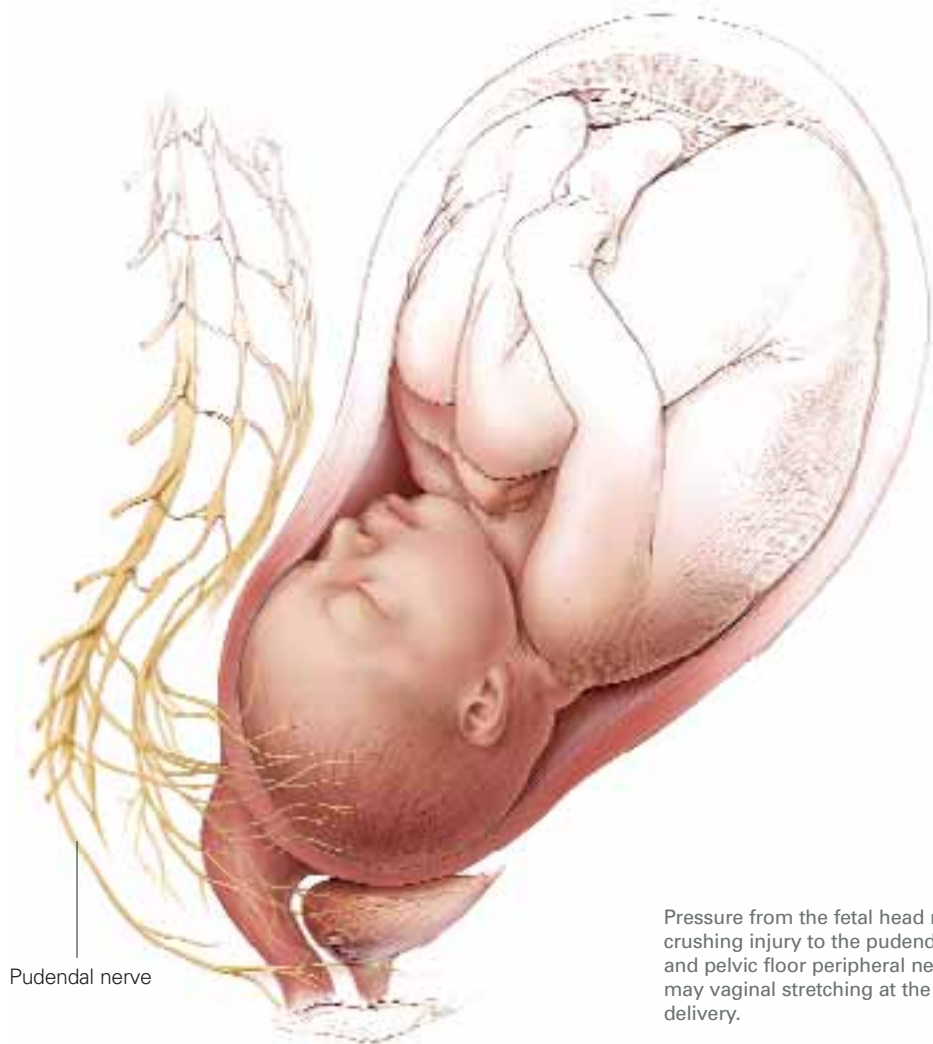


K.L. Calvert, MD

Specialist Registrar, Department
of Obstetrics and Gynecology
Cheltenham General Hospital
Cheltenham, England

Rachel E. Liebling, MD

Specialist Registrar, Department
of Obstetrics-Gynecology
and Women's Health,
Royal United Hospital,
Bath, England



Pudendal nerve

Pressure from the fetal head may cause crushing injury to the pudendal nerves and pelvic floor peripheral nerves, as may vaginal stretching at the time of delivery.

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CASE-BASED LEARNING

When does vaginal delivery invite incontinence?

Cesarean or no cesarean, only a few factors can reduce risk of pelvic floor damage, and not all are controllable. What to counsel the worried, incontinent gravida.

MARISOL'S CASE

Pregnant and incontinent

Marisol, a 32-year-old physiotherapist expecting her second child, presents to your antenatal clinic at 20 weeks' gestation. She complains of urinary incontinence, which has been worsening throughout this pregnancy, and wants to know what can be done about it.

