Is Forceps delivery Obsolete?

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Declaration of Interest

• See http://www.bjog.org/view/0/EdDisclOfInt.html#Philip_Steer

• I have no conflict of interest relating to forceps delivery
“Obstetric Forceps – a Species on the brink of Extinction” - USA

Canada 2004 → 2012

- % Ventouse 8.9 → 8.2
- % Forceps 3.1 → 2.5

516,487 births in 17 Maternity Units
North West Thames 1988-2000

- Ventouse: 1% → 9%
- Straight Forceps: 8.5% → 3.5%
- Rotational forceps: 1.5% to 0.5%
Chelsea and Westminster
1988-2016 (N=117,423)
3,223,688 births in England 2010-2014

Ventouse 6%
Low Forceps 3.5%
Other Forceps 3.5%
Total forceps = 7%

https://data.gov.uk/dataset/nhs_maternity_statistics_england
Why did forceps become unpopular?
Kielland’s forceps: association with neonatal morbidity and mortality – Chiswick ML and James DK
British Medical Journal 1979 1, 7-9

- 86 babies attempted/actual delivery by Kielland’s forceps Jan-Dec 1976
- 3 deaths from tentorial tears
- Neonatal mortality rate x 2.5 cf matched controls
- Abnormal neurological behaviour in 23%
Should we abandon Kielland’s forceps?
Cardozo L, Gibb DMF, Studd JWW, Cooper DJ
British Medical Journal 1983, 287, 315-317

- 2708 consecutive births
- 65 Kielland’s deliveries
- No neonatal mortality
- No evidence of severe birth trauma or neurological abnormality
Criteria for safe use of Kielland’s forceps

• Senior obstetrician
• < 1/5<sup>th</sup> Head palpable per abdomen
• No excessive moulding
• Epidural analgesia
• Trial in theatre
• Easy application and rotation
• Moderate traction over no more than 3 contractions

Cardozo L, Gibb DMF, Studd JWW, Cooper DJ
British Medical Journal 1983, 287, 315-317
Kielland’s can be used safely

- Illogical to dispose of Kielland’s forceps in favour of caesarean section, as this confers no benefit and is detrimental to the mother

Cardozo L, Gibb DMF, Studd JWW, Cooper DJ
British Medical Journal 1983, 287, 315-317
Replace Forceps with Ventouse?
Cochrane review 2010 – all forceps vs ventouse

- 13 studies including 3338 women
- Failure to deliver less likely with forceps (RR 0.65, 0.45 to 0.94)
- More perineal trauma with forceps
  - 3rd & 4th degree tears RR 1.89, 1.51 to 2.37
- More facial injuries with forceps but more cephalhaematoma with ventouse

Kielland’s vs Ventouse - failure rate

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Kielland Events</th>
<th>Total</th>
<th>Ventouse Events</th>
<th>Total</th>
<th>Weight</th>
<th>Risk ratio M-H, Random, 95% CI</th>
<th>Risk ratio M-H, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Suhel 2009</td>
<td>5</td>
<td>94</td>
<td>20</td>
<td>85</td>
<td>15.2%</td>
<td>0.23 [0.09, 0.59]</td>
<td>1.41 [0.53, 3.76]</td>
</tr>
<tr>
<td>Bahl 2013</td>
<td>14</td>
<td>145</td>
<td>5</td>
<td>73</td>
<td>14.9%</td>
<td>0.02 [0.01, 0.19]</td>
<td>1.34 [0.40, 4.75]</td>
</tr>
<tr>
<td>Gleeson 1992</td>
<td>1</td>
<td>32</td>
<td>6</td>
<td>64</td>
<td>8.9%</td>
<td>0.2  [0.04, 2.65]</td>
<td>0.03 [0.02, 0.30]</td>
</tr>
<tr>
<td>Hastie 1966</td>
<td>2</td>
<td>50</td>
<td>46</td>
<td>100</td>
<td>12.6%</td>
<td>0.25 [0.02, 0.28]</td>
<td>0.10 [0.10, 1.00]</td>
</tr>
<tr>
<td>Herabuty 1988</td>
<td>0</td>
<td>117</td>
<td>2</td>
<td>142</td>
<td>5.6%</td>
<td>0.25 [0.01, 0.52]</td>
<td>0.11 [0.09, 0.30]</td>
</tr>
<tr>
<td>Schiff 2001</td>
<td>13</td>
<td>146</td>
<td>10</td>
<td>146</td>
<td>16.0%</td>
<td>1.50 [0.55, 4.27]</td>
<td>0.17 [0.10, 0.30]</td>
</tr>
<tr>
<td>Svigos 1990</td>
<td>1</td>
<td>30</td>
<td>9</td>
<td>30</td>
<td>9.2%</td>
<td>0.10 [0.01, 0.08]</td>
<td>0.10 [0.10, 0.26]</td>
</tr>
<tr>
<td>Tempest 2013</td>
<td>38</td>
<td>1038</td>
<td>24</td>
<td>107</td>
<td>17.3%</td>
<td>0.32 [0.14, 0.76]</td>
<td>0.16 [0.10, 0.26]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>1652</td>
<td>747</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total events</td>
<td>74</td>
<td>122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: Tau² = 1.04; Chi² = 33.66, df = 7 (P &lt; 0.001); I² = 79%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Test for overall effect: Z = 2.59 (P &lt; 0.009)</td>
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<td></td>
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</tr>
</tbody>
</table>

**FIGURE 3.** Pooled risk ratio of the failure rate for rotational deliveries performed with Kielland’s forceps and rotational ventouse.

