

# Minimizing Genital Tract Trauma and Related Pain Following Spontaneous Vaginal Birth

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Genital tract trauma is common following vaginal childbirth, and perineal pain is a frequent symptom reported by new mothers. The following techniques and care measures are associated with lower rates of obstetric lacerations and related pain following spontaneous vaginal birth: antenatal perineal massage for nulliparous women, upright or lateral positions for birth, avoidance of Valsalva pushing, delayed pushing with epidural analgesia, avoidance of episiotomy, controlled delivery of the baby's head, use of Dexon (U.S. Surgical; Norwalk, CT) or Vicryl (Ethicon, Inc., Somerville, NJ) suture material, the "Fleming method" for suturing lacerations, and oral or rectal ibuprofen for perineal pain relief after delivery. Further research is warranted to determine the role of prenatal pelvic floor (Kegel) exercises, general exercise, and body mass index in reducing obstetric trauma, and also the role of pelvic floor and general exercise in pelvic floor recovery after childbirth. *J Midwifery Womens Health* 2007;52:246–253 © 2007 by the American College of Nurse-Midwives.

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## INTRODUCTION

Approximately three million women give birth vaginally each year in the United States.<sup>1</sup> Perineal pain from childbirth lacerations is a common symptom reported by new mothers, and if protracted, the pain may interfere with activities of daily living and family functioning.<sup>2,3</sup> Because the well-being of newborn infants is so dependent on the health and functional abilities of their mothers, the overall health status of new mothers is a priority concern for all who work in maternity care. Women who have spontaneous vaginal births and minimal or no genital tract trauma have the best health postpartum. Such women have the fewest hospital readmissions for postdelivery morbidity, less perineal pain, stronger pelvic floors, better sexual function, less depression, and optimum functional status.<sup>4–6</sup>

Genital tract trauma can be caused by episiotomy, spontaneous lacerations, or both. Episiotomy rates in the United States have steadily declined over the past 25 years,<sup>7</sup> but in 2003, were performed in approximately 25% of all vaginal births.<sup>8</sup> Conversely, spontaneous lacerations requiring suturing have gradually risen as episiotomies have declined, and in 2003, 41% of the women who had vaginal births in the United States experienced spontaneous lacerations.<sup>8</sup> Because some lacerations are not sutured, this proportion is an undercount.

A direct relationship exists between the extent and complexity of genital tract trauma sustained with vaginal birth and subsequent pain and functional impairment.<sup>9,10</sup> More genital tract trauma equals greater postpartum morbidity, and vice versa. While delivery over an intact peri-

neum may require additional time in second stage and greater patience from the birth attendant, it is associated with fewer maternal health problems in the short run (blood loss, pain, and need for suturing) and in the long run (continued pain, pelvic floor weakness, sexual problems, and bowel and urinary incontinence).<sup>11</sup> Therefore, clinical care that enables women to give birth without genital tract lacerations will improve the health of new mothers.

This article reviews the available research on the reduction of genital tract trauma and related postdelivery pain. Key concepts for practicing clinicians will be summarized for the periods before, during, and after birth, and areas for future research will be highlighted.

## LATE PREGNANCY: PERINEAL MASSAGE

Two randomized trials have been published on the effects of perineal massage in the latter weeks of pregnancy, to assess whether regular massage leads to reduced perineal trauma at birth. Shipman et al.<sup>12</sup> in the United Kingdom asked 681 nulliparas to perform daily pelvic floor (Kegel) exercises during the last 6 weeks of pregnancy, and half of the women were randomly assigned to perineal massage for 4 minutes, three to four times per week. Labrecque et al.<sup>13</sup> in Canada randomly assigned 1034 nulliparas and 493 multiparas to either perineal massage or usual care for the last 6 weeks of pregnancy. Perineal massage was to be done daily for 10 minutes. Both studies assessed intervention fidelity by reviewing women's entries in daily diaries, and one-third of the women in each study complied fully with the respective study protocol. Both studies defined an intact perineum as no trauma, or minor and unsutured trauma, and both conducted intent-to-treat analyses.

Shipman et al.<sup>12</sup> found a 6% reduction in trauma (second degree or more) in women who did antenatal massage, with the largest benefit found in women aged 30 or older. Labrecque et al.<sup>13</sup> found a 9% reduction in

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sutured trauma in first-time mothers in the massage group, but no significant differences in multiparous women. The greatest benefit was seen in those women who fully complied with the prescribed frequency of perineal massage, suggesting that regular massage is better. Labrecque et al. also assessed women's views and found that perineal massage was highly acceptable; women would use it again in a future pregnancy, and would recommend it to other women. No harmful effects of perineal massage in late pregnancy were found in either study.

Together, these studies indicate that perineal massage in the later weeks of pregnancy may help some first-time mothers avoid sutured obstetric trauma. Daily massage appears of greater benefit than occasional or intermittent massage. These techniques may help women recognize and tolerate the stretching and pressure sensations they may feel when giving birth. A patient education handout on antenatal perineal massage was distributed in a recent issue of this *Journal*<sup>14</sup> and explains how to perform perineal massage.

