Case Report: Temporal bone osteomyelitis following myringoplasty from highly resistant strain of Pseudomonas.

Alexander Hampson, Benjamin Silver, James Quinn.

Introduction

Antimicrobial drug resistance is one of the biggest threats to global health. With the advances of international travel, the impact of resistance has exponentially increased. Sensible and judicious usage of antimicrobials is imperative to prevent future resistance.

Background

Since Alexander Fleming’s discovery in 1928, the medical community has been producing, refining, and treating with antibiotic therapies. Millions of lives have been saved by antibiotics, but less than 15 years after starting to use antibiotics, the first case of resistance was seen⁽¹⁾. Over the next 20 years, many classes of antibiotics have been developed, with resistance often following (Figure 1).

Colistimethate (Colistin™) works by binding to the lipopolysaccharides and phospholipids in the outer cell membrane of gram negative bacteria, displacing cations and resulting in membrane rupture. Due to this mechanism of action, inherent and developed resistance to this drug is rare⁽²⁾.

When colistimethate became available for clinical use in 1959⁽³⁾, antibiotic resistance was less prevalent so choice dictated that colistimethate with its nephrotoxic and neurotoxic effects⁽⁴⁾ was avoided in favour of other antibiotics.

The combination of less common use and difficulty in bacteria developing resistance has resulted in this antibiotic being one of the last lines of defence against multi-drug resistant (MDR) bacteria. CRE are sub-categorised by the enzyme resulting in resistance, the most common being New Delhi Metallo-β-lactamase (NDM), and others being Verona Integron-Mediated Metallo-β-lactamase (VIM) and Klebsiella pneumoniae carbapenemase (KPC)⁽⁵⁾.

This case of persistent Otitis Externa looks at the treatment of such a microbe; VIM positive Carbapenem-resistant Enterobacteriaceae (CRE) *Pseudomonas aeruginosa*⁽⁶⁾.

Figure 1: CT mastoid.

Figure 2: MRI mastoid

Figure 3: Antibiotic deployment timeline

History

A 65 year old lady who had spent 12 months on holiday in India, presented to an outpatient ENT clinic with left sided otalgia and otorrhoea following a recent myringoplasty. This was swabbed and meanwhile was empirically treated in the community with topical ciprofloxacin. As symptoms persisted, she was admitted for regular microsuctioning and a combination of IV and topical antibiotic treatment (Figure 4).

A CT scan showed circumferential soft tissue thickening of the left external auditory canal and soft tissue in the left middle ear cavity, mastoid antrum, and mastoid air cells. It was also noted that the bony margin of the middle ear was poorly defined, possibly indicating early erosion.

A repeat CT following a 6 week course of IV colistimethate sodium and ceftazidime showed a marked reduction in the soft tissue thickening within the external auditory canal. It was also noted that the scutum, ossicular chain and tegmen tympani were fully intact. There was no evidence of intra-mastoid destruction or skull base osteomyelitis.

She was discharged and followed up in an outpatient clinic two weeks later. She has been symptom free since discharge.

Figure 4: Microbiology results and antibiotic therapy

Initial Swab: Started on IV Tazocin 4.5g TDS, Fluconazole 400mg IV OD, topical 1% Clotrimazole TDS.	Ceftazidime - Resistant Ciprofloxacin - Resistant Gentamicin - Resistant Neomycin - Resistant Aztreonam - Intermediate Tobramycin - Resistant
2nd Swab: IV Meropenem 2g BD was added to the previous antibiotic regime.	Ciprofloxacin - Resistant Gentamicin - Resistant Neomycin - Resistant Amoxicillin/Clavulanate -Resistant Ceftazidime - Sensitive
3rd Swab: Antibiotic therapy changed to IV Ceftazidime 2g TDS and IV Colistimethate Sodium 1 million Units TDS which was continued for 6 weeks.	Amikacin - Resistant Gentamicin - Resistant Ceftazidime - Resistant Ciprofloxacin - Resistant Neomycin - Resistant Ceftolozane Tazobactam - Resistant Imipenem - Resistant Meropenem - Resistant
Carbapenemase PCR Results	CPE IMP1 GENE - Not detected CPE VIM GENE - Detected CPE NDM GENE - Not detected CPE KPC GENE - Not detected CPE OXA-48 LIKE GENE - Not detected

Conclusion

Early identification of microorganisms through microbial cultures and sensitivity is paramount in all cases. Appropriate peri-operative antimicrobial use, isolation of patients with effective barrier nursing and regular mandatory training for all healthcare professionals is essential in minimising bacterial resistance in this new era.

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