Etomidate as a rectal induction agent

Part II. A clinical study in children

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Summary

Following the preliminary study in rats, etomidate (Hypnomidate; Janssen) 1.25% in sterile water (pH 3.5) was administered rectally to 40 children aged between 6 months and 5 years to induce general anaesthesia for scheduled minor surgical procedures. The doses given ranged from 3.0 mg/kg to 6.5 mg/kg. The time taken for hypnosis to occur and the incidence of muscle movements were recorded. Cardiovascular and respiratory parameters were monitored. Anaesthesia was maintained with nitrous oxide/oxygen and halothane as needed. The time taken for recovery from anaesthesia was recorded and the children were observed for 24 hours postoperatively.

The lowest hypnotic dose was 4.5 mg/kg, when 2 out of 5 children fell asleep. In all children given 6.5 mg/kg hypnosis occurred within 4 minutes. Cardiovascular and respiratory parameters were stable. There did not appear to be any delay in the recovery of the children from inhalational anaesthesia. There was no clinical evidence of irritation of the rectal mucosa by the etomidate solution.

This study shows that rectal administration of etomidate 1.25% in sterile water at a dose of approximately 20 times the recommended intravenous dose in children produces a rapid, predictable onset of hypnosis within 4 minutes and allows rapid recovery. This is highly suitable for outpatient anaesthesia in unpremedicated children who will accept neither inhalational nor intravenous induction.

Patients and methods

Forty children aged between 6 months and 6 years who were scheduled for general anaesthesia for minor surgical procedures at the Red Cross War Memorial Children's Hospital, Cape Town, were included in the study.

In addition to the routine pre-operative assessment, the children were weighed and informed consent for the anaesthetic procedure was obtained from their parents. The children were given clear fluids (half-strength Darrow's solution in 5% dextrose) orally 4 hours pre-operatively. No premedication was administered.

Immediately before the operation each child's pulse rate, blood pressure and respiratory rate were recorded. The first 5 children were given etomidate 1.25% solution 3 mg/kg in sterile water (pH 3.5) rectally using a specially designed soft silicone elastomer catheter connected to a syringe. The solution was deposited just within the anus and the buttocks were tightly apposed to avoid loss of the solution. Each child was closely observed to determine the first signs of the drug, the onset of hypnosis as judged by loss of eyelash reflex, and the presence of involuntary muscle movements. The cardiovascular and respiratory parameters were measured at 2-minute intervals.

As soon as the children fell asleep or became drowsy, anaesthesia was continued using inhalation of N₂O 60%/O₂ 40% and halothane up to 2% as needed.

At the conclusion of surgery inhalational anaesthesia was discontinued. O₂ 30% in air was administered, and the recovery times as judged by return of the eyelash reflex, spontaneous movement and response to pain and commands were recorded.

Subsequently, in groups of 5, the children were given doses increasing by 0.5 mg/kg until a dose was reached which produced hypnosis in 100% of cases.

The children were observed for 24 hours after recovery.

Results

The rectal administration of etomidate 1.25% solution in sterile water produced drowsiness in all the children studied. At the lower dose levels tested, however, the drowsiness was shortlived and not adequate enough to allow inhalation of N₂O 60%/O₂ 40% and halothane 2% without upsetting the child.

The induction of general anaesthesia should not be allowed to result in psychological trauma to the paediatric patient. In the well-premedicated and co-operative child who will accept a mask, inhalational induction provides the easiest method. Intravenous induction is preferred for most older children and has been demonstrated to cause less immediate and delayed emotional disturbance. Inhalational or intravenous induction is often difficult in the younger, unpremedicated and sometimes unco-operative child. Rectal induction of anaesthesia is a practical alternative, especially for outpatient anaesthesia. Barbiturates have been most commonly used, but their absorption is unpredictable, resulting in a delayed or even absent effect. Recovery may be prolonged and circulatory and respiratory depression occasionally occur.

Etomidate (Hypnomidate; Janssen), a non-barbiturate, has been shown to be a safe, reliable, rapidly acting intravenous induction agent in children. However, an unacceptably high incidence of pain on injection has discouraged intravenous use thereof in children.

The preliminary study in rats (Part I) indicated that the rectal administration of etomidate is an efficient, predictable and safe method of inducing anaesthesia and warranted further investigations in clinical anaesthesia. This study evaluates the efficacy of rectally administered etomidate as an induction agent for general anaesthesia in children.

The preliminary study in rats (Part I) indicated that the rectal administration of etomidate is an efficient, predictable and safe method of inducing anaesthesia and warranted further investigations in clinical anaesthesia. This study evaluates the efficacy of rectally administered etomidate as an induction agent for general anaesthesia in children.
The lowest hypnotic dose was 4.5 mg/kg, when 2 out of 5 children fell asleep (Table 1). The prompt administration of N, O 60%, O2 40% and halothane 2% allowed general anaesthesia to continue without disturbing the child. In all children given 6.5 mg/kg hypnosis occurred within 4 minutes.

There was a noticeable reduction (15%) in the pulse rate in all of the children, associated with the onset of hypnosis following rectal administration of etomidate. All the other cardiovascular and respiratory parameters measured remained constant. Involuntary muscle movements did not occur during the induction period and no other untoward or disconcerting effects of the drug were seen.

After discontinuation of inhalational anaesthesia at the end of the surgical procedure, 90% of the children recovered as rapidly as we would expect after halothane anaesthesia. In the remaining 10% the surgical procedure was extremely short (viz. incision and drainage of a superficial abscess) and recovery was slightly delayed. However, all of these children were wide awake within 15 minutes. In these children involuntary muscle movements and twitching during the recovery period were seen only in response to painful stimuli.

There was no clinical evidence of irritation of the rectal mucosa by the etomidate solution in the children observed for 24 hours postoperatively.

Discussion

Tribromo-ethanol, thiopentone, methohexitone and ketamine have been used for the rectal induction of anaesthesia in children.5-7 Tribromo-ethanol and thiopentone are used less often because of their unpredictability and delayed recovery and 'hangover' effects. Methohexitone has been most extensively used and documented.3,5 Objections to the use of methohexitone have been related to the unpredictable time of onset of hypnosis (range 4-22 minutes with a mean of 8.6 minutes), depression of ventilation, laryngospasm and occasional apnoea and hiccup.9 Ketamine provides analgesia as well as anaesthesia after 15 minutes. In these children involuntary muscle movements and twitching during the recovery period were seen only in response to painful stimuli.

There was no clinical evidence of irritation of the rectal mucosa by the etomidate solution in the children observed for 24 hours postoperatively.

Alalad side-effects on the cardiovascular system.10,11 Furthermore, etomidate is considered to be the first hypnotic agent unlikely to cause histamine release.12 Complete recovery from hypnotic action occurs more rapidly than after a comparable dose of methohexitone, and drowsiness does not occur after the anaesthetic.8

Conclusion

The rectal administration of etomidate 1.25% solution in sterile water at a dose of 6.5 mg/kg in children produces a rapid, predictable onset of hypnosis within 4 minutes and allows rapid recovery. This is highly suitable for unpremedicated, uncooperative children who will accept neither an inhalational nor an intravenous induction.

The authors wish to thank Dr A. L. Swanepoel for stimulating their interest in this subject, Professor G. G. Harrison for editing this paper, Mrs A. Garschagen for typing, and Dr J. G. L. Strauss, Medical Superintendent of the Red Cross War Memorial Children's Hospital, for permission to publish.

REFERENCES