Dental Anaesthesia

Dr E Rawlings
Anaesthetic Directorate

Chair Dental Anaesthesia

Day Stay Surgery

- Dental chair
- Isolated site
- Brief duration
- Shared airway
- Young children/Nervous adults
- Rapid recovery
History

- General anaesthesia & dentistry closely associated 157 years

- 1800 - Nitrous oxide
  - Analgesic properties noted Humphrey Davy
  - Suffering from gingivitis

- 1844 - Surgery
  - Gardner
  - Horace Wells
  - Great success
    - Colton – (24,000 GA’s – no fatalities)

- 1868 – Nitrous available in cylinders
- 1887 - Hewitt
  - Designed apparatus for administering N2O & O2 mixtures
- 1899 - invention of nasal mask
- 1926 - Demand flow apparatus  McKesson
1920’s Walton machine

- Demand flow
- Remained in service until 1970’s

Nitrous oxide
Commonly used
100% nitrous
patient cyanosed/twitching
(cerebral hypoxia)

100% oxygen
Patient pink
(5-10 mins. for extractions)

Still practised in late 1950’s

- 1956 - Halothane
- 1955/6 Klock & Tom - oxygen restriction unnecessary
- 1957- 1998 – Methohexitone
  - Methohexitone
    - Popular induction agent.

  *Sedation* (Drummond Jackson – 1965)
    - minimal incremental technique
  Narrow therapeutic margin
    - sedation & anaesthesia
1983 - Operator anaesthetist banned
1996 – introduction of Sevoflurane

Standards!

1981 Wylie report
1991 Poswillo report
1998/9 General Dental Council & Royal College of Anaesthetists
1999 - November - Committee on Safety of Medicines
- Halothane withdrawn from use outside hospital setting

31st December 2001 – Department of Health
- All chair dentals must be administered in hospital setting

Statistics on general anaesthetics for Minor Dental procedures

1950’s – 2 million GA’s per annum
1965 - 1.5 million dental GA’s
1998 - 300 000 dental GA’s

Overall reduction of caries
1973 - 7% children caries free
1993 - 50% children caries free
1948 Health service – started
   ✦ All treatment free

1950’s – sweets off ration
   ✦ Large increase in need for dental treatment

Dental Health - improvements

 Improved dental hygiene & education
   ✦ 1955 – 1st advert Gibbs SR
   ✦ 1974 - toothpaste (fluoride)

 fluoride
   ✦ naturally occurring
   ✦ added to water
   ✦ tablets & drops
Dental health improvements (cont).

- **Conservation**
  - lignocaine 1948
  - air rotor drill (1960)
    - High speed

- **Sedation techniques**
  - Intravenous - midazolam
  - Inhalational – relative analgesia (nitrous & oxygen)

- **Improvements in general health & diet**
  - 30’s poverty & poor nutrition
  - Poor dental health

- **Dentists no longer giving GA’s**
  - No longer training dentists to give GA’s
Dental anaesthetists – qualifications & experience?

- **Before 1998 – variable**
  - Dental surgeons
  - General medical practitioners
  - Consultant anaesthetists

Dental Anaesthesia Technique

- **Induction - inhalation/IV**
  - nasal mask

- **Adequate anaesthesia**
  - open mouth
  - insert pack ± prop
  - extract teeth

- **Recovery**
  - lateral position
  - head down
Anaesthetic considerations

Sitting – potential cause of mortality
Posture

Differentiate

true “sitting”
&
semi-reclining position
### Sitting Position

<table>
<thead>
<tr>
<th><strong>Pro’s</strong></th>
<th><strong>Cons</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reduces likelihood of passive regurgitation of gastric contents</td>
<td>- Reduction of venous return reduced cardiac output, cerebral hypoperfusion</td>
</tr>
<tr>
<td>- Airway maintenance easier</td>
<td>- Unrecognised vasovagal syncope</td>
</tr>
<tr>
<td>- Floor of mouth angles forwards facilitates suction</td>
<td>- Debris passing posterior to tongue - laryngeal spasm &amp; aspirated</td>
</tr>
<tr>
<td>- Extraction easier + counterpressure applied</td>
<td></td>
</tr>
</tbody>
</table>

