

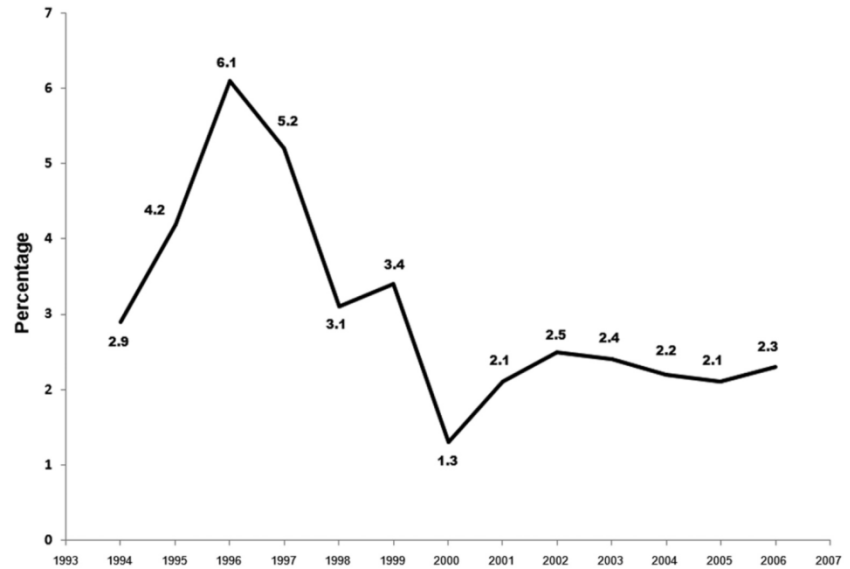
USE AND “MISUSE” OF ANTIBIOTICS IN NEUROSURGERY

- **CSF infection** in the United States after neurosurgery from 1992 to 2003
 - **0.86% to 2.32% ***

*National Nosocomial Infections Surveillance System: National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2003, issued August 2003. Am J Infect Control 31:481–498, 2003.

AIIMS data

- CSF infection from 1994 to 2006 = 2.9 %
 - 1996 = 6.1%
 - 2000 = 1.3%
 - 2006 = 2.3%



Graph showing trend line depicting the incidence of culture-proven meningitis as a percentage of the total number of procedures performed per year at AIIMS

Role of prophylactic antibiotic

- The role of antibiotic prophylaxis*
 - Not to eradicate all the bacteria
 - To control the number of contaminating bacteria below the significant level that cannot cause infection
- Concentration **of antibiotics should be at the maximum at the time of incision**

* Krizek TJ, Robson MC. Evolution of quantitative bacteriology in wound management. Am J Surg 1975;130:579-84

General principles of prophylactic antibiotic

- Directed at the **most common organism** in the hospital
- Repeat the antibiotic dose at intervals so that bactericidal serum levels are maintained

- Do not continue the antibiotic more than a few hours after the end of the operation.
- **Vancomycin should be avoided**

Wound classification

Wound class	Examples
1. Clean cases	< 4 hrs
2. Clean contaminated cases	4- 6 hrs or when there is a breach in sterility
3. Contaminated cases	<ul style="list-style-type: none">• >6 hrs• All emergency cases• Trans-sphenoidal surgery• Frontal or mastoid air cells opened• Implants• Diabetic patients• Re-do patients• Osteomyelitis
4. Dirty cases	<ul style="list-style-type: none">• Abscesses• Suspected meningitis• Penetrating head injuries

AIIMS antibiotics protocols in the past

- 1994–2000
 - ciprofloxacin + amikacin based
- A comprehensive written antibiotic policy came into being for the first time in 2000.
 - 3 classes
- 2000–2004
 - cefotaxime + netilmicin based
- 2004–2006
 - chloramphenicol + netilmicin based

Class I

- At induction
 - iv cloxacillin 500 mg (12.5 mg/kg) push
 - iv amikacin 500 mg (7.5 mg/kg) push
- Follow through in hospital
 - Repeat iv cloxacillin 6 hrly for 24 hrs
 - Repeat iv amikacin 12 hrly for 24 hrs
- At discharge
 - No a/b

Class II

- Same as class I except that total duration is 48 hrs
- At discharge
 - No a/b

Class III

- Same as class III except
- Add iv metrogyl 500 mg (10 mg/kg) iv at induction and 8 hrly for 48 hrs
- Follow through
 - Oral/ iv cloxacillin 500 mg 6 hrly (day 2- 5)
 - Im/iv amikacin 500 mg 12 hrly (day 2-5)

