COMPARISON OF ALTHESIN AND THIOPENTONE IN ANAESTHESIA FOR
PAEDIATRIC OUT-PATIENT OTOLOGY

LAILA SAARNIVAARA

SUMMARY
Althesin (0.055 ml/kg) as an anaesthetic induction agent was compared with thiopentone (4 mg/kg) in 87 children undergoing minor ear surgery as out-patients. The children were premedicated with pethidine and atropine and anaesthesia was maintained with nitrous oxide in oxygen and halothane. Both drugs were associated with similar reductions in heart rate and similar increases in respiratory rate. The depressant effect on systolic arterial pressure caused by thiopentone was more marked than that caused by Althesin. There were cardiac arrhythmias in three children who received thiopentone but none in the Althesin group. Althesin was associated with a more rapid recovery.

Althesin is a new steroid anaesthetic agent which, in the rat, enters the brain and concentrates in the liver and kidney. It is eliminated rapidly and is not redistributed in the body fat (Card, McCulloch and Pratt, 1972).

In man Althesin produces a rapid induction of anaesthesia without cardiovascular disturbance (Campbell et al., 1971; Clarke et al., 1971; Swerdlow, Chakraborty and Zahangir, 1971; Sævege et al., 1972; Tammisto et al., 1973). It does not interact with the volatile anaesthetic agents, halothane and trichloroethylene, or with the most commonly used muscle relaxants (Bradford et al., 1971). Recovery following anaesthesia induced by Althesin is sufficiently rapid and uneventful to make it a useful drug for out-patients (Clarke et al., 1971; Hannington-Kiff, 1972; Swerdlow, 1972).

This study was designed to compare Althesin with thiopentone in children undergoing myringotomy and the insertion of small plastic tubes, for the drainage of the middle ear, as out-patients.

PATIENTS AND METHODS
The study was carried out in 87 unselected children between 1972 and 1973 at the Otolaryngological Hospital of the University of Helsinki. Althesin (CT1341) (Glaxo Laboratories Ltd) was administered to each alternate child, the remainder of the children receiving thiopentone. Prior to the induction of anaesthesia, a medical history was taken and a physical examination was performed. In both groups, about 66% of the children were in good physical condition and the remainder were in a "moderate" condition, most commonly as a result of mild rhinitis, allergies or retardation of development. With the exception of the drugs used for anaesthesia the children received no other medication.

The children were starved overnight before the procedure, which was always performed between 9 a.m. and 12 noon. All the children were premedicated with 1 mg/kg of pethidine and 0.02 mg/kg of atropine given i.m. 45 min before the start of anaesthesia. Thiopentone 4 mg/kg, or Althesin 0.055 ml/kg, was injected intravenously over 45 sec. These doses were chosen on the basis of the studies of comparative potency of Althesin and thiopentone (Clarke, Dundee and Carson, 1972). Immediately after injection of the drugs the children were examined for the presence of the eyelash reflex and eye movements.

Anaesthesia was maintained with nitrous oxide and oxygen (3:1) and halothane (commencing with 2% and gradually reducing the concentration to 0.5% towards the end of the procedure). The gas mixture was delivered from a face mask. The heart sounds were monitored throughout the operation with the aid of a precordial stethoscope. Pulse rate, systolic arterial pressure and respiratory frequency were measured just before the induction of anaesthesia and then at intervals of about 3 min until the end of anaesthesia. Respiration was spontaneous. Side effects, such as involuntary movements, were recorded. All anaesthetics were administered by the author.

Following the completion of the procedure the
children were kept in a quiet room. The stages of the recovery were always recorded by the same nurse. Each child was asked at 30-sec intervals to open his eyes, to sit up, or to tell his name. The Romberg test was performed 2 min after the child was able to sit unaided. For this test he was asked to stand with his eyes closed and the arms stretched out in front for 30 sec. The test was repeated every 2 min until the child was able to perform it satisfactorily (i.e. Romberg negative). Thereafter the child was taken to his mother and observed for 2 hours.

Student's t-test was used for statistical analysis of the results.

RESULTS

Table I shows that on the basis of sex, age, weight and physical condition both groups were comparable.

Table II shows that immediately after the injection of thiopentone or Althesin the eyelash reflex was present in 86% and 88% of the children, respectively. The eye movements disappeared in all except three patients in the thiopentone group. Table II also shows that the mean duration of anaesthesia in both groups was 13.7 min and the duration of the procedure was about 10 min.

Table III shows the cardiovascular and respiratory changes occurring during the two methods of anaesthesia. In both groups the maximum decrease in pulse rate was similar. There was no increase in pulse rate in either group. In both groups the lowest systolic arterial pressure values differed significantly from the corresponding initial values. The highest value seen in the thiopentone group was still significantly less than the initial value, whereas in the Althesin group it was similar to the initial value. In both groups the respiratory frequency was significantly increased.