### Supine Position
### Supine position

<table>
<thead>
<tr>
<th><strong>Pro’s</strong></th>
<th><strong>Cons</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous return lower limbs - unimpeded</td>
<td>Compromised respiratory mechanics</td>
</tr>
<tr>
<td>Reduced incidence of cerebral hypoperfusion</td>
<td>Fluids &amp; solid debris more likely to pass into the oropharynx</td>
</tr>
<tr>
<td>Operator &amp; anaesthetist can sit</td>
<td>Passive regurgitation &amp; and aspiration may occur</td>
</tr>
</tbody>
</table>

### Anaesthetic Machine

- Intermittent flow
Anaesthetic Machine

- Continuous flow

Shared airway

- Nasal mask
- Laryngeal mask airway
- Intubation
Nasal mask & oral pack

Oral pack prevents aspiration

Nasal mask & oral pack

Anterior – airway leakage/air entrainment aspiration – saliva/blood/debris
Nasal mask & oral pack

Posterior – airway obstruction

Shared airway

- Laryngeal mask airway

Good control of airway
  Surgeon works around it
  - Airway protection - Good
    - blood, teeth, debris
  - Fewer hypoxic episodes
    - In theatre & recovery
  - Pollution
    - reduced
Age of patient?

- Majority – children ASA I & II
- Median age (Birmingham Dental Hospital)
  - 6 years
- Low incidence
  - co-existing systemic disease
- High incidence
  - Respiratory tract infections
  - Adenotonsillar hypertrophy
  - Nasal obstruction

Nitrous oxide exposure!

- Occupation exposure N\textsubscript{2}O
  - Exceeding 100 ppm
- High fresh gas flow
- Inhalational induction
- Poor airway seal

Sevoflurane + oxygen
Volatile Agents

- Halothane
  - good induction agent
  - associated with arrhythmia’s

Nov. 1999
Halothane withdrawn from use outside hospital setting

Volatile Agents

- Enflurane
  - Less arrhythmias
  - Difficult to use

- Isoflurane
  - No ventricular arrhythmias
  - High incidence
    - Coughing
    - Excess salivation
    - Laryngospasm
Volatile Agents

- Sevoflurane (1996)
  - Good induction agent
  - Pleasant smell
  - No ventricular arrhythmias

Intravenous agents

- Methohexitone
  - Withdrawn 1998

- Propofol
  - Introduced with caution
  - Causes hypotension
Analgesics

- Non-steroidal
  - Diclofenac
  - Ibuprofen
- Paracetamol

- Oral
- Rectal

Analgesics

- Local anaesthesia
  - Infiltration
  - Nerve block

Lignocaine + adrenaline (not suitable with Halothane)
Analgesics

- Local anaesthesia
  - Infiltration
  - Nerve block

Prevents
- surgically induced arrhythmias

Analgesics

Third molar extraction

- Dexamethasone
  - Diminished post-operative swelling
  - Decreased demand - analgesia
**Recovery**

Coplans & Curson  
(1982)  
50% deaths occurred in recovery period

**Complications**

- **Minor**
  - PONV
  - Dental damage
  - Bruising
  - Discomfort temperomandibular joint

- **Major**
  - Airway obstruction, hypoxia
  - Inhalation foreign material
  - Arrhythmias, cardiac arrest
70’s – 80’s - Safety concerns

- Deaths
  - Healthy children
  - Simple procedures

- Substandard
  - Monitoring
  - Assistance
  - Resuscitation equipment

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**Equipment Available in Dental Surgeries 1990**

*A Survey of Dental Practice in two Cities*

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Sheffield</th>
<th>Bristol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laryngoscope</td>
<td>41%</td>
<td>27%</td>
</tr>
<tr>
<td>ET tubes</td>
<td>35%</td>
<td>50%</td>
</tr>
<tr>
<td>ECG</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Pulse oximeter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defibrillator</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Types of anaesthetic machine found in dental surgeries

<table>
<thead>
<tr>
<th>Machine No.</th>
<th>Mean age yrs.</th>
<th>Time since serviced</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp; E Cyprane</td>
<td>15+</td>
<td>3</td>
</tr>
<tr>
<td>Airmed</td>
<td>15</td>
<td>0.3</td>
</tr>
<tr>
<td>McKesson</td>
<td>15</td>
<td>0.7</td>
</tr>
<tr>
<td>MIE Salisbury</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Piped gas &amp; vapouriser</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Walton</td>
<td>18</td>
<td>0.9</td>
</tr>
</tbody>
</table>

- **70’s – 80’s - Safety concerns**
  - **Patients**
    - Poorly prepared
  - **Dental remuneration – poor**
    - Encouraged – high throughput of patients
Poswillo Report - 1990