Class IV

- At induction
 - iv ceftriaxone- tazobactam 2 g (40 mg/kg)
 - iv netilmicin 300 mg (5 mg/kg)
 - iv metrogyl 500 mg (10 mg/kg) 30 min infusion
- Follow through in hospital
 - iv. ceftriaxone- tazobactam 2 g (40 mg/kg) 12 hrly for 7 days
 - iv netilmicin 200 mg (7.5 mg/kg/ day) 12 hrly for 7 days
 - iv metrogyl 500 mg (10 mg/kg) 8 hrly for 7 days
- Review at 48 hrs with c/s reports

Only as last resort

- Iv cefoperazone- sulbactam 2 g (40mg/kg) 3 minute push 12 hrly
- Iv vancomycin 500 mg (10 mg/kg) 60 min infusion 6hrly

Controversies

External ventricular drainage

- Controversies-
 - Whether to administer prophylactic antibiotics or not?
 - If yes, for how long?

- Patients getting no prophylactic antibiotics
 - 27%
- Patients getting prophylactic antibiotics
 - 9%

Wyler AR, Kelly WA: Use of antibiotics with external ventriculostomies. J Neurosurg 37:185–187, 1972.

- Periprocedural antibiotics= 4% (4/99)
- Prophylactic antibiotics= 3.8% (8/209)
- No association between the duration and indication of EVD insertion

Current evidence

- Antibiotic prophylaxis indicated
- Only periprocedural (three doses or less, including one well before making the incision) and not prolonged prophylactic

Ventriculoperitoneal shunts

- Rate of infection- 1.5 to 38%*
- Controversy-
 - Is there a role for prophylactic antibiotics
 - If yes, for how long?

*Claus BC: Shunt infection, in Winn HR (ed): Youmans Neurological Surgery, vol 3. Philadelphia: Saunders, 2004, pp 3419–3425

- Results from a meta analysis showed that the use of systemic antibiotic prophylaxis for internal shunts was associated with a decrease in shunt infection (odds ratio 0.51)
- Benefit remains uncertain after the first 24 hours

Bernardo Ratilal, João Costa, Cristina Sampaio, Antibiotic prophylaxis for surgical introduction of intracranial ventricular shunts: a systematic review, J Neurosurg Pediatrics 1:48–56, 2008

Instrumentation in spinal surgery

- Smaller number of bacteria can cause infection with **foreign material***
- Clean surgery with implantation: higher risk for infection
- Infection rate**
 - Instrumented fusion - 6% or more
 - Spinal fusion without instrumentation- 2-3%
 - Discectomy- 1%

* Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999: Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Am J Infect Control 1999;27:97-132

**Massie JB, Heller JG, Abitbol JJ, McPherson D, Garfin SR. Postoperative posterior spinal wound infections. Clin Orthop Relat Res 1992;(284):99-108.

- Therefore, it is appropriate to increase the duration of prophylactic antibiotics in cases with instrumentation[#]
- Included in class C in our protocol

[#]Fang A, Hu SS, Endres N, Bradford DS. Risk factors for infection after spinal surgery. Spine (Phila Pa 1976) 2005;30:1460-5

CSF leak/ rhinorrhea

- Currently available evidence from RCTs **does not support prophylactic antibiotic use** in patients with BSF, whether there is evidence of **CSF leakage or not**
- Until more research is completed, the effectiveness of antibiotics in patients with BSF cannot be determined because studies published to date are flawed by biases

Ethical questions

- Antibiotics
 - Costly
 - Involve risks
 - Side effects and drug interactions
 - Resistant organism

Antibiotic resistance

- Moral conflict
 - Doctor's responsibility to the patient
 - Responsibility to the society/ future patients to prevent resistance

- Can empirical evidence of efficacy alone justify the use of an antibiotic regimen that some consider dangerous?
- What is Malis protocol?

- Is it ethical to conduct antibiotic trials with placebo as control group?

- Proper cleaning, draping technique and surgical discipline among all the staff is the best antibacterial prophylaxis.
- In the preantibiotic era, **Harvey Cushing** reported only a single mortality, attributable to streptococcal meningitis in a series of 130 tumor operations*

*Cushing H: Concerning the results of operations for brain tumor. JAMA 64:189–195, 1915

Take home message

- Antibiotics usage and resistance needs to be monitored.
- Should be based on objective evidence.
- Protocol based management is helpful.
- Protocols should be routinely revised according to changing sensitivity of organisms
- Proper surgical technique is the ultimate elixir for antibacterial prophylaxis.



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Thank You
