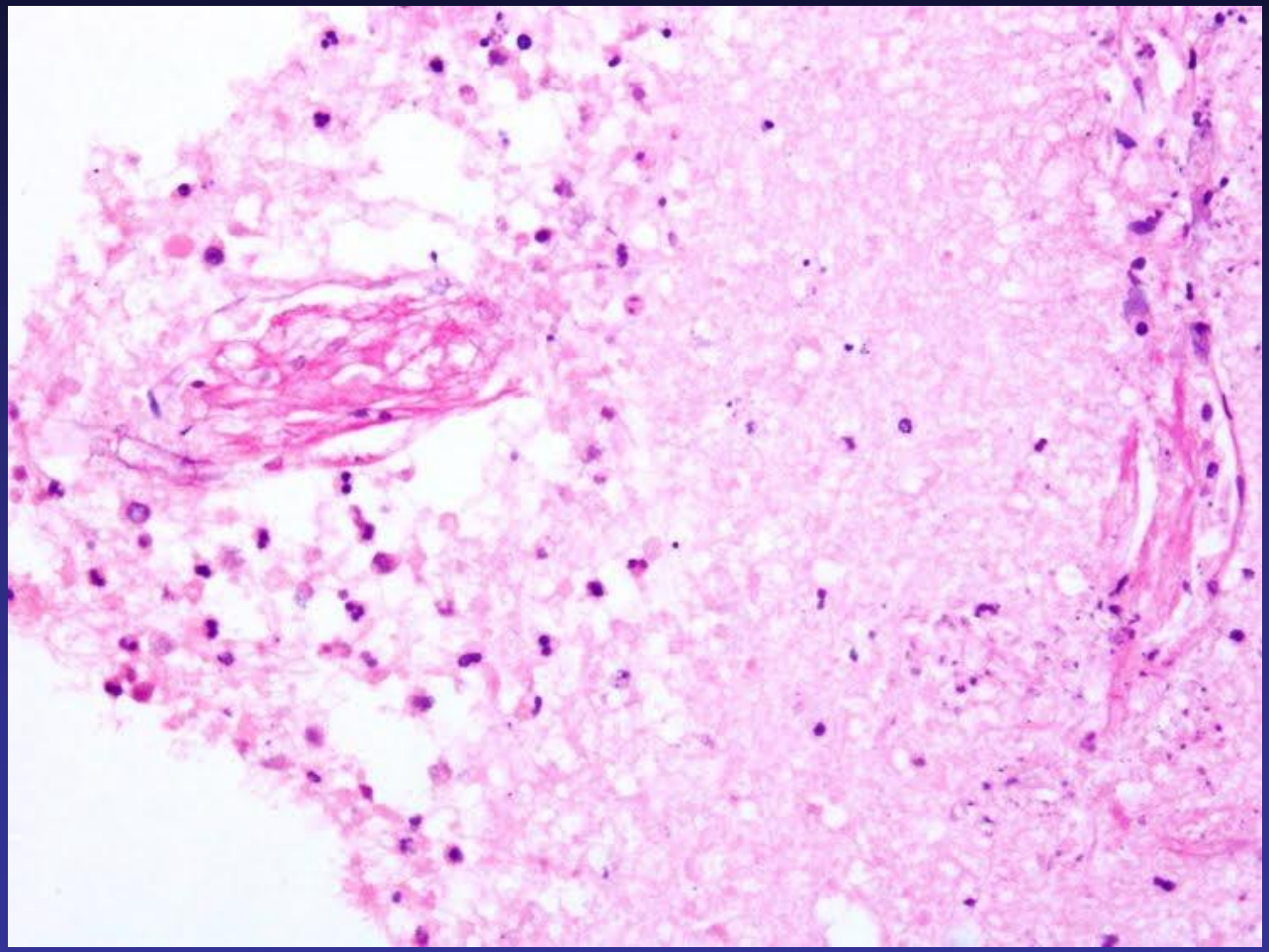




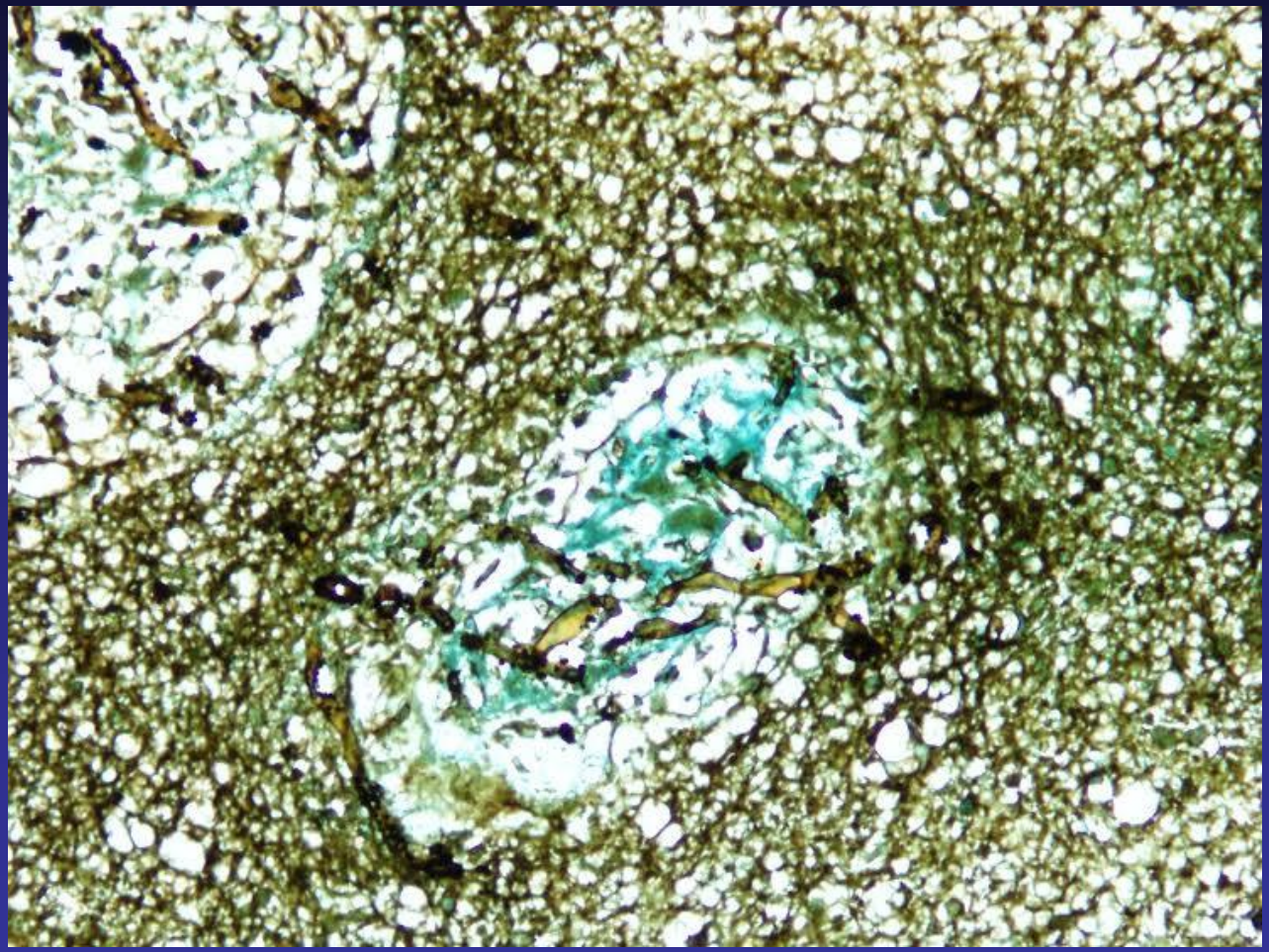
Procedure

- Evacuation of left subdural haematoma
- Left temporal biopsy done
- GCS improved with good movement both sides
- What could this be?

Histopath



Histopath



Histopath

- The sections shows glial parenchyma, hemorrhage along with necrotic tissue containing multiple septate fungal hyphae with acute angled branching admixed with inflammatory cells and nuclear debris. There is angioinvasion. Illdefined histiocytic collections also noted

Treatment

- Fungal culture: Aspergillus noted
- Antifungal changed to iv voriconazole
- Switched to oral voriconazole when po tolerated

WELL IT LOOKED EASY

WHEN THE DAMN HORSE DID IT

Current practice (46 high volume centers)

- 91% use prophylaxis
- 72% for high risk, 28% universal
- 86% fluconazole
- In places of mold concern, different agents used, including ampho B
- Echinocandins gaining favor
- Prophylaxis for the duration of the hospital stay in 40% of centers, for 1 month after transplant in 20%, for 3 months in 10%, and for varied durations in the remainder

Prophylaxis: the last word

- SDD is interesting, BUT?
- The choice should be based on the risk at the center
- Modern surgical and medical practice can reduce risk (1.7% from Singh et al)
- Choice in places with azole resistance unclear
- If Aspergillus a concern, ampho B or echinocandins may be an option
- Retransplant and dialysis are highest risk

Indian data

- Candida isolates from liver transplant/ GI center, Delhi
- In 2 years, 216 isolates of Candida
- *C.albicans* predominant (32.4%); *C.tropicalis* (26.8%) and *C.haemalunii* (16.2%)
- 85% of blood isolates were non albicans
- Fluconazole resistance >20%