## CARE AT BIRTH

Care measures at birth can be separated into those that are directly or indirectly linked with perineal outcomes. Care measures that could indirectly influence perineal outcomes include the style of pushing women are encouraged to do in the second stage of labor and maternal position for birth. Episiotomy and other manual techniques for perineal management may directly affect the degree of obstetric trauma sustained.

## SECOND STAGE PUSHING: COACHED VERSUS SPONTANEOUS

Most of the research on pushing method has compared directed, coached, or Valsalva pushing (forceful bearing down, closed glottis, and sustained breath holding) with spontaneous or self-paced pushing (non-directed, multiple short pushes, with no sustained breath holding). Studies comparing these two techniques have been primarily concerned with the effect of pushing style on neonatal acid-base status and/or the length of second stage.<sup>15</sup> Some studies have directly addressed the relationship between pushing method and perineal or pelvic floor injury, or have included it in their analyses.<sup>16,17</sup>

Sampsel and Hines<sup>16</sup> reported survey data from 39 first-time mothers who gave birth within the previous

year. Eleven women recalled pushing spontaneously and 28 recalled using Valsalva pushing. An intact perineum resulted in 5 of the 11 women who pushed spontaneously and 2 of the 28 women who pushed forcefully ( $P < .05$ ). Simpson and James<sup>17</sup> randomized 45 nulliparas with epidurals to either coached pushing at complete cervical dilatation, or to a 2-hour rest period at the beginning of second stage, followed by non-Valsalva pushing. Immediate pushing was associated with lower fetal oxygen saturation and 13 of 22 women in this group had perineal lacerations compared with 5 of 23 in the delayed pushing group ( $P = .01$ ).

Schaffer et al.<sup>18</sup> randomized 128 nulliparas to either coached (Valsalva) or non-coached pushing for second-stage labor to assess the effect on pelvic floor function at 3 months after birth. Only two women per group used epidural analgesia. Three months after birth, all women had pelvic floor and urodynamic studies, including vaginal squeeze tests and coughing against a full bladder. Women who had used Valsalva pushing had less favorable urodynamic indices, indicating potential pelvic floor dysfunction from forceful pushing to effect delivery.

Finally, a secondary analysis from the perineal management trial by Albers et al.<sup>19</sup> assessed risk factors for sutured genital tract trauma in first-time versus other mothers. All women ( $N = 1176$ ) had spontaneous vaginal births without an episiotomy. Women with sutured obstetric lacerations were more likely to have used Valsalva pushing than women without lacerations (37% vs. 24% of first-time mothers and 26% vs. 15% of other mothers). In first births, where mothers tend to push longer, regression analysis showed that Valsalva pushing in second stage was an independent predictor of child-birth lacerations ( $RR = 1.65$ ; 95% CI, 1.05–2.59).

These studies indicate that the only apparent advantage of Valsalva pushing is a shorter second stage, which, on occasion, may be desirable. However, expediting delivery by forceful, directed pushing is achieved at the expense of three negative outcomes: reduced oxygenation of the fetus, more frequent trauma to the birth canal, and potential injury to future pelvic floor function.

## SECOND STAGE PUSHING WITH EPIDURAL: EARLY VERSUS DELAYED PUSHING

Epidural analgesia has become a prevalent method of pain management in labor. Epidurals give most women excellent pain relief, but are associated with numerous untoward events, including a higher risk of an instrumental vaginal birth, which is associated with more perineal injury.<sup>20</sup> During the 1990s, several research groups assessed whether delaying pushing until fetal descent would lower the rate of instrumental birth and perineal trauma in women using epidurals, compared with the usual policy of encouraging the woman to begin pushing at complete cervical dilatation.

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A recent review summarized the studies that assessed the effect of immediate versus delayed pushing in women using epidurals on the likelihood of an instrumental delivery.<sup>21</sup> Nine studies of 2953 healthy, child-bearing women were pooled in a meta-analysis. Delayed pushing was associated with a longer second stage but a shorter phase of active pushing. The incidence of instrumental births was lower in women who delayed pushing (RR = 0.92; 95% CI, 0.84–1.01), as were rotational or mid-pelvic instrumental deliveries (RR = 0.69; 95% CI, 0.55–0.87). No statistically significant differences were noted in episiotomies or spontaneous lacerations; however, in this meta-analysis, only 4 of the 9 included studies reported on episiotomy as a key outcome, and only 5 reported on spontaneous lacerations. Because each of these are common covariates with instrumental births, this can be viewed as a limitation of the meta-analysis. Any reduction in instrumental deliveries would be clinically significant in reducing the incidence of genital tract trauma and subsequent postdelivery pain.