Table IV shows the stages of recovery after the two types of anaesthesia. In both groups the children responded to the different commands after about 20 min. The mean time from the end of anaesthesia

<table>
<thead>
<tr>
<th>Drug</th>
<th>No. of children</th>
<th>Male</th>
<th>Female</th>
<th>Age (years)</th>
<th>Weight (kg)</th>
<th>Physical condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiopentone</td>
<td>44</td>
<td>24</td>
<td>20</td>
<td>6.0 ±2.4</td>
<td>21.0 ±7.9</td>
<td>Good</td>
</tr>
<tr>
<td>Althesin</td>
<td>43</td>
<td>27</td>
<td>16</td>
<td>6.2 ±2.3</td>
<td>22.4 ±8.8</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Thiopentone 4 mg/kg</th>
<th>Althesin 0.055 ml/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immediatly after injection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyelash reflex present</td>
<td>86.4% (38/44)</td>
<td>88.4% (38/43)</td>
</tr>
<tr>
<td>Eye movements absent</td>
<td>93.2% (41/44)</td>
<td>100.0% (43/43)</td>
</tr>
<tr>
<td>Duration of anaesthesia* (min)</td>
<td>13.7±6.0</td>
<td>13.7±5.3</td>
</tr>
<tr>
<td>Duration of procedure* (min)</td>
<td>10.1±6.1</td>
<td>10.4±5.0</td>
</tr>
</tbody>
</table>

*Mean values ± SD

<table>
<thead>
<tr>
<th></th>
<th>Thiopentone 4 mg/kg</th>
<th>Althesin 0.055 ml/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulse rate (beats/min)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial value</td>
<td>130±2.6 (44)</td>
<td>130±2.6 (42)</td>
</tr>
<tr>
<td>Lowest ,,</td>
<td>120±1.8** (44)</td>
<td>119±2.0** (43)</td>
</tr>
<tr>
<td>Highest ,,</td>
<td>133±1.9 (44)</td>
<td>130±2.0 (43)</td>
</tr>
<tr>
<td><strong>Systolic arterial pressure (mm Hg)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial value</td>
<td>118±2.1 (43)</td>
<td>114±2.0 (42)</td>
</tr>
<tr>
<td>Lowest ,,</td>
<td>98±1.1** (44)</td>
<td>97±1.3** (43)</td>
</tr>
<tr>
<td>Highest ,,</td>
<td>110±1.5** (44)</td>
<td>112±2.0 (43)</td>
</tr>
<tr>
<td><strong>Respiratory frequency/min</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial value</td>
<td>24±1.2 (26)</td>
<td>23±0.8 (28)</td>
</tr>
<tr>
<td>Lowest ,,</td>
<td>27±0.7 (43)</td>
<td>27±0.9* (43)</td>
</tr>
<tr>
<td>Highest ,,</td>
<td>33±0.8** (43)</td>
<td>33±0.9** (43)</td>
</tr>
</tbody>
</table>

Significant difference from initial value: * = P<0.01; ** = P<0.001
TABLE IV. Stages of recovery after anaesthesia induced by thiopentone or Althesin. Mean values ± SE. Number of cases in brackets.

<table>
<thead>
<tr>
<th>Stages of recovery</th>
<th>Thiopentone 4 mg/kg</th>
<th>Althesin 0.055 ml/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response to the following commands</td>
<td>Time (min) from the end of anaesthesia</td>
<td></td>
</tr>
<tr>
<td>Open your eyes</td>
<td>19.1 ±1.2 (44)</td>
<td>18.8 ±1.2 (43)</td>
</tr>
<tr>
<td>Tell me your name</td>
<td>19.3 ±1.2 (40)</td>
<td>19.0 ±1.2 (40)</td>
</tr>
<tr>
<td>Sit up</td>
<td>20.8 ±1.3 (41)</td>
<td>19.8 ±1.2 (42)</td>
</tr>
<tr>
<td>Romberg test negative</td>
<td>% of patients in groups</td>
<td></td>
</tr>
<tr>
<td>2 min after sitting up</td>
<td>51.2%*** (21/41)</td>
<td>85.0%*** (34/40)</td>
</tr>
<tr>
<td>4 &quot; &quot; &quot; &quot; &quot;</td>
<td>75.6%** (31/41)</td>
<td>97.5%** (39/40)</td>
</tr>
<tr>
<td>6 &quot; &quot; &quot; &quot; &quot;</td>
<td>90.2%* (37/41)</td>
<td>100.0%* (40/40)</td>
</tr>
<tr>
<td>8 &quot; &quot; &quot; &quot; &quot;</td>
<td>100.0% (41/41)</td>
<td>—</td>
</tr>
<tr>
<td>Mean time from end of anaesthesia (min)</td>
<td>23.7 ±1.2 (41)</td>
<td>21.9 ±1.2 (40)</td>
</tr>
</tbody>
</table>

Significant difference between groups: *=P<0.05; **=P<0.01; ***=P<0.001

TABLE V. Side effects during and after anaesthesia in the two groups.