Ventouse is 3 times more likely to fail than Kiellands

### Kielland’s vs Ventouse – maternal outcomes

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Kielland</th>
<th>Ventouse</th>
<th>Risk ratio M-H, Random, 95% CI</th>
<th>Risk ratio M-H, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sphincter injury</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al-Suhel 2009</td>
<td>4/94</td>
<td>3/85</td>
<td>1.21 [0.26, 5.33]</td>
<td></td>
</tr>
<tr>
<td>Bani 2013</td>
<td>15/145</td>
<td>8/73</td>
<td>0.94 [0.42, 2.12]</td>
<td></td>
</tr>
<tr>
<td>Gleeson 1992</td>
<td>1/2</td>
<td>1/64</td>
<td>2.00 [0.13, 30.96]</td>
<td></td>
</tr>
<tr>
<td>Hasler 1988</td>
<td>0/50</td>
<td>1/100</td>
<td>0.66 [0.03, 15.92]</td>
<td></td>
</tr>
<tr>
<td>Schiff 2001</td>
<td>1/146</td>
<td>1/146</td>
<td>1.00 [0.06, 15.94]</td>
<td></td>
</tr>
<tr>
<td>Stock 2013</td>
<td>53/873</td>
<td>3/159</td>
<td>3.22 [1.02, 10.17]</td>
<td></td>
</tr>
<tr>
<td>Svigos 1990</td>
<td>1/30</td>
<td>0/30</td>
<td>3.00 [0.13, 70.83]</td>
<td></td>
</tr>
<tr>
<td>Tempest 2013</td>
<td>25/1038</td>
<td>0/107</td>
<td>5.30 [0.33, 86.49]</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td>2408</td>
<td>764</td>
<td>1.46 [0.84, 2.57]</td>
<td></td>
</tr>
<tr>
<td>Total events</td>
<td>100</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: $I^2 = 0.00$; $h^2 = 4.72$, df = 7 ($P = 0.69$); $P = 0.00$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: $Z = 1.35$ ($P = 0.18$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Vaginal and cervical tears** |          |          |                                |                                |
| Bani 2013           | 29/145   | 9/73     | 1.13 [0.81, 1.56]              |                                |
| Harabuia 1988       | 5/117    | 2/142    | 3.03 [0.60, 15.38]             |                                |
| Schiff 2001         | 15/146   | 13/146   | 1.92 [0.95, 2.42]              |                                |
| **Subtotal (95% CI)** | 433       | 372     | 1.50 [0.95, 2.42]              |                                |
| Total events        | 54       | 24       |                                |                                |
| Heterogeneity: $I^2 = 0.00$; $h^2 = 2.05$, df = 3 ($P = 0.59$); $P = 0.00$ |
| Test for overall effect: $Z = 1.76$ ($P = 0.08$) |

| **Postpartum haemorrhage** |          |          |                                |                                |
| Al-Suhel 2009        | 16/94    | 8/85     | 1.69 [0.34, 1.00]              |                                |
| Bani 2013            | 36/145   | 7/73     | 1.13 [0.68, 1.90]              |                                |
| Gleeson 1992         | 1/32     | 2/64     | 1.00 [0.08, 10.02]             |                                |
| Hastie 1986          | 5/50     | 10/101   | 4.00 [0.37, 43.06]             |                                |
| Harabuia 1988        | 5/117    | 10/145   | 3.03 [0.60, 15.38]             |                                |
| Schiff 2001          | 9/146    | 2/146    | 0.90 [0.38, 2.15]              |                                |
| Stock 2013           | 53/873   | 4/159    | 2.60 [0.96, 7.05]              |                                |
| Svigos 1990          | 2/30     | 0/30     | 5.00 [0.25, 99.95]             |                                |
| Tempest 2013         | 25/1038  | 2/107    | 0.06 [0.03, 1.42]              |                                |
| **Subtotal (95% CI)** | 1476     | 61      | 1.16 [0.78, 1.78]              |                                |
| Total events         | 147      | 61       |                                |                                |
| Heterogeneity: $I^2 = 0.11$; $h^2 = 11.33$, df = 8 ($P = 0.18$); $P = 0.29$ |
| Test for overall effect: $Z = 0.89$ ($P = 0.39$) |

**Figure**: Direct comparison of different adverse maternal outcomes between Kielland’s forceps and rotational ventouse.


**16% more maternal morbidity with Kiellands**
Kielland’s vs Ventouse – neonatal outcomes

28% less neonatal morbidity with Kiellands
Why the shift to ventouse?