## POSITIONING FOR BIRTH

Most women in the United States push and give birth while lying flat on their backs. The first Listening to Mothers Survey<sup>22</sup> estimated that 74% of women who delivered vaginally in 2002 did so while in a recumbent or lithotomy position. But upright or lateral positions for birth are associated with greater maternal comfort and less perineal injury.<sup>23</sup> A Cochrane review on this topic combined data from 20 clinical trials that included 6135 women. Compared with women who gave birth in supine or lithotomy positions, women who were upright or side-lying reported greater comfort, had fewer episiotomies (RR = 0.83; 95% CI, 0.75–0.92), and had a slightly shorter second stage (mean = 4.3 min; 95% CI, 2.9–5.6).<sup>22</sup> Some of the included studies suggested that upright positions for birth are associated with greater blood loss, but this could be because blood loss may be more visually apparent to the clinician when the woman is upright. Given the variability in quality of the included studies, the review concluded that no clear indication of harm is associated with upright or lateral positions for birth, and therefore, women should be encouraged to choose their own position according to individual preference.

Two recent studies from Australia have examined the relationship between birth position and perineal outcomes in retrospective analyses of large datasets.<sup>24,25</sup> These studies are from teaching hospitals where most births were attended by midwives. In both settings, an “intact perineum” was defined as no tears or minor but unsutured trauma, and in both, the baseline rate of “intact” was 55%. Shorten et al.<sup>24</sup> used multivariable regression techniques to analyze data from 2891 women who had normal vaginal births. An intact perineum was

most likely with delivery in a side-lying position. Approximately 12% of all women used a lateral position for birth, and of these, 67% experienced no lacerations that required suturing. Soong and Barnes<sup>25</sup> analyzed data from 3756 women who had spontaneous vaginal births. Women who gave birth on all fours were the least likely to experience any genital tract trauma that required suturing. Approximately 10% of women gave birth on all fours, and of these, 61% were judged as having intact perineums. Also, 22% of women in this analysis used epidurals, and these women were more likely to have sutured obstetric lacerations, especially if bed-confined and immobile (OR, 1.5; 95% CI, 1.1–2.1). Together, these studies argue for alternatives to supine or lithotomy positions for birth and maternal choice in the matter.

Upright or lateral positions for birth are more comfortable and may increase the woman’s sense of control. This may facilitate her ability to work with her clinician to control the expulsion of her infant. In addition, some positions make performance of episiotomies more difficult and, therefore, may indirectly encourage clinician patience.

## PERINEAL MANAGEMENT TECHNIQUES

Hand maneuvers for perineal management with second stage pushing and for expulsion of the infant have been studied to determine whether any is preferable in terms of reduced childbirth lacerations and subsequent pain. The largest midwifery clinical trial to date was the HOOP trial from the United Kingdom.<sup>26</sup> In this study, 5471 healthy women in the care of English midwives were randomized to either “hands on” (one hand flexing the baby’s head and the other hand guarding the perineum) or “hands poised” (both hands off, but ready to apply light pressure to the emerging baby in the case of too-rapid expulsion) for the actual birth of the baby. The primary outcome was perineal pain at the tenth postpartum day. This was the first study to systematically collect complete data on all types of genital tract trauma (perineum and other sites) sustained after normal vaginal births. The genital tract trauma profiles of women in the two groups were virtually identical. Nearly 16% had no trauma at all and 11% had episiotomies. Spontaneous lacerations of the perineum occurred in 68% of study participants, the vagina in 61%, and the labia in 35%. However, women in the “hands on” group reported slightly less perineal pain at the 10th postpartum day (31% vs. 34% of women in “hands poised”). At 3 months postpartum, no differences were observed in perineal pain or other functional outcomes (sexual, bowel, or urinary function or risk of depression).

More recently, Brazilian midwives compared “hands on” versus “hands off” in 70 nulliparous women to examine the relationship between these hand maneuvers and perineal trauma.<sup>27</sup> With 35 women per group, genital

tract trauma distributions were equal, indicating no advantage for one delivery method. A lack of statistically significant differences in small samples may indicate that too few women were studied to ascertain a true difference.

Perineal massage during second-stage labor has been tested in a randomized trial by Australian midwives to determine the effect on perineal trauma.<sup>28</sup> Women were randomized ( $n = 1340$ ) to either perineal massage with lubricant or “usual care,” which included a variety of perineal management approaches but excluded perineal massage during the second stage of labor. No differences between groups were found in episiotomies (26% overall), or first- or second-degree perineal tears (43%). Third- or fourth-degree lacerations, while infrequent, occurred in 12 women who received massage, and 24 women in the usual care group. Because this is a rare outcome (2.7% in the study), this difference was not statistically significant; however, it is clinically important. Assessments at 3 months postpartum showed no group differences in perineal pain, sexual difficulties, or bowel or urinary symptoms. Perineal massage conferred no clear benefit, but caused no harm.