How do you respond?

The bad news is that Marisol's complaints are not uncommon. The good news: Detailed evaluation and considered discussion can help reveal the full extent of her symptoms and shed light on how to proceed, though, in some cases, your options may be limited. Since we are in the early stages of understanding pelvic floor dysfunction related to pregnancy and childbirth, giving clear advice and guidance can

IMAGE: KIMBERLY MARTENS

sometimes be difficult. The starting point here, as in any case involving urinary symptoms, is a detailed history to pin down the cause of the patient's complaints.

In women, urinary incontinence generally stems from overactive bladder or urethral sphincter incompetence; the latter is generally acquired through pregnancy and childbirth.¹ Other causes or contributors include vascular disease, connective tissue disorders, spinal cord injury, and neurological complaints such as multiple sclerosis.

SYMPTOMS PRECEDE PREGNANCY.

Marisol reports that she leaks urine when she coughs or laughs, and experiences incontinence most days. She recalls having had stress incontinence before her first pregnancy, though it was not severe until she became pregnant. At present, it is worst when she has to push her first child in a stroller, especially uphill, though she has no problems holding on when her bladder is full. She usually has to urinate once during the night. In addition, as the current pregnancy has progressed, she has developed increasing frequency.

These symptoms suggest stress incontinence as the primary pathology rather than overactive bladder. Although frequency usually is linked to overactive bladder, it is common during pregnancy and is not necessarily a sign of detrusor instability.

Marisol's incontinence may have been exacerbated by disruption of her pelvic floor muscles, connective tissue, and nerve supply in the first pregnancy. To be certain, however, we need to continue exploring her general medical history and risk factors.

PREVIOUS FORCEPS DELIVERY.

Marisol is of normal weight, doesn't smoke, and lacks any notable medical history. Her first delivery was by forceps after an 18-hour labor. The baby weighed 3.6 kg (7 lb 15 oz).

In nulligravid women, incontinence has a prevalence of 3% to 22%, but it rises to 35% to 65% antenatally.²⁻⁴

This incontinence usually resolves postpartum, with only 13% to 30% of women reporting persistent symptoms at 3 months.^{3,4} These symptoms may be related to:

- increasing parity (particularly 4 or more deliveries),
- increased maternal age at first delivery,
- maternal obesity,
- prolonged second stage,
- increased fetal head circumference,
- episiotomy,
- instrumental delivery (especially forceps), and
- constipation 4 to 8 weeks postpartum.^{2,5-8}

However, the evidence for the potential role of these factors is not always clear.^{2,4,8}

Postnatal incontinence is more frequent in women delivered by cesarean than in nulliparous women; nevertheless, both groups have lower rates than parous women who deliver their infants vaginally.

Why pregnancy increases incontinence

Pudendal nerves and pelvic floor peripheral nerves, such as the nerves leading to the levator ani, are thought to be vulnerable to crushing injury due to pressure from the fetal head in the pelvis, not to mention stretching injuries at delivery.⁵

In a study of nerve function before and after labor, pudendal nerve terminal motor latency (PNTML) did not increase in pregnant, nonlaboring women.⁹ This finding supports the theory that labor and delivery are the principal times of nerve injury, rather than pregnancy per se. However, PNTML increases only when large and heavily myelinated axons of the pudendal nerve are damaged, and not if only smaller nerve fibers are affected. This means women can have neurologic pelvic floor dysfunction but have normal findings.

Other incriminating factors

Animal studies suggest that vaginal distension can diminish blood flow to the blad-

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Women can have neurologic pelvic floor dysfunction yet have normal findings

der, leading to hypoxia of the bladder, urethra, and vagina.¹⁰

In addition, bladder neck mobility 45 to 60 days after delivery is greater in women who deliver vaginally than in those who undergo cesarean section, with greater displacement of the urethrovesical junction—and, therefore, disruption of one of the anatomical mechanisms that maintain continence.¹¹

What imaging and histology reveal

Magnetic resonance imaging (MRI) detects visible defects in the levator ani muscle in 20% of primiparous women, generally in the pubovisceral portion of the muscle.¹² These defects are not found in nulliparous women.

