Glue Ear
- An Update

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GP Study day – 10th December 2007
Outline

► Clinical Presentation
► Aetiologies - causation
► Pathophysiology & Biofilms
► Pneumococcus vaccination
► Treatments - Non-Surgical
  - Surgical
► Conclusions
Otitis Media with Effusion
Glue Ear

► Very Common in toddlers & young children
► Causes hearing loss, language delay, behavioural difficulties
► Strong Seasonal variation - July to Sept better
► Watchful waiting - 50 % resolve in 3 months
► Surgery - Grommets (VT), Adenoidectomy
Age distribution

Number of patients.

Age of patients (years).

Series 1
TM changes following OME/recurrent AOM
Cholesteatomas
Diagnosing Glue Ear

► View eardrum - wax difficulties
  - if TM not clearly normal = OME

► Tuning Fork Test – Rinne’s negative (512, 256 Hz) – can be unreliable

► Parental History – important

► Tympanogram – most reliable
Types of Tympanogram

- **Type A** = normal
- **Type C** = glue ear
- **Type B** = glue ear unless volume reading high = perforation
Glue ear – Predisposing Factors

- Age – bimodal
- Season
- Allergy
- Following AOM
- Sex M>F
- Family History - Sibs
- Parental Smoking, breast feeding, sleep supine, dummy use.
- Associated Conds. Cleft Palate, Down, Ciliary dyskinesia, craniofacial syndromes etc.
Allergy Association?

► Both conditions are very common
► Allergy incidence in OME 14% - 89 %!
  if matched controls 15 - 25 %
► Cellular & Humoral mediators of allergic inflammation active in OME
► Eosinophilic degranulation, T cells, IL-4, IL-5 in atopic children with OME but not in non-atopics
► Conclusion – 25-30 % children with OME have allergy as a factor. Treatments may become more specific in future.
Causations of Glue Ear

► Eustachian Tube Obstruction/dysfunction
► Pressure changes & reduced O$_2$ tension
► Increase goblet cells/mucous glands in ME
► Transudate of Effusion
► Bacterial influence?
  - Positive Bacterial Cultures in OME 30-50 %
  - Bacterial DNA by PCR analysis in 75 - 90 %
  - Likely role of Biofilms
Acute Otitis Media

Organisms in AOM

- 40 – 50 % Strep. Pneumoniae
- 20 – 30 % Haemophilus infl.
- 10 – 15 % Moxarella catarrhalis
**Micro-organisms**

TWO routes of infection – via ET, via perforation

- **CSOM**
  - Staphlococcus: 32%
  - Proteus: 27%
  - Pseudomonas: 16%
  - E. Coli: 9%
  - Klebsiella: 16%

- **Otorrhoea through grommet**
  - Strep. Pneumonae: 21%
  - Pseudomonas: 20%
  - Haemophilus: 16%
  - Moxarella: 9%
Viable Bacteria

- **Planktonic form** = free culturable dividing cells

- **Biofilms** = adherent protected communities - towers of bacteria, often non-culturable.

- Most bacteria in nature exist in Biofilm forms, evolved billions of years ago
Biofilms

- Biofilms involved in 65% all human bacterial infections
- Community of bacteria embedded in slime of extracellular polymeric substances (polysaccharides, nucleic acids & proteins)
- Very low metabolic/reproductive rate
- 1000 more resistant to antibiotic agents.
- Develop on mucosal or on inert surfaces
- Complex multicellular microenvironment of mushroom shaped structures.
Biofilms in ENT

- Cholesteatoma
- CSOM
- Chronic tonsillitis
- Implants - stents, tracheostomy tubes etc.
- Possibly OME
- Probably chronic sinusitis
Evidence for Biofilms in Glue Ear

- Evidence of bacterial DNA in most OME samples by PCR
- Mucosal biofilm formation shown in CSOM primate model (Pseudomonas).
- Streptococcal biofilms found in these primate control middle ears.

Future management – new strategies?
Vaccination – will it help?

- Strep pneumonia - >90 serotypes based on polysaccharide capsules.
- AOM caused by serotypes 1,3,5,12F,18C, 19A 19F
- Prevnar – heptavalent conjugate vaccine for 2 year olds
Pneumococcal vaccination

- After vaccination, get increase incidence of colonisation and infections by other bacteria (Haemophilus) and see non-vaccine serotype shift

- Finnish study - Reduced incid AOM by 7 %

- Vaccine efficacy in OME – 2-5 years
  39 % reduction in grommet insertions
Non-Surgical Treatments of Glue Ear

- Watchful waiting ✓
- Cranial Osteopathy x
- Dairy-free diet ?
- Decongestants x
- Long-term antibiotics ✓
- Antibiotics and Systemic Steroids x
- Montelukast ? / ✓
- Topical Nasal Steroids – compliance ?
- Oto-vent balloons ?
- Vaccination (prevnar) ? / ✓
Surgery
Grommets & Adenoids

THE EVIDENCE
TARGET

Trial of Alternative Regimens of Glue Ear Treatment

MRC-funded multi-centre randomised controlled trial
Target trial

- Grommets
- G’s + Ads
- Medical

- 75% of the medical arm elected to come out of study and chose grommets!

- Never published
TREATMENT EFFECT ON HEARING LEVELS

- Mean at Randomisation

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean at 3 mo</th>
<th>Mean at 6 mo</th>
<th>Mean at 12 mo</th>
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</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>32.1 dB</td>
<td>16.3 dB</td>
<td></td>
</tr>
<tr>
<td>Medical Management</td>
<td>33.2 dB</td>
<td>23.7 dB</td>
<td></td>
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</tbody>
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- SD = 6.1 dB
- Difference = 7.4 dB
TIME COURSE OF HEARING LEVEL
Maximum vs complete Hearing Level data
TIME COURSE OF “BENEFIT SUMMARY” (EXCLUDING HL)
For children over 3 yrs, short-stay VTs are indicated given a 20 dB HL over 3 months. The 1-year treatment effect size is large for HL (» 1.2 SD).

Combined VTs + ADs has benefit of an immediate effect (VTs) plus prolongation (ADs).

Hearing level is a good surrogate predictor of the broader outcomes.
Surgical management of otitis media with effusion

National Collaborating Centre for Women’s and Children’s Health

Commissioned by the National Institute for Health and Clinical Excellence
NICE Guidance & OME

- Final report due Spring 2008
- Political / financial Agenda?
- Concerns so far:
  - Benefit of Adenoidectomy not acknowledged
  - GDG decided to recommend hearing aids in Down in absence of any evidence
  - > 25-30 dB loss in better ear documented for over 3 mo.
Local Commissioning Criteria

► Watchful waiting for 6 months before surgery

► Contravenes the GMC’s Good Medical Practice Requirements “Make the Care of your Patients the FIRST concern”
Summary

► Allergy is a factor in only 30 % of children with Glue ear
► Biofilms may be involved in aetiology of OME and lead to new therapies
► Watchful waiting remains very important
► Medical treatments – largely ineffective
► Pneumococcal vaccine and/or Montelukast might reduce need for surgery in the future.
► Grommets & Adenoidectomy – proven to be highly effective