Transplacental Haemorrhage Following Caesarean Section

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SUMMARY

A study was undertaken to determine the effect of caesarean section on the incidence and degree of foetomaternal transplacental haemorrhage. It was found that operation per se did not increase transplacental haemorrhage.

Elective manual removal of the placenta resulted in a significant foetomaternal transfusion in 12.5% of cases, as compared with 3.3% of cases in which the third stage was managed by controlled cord traction. Rh-negative mothers requiring caesarean section should not have the placenta removed manually, except for strict obstetrical indications.


Foetomaternal haemorrhage severe enough to cause Rh iso-immunization can occur in the antenatal period, but the transfusion is usually small and is not thought to be clinically significant. Most clinical evidence indicates that sensitizing transplacental haemorrhage (TPH) occurs during labour, particularly at delivery. The mechanism of TPH is almost certainly related to placental separation.

Although large haemorrhages have been recorded after obstetrical procedures, such as manual removal of the placenta, there has been scant documentation regarding the effect of caesarean section on foetomaternal transfusion. The objective of this study was to determine the effect of abdominal delivery on the degree and incidence of foetomaternal TPH, and to see whether it is affected by the mode of placental delivery.

MATERIAL AND METHODS

The subjects studied attended the Obstetric Units at Addington and King Edward VIII Hospitals, Durban, and were randomly selected as far as their ABO grouping was concerned. All Rh-negative patients were excluded. The results are based on patients confined at term and delivered by caesarean section, either while in labour or as an elective procedure. On a random sample basis, the placenta was delivered either by cord traction, in which controlled traction on the umbilical cord is combined with upward displacement and support of the contracted uterus, or by manual removal. Oxytocics (oxytocin 5 units; ergometrine 0.5 mg) were administered intravenously to patients in both groups with the crowning of the head through the uterine incision.

Sixty-two patients were studied, of whom 30 had the placenta delivered by cord traction and 32 by manual removal. Caesarean sections were undertaken during labour in 40 instances for varying obstetrical indications, such as cephalopelvic disproportion, malpresentation, antepartum haemorrhage, and foetal distress. The remainder were performed electively.

Age and parity were similar in both groups.

Two specimens of blood were obtained from each patient; the first was taken before the induction of anaesthesia, and the second usually within 30 minutes of delivery of the placenta.

The technique used to demonstrate foetal cells in the maternal circulation was based on a modification of the acid elution method as described by Kleihauer and Betke, while the volume of the transplacental haemorrhage was calculated according to the method of Grobbelaar and Dunning. According to this method, a foetal score of 1 cell is equivalent to 0.01 ml of blood being passed into the maternal circulation; a score of 2 cells would be equivalent to a volume of 0.02 ml, etc. The minimum volume of foetal blood required to induce a primary sensitization in the mother has usually been taken as 0.2 ml. It has been shown, however, that with a foetal score of 10 or more, the estimated volume transfused into the mother (0.1 ml) becomes clinically significant with regard to primary Rh sensitization. We have therefore taken this volume to be significant for our present study. In the following tables a positive transfer refers to a postpartum foetal score greater than that in the prepartum specimens.

RESULTS

Transplacental Haemorrhage in Patients Delivered Vaginally vs. Caesarean Section

The incidence and degree of transplacental haemorrhage associated with delivery by caesarean section were com-
pared with those in a group of patients who had had spontaneous vaginal deliveries (Table I). In the control group, the third stage was managed by the Brandt-Andrew’s manoeuvre. Further details regarding these patients have been published elsewhere. As reflected in Table I, the incidence of TPH following caesarean section (as a group) was very similar to that following vaginal delivery—24.2% and 26.2%, respectively. It was surprising to note that despite the greater trauma induced by the operative procedure, fewer patients (8.1%) delivered by caesarean section had significant TPH (>0.1 ml) when compared with patients delivered vaginally (10.4%).

**TABLE I. TRANSPLACENTAL HAEMORRHAGE FOLLOWING DIFFERENT METHODS OF DELIVERY**

<table>
<thead>
<tr>
<th>Method of delivery</th>
<th>No.</th>
<th>Positive transfer (%)</th>
<th>Significant transfer volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caesarean section</td>
<td>62</td>
<td>24.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>221</td>
<td>26.2</td>
<td>10.4</td>
</tr>
</tbody>
</table>

* Volume of foetal cells transfused 0.1 ml or more.

**Elective vs. Caesarean Section in Labour**

To assess the influence of labour on TPH, patients were divided into those delivered electively and those in whom abdominal delivery was undertaken during labour (Table II). Six of the patients in labour and none of those delivered electively had foetal cells in the prepartum maternal blood specimens. Yet, the incidence of positive TPH in the labour group (25%) was only slightly greater than that in the elective group (18.2%). Two (9.09%) of the patients delivered by elective caesarean section and 3 of those in labour (7.5%) had large (0.1 ml) foetal cell transfusions. The difference between these two groups was not statistically significant.