Finally, 1211 women in New Mexico were randomized to one of three methods of perineal management in the second stage of labor: warm compresses to the perineum, perineal massage with lubricant, or keeping the hands completely off the perineum until the infant’s head was crowning.<sup>29</sup> The purpose was to identify if any of these methods decreased the incidence of spontaneous lacerations of the birth canal. Data collection recorded all sites of genital tract trauma, as first done in the HOOP study. Verification of midwife compliance with the study protocol and their accuracy in assessing childbirth lacerations was built into the study. Verification of midwife compliance with the study protocol and their accuracy in assessing childbirth lacerations was built into the study. In each of the three study groups, 23% of the women had no trauma whatsoever, 40% had a first- or second-degree perineal laceration, and 40% had a vaginal laceration. Only 1% of study participants had an episiotomy. Women in this study sustained less genital tract trauma overall than did women in the other perineal management studies. No differences in protracted pain or faulty healing were observed at the 6-week office visit according to the assigned perineal management method. This study used multivariate analysis to examine the role of factors beyond the hand techniques. Two elements of delivery technique were associated with reduced genital tract trauma: a sitting position for birth (RR = 0.68; 95% CI, 0.50–0.91) and controlled delivery of the infant’s head between uterine contractions (RR = 0.82; 95% CI, 0.67–0.99).

These studies indicate that specific perineal management techniques in the second stage of labor, such as warm compresses or massage with lubricant, hands on or hands off, are not helpful in lowering overall rates of

genital tract trauma with birth. Because none cause harm, they may have a role in provision of comfort or relaxation in selected situations and with particular women. What appears important in reducing genital tract trauma is having a reasonably comfortable mother, a slow and controlled expulsion of the infant, and shared responsibility for the outcome.

## EPISIOTOMY

During the past 20 years, many observational studies, randomized trials, and systematic reviews have appeared in the literature concerning outcomes of liberal versus restricted use of episiotomy. The Cochrane Database contains a meta-analysis of 4850 women in 6 clinical trials from 5 different countries.<sup>30</sup> This review has been available since 1997, thus, the information has been widely disseminated and is already well-known to many clinicians. In 2005, Hartmann et al.<sup>31</sup> updated this review but added only one clinical trial of 146 women, therefore the two reviews are in complete agreement. The assembled evidence indicates that episiotomies are to be avoided except in rare situations, such as extreme fetal jeopardy. No benefits accompany the routine use of episiotomies, and women who receive them have more genital tract trauma, require more suturing, and have more persistent perineal pain after childbirth. Further, no long-term benefits follow episiotomy, such as improved sexual function, fewer bowel or urinary symptoms, or a stronger pelvic floor. As such, routine episiotomy causes more harm than benefit.

While episiotomy rates have declined in the United States, approximately 25% of all vaginal births still are accompanied by this procedure.<sup>8</sup> Rates vary according to geographic location.<sup>7</sup> Rates also vary by the birth attendant, with the lowest rates found in midwifery practices.<sup>15</sup> Clinicians in academic centers have been shown to have lower rates than those in private practice settings.<sup>32</sup> Rates below 15% have been advocated as immediately possible.<sup>31</sup> Currently, some academic centers have extremely low rates (<1% for all clinicians, including midwives, obstetricians, and family physicians), demonstrating that episiotomies are almost never truly indicated.<sup>29</sup>

## CARE AFTER CHILDBIRTH

The extent and complexity of genital tract trauma is directly related to the amount of suturing required and to subsequent perineal pain. Thus, more trauma equals greater morbidity after birth.<sup>9–11</sup> Although some clinicians have adopted the practice of not suturing lacerations that exclude the anal sphincter and rectum, this approach has not been systematically evaluated in studies of adequate size and with sufficient long-term follow-up.<sup>33</sup> The existing clinical standard favors the suturing of lacerations, other than those that are small and shallow,

to promote healing and restore tissue function. Thus, the methods of suturing and the materials used for repair of lacerations, as well as pharmacologic and nonpharmacologic methods of pain management, may have an effect on perineal pain.

## SUTURING METHOD AND MATERIALS

The most important study about method of perineal suturing comes from Kettle<sup>34</sup> in the United Kingdom. This midwife researcher randomized 1542 women to one of two methods of perineal suturing for an episiotomy or second-degree laceration after a normal vaginal birth. One group received the traditional 3-layer repair, with interrupted sutures used to close the perineal skin. The other group was sutured according to the method of Fleming,<sup>35</sup> which involved continuous, nonlocked sutures in the vagina and perineal muscles, and a continuous subcuticular stitch under the perineal skin. Pain data were collected at 2 and 10 days after birth and at 3 and 12 months postdelivery. With 771 women in each group, women sutured by the “Fleming method” reported less perineal pain at all time points, and they used fewer analgesics in the 10 days after birth. Significantly less suture material was placed in the perineal tissues with this technique, and this may explain the decreased tissue reactivity.

The Ipswich Childbirth Study<sup>36–38</sup> compared a 3-layer perineal repair with a 2-layer approach that left the perineal skin unsutured, as long as the skin edges were not gaping (defined as a separation of  $\leq 0.5$  cm with the woman in lithotomy position). Midwife researchers in the United Kingdom randomly allocated 1780 women (890 to 3-layer repair and 890 to 2-layer repair), and they also compared polyglactin (Vicryl; Ethicon, Inc., Somerville, NJ) versus chromic catgut suture materials.<sup>37</sup> No pain differences were found at 2 or 10 days after birth, according to suturing method. However, at 3 months postpartum, slightly fewer women with the 2-layer repair reported any perineal pain (8% vs. 10%) and also less dyspareunia (15% vs. 19%). One-year follow-up with postal surveys<sup>38</sup> indicated equivalent ratings of pain and dyspareunia in the two groups, but women with a 2-layer repair were less likely to report that their perineums felt different than before the birth. No disadvantages in the 2-layer method were identified.