• Reduced training hours
• Ventouse seen as safer for the inexperienced trainee
• Litigation
Total Expenditure of the NHS Litigation Authority up to and including 2015-6

The data above have been extracted from the annual reports of the NHS litigation Authority, the website containing these reports is http://www.nhsla.com/home
Figure 13: The value of clinical negligence claims received in 2015/16 by specialty.

Total value of claims received £2,896,367,802

- Obstetrics: 20%
- Casualty / A & E: 2%
- Paediatrics: 2%
- Neurosurgery: 2%
- Orthopaedic Surgery: 2%
- General Surgery: 3%
- Gynaecology: 3%
- Radiology: 3%
- General Medicine: 7%
- Neurology: 8%
- Other (aggregated specialties): 42%
Annual value of NHSLA obstetrics payouts per year

≈ £1.6M per day, £825 per birth
Replace forceps with caesarean section?
CS rates in England to 2015

http://www.birthchoiceuk.com/Professionals/Frame.htm
Is CS less traumatic?

Table 1. Incidence and Type of Fetal Injury Identified in 37,110 Cesarean Deliveries

<table>
<thead>
<tr>
<th>Number (Incidence per 1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of injuries</strong>*</td>
</tr>
<tr>
<td>Skin laceration</td>
</tr>
<tr>
<td>Cephalohematoma</td>
</tr>
<tr>
<td>Clavicle fracture</td>
</tr>
<tr>
<td>Facial nerve palsy</td>
</tr>
<tr>
<td>Brachial plexus injury</td>
</tr>
<tr>
<td>Skull fracture</td>
</tr>
<tr>
<td>Long bone fracture</td>
</tr>
<tr>
<td>Intracranial hemorrhage</td>
</tr>
<tr>
<td>Other†</td>
</tr>
</tbody>
</table>

* Nine patients had two fetal injuries.
† Includes abnormal bruising, subconjunctival hemorrhage, abrasion, and minor injuries not able to be classified.
Caesarean section at full dilatation

- Caesarean sections at full dilatation have become more common because of a growing reluctance to embark on vaginal mid-cavity instrumental deliveries

Comparison of techniques used to deliver a deeply impacted fetal head at full dilation: a systematic review and meta-analysis

• “There is an urgent need to develop trainees’ skills on the use of … methods to deliver the impacted fetal head, and thus reduce complications associated with full-dilation caesarean section”.

Jeve YB et al 2016 BJOG;123:337-345
Are Kielland’s going to make a come-back?
Maternal and neonatal outcomes of successful Kielland’s rotational forceps delivery
Edinburgh, Scotland

- 873 cases 2001-2008 in 47,501 births (1.8%)

Stock SJ et al, 2013, Obstet Gynecol;121:1032-1039
Stock et al, 2013, Obstet Gynecol;121:1032-1039

• “We believe that there is a place for Kielland’s rotational forceps delivery of neonates with malposition of the head”
5.3 The options available for rotational delivery include Kielland’s forceps.
Training should include direct senior supervision of all deliveries and a structured assessment of skills through workplace based assessments.

“Contemporary evidence suggests that Kielland’s forceps are not only safe in trained hands, but are also the most successful method of managing malposition in the second stage of labor.”

Acta Obstetricia et Gynaecologica Scandinavica 94 (2015) 8–12
Some obstetricians in the USA still use forceps

Figure 2A. Proportion of vaginal births delivered by forceps by geographic region

Legend: The figure demonstrates the proportion of all vaginal births by geographic region delivered by forceps from 2007 through 2013

Merriam AA et al  *BJOG* in Press (with permission)
Increase in forceps at Mount Sinai Hospital, New York, USA

- In 2012, resident training programme implemented in daylight hours (obstetricians with >20 years experience)
- Forceps deliveries 0.6% → 2.6%
- CS 25.6% → 22.7%
- Effect only seen in daylight hours

Simulation training

- 22% reduction in maternal perineal trauma following introduction of simulation training with ‘SimMom’ in Chicago USA

Gossett DR et al Obstet Gynecol 2016;128:429-435
Current UK trainees and Kielland’s

- Only 31% receive training
- Only 6% confident unsupervised
- 64% keen to be trained
- 86% support simulation training

Conclusions

• Forceps remain acceptable practice

• In women with deep transverse arrest following an otherwise straightforward labour, and no evidence of fetal asphyxia, a midcavity forceps rotation by a skilled obstetrician is probably optimal

• Such skills should therefore still be taught
Fetal Pillow

The Fetal Pillow is a novel device designed to atraumatically elevate the fetal head out of the pelvis during a caesarean section, making the delivery safer, easier and less traumatic.

http://www.fetalpillow.com
RCT of fetal pillow, N=240

• Two teaching hospitals in West Bengal, India
• April 1, 2013, to March 31, 2014
• Pillow vs push/pull
• Major uterine wound extensions in 6 (5.0%) women vs 39 (32.5%)
• No difference in neonatal outcome