However, MRI has not been widely applied during pregnancy—only after delivery. Thus, the extent of damage caused by downward pressure during pregnancy—as opposed to damage caused by delivery itself—is difficult to determine.

Cadaveric dissection reveals that many muscle fibers in the levator ani muscles are replaced by fibrosis in women who have delivered vaginally.⁵

Damage can extend beyond the urinary tract

So far, the discussion has centered on urinary symptoms, but pelvic floor dysfunction involves a triad of symptoms: urinary incontinence, fecal incontinence, and pelvic organ prolapse. There is a strong association between the 3.¹³

Since women may not volunteer information about these symptoms without prompting, it is important to ask specifically about them.

NO FECAL SYMPTOMS

Marisol says she has no fecal incontinence, but she does admit to occasional incontinence of flatus. However, this symptom improved with postpartum pelvic floor exercises after her first delivery and does not trouble her. She reports normal sexual function and no symptoms of pelvic organ prolapse.

It is reassuring that Marisol has no significant fecal symptoms, since evidence suggests that the first delivery carries the highest risk.^{14,15} Up to 25% of primiparous women experience altered fecal continence after delivery; that figure increases to 50% when identifiable sphincter injury occurs.^{16,17} This is not the complete picture, however.

Mechanisms of injury. Fecal incontinence is thought to occur primarily through direct injury to the anal sphincter, though injury to the pudendal nerves is also indicated. The incidence of sphincter injury detected at the time of delivery ranges from 1% to 24% and is highly dependent on the observer's level of training.¹⁶

Risk factors for both overt and occult sphincter injury include forceps delivery, prolonged second stage, large infants, midline episiotomy, and occipitoposterior positions.

Although cesarean section is entirely protective against overt sphincter trauma, it is thought to prevent fecal incontinence in the short term only, since the prevalence of incontinence 30 years after delivery is similar among women delivered vaginally or by cesarean.

Ultrasound reveals anal sphincter defects

Postnatal endoanal ultrasound reveals defects in the anal sphincter in 35% of primiparous women who deliver vaginally and up to 44% of multiparous patients, even in the absence of identifiable trauma.¹⁶ Since most of these women are asymptomatic, the significance of this finding may seem questionable; after all, it is function that matters to the patient.

Women may develop problems as they age, however, since the prevalence of fecal incontinence in the general population rises with age, reaching 13 per 1,000 in women over 65.

The incidence in 45-year-old women is 8 times higher than in men the same age, suggesting that childbearing plays an important role, even when injury is not recognized at delivery.

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30 years after delivery, fecal incontinence is equally prevalent among women who delivered vaginally or by cesarean

SHE'S WORRIED

Marisol says her main concern is preventing further deterioration. She wonders if more testing would be of any benefit.

Although urodynamic studies provide useful insights into the underlying pathology, they are invasive and unpleasant for the patient. They also have questionable reliability in the pregnant patient, since normal bladder function in pregnancy is not the same as in the nonpregnant state.¹⁵ Other investigations such as PNTML are research tools only.

Endoanal ultrasound may be different, since, theoretically, it can detect existing damage and suggest whether another vaginal delivery might move a woman from asymptomatic to symptomatic. However, fecal symptoms generally deteriorate over decades rather than years. We also lack ultrasound evidence that significant damage occurs in second or higher-order deliveries if none occurred in the first.

Conclusion: We recommend the pragmatic approach. Since further investigation is unlikely to add useful information and would be invasive and unpleasant for Marisol, it is not recommended at this time.

■ Reducing risk: Is it possible?**"SHOULD I HAVE A CESAREAN?"**

Marisol asks what she can do to decrease her risk of incontinence over the long term. She wants to know whether a cesarean section would help prevent further trauma.

Elective cesarean protects against stress incontinence but not against other urinary or fecal symptoms.^{8,18} Research suggests that 56% of postpartum urinary incontinence follows incontinence during pregnancy and 69.5% follows vaginal delivery.¹⁹ However, Foldspang et al¹⁹ did not examine the contribution made by prepregnancy incontinence. This study found no proof that cesarean section lowers the risk of postpartum urinary incontinence.