A Cochrane review<sup>39</sup> pooled data from 8 clinical trials that compared suture materials for perineal repairs. Although the quality of the included trials was variable, all compared use of chromic catgut with either polyglycolic acid (Dexon; U.S. Surgical; Norwalk, CT) or polyglactin (Vicryl), which are synthetic and are absorbed more quickly than chromic catgut. Use of the synthetic materials was associated with less short-term pain in the first 3 days after birth (RR = 0.62; 95% CI, 0.54–0.71). Also, women sutured with Dexon or Vicryl

had less need for analgesia in the 10 days after birth (RR = 0.63; 95% CI, 0.52–0.77). No differences in longer-term pain or dyspareunia were associated with either type of suture material.

Greenberg et al.<sup>40</sup> compared chromic catgut with polyglactin 910 (Vicryl Rapide) in a randomized trial of 1361 women. Laboring women were assigned to one of two suture materials and two-thirds of all women ultimately required suturing after giving birth. Women were queried about pain at 24 to 48 hours after birth and by phone at 10 to 14 days postdelivery. The protocol also called for a pain assessment at 6 to 8 weeks, but the majority of women did not continue study participation to that time. Equal numbers of women reported perineal pain at 24 to 48 hours and at 10 to 14 days, regardless of the suture material used. However, women reported less uterine pain with the synthetic suture material at 24 to 48 hours, a curious finding unlikely to be related to the type of suture material used in the study.

These studies indicate that women who require suturing of perineal trauma will have less pain and less extended morbidity with the “Fleming method” of repair, which is easier for beginners to learn, and leaves less suture in the maternal tissues. Also, allowing the perineal skin to remain unsutured, as long as it is not gaping, is associated with less perineal pain. Synthetic suture materials are preferable to chromic catgut in terms of short-term perineal pain.

## ANALGESIA FOR PERINEAL PAIN

Treatment of perineal pain after childbirth has received surprisingly little research attention, given the large number of women affected. Two Cochrane reviews have found that therapeutic ultrasound<sup>41</sup> and topical analgesics<sup>42</sup> are not harmful, but neither demonstrated any compelling benefits. Oral ibuprofen has been compared with acetaminophen with codeine in one randomized trial.<sup>43</sup> Women were randomized to receive 400 mg of ibuprofen or 600 mg of acetaminophen with 60 mg of codeine and 15 mg of caffeine (Tylenol #3; Ortho-McNeil Pharmaceutical, Raritan, NJ). These 233 new mothers who had episiotomies or third- or fourth-degree lacerations rated their pain relief as equivalent in the first 24 hours after birth, but the women in the ibuprofen group had fewer drug-related side-effects. Finally, a Cochrane review assessed rectal analgesia to treat post-delivery perineal pain.<sup>44</sup> Nonsteroidal anti-inflammatory drug suppositories conferred more pain relief than placebo in the first 2 days after birth in women who had episiotomies or second-degree lacerations. The rectal route may allow faster pain relief than oral administration without side-effects, but its acceptability to women outside of research settings is not known.

## RECOVERY AFTER CHILDBIRTH

Aspects of intrapartum and immediate postpartum care, as reviewed above, affect perineal pain after childbirth. Although perineal pain tends to diminish in the weeks and months after birth,<sup>3,4,9</sup> continuing pain and related symptoms (e.g., bowel or urinary) may interfere with a woman's ability to care for her baby. Pain that persists may delay the resumption of sexual activity.<sup>45</sup> Therefore, avoiding trauma where possible and using optimal suturing techniques will improve the health of new mothers. Longer-term assessments of pelvic floor function, according to the degree of birth trauma experienced, are rare in the literature. Long-term pelvic floor strength has been measured in 3 studies using perineometers to assess squeeze tone of the levator muscle group.

Data from Klein et al.<sup>46</sup> compared measurements with a perineometer before birth and at 3 months after birth in women from 5 groups (N = 701): cesarean delivery, intact perineum, spontaneous tear, episiotomy, and third- or fourth-degree lacerations. At 3 months postpartum, women with cesareans or intact perineum (regardless of parity) had the strongest pelvic floors, followed by women with spontaneous tears, then episiotomies, and finally third- or fourth-degree lacerations. First-time mothers who delivered vaginally without any lacerations had the strongest pelvic floors antenatally, suggesting that pelvic floor condition may partially determine perineal outcomes.