Our situation

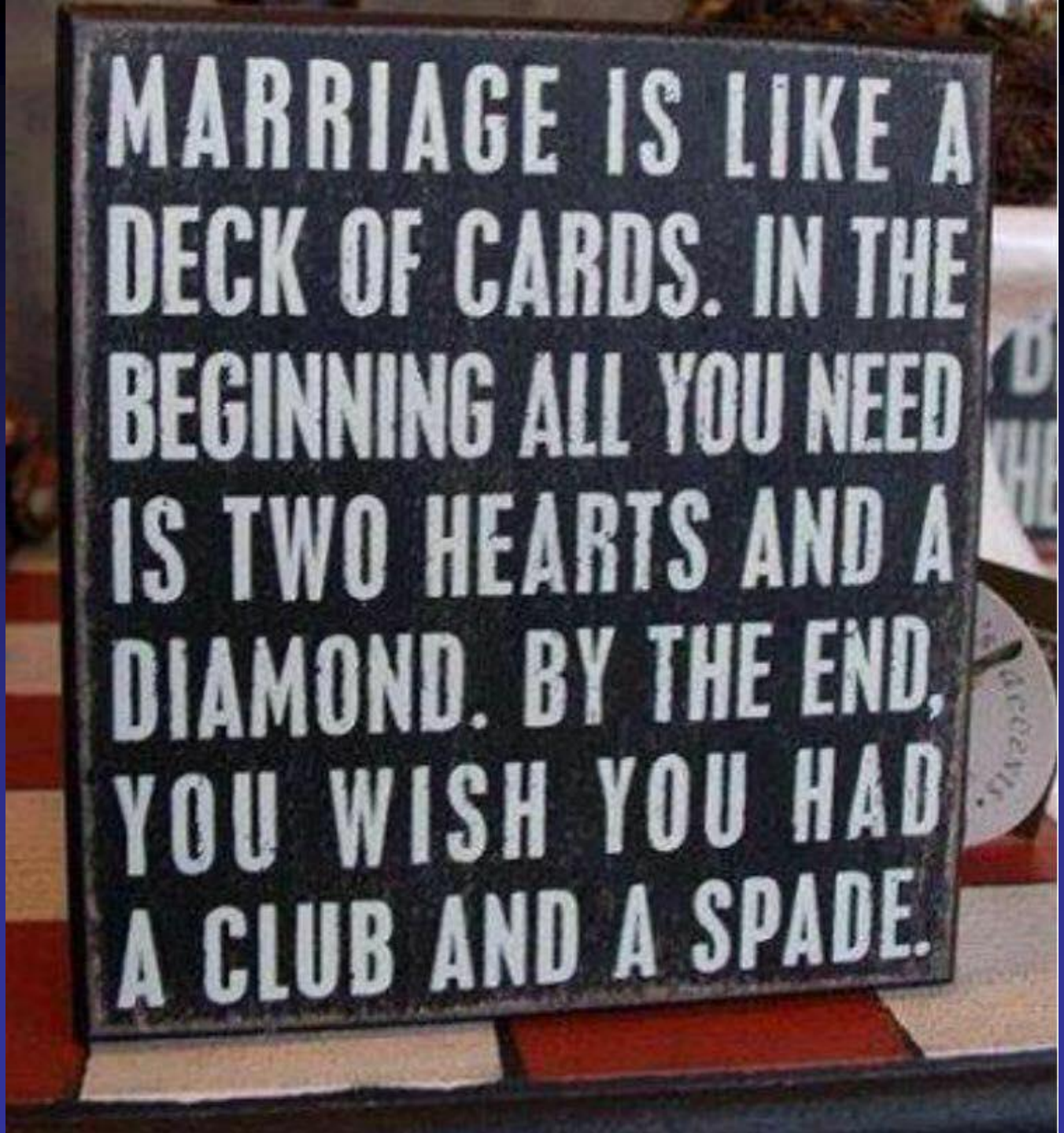
- More than 1000 liver transplants to date
- Universal fluconazole use
- No breakthrough Candidemia or azole resistant Candida noted in this population
- 8 Aspergillus and 15 Mold/Zygo, with 8 deaths

Our guidelines

- Universal fluconazole for 2 months
- In patients with retransplant, dialysis, re exploration, increased blood use, previous fungal infection, use of either echinocandin or lipid formulation Ampho B initially, and downsize to fluconazole once stable

More importantly

- Pre transplant screening
- Counseling on post transplant living
- HIC assessment- engineering controls
- Constant reassessment for new threats


MARRIAGE IS LIKE A DECK OF CARDS. IN THE BEGINNING ALL YOU NEED IS TWO HEARTS AND A DIAMOND. BY THE END, YOU WISH YOU HAD A CLUB AND A SPADE.

Dates to remember

- Transplant ID conference, Hyderabad
- August 14-15, 2018
- CIDSCON 2018, Vellore
- August 16-18, 2018