Some investigators argue that avoidance of labor—and not cesarean section per se—protects against pelvic floor damage. Cesarean at full dilatation carries a lower risk of urinary symptoms and dyspareunia at 1 year than does instrumental vaginal delivery, but is not risk-free.²⁰

Women themselves tend to favor vaginal delivery even after experiencing the morbidity associated with instrumental delivery.²¹ Thus, it is difficult to recommend a blanket policy of immediate cesarean, rather than attempted instrumental delivery, when assisted delivery is necessary at full dilatation.

Cesarean on demand

This issue has sparked debate around the world among the obstetric community and women's health groups. The World Health Organization recommends a cesarean rate of 10% to 15% or less, although the current averages of 21% in the UK and 26.1% in the United States are far above this cutoff.^{22,23}

US data indicate that primary elective cesarean at the patient's request now comprises 4% to 18% of all cesareans and 14% to 22% of elective cesareans.²⁴ Almost two thirds of American obstetricians say they are willing to perform cesarean section on request, citing decreased risk of pelvic floor or fetal injury, maintained sexual function, and convenience as reasons.

5 to 9 repeat cesareans pose no more risk than 3 or 4

Cesarean raises the potential morbidity and health-care costs exponentially, is the argument often raised against cesarean on demand. However, recent research suggests that higher-order (5 to 9) repeat cesareans pose no additional risk to the mother or baby compared with lower-order (3 or 4) repeat cesareans.²⁵

Greater risk of rupture. The rate of uterine rupture and dehiscence after 1 cesarean is 1%, compared with 2% to 4% in higher-order repeat cesareans.²⁶

Higher rates of placental abnormalities have been reported with multiple cesareans:

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Elective cesarean protects only against stress incontinence—not other urinary or fecal symptoms

10% for placenta previa and 69% for placenta accreta.²⁷

Conclusion: No evidence. These concerns may not seem relevant to Marisol, whose future childbearing is uncertain. However, after counseling about the risks and benefits of elective cesarean in her particular case, Marisol must be the one to ultimately decide for or against it, since we lack evidence of its medical benefit.

WHAT ARE HER PROSPECTS?

Marisol asks if there is anything she can do during the rest of her pregnancy and at the time of delivery to reduce her risk of worsening symptoms. She is concerned about both short-term and long-term prospects.

Which women face a higher risk of persistent urinary incontinence in the long term? Not surprisingly, it is those who had urinary incontinence prior to pregnancy.

Eason et al⁴ found that the number of women experiencing incontinence 3 months postpartum (31%) was virtually identical to the number of parous women reporting incontinence prior to the index pregnancy (32%), suggesting that women with incontinence after pregnancy are unlikely to experience any significant degree of recovery in the long term.

Eason et al⁴ also found an extremely low risk of incontinence arising postpartum in women who had not suffered this symptom antenatally, suggesting the effect of delivery may have been overstated.

The lucky few. In short, urinary continence is a state enjoyed by few pregnant women, suggesting that these lucky individuals are at low risk of urinary incontinence regardless of the circumstances or insults to their pelvic floors.

Multiparity and long-term risk

Multiparity is thought to be a risk factor for long-term urinary incontinence. New onset of urinary incontinence during pregnancy is more common in parous than in nulliparous women.⁴ Single-fiber electromyography has shown increased nerve-

fiber density in multiparous subjects.²⁸ This points to previous nerve injury with successful small-fiber reinnervation. The fact that this finding is most striking in multiparous women suggests a cumulative effect of multiple insults to the pelvic floor.

It is not possible to predict which women will become incontinent using other criteria such as body mass index, weight gain during pregnancy, or factors that may relate to connective tissue properties, such as hair color or stretch marks.⁴

Pelvic floor exercises aren't cheap

Since it is difficult to predict which women will experience long-term pelvic floor dysfunction and damage, researchers have attempted to lower global risk by introducing putative protective measures to the whole population. Pelvic floor exercises are a prominent example. Though they have been shown to decrease the risk of postpartum urinary incontinence,¹⁷ they must be employed by all pregnant women to achieve the maximum results observed.⁴

Pelvic floor exercises have also been associated with fewer cases of active pushing in the second stage of labor lasting longer than 60 minutes,²⁹ perhaps because of greater pelvic floor health. These exercises are best taught in a structured way by trained individuals, and biofeedback improves their efficacy. These requirements make this an expensive intervention. **Marisol might be an exception.** Presumably she is performing the exercises correctly, as she is herself a physiotherapist, although it would be useful to ascertain her degree of expertise in this particular field.