Fleming et al.<sup>47</sup> used a perineometer to assess 5 groups of women (N = 102) in late pregnancy, and at 6 weeks and 6 months postdelivery: those with intact perineum, cesarean delivery, first-degree perineal lacerations, second- or third-degree lacerations, and episiotomies. Women with instrumental deliveries or epidurals were excluded. At 6 months after birth, greater perineal strength was observed in women with intact perineum or cesarean deliveries, followed by women who sustained first-degree lacerations, then second- or third-degree lacerations, and lastly episiotomies. Women with no perineal trauma had the best pelvic floor muscle function at 6 months after birth. When trends from before to after the birth were examined, women with intact perineum or cesareans showed a gain in pelvic floor strength, but women with episiotomies had a net loss after birth.

Finally, Gordon and Logue<sup>48</sup> examined pelvic floor strength at 1 year after birth in 6 groups of women: those who had intact perineum, cesarean delivery, second-degree lacerations, episiotomies, forceps and episiotomies, and these authors included a comparison group of midwives who had never been pregnant. Fourteen women were assessed in each group (study, N = 84). Perineal muscle tone at 1 year postdelivery was unrelated to the degree of birth trauma, but was related to regular exercise following birth. Those women who performed pelvic floor exercises and engaged in regular, generalized exercise

### Key Concepts for Clinical Practice

- Teach perineal massage with lubricant, for use by first-time mothers in the last 6 weeks of pregnancy.
- Avoid Valsalva pushing in the second stage of labor unless a clear reason exists to expedite the delivery.
- If an epidural is used, encourage a rest period of 1–2 hours after complete cervical dilatation prior to the commencement of any pushing.
- Encourage upright or lateral positions for giving birth; help the woman identify and assume a position that is most comfortable for her at the time.
- Use perineal management techniques (massage or compresses) only in selected situations, such as a mother's need for comfort or distraction.
- Avoid episiotomy unless a compelling indication (such as severe fetal jeopardy) exists.
- Control the expulsion of the baby at birth by using "hands on" with crowning and by delivering the baby's head slowly and between contractions.
- Use the "Fleming method" of suturing. Leave the subcuticular layer unsutured if it is not gaping, and if it is, use a continuous stitch, keeping below the skin.
- Use Dexon or Vicryl as the preferred suture materials for repair of any childbirth lacerations.
- Prescribe oral ibuprofen for relief of perineal pain after birth in women with episiotomies or third- or fourth-degree lacerations.
- Prescribe rectal ibuprofen for relief of perineal pain after birth in women who have episiotomies or second-degree perineal lacerations.
- Encourage pelvic floor exercises and regular generalized exercise after childbirth.

(walking, dancing, swimming, jogging, yoga, etc.) had better overall muscle tone, including pelvic floor strength.

Together, these studies provide data for 897 women, with the Fleming<sup>47</sup> and Gordon and Logue<sup>48</sup> studies using small, nonrepresentative samples of women. The data suggest that pelvic floor muscle tone in the 6 months after birth may be a function of the degree of trauma experienced with birth. Beyond 6 months, the degree of regular exercise (pelvic floor and generalized) may play an important role in pelvic floor recovery after childbirth. While further research is warranted to confirm these hypotheses, a dual approach of minimizing genital tract trauma and postdelivery pain, and encouraging postnatal exercise can be supported at this time.

### SUMMARY AND FUTURE RESEARCH DIRECTIONS

The key concepts as developed in this article are summarized [above](#). These items represent the clinical practices best supported by the available research, and are elements of care most likely to promote women's health and comfort, and cause no harm. Taken together, these strategies acknowledge childbirth as a normal physiologic event, and they underscore the importance of nonintervention for women without complications, and women being partners in their own care, all hallmarks of midwifery practice.<sup>49</sup>

Several factors have not been examined for their potential contribution in preventing genital tract trauma in childbirth, including pelvic floor exercises, general exercise, and body mass index. The role of regular pelvic floor (Kegel) exercises in preventing obstetric trauma has not been a research priority. Although assessment of compliance with a study regimen on this topic would be problematic, it is plausible that improved tone of the pelvic floor may aid in reducing childbirth lacerations. The role of general exercise during pregnancy has not been studied for its effect on genital tract trauma. General exercise (walking, running, swimming, dancing, aerobics, etc.) benefits the entire body, including the pelvic floor, and may increase physical stamina and body awareness when giving birth. Finally, the importance of body mass index and maintaining a healthy weight has not been studied in relation to minimizing childbirth trauma, although women in the United States are heavier than in previous decades and retrospective analyses have indicated that obesity may be associated with greater genital tract trauma in childbirth.<sup>50</sup> Much remains to be learned about minimizing genital tract trauma in vaginal childbirth.