- Working party
  - Recommendations for safe provision of general anaesthesia in dentistry outside hospital

Poswillo - Recommendations

- General anaesthesia
  - avoided where possible

- Uniform standards – hospital or dental surgery
  - monitoring
  - personnel
Poswillo

- Dental surgeries
  - inspected
  - registered
- Doctors & dentists sufficient competence allowed to continue practicing
  - Variable competencies

Recommendations not taken up
Increase in anaesthetics & deaths

Continued mortality

1996-1999
- Deaths in dental chair 8
- Children 5

Critical
- Preoperative assessment
- Peri-operative monitoring
  - Resuscitation
- Transfer to critical care facility
<table>
<thead>
<tr>
<th>Decade</th>
<th>GA’s</th>
<th>Deaths</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-9</td>
<td>24.39m</td>
<td>134</td>
<td>1:182,000</td>
</tr>
<tr>
<td>1960-9</td>
<td>20.95</td>
<td>70</td>
<td>1:299,000</td>
</tr>
<tr>
<td>1970-9</td>
<td>15.56</td>
<td>64</td>
<td>1:243,000</td>
</tr>
<tr>
<td>1980-9</td>
<td>6.58</td>
<td>20</td>
<td>1:329,000</td>
</tr>
<tr>
<td>1990-00</td>
<td>3.10</td>
<td>12</td>
<td>1:258,000</td>
</tr>
<tr>
<td>50 year total</td>
<td>70.58</td>
<td>300</td>
<td>1:235,000</td>
</tr>
</tbody>
</table>

**Cause of death**

- **Respiratory difficulty**
- **Sudden cardiovascular collapse**
  - Coroner’s report
    - Unexpected cardiac arrest
    - No precipitating factor
    - Resistant to resuscitation
    - Postmortem - no evidence of cause
- **Posture not implicated**
Halothane & Cardiac Arrest

- Incidence of arrhythmias - Halothane

Volatile anaesthetic agents
- halothane
  • Hypoxia
  • Hypercarbia
  • Inadequate anaesthesia

General Dental Council 1998
Maintaining Standards - General anaesthesia

- Referring Dentist
- Treating Dentist
- Anaesthetic support staff
- Recovery & discharge
- Monitoring & Resuscitation

Consultation with RCA
RCA report - 1999

- General Anaesthetics in Dentistry increasing
- Deaths continue to occur
- Standards - same as other aspects of anaesthesia

Royal College of Anaesthetists 1999

General anaesthesia in dentistry strictly limited to the following
- Local anaesthesia inappropriate - infection
- Problems related to age/maturity
  physical/mental disability
- Long-term dental phobia induced
  prolonged
  - long term aim: treat with sedation & then local
RCA report 1999

- **Patient assessment**
  - screened referring dentist
    - medical history
    - discuss risks & benefits with patient

- **Final decision**
  - Patient
  - Parent or guardian
  - Operating dentist/anaesthetist

RCA report 1999

- **Clinical setting**
  - NHS District General Hospital

- **Outwith DGH**
  - clear protocols
  - additional support if resuscitation/transfer

- **Location**
  - easy access to emergency services
RCA report 1999

- **Suitable**
  - equipment
  - monitoring
  - drugs

- **apparatus**
  - checked
  - maintained
  - spares
  - storage supply facilities

RCA report 1999

- **Staffing**
  - Anaesthetists - specialist register of GMC
  - Trainees - accredited programme RCA
  - Non-consultant career grade
    - responsibility of named consultant

- **Team**
  - Anaesthetist & dedicated assistant
  - Dentist & dental nurse

- **Recovery**
  - Appropriate monitoring
  - anaesthetist/suitably trained individual
RCA report 1999

- **Aftercare**
  - home - responsible legally competent adult
  - clear instructions
  - anaesthetist to assess fitness for discharge

- **Audit**

- **Training**
  - Basic/advanced life support
  - Trainee anaesthetists to have instruction
  - Record in log book

RCA report 1999 - Future

- **Patient education**
  - relative risks of GA
  - reduce number of GA’s given

- **Training anaesthetists**

- **Centralise services**

- **Audit of activity**
  - improve service
“A conscious Decision”

Recommendation
- Chair Dental Anaesthetics must be administered in a hospital setting after 31st December 2001

Alternative techniques

- Anxiety control
  - Psychological
  - Pharmacological
- Relative analgesia
  - Nitrous oxide
- Intravenous sedation
  - Midazolam
  - TCI propofol

Morbidity/mortality associated with sedation not clearly defined