Even with well-taught pelvic floor exercises, long-term benefit has not been demonstrated. Any benefit found 1 year after delivery is lost by 6 years.³⁰ (That may be because only half the women were still doing the exercises at 6 years.)

Lowering risk during delivery itself

Only a few factors can be modified to reduce the risk of pelvic floor damage, and not all of them are within the patient's control.

Fetal positioning. Optimal fetal positioning,

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The effect of delivery on incontinence has perhaps been overstated

as practiced by the mother in the antenatal period, may decrease the incidence of occipitoposterior positions at term. The theory is that the fetus will naturally settle into a “hammock” position formed by the mother’s body. If the woman spends a great deal of time sitting or lying back, the fetus will settle into an occipitoposterior position. If she spends more time leaning forward or on all fours, the “hammock” will be the other way around, and the fetus will be inclined to assume an occipitoanterior position. High-quality evidence for this practice is lacking.

Duration of labor. Longer labors have been associated with greater risk of pelvic floor damage—and this aspect may be amenable to intervention. For example, if the patient can avoid epidural anesthesia, she may be able to shorten labor, as epidurals can prolong the second stage.³¹

Instrumental delivery. The patient can state her intention of avoiding instrumental delivery if at all possible, although it may still be necessary for specific indications such as fetal distress.

Research has shown a higher risk of pelvic floor dysfunction with attempted instrumental delivery, compared with emergency cesarean section at full dilatation; thus, a prelabor decision to proceed directly to cesarean rather than attempt a potentially difficult delivery may be advisable.²⁰ This is a difficult decision to make, however. Hopefully, this situation is unlikely to arise in a multiparous patient who has already achieved 1 vaginal delivery.

Avoid routine episiotomy. Though episiotomy was thought to protect against perineal trauma when tearing is imminent at the time of delivery, research indicates this may not be the case.³² (See, for example, Examining the Evidence, page 15.)

Episiotomy also has been associated with diminished pelvic floor muscle strength, compared with spontaneous perineal lacerations.³³

Other factors with protective potential. Some recommendations may reduce the overall risk of incontinence in the long term in the general population, though they do not apply in Marisol’s case. For

example, weight reduction in moderately obese women can reduce the risk of urinary symptoms.³⁴

Chronic cough also increases the risk of pelvic floor dysfunction and prolapse, particularly among older women,¹³ so smoking cessation should be recommended.

Selecting the mode of delivery in a case like Marisol’s involves weighing her risks and desires with your expertise. No clear evidence is available to guide the way. This makes judicious counseling about the short- and long-term risks of conservative management and surgical delivery doubly important.

DID PRIOR DELIVERY DO DAMAGE?

Marisol’s final question concerns her first delivery. She feels she was inadequately counseled and wants to know whether delivery by cesarean would have protected her from her current symptoms.

In a prospective cohort study, Eason and colleagues⁴ found that 93.4% of women undergoing abdominal delivery remained continent postpartum, whereas 20.6% of women delivering vaginally lost urinary continence. However, Marisol’s symptoms predated the initial pregnancy.

The Term Breech Trial³⁵ found no significant differences in maternal outcomes, including incontinence and sexual function, between the planned cesarean and planned vaginal delivery groups. However, the high crossover from planned vaginal delivery to delivery by cesarean suggests this evidence should be interpreted with caution. Cesarean delivery comes with its own set of complications and long-term problems.

Counsel all women about the risks of vaginal delivery?

This is a thorny question. As the body of evidence increases on the long-term effects of pregnancy and delivery, these issues are entering the public domain. We may be approaching a time when the specter of litigation influences how we counsel women about the risks of natural childbirth. How this change will be viewed by

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Pelvic floor injury is more likely with attempted forceps delivery than with emergent c-section at full dilatation

women's health groups—some of which already perceive the health-care system as overmedicalizing a natural event—can only be imagined. ■

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**Term Breech Trial:
No differences
in incontinence
and sexual function
between planned
cesarean and
planned vaginal
delivery**