SOME FACTORS ASSOCIATED WITH NEONATAL DEPRESSION IN OPERATIVE OBSTETRICS

BY
The Obstetric Unit, St. Mary's Hospital, Portsmouth, England

Many factors have been held responsible for respiratory depression in the newborn following operative delivery. Intrapartum asphyxia, birth trauma and central depression from drugs are among the most commonly incriminated. Adequate antenatal care, careful observation of the foetal heart during labour, skilful obstetrics and the use of nondepressant analgesic and anaesthetic techniques go far to obviate many of the preventable causes. The remaining unavoidable aetiological factors are not easily segregated but recently we have had the opportunity to examine some of these factors and to draw some conclusions therefrom.

MATERIAL AND METHOD

During a 32-month period 6,574 deliveries took place in the obstetric unit concerned (table I). Of these 873 (13.3 per cent) were operative deliveries under anaesthesia. Of the operative deliveries 119 patients (13.6 per cent) received general anaesthesia likely to affect neonatal respiratory activity (Apgar et al., 1957; Sjostedt and Rooth, 1958; Roberts et al., 1957; Kolstad and Schye, 1957; Donald, Kerr and Macdonald, 1958; Hodges et al., 1959) and these were excluded. The remaining 754 deliveries were conducted under a standardized general anaesthetic technique, which has been shown to have minimal effects on the newborn (Hodges et al., 1959). Of the infants in this latter group, 137 were intubated at birth for the purposes of aspiration or oxygenation (Hodges et al., 1960).

Records were kept of the pre-operative obstetric conditions prevailing, the state of the infant at birth and the subsequent progress. The special anaesthetic-obstetric record card already described (Hodges, 1959) was used. The association of anaesthetic and obstetric factors with the incidence of postpartum depression was examined and analyzed. In particular it was desired to determine the incidence of pre-operative foetal distress and the effects of timing of pre-operative analgesic drugs.

The circumstances in which postpartum respiratory difficulties are most likely to arise are outlined.

RESULTS

Firstly, it was necessary to exclude as far as possible any variable depressant effect of the anaesthetic technique used.

Table I

<table>
<thead>
<tr>
<th>Total number of deliveries</th>
<th>Number of operative deliveries (873)</th>
<th>Number of infants intubated in the standard anaesthetic series</th>
<th>Operative procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nonstandard</td>
<td>Standard</td>
<td>80</td>
</tr>
<tr>
<td>6574</td>
<td>29</td>
<td>333</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>245</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>153</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>119</td>
<td>754</td>
<td>137</td>
</tr>
</tbody>
</table>

*Present appointment: Captain, R.A.M.C.
It has already been shown that, of operative deliveries, those infants whose mothers received thiopentone-suxamethonium and nitrous oxide-oxygen appeared to breathe and cry more readily at birth and to have less postpartum depression than those whose mothers were anaesthetized by more traditional techniques (Hodges et al., 1959).

In 754 patients (Caesarean sections and forceps—see table I) the results of the use of this technique, standardized in this unit, was examined to see whether, apart from being apparently the best of the compared methods, it was in fact nondepressant to the infant over a larger series of patients. It will be seen from figure 1 that, when all patients were considered, two-thirds of the infants delivered were breathing regularly within 30 seconds of delivery and over 90 per cent of all infants did so within 5 minutes.

**Fig. 1**

The incidence of infants who breathed regularly within 0.5, 2.5, and 5.0 minutes—from 754 patients* delivered under general anaesthesia.†

*Caesarean section 333, Midcavity forceps 245, Outlet forceps 153. (Stillbirths excluded.)
†Thiopentone-suxamethonium-nitrous oxide-oxygen.

**Fig. 2**

The incidence of (a) pre-operative foetal distress and (b) the administration of maternal sedative drugs before delivery, in 731 infants of whom 133 were intubated after delivery for the purposes of endotracheal toilet and/or oxygenation* (all patients delivered under general anaesthesia†).

*According to criteria outlined in text.
†Thiopentone-suxamethonium-nitrous oxide-oxygen.

Fig. 2a shows the incidence of pre-operative foetal distress in 731 patients considered. The group of 23 breech deliveries (table I) was excluded from the series as the number was too small for adequate analysis. It will be seen that the incidence of foetal distress pre-operatively is uniformly higher in all types of delivery where respiratory difficulties necessitated endotracheal intubation. In Figure 2b the administration of pre-operative drugs to the mother is considered in the same series. It will be seen that, taking all infants, there was an increased incidence of
the administration of drugs pre-operatively (within 3 hours of delivery) in the intubated series, 17.3 per cent compared with 7.4 per cent in the nonintubated. When this is analyzed, however, it is apparent that this difference is entirely due to infants delivered by Caesarean section, where the incidence of drugs administered within 3 hours to infants needing intubation was over ten times the incidence in the infants who needed no resuscitation.