## REFERENCES

1. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Menacker F, Munson ML. Births: Final data for 2003. National Vital Statistics Reports, vol 54, no 2. Hyattsville, MD: National Center for Health Statistics, 2005.
2. Brown S, Lumley J. Maternal health after childbirth: Results of an Australian population based survey. *Br J Obstet Gynaecol* 1998;105:156–61.
3. Glazener CMA, Abdallah M, Stroud P, Naji S, Templeton A, Russell IT. Postnatal maternal morbidity: Extent, causes, prevention and treatment. *Br J Obstet Gynaecol* 1997;104:330–5.
4. Thompson JF, Roberts CL, Currie M, Ellwood DA. Prevalence and persistence of health problems after childbirth: Associations with parity and method of birth. *Birth* 2002;29:83–94.
5. Lydon-Rochelle MT, Holt VL, Martin DP. Delivery method and self-reported postpartum general health status among primiparous women. *Paediatr Perinatal Epidemiol* 2001;15:232–40.
6. Borders N. After the afterbirth: A critical review of postpartum health relative to method of delivery. *J Midwifery Womens Health* 2006;51:242–8.
7. Weeks JD, Kozak LJ. Trends in the use of episiotomy in the United States 1980–1998. *Birth* 2001;28:152–60.
8. DeFrances CJ, Hall MJ, Podgornik MN. 2003 National Hospital Discharge Survey. Advance data from vital and health statistics; no 359. Hyattsville, MD: National Center for Health Statistics, 2005.
9. Albers L, Garcia J, Renfrew M, McCandlish R, Elbourne D. Distribution of genital tract trauma in childbirth and related postnatal pain. *Birth* 1999;26:11–5.
10. Macarthur AJ, Macarthur C. Incidence, severity, and determinants of perineal pain after vaginal delivery: A prospective cohort study. *Am J Obstet Gynecol* 2004;191:1199–204.
11. Eason E, Feldman P. Much ado about a little cut: Is episiotomy worthwhile? *Obstet Gynecol* 2000;95:616–8.
12. Shipman MK, Boniface DR, Tefft ME, McCloghry F. Antenatal perineal massage and subsequent perineal outcomes: A randomized trial. *Br J Obstet Gynaecol* 1997;104:787–91.
13. Labrecque M, Eason E, Marcoux S, Lemieux F, Pinault JJ, Feldman P, et al. Randomized controlled trial of prevention of perineal trauma by perineal massage during pregnancy. *Am J Obstet Gynecol* 1999;180:593–600.
14. Share With Women. Perineal massage. *J Midwifery Womens Health* 2005;50:63–4.
15. Renfrew MJ, Hannah W, Albers L, Floyd E. Practices that minimize trauma to the genital tract in childbirth: A systematic review. *Birth* 1998;25:143–60.
16. Sampselle CM, Hines S. Spontaneous pushing during birth: Relationship to perineal outcomes. *J Nurse-Midwifery* 1999;44:36–9.
17. Simpson KR, James DC. Effects of immediate versus delayed pushing during second stage labor on fetal well-being: A randomized controlled trial. *Nurs Res* 2005;54:149–57.
18. Schaffer JI, Bloom SL, Casey BM, McIntire DD, Nihira MA, Leveno KJ. A randomized trial of the effects of coached vs uncoached maternal pushing during the second stage of labor on postpartum pelvic floor structure and function. *Am J Obstet Gynecol* 2005;192:1692–6.
19. Albers LL, Sedler KD, Bedrick EJ, Teaf D, Peralta P. Factors related to genital tract trauma in normal spontaneous vaginal births. *Birth* 2006;33:94–100.
20. Anim-Somuah M, Smyth R, Howell C. Epidural versus non-epidural or no analgesia in labour. The Cochrane Database of Systematic Reviews 2005, Issue 4. Art No: CD000331. DOI: 10.1002/14651858.CD000331.pub2.
21. Roberts CL, Torvaldsen S, Cameron C, Olive E. Delayed versus early pushing in women with epidural analgesia: A systematic review and meta-analysis. *Br J Obstet Gynaecol* 2004;111:1333–40.
22. Declercq ER, Sakala C, Corry MP, Applebaum S, Risher P. Listening to mothers: Report of the first national U.S. survey of women's childbearing experiences. New York: Maternity Center Association, 2002.
23. Gupta JK, Hofmeyr GJ, Smyth R. Position in the second stage of labour for women without epidural anaesthesia. The Cochrane Database of Systematic Reviews 2004, Issue 1. Art No: CD002006.pub2. DOI: 10.1002/14651858.CD002006.pub2.
24. Shorten A, Donsante J, Shorten B. Birth position, accoucheur, and perineal outcomes: Informing women about choices for vaginal birth. *Birth* 2002;29:18–27.
25. Soong B, Barnes M. Maternal position at midwife-attended birth and perineal trauma: Is there an association? *Birth* 2005;32:164–9.
26. McCandlish R, Bowler U, van Asten H, Berridge G, Winter C, Sames L, et al. The HOOP study: A randomized controlled trial

of care of the perineum during second stage of normal labour. *Br J Obstet Gynaecol* 1998;105:1262–71.

27. Caroci AS, Riesco MLG. A comparison of “hands off” versus “hands on” techniques for decreasing perineal lacerations during birth. *J Midwifery Womens Health* 2006;51:106–11.

28. Stamp G, Kruzins G, Crowther C. Perineal massage in labour and prevention of perineal trauma: Randomized controlled trial. *Br Med J* 2001;322:1277–80.