**TABLE II. TRANSPLACENTAL HAEMORRHAGE FOLLOWING ELECTIVE AND EMERGENCY CAESAREAN SECTION**

<table>
<thead>
<tr>
<th>Mode of delivery</th>
<th>No.</th>
<th>Positive transfer (%)</th>
<th>Significant transfer volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caesarean section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>22</td>
<td>18.2</td>
<td>9.09</td>
</tr>
<tr>
<td>Emergency (in labour)</td>
<td>40</td>
<td>25.0</td>
<td>7.5</td>
</tr>
</tbody>
</table>

* Volume of foetal cells transfused 0.1 ml or more.

**Method of Placental Delivery**

The incidence and quantity of transplacental haemorrhage associated with the various methods of delivery of the placenta were next compared (Table III). With cord traction both the incidence and the degree of TPH were significantly lower than those in patients whose placentae were delivered by manual removal. Thus, 16.16% of patients delivered by cord traction had evidence of TPH, the transfusion being greater than the 0.1 ml immunizing dose in 3.3%. The respective incidence in patients whose placentae were manually removed was 31.25% and 12.5%.

**TABLE III. TRANSPLACENTAL HAEMORRHAGE FOLLOWING CAESAREAN SECTION: MANUAL REMOVAL vs. CORD TRACTION**

<table>
<thead>
<tr>
<th>Method of placental delivery</th>
<th>No.</th>
<th>Positive transfer (%)</th>
<th>Significant transfer volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual removal</td>
<td>32</td>
<td>31.25</td>
<td>12.5</td>
</tr>
<tr>
<td>Cord traction</td>
<td>30</td>
<td>16.16</td>
<td>3.3</td>
</tr>
</tbody>
</table>

* Volume of foetal cells transfused 0.1 ml or more.

Because of the higher incidence of TPH following elective manual removal of the placenta at caesarean section, a comparison was made when the same manoeuvre was performed vaginally. Twenty-one patients who had delivered spontaneously vaginally, required manual removal of the placenta. Although the numbers involved were small, and were therefore not suitable for statistical analysis, the incidence of positive TPH (52.4%) and the volume of significant transfusions (23.8%) in this group was found to be almost double that following the same procedure performed electively at caesarean section (Table IV).

**TABLE IV. TRANSPLACENTAL HAEMORRHAGE FOLLOWING MANUAL REMOVAL OF THE PLACENTA VAGINALLY AND AT CAESAREAN SECTION**

<table>
<thead>
<tr>
<th>Mode of delivery</th>
<th>No.</th>
<th>Positive transfer (%)</th>
<th>Significant transfer volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaginal</td>
<td>21</td>
<td>52.28</td>
<td>23.8</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>32</td>
<td>31.25</td>
<td>12.5</td>
</tr>
</tbody>
</table>

* Volume of foetal cells transfused 0.1 ml or more.

**DISCUSSION**

It has been noted that large haemorrhages through the placenta are common after its manual removal, after caesarean section and in prolonged labour. More recently it has been shown that whereas transplacental haemorrhage after spontaneous abortion was invariably small, that following artificially terminated early pregnancies was very much greater. Thus Matthews and Matthews, and Walsh and Lewis estimated that approximately a quarter of their patients undergoing therapeutic termination had evidence of TPH, and that this was frequently associated with a sufficiently high foetal-maternal transfusion to induce primary sensitization of the mother. In both series, the risk of TPH following abdominal, as opposed to vaginal, termination was almost identical, namely 23% and 25%. The incidence and degree of TPH therefore appear to be
Nitrous oxide is one of the oldest and best tried of the anaesthetic agents. Currently it is more frequently used than any other agent for obstetric analgesia and anaesthesia. The popularity of nitrous oxide is justified on the grounds that, with orthodox use, it is an agent of low toxicity to vital organ function. When used as the main anaesthetic, it may have its origin in diffusion hypoxia. We are therefore examining this hypothesis, and take this opportunity to make a preliminary report.

**METHODS**

Mothers scheduled for elective caesarean section were selected for this study. All mothers were subjected to controlled ventilation using a mechanical respirator delivering 70% nitrous oxide and 30% oxygen through a non-rebreathing circuit at an expired minute volume of 15 litres. The full anaesthetic technique is described elsewhere. A preliminary report is presented on the use of nitrous oxide in obstetric anaesthetic practice. Nitrous oxide levels were measured during the anaesthetic for caesarean section: in the umbilical cord at birth, and in a sample of 'alveolar' gas taken from the newborn 30 seconds after delivery. The mean nitrous oxide levels were as follows: maternal arterial 28.1 volumes %, the umbilical vein 14.8 volumes %, the umbilical artery 10.2 volumes %, the alveolar gas 11.7 volumes %.

The implications of these findings are discussed.

**SUMMARY**

Nitrous oxide is one of the oldest and best tried of the anaesthetic agents. Currently it is more frequently used than any other agent for obstetric analgesia and anaesthesia. The popularity of nitrous oxide is justified on the grounds that, with orthodox use, it is an agent of low toxicity to vital organ function. When used as the main anaesthetic, it may have its origin in diffusion hypoxia. We are therefore examining this hypothesis, and take this opportunity to make a preliminary report.

**REFERENCES**