Figure 3 shows the interval between the start of induction of anaesthesia and delivery of the infant in its relationship to the intubated and nonintubated infants. This figure overall shows little difference in the two series, substantiating the suggestion that the duration of anaesthesia of this type has little effect on the state of the infants at birth. Closer examination of the figure, however, discloses some small differences from which interesting implications may be drawn. It will be seen that an induction-delivery interval of more than 25 minutes occurred 3 times more often in the intubated series than in the nonintubated, whereas in the 20–25 minute interval no difference between the two series is apparent. This, it is believed, is a reflection of the respiratory depression encountered when obstetric difficulties produce a marked delay in the delivery of the child. The aetiological factor in respiratory depression in this group is probably unavoidable birth trauma associated with obstetric difficulties.

Further, from this figure, it is seen that of the infants requiring intubation, a lower percentage...
SOME FACTORS ASSOCIATED WITH NEONATAL DEPRESSION

Influence of anaesthesia.

The writers' opinion (Hodges et al., 1959) that an anaesthetic technique based on thiopentone-suxamethonium-nitrous oxide-oxygen affects the infant to a minimal degree is further substantiated, and it is considered that any such effect can be disregarded in practice. However, the results again suggest that (when those deliveries in which technical difficulties have been experienced are excluded) it is the infants delivered in the 7-11 minute induction-delivery interval who are most affected. It is repeated, therefore, that, contrary to the opinion of others (Crawford and Kane, 1956; Steel, 1957), a rapid delivery of the infant may still have a definite advantage, especially in the presence of foetal distress. Speed should not, of course, take precedence over safety.

From our results there appear to be three factors which significantly predispose to the occurrence of postpartum neonatal depression when the effects of toxic depressant anaesthetic agents (ether, cyclopropane, trichloroethylene) the 7-11 minute induction-delivery interval who are most affected. It is repeated, therefore, that, contrary to the opinion of others (Crawford and Kane, 1956; Steel, 1957), a rapid delivery of the infant may still have a definite advantage, especially in the presence of foetal distress. Speed should not, of course, take precedence over safety.

From our results there appear to be three factors which significantly predispose to the occurrence of postpartum neonatal depression when the effects of toxic depressant anaesthetic agents (ether, cyclopropane, trichloroethylene)
have been excluded. These factors are: the administration of sedative drugs pre-operatively to the mother; the presence or absence of foetal distress in the first instance; and a prolonged induction-delivery interval associated with obstetric difficulties.

**The influence of pre-operative foetal distress.**

In all women in whom Caesarean section or forceps delivery is undertaken for foetal distress, the incidence of postpartum depression of the infant rises, irrespective of the type of operative procedure. This is a consideration which should seriously concern the anaesthetist, for not only are more than 50 per cent of the total anaesthetic calls for operative obstetrics associated with foetal distress in our experience, but further the responsibility for resuscitative procedures in the newborn is falling increasingly on to the anaesthetic staff (Secher, 1956; Hodges et al., 1960).

**Influence of analgesic drugs administered pre-operatively.**

In those patients to whom sedative drugs have been administered less than 3 hours pre-operatively there is an increased risk of neonatal depression. It is in those women delivered by Caesarean section in whom this added risk is most dramatically illustrated. It would appear advisable that in elective procedures, operations should be postponed where sedation has recently been administered and the routine administration of "pre-operative" sedation must be regarded as a hazard to the infant.

**Other factors.**

Factors which did not appear to have any influence on the necessity or otherwise for endotracheal intubation of the infant after delivery included prematurity of up to 4 weeks (though the incidence of depression rose in infants of less than 36 weeks gestation), pre-operative toxaemia of pregnancy, and the age of the patient. The primigravida and the grand multiparae do not, from our results, appear to be affected in this respect.

**SUMMARY**

Factors associated with postpartum respiratory difficulties in the newborn are examined in a series of 754 operative obstetric deliveries in which 137 infants were intubated after delivery for the purposes of aspiration or intermittent positive pressure inflation with oxygen.

The previous conclusion (Hodges et al., 1959) that an anaesthetic technique based on thiopentone-suxamethonium and nitrous oxide-oxygen is nondepressant to the infant was further substantiated.

The incidence of pre-operative foetal distress causes an overall increase in infant respiratory difficulties irrespective of the operative procedure, be it Caesarean section or forceps delivery. The administration of drugs less than 3 hours before delivery greatly increased the hazard of postpartum respiratory depression in those infants delivered by Caesarean section. The infants in whom for obstetric reasons delivery was delayed for more than 25 minutes after anaesthesia was induced also showed an increased incidence of respiratory difficulties, probably associated with birth trauma.

Other factors appeared to be of little significance.

**REFERENCES**