29. Albers LL, Sedler KD, Bedrick EJ, Teaf D, Peralta P. Midwifery care measures in the second stage of labor and reduction of genital tract trauma at birth: A randomized trial. *J Midwifery Womens Health* 2005;50:365–72.

30. Carroli G, Belizan J. Episiotomy for vaginal birth. *The Cochrane Database of Systematic Reviews* 1999, Issue 3. Art No: CD000081. DOI: 10.1002/14651858.CD000081.

31. Hartmann K, Viswanathan M, Palmieri R, Gartlehner G, Thorp J, Lohr KN. Outcomes of routine episiotomy: A systematic review. *JAMA* 2005;293:2141–8.

32. Howden NLS, Weber AM, Meyn LA. Episiotomy use among residents and faculty compared with private practitioners. *Obstet Gynecol* 2004;103:114–8.

33. McCandlish R, Sandland D, Horey D, Brocklehurst P. Surgical repair versus non-repair of perineal trauma following vaginal birth. *The Cochrane Database of Systematic Reviews* 2001, Issue 4. Art No: CD003394. DOI: 10.1002/14651858.CD003394.

34. Kettle C, Hillis RK, Jones P, Darby L, Gray R, Johanson R. Continuous versus interrupted perineal repair with standard or rapidly absorbed sutures after spontaneous vaginal birth: A randomized controlled trial. *Lancet* 2002;359:2217–23.

35. Fleming N. Can the suturing method make a difference in postpartum perineal pain. *J Nurse-Midwifery* 1990;4:65–9.

36. Gordon B, Mackrodt C, Fern E, Truesdale A, Ayers S, Grant A. The Ipswich childbirth study: 1. A randomized evaluation of two stage postpartum perineal repair leaving the skin unsutured. *Br J Obstet Gynaecol* 1998;105:435–40.

37. Mackrodt C, Gordon B, Fern E, Ayers S, Truesdale A, Grant A. The Ipswich childbirth study: 2. A randomized comparison of polyglactin 910 with chromic catgut for postpartum perineal repair. *Br J Obstet Gynaecol* 1998;105:441–5.

38. Grant A, Gordon B, Mackrodt C, Fern E, Truesdale A, Ayers S. The Ipswich childbirth study: One year follow-up of alternative

methods used in perineal repair. *Br J Obstet Gynaecol* 2001;108:34–40.

39. Kettle C, Johanson RB. Absorbable synthetic versus catgut suture material for perineal repair. *The Cochrane Database of Systematic Reviews* 1999, Issue 4. Art No: CD000006. DOI: 10.1002/14651858.CD000006.

40. Greenberg JA, Lieberman E, Cohen AP, Ecker JL. Randomized comparison of chromic versus fast-absorbing polyglactin 910 for postpartum perineal repair. *Obstet Gynecol* 2004;103:1308–13.

41. Hay-Smith EJC. Therapeutic ultrasound for postpartum perineal pain and dyspareunia. *The Cochrane Database of Systematic Reviews* 1998, Issue 3. Art No: CD000495. DOI: 10.1002/14651858.CD000495.

42. Hedayati H, Parsons J, Crowther CA. Topically applied anaesthetics for treating perineal pain after childbirth. *The Cochrane Database of Systematic Reviews* 2005, Issue 2. Art No: CD004223.pub2. DOI: 10.1002/14651858.CD004223.pub2.

43. Peter EA, Janssen PA, Grange CS, Douglas MJ. Ibuprofen versus acetaminophen with codeine for the relief of perineal pain after childbirth: A randomized controlled trial. *Can Med Assoc J* 2001;165:1203–9.

44. Hedayati H, Parsons J, Crowther CA. Rectal analgesia for pain from perineal trauma following childbirth. *The Cochrane Database of Systematic Reviews* 2003, Issue 3. Art No: CD003931. DOI: 10.1002/14651858.CD003931.

45. Glazener CMA. Sexual function after childbirth: women’s experiences, persistent morbidity and lack of professional recognition. *Br J Obstet Gynaecol* 1997;104:330–5.

46. Klein MC, Gauthier RJ, Robbins JM, Kaczorowski J, Jorgensen SH, Franco ED, et al. Relationship of episiotomy to perineal trauma and morbidity, sexual dysfunction, and pelvic floor relaxation. *Am J Obstet Gynecol* 1994;171:591–8.

47. Fleming N, Newton ER, Roberts J. Changes in postpartum perineal muscle function in women with and without episiotomies. *J Midwifery Womens Health* 2003;48:53–9.

48. Gordon H, Logue M. Perineal muscle function after childbirth. *Lancet* 1985;2:123–5.

49. American College of Nurse-Midwives. The core competencies for basic midwifery practice. *J Midwifery Womens Health* 2002;47:403–6.

50. Albers LL, Greulich B, Peralta P. Body mass index, midwifery intrapartum care, and childbirth lacerations. *J Midwifery Womens Health* 2006;51:249–53.