<table>
<thead>
<tr>
<th>Side effects</th>
<th>Thiopentone 4 mg/kg</th>
<th>Althesin 0.055 ml/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>During anaesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle movements</td>
<td>63.6%* (28/44)</td>
<td>88.4%* (38/43)</td>
</tr>
<tr>
<td>Cardiac arrhythmias</td>
<td>6.8% (3/44)</td>
<td>0.0% (0/43)</td>
</tr>
<tr>
<td>Hiccup</td>
<td>0.0% (0/44)</td>
<td>2.3% (1/43)</td>
</tr>
<tr>
<td>During 2-hour period after anaesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pallor and sweating</td>
<td>0.0% (0/44)</td>
<td>2.3% (1/43)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>4.5% (2/44)</td>
<td>18.6% (8/43)</td>
</tr>
<tr>
<td>2-hour after anaesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pallor, nausea, drowsiness or dizziness</td>
<td>4.5% (2/44)</td>
<td>11.6% (5/43)</td>
</tr>
</tbody>
</table>

*Significant difference between the groups (P<0.01)

DISCUSSION

The sex, age, weight and physical condition of the children, the duration of anaesthesia, and the type of operative procedure were similar in both groups. Thus the two methods of anaesthesia can be compared.

These results show that both the methods of anaesthesia studied were satisfactory for out-patient procedures in children. However, side effects such as involuntary muscle movements during anaesthesia, and nausea and vomiting after anaesthesia, were more frequent following Althesin than following thiopentone.

On the basis of the disappearance of the eyelash reflex and eye movements, 4 mg/kg of thiopentone seemed to be equipotent to 0.055 ml/kg of Althesin and this confirms the findings of Clarke and associates (1971).

In both groups the maximum decrease in pulse rate was similar. There was no increase in pulse rate in either group. Used alone, thiopentone and Althesin are known to increase the pulse rate (Savage et al., 1972). When Althesin is combined with halo-
COMPARISON OF ALTHESIN AND THIOPENTONE IN CHILDREN

was muscle movements during the procedure. In the
anaesthesia. Medication and nitrous oxide and halothane during
patients (Warren, 1972). The absence of excitatory
side effects in our children may be attributable to
the analgesic and sedative effect of pethidine pre-
mixed with nitrous oxide and halothane these excita-
tory side effects occurred in only 10% of the
patients as well as in the procedures or operations
performed. Swerdlow (1972) found that recovery
was significantly longer in patients
after Althesin was longer than after methohexitone.
However, Foley and associates (1972) and
Warren (1972) stated that recovery in out-patients
after Althesin was more rapid than after thiopentone.
This result is in agreement with that obtained by
Clarke and associates (1971), who found that recov-
er after Althesin seems to be more rapid than
after comparable doses of methohexitone and thio-
pentone. However, Foley and associates (1972) and
Warren (1972) stated that recovery in out-patients
after Althesin was longer than after methohexitone
and Cooper (1972) found that the recovery times
after Althesin and methohexitone were similar. The
difference in these results may be the effect of
differences in age and physical condition of the
patients as well as in the procedures or operations
performed. Swerdlow (1972) found that recovery
after Althesin was significantly longer in patients
over 40 years of age than in those under 40 years.

In our study there was no crying or confusion in
the early recovery period as found by Warren (1972)
who used Althesin only. When Althesin was com-
bined with nitrous oxide and halothane these excita-
tory side effects occurred in only 10% of the
patients (Warren, 1972). The absence of excitatory
side effects in our children may be attributable to
the analgesic and sedative effect of pethidine pre-
medication and nitrous oxide and halothane during
anaesthesia.

In both groups the most disturbing side effect
was muscle movements during the procedure. In the
Althesin group these movements occurred more
frequently and were more violent than in the thio-
pentone group. In this respect Althesin was clearly
inferior to thiopentone.

The use of Althesin or methohexitone alone in
out-patients undergoing minor surgical procedures
was not found to be associated with nausea or
vomiting (Hannington-Kiff, 1972). This finding was
supported for Althesin by Warren (1972). When
patients were premedicated with atropine and anaes-
thesia was maintained with nitrous oxide and oxygen,
postoperative nausea and vomiting were less
frequent after induction with Althesin than after
induction with thiopentone, methohexitone, pro-
panidid or ketamine (Clarke et al., 1971). However,
in our patients more nausea and vomiting occurred
after Althesin than after thiopentone. It may be that
the quicker recovery after Althesin may increase the
effect of pethidine on vestibular function and, by
this mechanism, aggravate nausea and vomiting.

There is evidence that Althesin has an anti-
arrhythmic effect (Cundy, 1973). Furthermore,
Heinonen, Orko and Louhija (1973) found that the
success rate for conversion of cardiac arrhythmias
to sinus rhythm was slightly greater in patients
anaesthetized with Althesin than in those anaes-
thesized with thiopentone. In our material there were
no arrhythmias in the Althesin group whereas they
occurred in three children in the thiopentone group.
It would appear from this study that Althesin is
superior to thiopentone in out-patient anaesthesia
because (1) there is less disturbance of arterial
pressure and cardiac rhythm, (2) there is a faster re-
covery. Althesin would appear to be inferior to
thiopentone in two respects: (1) involuntary muscle
movements during the surgical procedure are more
marked; (2) postoperative nausea and vomiting tend
to occur slightly but not significantly more often
after Althesin than after thiopentone.

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